WELCOME TO SHORTER COLLEGE MATHEMATICS AND COMPUTER SCIENCE DEPARTMENT MATHEMATICS LAB

**Introduction**

**The Mathematics Laboratory is a unique room or place, with relevant and Up-to-date equipment known as instructional materials, designated for the teaching and learning of mathematics and other scientific or research work, whereby a trained and professionally qualified person (mathematics Instructor) readily interact with learners(students) on specified set of instructions.**

**Mathematics lab is a practical oriented classroom for the effective teaching and learning of mathematics. It is designed to make mathematics real. It is a “laboratory method” which provides opportunity to the learners to abstract mathematical ideas through their own experiences, that is to relate symbol to realities. It is a place where students can learn and explore mathematical concepts and verify mathematics facts and theorem through a variety of activities using different materials. The activities may be carried out by the teacher or the students to explore, to learn, to stimulate interest and develop favorable attitude towards mathematics. It is uncommon in our schools today possibly as a result of lack of fund or the absence of any government policy on the provision of such laboratory facilities. I believe that its non-existence in our schools is one of the major contributory factors to mass failure in mathematics.**

**The benefits of Mathematics laboratory include the following:**

1. **Permits students to learn abstract concepts through concrete experiences and thus increase their understanding of those ideas.**
2. **Enables students to personally experience the joy of discovering principles and relationships.**
3. **Arouses interest and motivates learning.**
4. **Cultivates favorable attitudes towards mathematics.**
5. **Enriches and varies instructions.**
6. **Encourages and develops creative problems solving ability.**
7. **Allows for individual differences in manner and speed at which students learn.**
8. **Makes students to see the origin of mathematical ideas and participates in “mathematics in the making”.**
9. **Allows students to engage in the doing rather than being a passive observer or recipients of knowledge in the learning process.**
10. **Allows students with learning disabilities the time and support needed to be successful in mathematics**
11. **Assists students with memory deficits by allowing the repetition of material and provides continuous practice formats**
12. **Allows and encourages students to think, discuss with each other and the teacher and assimilate the concepts in a more effective manner**

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**desk Tutorial**

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| **Tips on How to Succeed in a Math Class**  **Yes, You Can Learn Math!!!** |

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| Note that these tips were written by Kim Seward and revised by A.P. 'Sissy' Campbell, tutor coordinator and counselor for Student Support Services at WTAMU, and Kim Seward. |

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| **Get a “can do” attitude:**   |  | | --- | | If you can do it in sports, music, dance, etc., you can do it in math!  Try not to let fear or negative experiences turn you off to math. | |

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| **Practice a little math every day:**   |  | | --- | | It helps you build up your confidence and move your brain away from the panic button at test time. | |

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| **Take advantage of your math class:**   |  | | --- | | If you are a college or high school student, realize that most colleges and universities require at least college algebra for any bachelor's degree.  Some classes, like chemistry, nursing, statistics, etc. will require some algebra skills to succeed in them.  If you are getting a bachelor's degree, then chances are you are going for a professional job. Most professional jobs require at least some math. Granted, some more than others, but nonetheless math (problem solving, numbers, etc...) is everywhere. **So, make sure that you embrace your math experience and make the most of it.** | |

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| **Get help outside the classroom:**   |  | | --- | | * **Go to your instructor’s office**for extra help during office hours or by appointment. * **See if your school has any tutors in math.**   SC, we offer free one-on-one tutoring to all SC students in a variety of subjects including math   **Located on campus**: Student Success Center and Rooms 206 and 207 Sherman Building | |

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| **Attend class full time:**   |  | | --- | | Math is a sequential subject.  That means that what you are learning today builds on what you learned yesterday.  Even problems based on a new math concept will need some old skills to work them.  (Think: Can you work problems with fractions if you don’t know the multiplication tables?) | |

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| **Keep up with the homework:**   |  | | --- | | It sounds simple but your time is limited, you have a job to go to, etc.  Think of it this way: No homework, no learning.  Homework helps you practice the applications of math concepts.  It’s like learning how to drive: the longer you practice, the better your driving skills become and the more confidence you will have on the road.  If you only read the driver’s manual, you’ll never learn to drive with confidence and skill.  We suggest you try some of the unassigned problems, too, for extra practice. | |

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| **Try to understand the math problems:**   |  | | --- | | When you work homework problems, ask yourself what you are looking for and how you are going to get there.  Don’t just follow the example.  Work the problem step-by-step until you know why you are doing what you are and have arrived at the solution.  If you follow the what, how, and whys, you’ll know what to do when you see a similar problem later. | |

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| **Use index cards to study tests:**   |  | | --- | | Here’s how you do that: When studying for a test, make sure you can understand the problems on each math concept as well as work them.  Then make the index cards with problems on them.  Mix the index cards (yes, shuffle the cards to mix them up) and set the timer.  Start working the problems in each card as it is dealt to you.  Oh, yeah, hide your textbook!  This will simulate a math test taking experience. | |

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| **Ask questions in class:**   |  | | --- | | Don’t be ashamed to ask questions.  The instructor WILL NOT make fun of you.  In fact, at least one other person may have the same question. | |

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| **Ask questions outside of class:**   |  | | --- | | Like most people, you don’t want to ask questions in class, OR you think of a question too late.  Then go to the instructor’s office and ask away. | |

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| **Check homework assignments:**   |  | | --- | | Make sure that when you get your graded homework back you look over what you got right as well as what you missed. | |

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| **Pay attention in class:**   |  | | --- | | Math snowballs.  If you don’t stay alert to the instructor’s presentation, you may miss important steps to learning concepts.  Remember, today’s information sets the foundation for tomorrow’s work. | |

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| **Don’t talk in class:**   |  | | --- | | If you have questions, please ask the instructor.  The information you get from classmates may be mathematically wrong!  And if it isn’t related to math info for this class, save it for outside the classroom. | |

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| **Read the math textbook and study guide:** |

**Practice exercises on Statistics and Mathematics. (Test bank)**







BEGINNING ALGEBRA

**desk Learning Objectives**

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| After completing this tutorial, you should be able to:   1. Use the definition of exponents. 2. Simplify exponential expressions involving multiplying like bases, zero as an exponent, dividing like bases, raising a base to two exponents, raising a product to an exponent and raising a quotient to an exponent. |

**Introduction**

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| This tutorial covers the basic definition and some of the rules of exponents.  The rules it covers are the product rule, quotient rule, power rule, power of a product rule and power of a quotient rule as well as the definitions for zero and negative exponents. Exponents are everywhere in algebra and beyond.  Let's see what we can do with exponents. |

**Tutorial**

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| **Definition of Exponents**  exponents (note there are*n*x’s in the product)  *x = base, n = exponent* |

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| **Exponents are another way to write multiplication.**  The exponent tells you how many times a base appears in a PRODUCT.    **Example 1:**Evaluate example 1a. |

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| example 1b | **\*Write the base 1/4 in a product 3 times** **\*Multiply** |

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| **Example 2:**Evaluate example 2a. |

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| example 2b | **\*Write the base -6 in a product 2 times** **\*Multiply** |

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| Note how I included the - when I expanded this problem out.  If the - is inside the ( ) of an exponent, then it is included as part of the base. |

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| **Example 3:**Evaluate example 3a. |

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| example 3b | **\*Negate 6 squared** **\*Put a - in front of 6 written in a product 2 times** **\*Multiply** |

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| Hey, this looks a lot like example 2!!!!  It may look alike, but they ARE NOT exactly the same.  Can you see the difference between the two??  Hopefully, you noticed that in example 2, there was a ( ) around the - and the 6.  In this problem, there is no -.  This means the - is NOT part of the base, so it will not get expanded like it did in example 2.  It is interpreted as finding the negative or opposite of 6 squared. |

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| **Multiplying Like Bases with Exponents** **(The Product Rule for Exponents)**  **Specific Illustration** |

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| **Let’s first start by using the definition of exponents to help you to understand how we get to the law for multiplying like bases with exponents:**  multiplying exponents  Note that 2 + 3 = 5, which is the exponent we ended up with.  We had 2 *x*’s written in a product plus another 3*x*’s written in the product for a total of 5 *x*’s in the product.  To indicate that we put the 5 in the exponent.  **Let's put this idea together into a general rule:** |

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| **Multiplying Like Bases with Exponents** **(The Product Rule for Exponents)**  ***in general,***  multiplying exponents |

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| In other words, **when you multiply like bases you add your exponents**.  **The reason is, exponents count how many of your base you have in a product, so if you are continuing that product, you are adding on to the exponents.** |

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| **Example 4:**Use the product rule to simplify the expression example 4a. |

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| example 4b | **\*When multiplying like bases you add your exponents** |

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| **Example 5:**Use the product rule to simplify the expression example 5a. |

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| example 5b | **\*When multiplying like bases you add your exponents** |

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| **Zero as an exponent**  zero exponent |

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| **Except for 0, any base raised to the 0 power simplifies to be the number 1.**  Note that the exponent doesn’t become 1, but the whole expression simplifies to be the number 1.    **Example 6:**Evaluate example 6a. |

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| example 6b | **\*Any expression raised to the 0 power simplifies to be 1** |

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| **Example 7:**Evaluate example 7a. |

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| Be careful on this example. The order of operations shown in Tutorial 4: Introduction to variable Expressions and Equation; says to evaluate exponents before doing any multiplication.  This means we need to find *x*raised to the 0 power first and then multiply it by 3. |

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| example 7b | **\**x*raised to the 0 power is 1** **\*Multiply by 3 gives 3** |

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| **Dividing Like Bases with Exponents** **(Quotient Rule for Exponents)**  **Specific Illustration** |

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| **Let’s first start by using the definition to help you to understand how we get to the law for dividing like bases with exponents:** |

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| **Dividing Like Bases with Exponents** **(Quotient Rule for Exponents)**  ***in general,*** |

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| **In other words, when you divide like bases you subtract their exponents.**  Keep in mind that you always take the numerator’s exponent minus your denominator’s exponent, NOT the other way around.  **Example 8:**Use the quotient rule to simplify the expression example 8a. |

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| example 8b | **\*When div. like bases you subtract your exponents** |

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| **Example 9:**Use the quotient rule to simplify the expression example 9a. |

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| example 9b | **\*When div. like bases you subtract your exponents** |

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| **Base Raised to Two Exponents** **(Power Rule for Exponents)**  **Specific Illustration** |

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| Let’s first start by using the definitions of exponents as well as the law for multiplying the bases to help you to understand how we get to the law for raising a base to two exponents:  Note how 2 times 3 is 6, which is the exponent of the final answer.   We can think of this as 3 groups of 2, which of course would come out to be 6. |

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| **Base Raised to two Exponents** **(Power Rule for Exponents)**  ***in general,*** |

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| In other words, **when you raise a base to two exponents, you multiply those exponents together.**  Again, you can think of it as *n* groups of *m* if it helps you to remember.  **Example 10:** |

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| In other words, **when you raise a base to two exponents, you multiply those exponents together.**  Again, you can think of it as *n* groups of *m* if it helps you to remember.  **Example 10:**Use the power rule for exponents to simplify the expression:  . |

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|  | **\*When raising a base to 2 powers you mult. your exponents** |

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| **A Product Raised to an Exponent** **(Power of a Product Rule)**  **Specific Illustration** |

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| Let’s first start by using the definition of Exponent to help you to understand how we get to the law for raising a product to an exponent:  products  Note how both bases of your product ended up being raised by the exponent of 3. |

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| **A Product Raised to an Exponent** **(Power of a Product Rule)**  ***in general,***  products |

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| In other words, **when you have a PRODUCT (not a sum or difference) raised to an exponent, you can simplify by raising each base in the product to that exponent.**  **Example 11:**Use the power of a product rule to simplify the expression . |

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|  | **\*When raising a product to an exponent, raise each base of the product to that exponent** |

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| **A Quotient Raised to an Exponent** **(Power of a Quotient Rule)**  **Specific Illustration** |

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| Let’s first start by using the **definition of exponent** to help you to understand how we get to the law for raising a quotient to an exponent:  quotient  Since, division is really multiplication of the reciprocal, it has the same basic idea as when we raised a product to an exponent. |

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| **A Quotient Raised to an Exponent** **(Power of a Quotient Rule)**  ***in general,***  quotient |

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| In other words, **when you have a QUOTIENT (not a sum or difference) raised to an exponent, you can simplify by raising each base in the numerator and denominator of the quotient to that exponent.**  **Example 12:**Use the power of a quotient rule to simplify the expression . |

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|  | **\*When raising a quotient to an exponent, raise each base of the quotient to that exponent**  **\*Use def. of exponents to evaluate** |

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| **Simplifying an Exponential Expression** |

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| **When simplifying an exponential expression, write it so that each base is written one time with one exponent**.  In other words, write it in the most condense form you can.  A lot of times you are having to use more than one rule to get the job done.  As long as you are using the rule appropriately, you should be fine. |

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| **Example 13:**Simplify . |

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|  | **\*When multiplying like bases you add your exponents**    **\*When div. like bases you subtract your exponents** |

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| **Example 14:**Simplify . |

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|  | **\*When raising a product to an exponent, raise each base of the product to that exponent**    **\*When div. like bases you subtract your exponents** |

**Practice Problems**

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| These are practice problems to help bring you to the next level.  It will allow you to check and see if you understand these types of problems. **Math works just like anything else, if you want to get good at it, then you need to practice it.  Even the best athletes and musicians had help along the way and lots of practice, practice, practice, to get good at their sport or instrument.**  In fact, there is no such thing as too much practice.  To get the most out of these, **you should work the problem out on your own and then check your answer by clicking on the link for the answer/discussion for that problem**.  At the link you will find the answer as well as any steps that went into finding that answer. |

**Practice Problems 1a - 1e: Simplify.**

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| 1a. problem 1a | 1b. problem 1b |

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| 1c. problem 1c | 1d. problem 1d |

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| 1e. problem 1e \ |

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| Hey, this looks a lot like example 2!!!!  It may look alike, but they ARE NOT the same.  Can you see the difference between the two??  Hopefully, you noticed that in example 2, there was a parenthesis around the 6.  In this problem, there is no -.  This means the - is NOT part of the base, so it will not get expanded like it did in example 2.  It is interpreted as finding the negative or opposite of 6 squared. |

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| **Multiplying Like Bases with Exponents** **(The Product Rule for Exponents)**  **Specific Illustration** |

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| **Multiplying Like Bases with Exponents** **(The Product Rule for Exponents)**  ***in general,***  multiplying exponents |

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| In other words, **when you multiply like bases you add your exponents**.  **The reason is, exponents count how many of your base you have in a product, so if you are continuing that product, you are adding on to the exponents.** |
| **\*\*\*\*Sets and Elements** |

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| A **set** is a collection of objects.  Those objects are generally called **members** or **elements** of the set. |

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| **Roster Form** |

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| **Roster form just lists out the elements of a set between two set brackets.**For example,   {January, June, July} |

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| **Equal**  **=** |

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| **To notate that two expressions are equal to each, use the symbol = between them.** |

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| **Inequalities**     Not Equal  **Read left to right** *a* < *b*: *a* is less than *b* *a* < *b:* *a* is less than or equal to*b* *a*> *b* : *a* is greater than *b* *a*> *b*:*a*is greater than or equal to*b* |

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| **Mathematical Statement** |

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| **A mathematical statement uses the equality and inequality symbols shown above.  It can be judged either true or false.** |

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| **Natural (or Counting) Numbers**  ***N* = {1, 2, 3, 4, 5, ...}** |

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| Makes sense, we start counting with the number 1 and continue with 2, 3, 4, 5, and so on. |

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| **Whole Numbers**  **{0, 1, 2, 3, 4, 5, ...}** |

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| The only difference between this set and the one above is that **this set not only contains all the natural numbers, but it also contains 0,**whereas 0 is not an element of the set of natural numbers. |

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| **Integers**  ***Z*= {..., -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, ...}** |

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| This set**adds on the negative counterparts to the already existing whole numbers** (which, remember, includes the number 0).  **The natural numbers and the whole numbers are both subsets of integers.** |

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| **Rational Numbers**  ***Q* = {| a and b are integers and }** |

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| In other words, **a rational number is a number that can be written as one integer over another.**  Be very careful. **Remember that a whole number can be written as one integer over another integer.** The integer in the denominator is 1 in that case. For example, 5 can be written as 5/1.  **The natural numbers, whole numbers, and integers are all subsets of rational numbers.** |

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| **Irrational Numbers**  ***I* = {*x* | *x*is a real number that is not rational}** |

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| In other words, an irrational number is a number that cannot be written as one integer over another.  It is a non-repeating, non-terminating decimal.  **One big example of irrational numbers is roots of numbers that are not perfect roots** - for example rootor root. 17 is not a perfect square -**the answer is a non-terminating, non-repeating decimal, which CANNOT be written as one integer over another**.  Similarly, 5 is not a perfect cube. Its answer is also a non-terminating, non-repeating decimal.  **Another famous irrational number is   (pi)**.  Even though it is more commonly known as 3.14, that is a rounded value for pi.  Actually, it is 3.1415927... It would keep going and going and going without any real repetition or pattern. In other words, it would be a non-terminating, non-repeating decimal, which again, cannot be written as a rational number, 1 integer over another integer. |

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| **Real Numbers**  ***R* = {*x*| *x* corresponds to point on the number line}** |

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| **Any number that belongs to either the rational numbers or irrational numbers would be considered a real number. That would include natural numbers, whole numbers and integers.** |

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| **Real Number Line** |

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| Above is an illustration of a number line. **Zero**, on the number line, is called the **origin**.  It separates the **negative numbers (located to the left of 0)** from the **positive numbers (located to the right of 0)**.  I feel sorry for 0, it does not belong to either group.  It is neither a positive or a negative number. |

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| **Order Property for** **Real Numbers** |

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| Given any two real numbers *a* and *b*,  **if *a* is to the left of*b*on the number line, then *a* < *b.***  **If *a* is to the right of *b* on the number line, then *a* > *b*.** |

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| **Absolute Value** |

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| Most people know that when you take the absolute value of ANY number (other than 0) the answer is positive.  But, do you know WHY?  Well, let me tell you why!  The **absolute value of *x*, notated |*x*|, measures the DISTANCE that *x* is away from the origin (0)** on the real number line.  Aha!  Distance is always going to be positive (unless it is 0) whether the number you are taking the absolute value of is positive or negative.  **The following are illustrations of what absolute value means using the numbers 3 and -3:** |

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| **Example 1:**Replace? with <, >, or =.       3?  5 |

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| **Since 3 is to the left of 5 on the number line, then 3 < 5.** |

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| **Example 2:**Replace? with <, >, or =.       7.41?  7.41 |

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| **Since 7.41 is the same number as 7.41, then 7.41 = 7.41.** |

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| **Example 3:**Replace? with <, >, or =.       2.5?  1.5 |

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| **Since 2.5 is to the right of 1.5 on the number line, then 2.5 > 1.5.** |

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| **Example 4:**Is the following mathematical statement true or false?          2 > 7 |

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| **Since 2 is to the left of 7 on the number line, then 2 < 7.**  **Therefore, the given statement is false.** |

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| **Example 5:**Is the following mathematical statement true or false?          5 > 5 |

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| **Since 5 is the same number as 5 and the statement includes where the two numbers are equal, then this statement is true.** |

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| **Example 6:**Write the sentence as a mathematical statement.  2 is less than 5. |

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| **Reading it left to right we get:**  **2 is less than 5** **2 < 5** |

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| **Example 7:**Write the sentence as a mathematical statement.  10 is less than or equal to 20. |

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| **Reading it left to right we get:**  **10 is less than or equal to 20** **10 < 20** |

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| **Example 8:**Write the sentence as a mathematical statement.  -2 is greater than -3. |

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| **Reading it left to right we get:**  **-2 is greater than -3** **-2 > -3** |

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| **Example 9:**Write the sentence as a mathematical statement.  0 is greater than or equal to -1. |

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| **Reading it left to right we get:**  **0 is greater than or equal to -1** **0 >** **-1** |

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| **Example 10:**Write the sentence as a mathematical statement.  5 is not equal to 2. |

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| **Reading it left to right we get:**  **5 is not equal to 2** |

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| **Example 11:**List the elements of the following sets that are also elements of the given set  {-4, 0, 2.5,  , ,, 11/2, 7}  Natural numbers, whole numbers, integers, rational numbers, irrational numbers, and real numbers. |

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| **Natural numbers?** The numbers in the given set that are also natural numbers are  {, 7}.  Note that  simplifies to be 5, which is a natural number. |

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| **Whole numbers**? The numbers in the given set that are also whole numbers are  {0, , 7}. |

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| **Integers?** The numbers in the given set that are also integers are  {-4, 0,, 7}. |

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| **Rational numbers?** The numbers in the given set that are also rational numbers are  {-4, 0, 2.5, , 11/2, 7}. |

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| **Irrational numbers?** The numbers in the given set that are also irrational numbers are  {,  }.  These two numbers CANNOT be written as one integer over another.  They are non-repeating, non-terminating decimals. |

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| **Real numbers?** The numbers in the given set that are also real numbers are  {-4, 0, 2.5, , ,, 11/2, 7}. |

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| **Example 12:**Replace? with <, >, or =.        |-2.5|?   |2.5| |

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| **Since |-2.5| = 2.5 and |2.5| = 2.5, then the two expressions are equal:**  **|-2.5|   =   |2.5|** |

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| **Example 13:**Replace? with <, >, or =.           -3?   |3| |

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| First, |3| = 3.  **Since -3 is to the left of 3 on the number line, then -3 <  |3|.** |

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| **Example 14:**Replace? with <, >, or =.           4? |-1| |

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| First, |-1| = 1  **Since 4 is to the right of 1 on the number line, then 4 > 1.** |

**Practice Problems**

|  |
| --- |
| These are practice problems to help bring you to the next level.  It will allow you to check and see if you understand these types of problems. **Math works just like anything else, if you want to get good at it, then you need to practice it.  Even the best athletes and musicians had help along the way and lots of practice, practice, practice, to get good at their sport or instrument.**  In fact, there is no such thing as too much practice.  To get the most out of these, **you should work the problem out on your own and then check your answer by clicking on the link for the answer/discussion for that problem**.  At the link you will find the answer as well as any steps that went into finding that answer. |

**Practice Problems 1a - 1c: Replace? with < , >, or = .**

|  |  |
| --- | --- |
| 1a. 5 ?  0 | 1b. |

|  |  |
| --- | --- |
| 1c. -2 ?   2 |  |

**Practice Problems 2a - 2b: Is the following mathematical statement true or false?**

|  |  |
| --- | --- |
| 2a.   -3 < -3 | 2b.    2 > 4 |

**Practice Problems 3a - 3c: Write each sentence as a mathematical statement.**

|  |  |
| --- | --- |
| 3a.    - 4 is less than 0. | 3b.    3 is not equal to -3. |

|  |  |
| --- | --- |
| 3c.  5 is greater than or equal to -5. |  |

**Practice Problems 4a - 4f: List the elements of the following set that are also elements of the given set:** **{-1.5, 0, 2, ,  }**

|  |  |
| --- | --- |
| 4a.  Natural numbers | 4b.  Whole numbers |

|  |  |
| --- | --- |
| 4c.  Integers | 4d.  Rational numbers |

|  |  |
| --- | --- |
| 4e.  Irrational numbers | 4f.  Real numbers |

<http://www.artofproblemsolving.com/Videos/index.php?type=prealgebra>

<http://www.artofproblemsolving.com/Videos/index.php?type=introalgebra>

<http://www.artofproblemsolving.com/Videos/index.php?type=minis>

<http://www.artofproblemsolving.com/Videos/index.php?type=amc>

<https://www.cliffsnotes.com/study-guides/basic-math/basic-math-and-pre-algebra>

<https://www.cliffsnotes.com/study-guides/algebra/algebra-i>

[**http://www.sosmath.com/algebra/logs/log2/log2.html#shortcuts**](http://www.sosmath.com/algebra/logs/log2/log2.html#shortcuts)   
This webpage gives the definition of exponents.

***Homework Guidelines for Mathematics***

Mathematics is a language, and as such it has standards of writing which should be observed. In a writing class, one must respect the rules of grammar and punctuation, one must write in organized paragraphs built with complete sentences, and the final draft must be a neat paper with a title. Similarly, there are certain standards for mathematics assignments. Write your **name and class number** clearly at the top of at least the first page, along with the assignment number, the section number(s), or the page number(s). If you are not stapling or paper-clipping the pages together, then put your name (or at least your initials) on all the pages.

Use **standard-sized paper** (8.5" × 11" for North Americans; A4 for others), with no "fringe" running down the side as a result of the paper’s having been torn out of a spiral notebook. Do not use sticky-notes, scented stationery, or other nonstandard types of paper.

Use **standard-weight paper**, not onion skin, construction paper, or otherwise abnormally thin or heavy paper. Attach your pages with a paper clip or staple. **Do not fold, tear, spit on, or otherwise "dog-ear" the pages.** It is better that the pages be handed in loose (with your name on each sheet) than that the corners be folded or shredded. Clearly indicate **the number of the exercise** you are doing. If you accidentally do a problem out of order, or separate one part of the problem from the rest, then include a note to the grader, directing the grader to the missed problem or work. **Write out the original exercise** (except in the case of word problems, which are too long). Do your work in pencil, with mistakes cleanly erased, not crossed or scratched out. If you work in ink, use "white-out" to correct mistakes. **Write legibly (that is, suitably large and suitably dark)**; if the grader can't read your answer, it's wrong. **Write neatly across the page**, with each succeeding problem below the preceding one, not off to the right. Do not work in multiple columns down the page (like a newspaper); your page should contain only one column. **Keep work within the margins**. If you run out of room at the end of a problem, continue onto the next page; do not try to squeeze lines together at the bottom of the sheet. Do not lap over the margins on the left or right; do not wrap writing around the notebook-paper holes. Do not squeeze the problems together, with one problem running into the next. Use sufficient space for each problem, with at least one blank line between the end of one problem and the beginning of the next. **Do "scratch work," but do it on scratch paper**; hand in only the "final draft." Show your steps, but any work that is scribbled in the margins belongs on scratch paper, not on your hand-in homework. **Show your work**. This means showing your steps, not just copying the question from the assignment, and then the answer from the back of the book. Show everything in between the question and the answer. Use complete English sentences if the meaning of the mathematical sentences is not otherwise clear. For your work to be complete, you need to **explain your reasoning** and make your computations clear. For tables and graphs, **use a ruler to draw the straight lines**, and clearly label the axes, the scale, and the points of interest. **Use a consistent scale** on the axes, and do a T-chart, unless instructed otherwise. Also, make your table or graph large enough to be clear. If you can fit more than three or four graphs on one side of a sheet of paper, then you're drawing them too small. Do not invent your own notation and abbreviations, and then expect the grader to figure out what you meant. For instance, do not use "#" in your sentence if you mean "pounds" or "numbers". Do not use the "equals" sign ("=") to mean "indicates", "stands for", "leads to", "is related to", or anything else in a sentence; use actual words. **The equals sign should be used only in equations**, and only to mean "is equal to". **Do not do magic.** Plus/minus signs ("±"), "= 0", radicals, and denominators should not disappear in the middle of your calculations, only to mysteriously reappear at the end. Each step should be complete. If the problem is of the "Explain" or "Write in your own words" type, then copying the answer from the back of the book, or the definition from the chapter, is unacceptable. Write the answer in *your* words, not the text's.

Remember to **put your final answer at the end** of your work, and mark it clearly by, for example, underlining it or drawing a box around it. Label your answer appropriately; if the question asks for measured units, make sure to put appropriate units on the answer. **If the question is a word problem, the answer should be in words.**

**In general, write your homework as though you're trying to convince someone that you know what you're talking about.**

You should use your instructor or grader as a study aid, in addition to the text, study guides, study groups, and tutoring services. Your work is much easier to grade when you have made your work and reasoning clear, and any difficulties you have in completing the assignment can be better explained by the grader. More importantly, however, completely worked and corrected homework exercises make excellent study guides for the Final. Also, if you develop good habits while working on the homework, you will generally perform better on the tests.

In summary, schools today have made the development of essential skills, the provision of significant and meaningful learning experiences, and the development of the workforce some of its primary goals for student success. As such, they want their instructors to guide the students toward a higher level of confidence and competence. In math, that translates into a greater need for clarity in mathematical writing. The intention on these "Homework Guidelines" is that you and your instructor communicate better, and that you succeed both in your present mathematics courses and in future mathematical communication with co-workers and clients.

For further information, review these [examples](https://www.purplemath.com/guidexam.htm) of acceptable and unacceptable solutions, and this [sheet](https://www.purplemath.com/HWformat.pdf) showing neat and messy papers.

**Instructors:** These "Homework Guidelines" are copyrighted by Elizabeth Stapes

***Math Study Skills Self-Survey***

Top of Form



|  |
| --- |
| This study skills survey is designed to help you review your current study habits and perhaps learn new ones. The survey has thirty-three statements divided into five categories. For each statement, choose the response that is closest to your current practices and attitudes. After answering each statement, click the "Get My Grade!" button to see how you did.  *(The questions in this survey were originally designed by* [*Dr. Carolyn Hopper*](https://www.purplemath.com/stdysrvy.htm#credit) *for her text "Practical College Study Skills". Some questions may not apply to the typical high-school student.)* |
| |  |  | | --- | --- | | . | ***Section 1: Selecting a math class*** | | **I schedule my math class for a time when I am mentally sharp.** | | |  | | --- | | always / almost always sometimes almost never never even thought of it | | | **I try to choose a class with the best instructor for me.** | | |  | | --- | | always / almost always sometimes almost never never even thought of it | | | **If I have a choice, I select a math class that meets three or four            days a week, instead of just once or twice.** | | |  | | --- | | always / almost always sometimes almost never never even thought of it | | | **I schedule the next math class as soon as possible after I have            completed the current course.** | | |  | | --- | | always / almost always sometimes almost never never even thought of it | | | **I am sure that I have signed up for the correct level math course.** | | |  | | --- | | always / almost always sometimes almost never never even thought of it | | |
| |  |  | | --- | --- | | . | ***Section 2: Time and place for studying*** | | **I study math every day during the semester.** | | |  | | --- | | always / almost always sometimes almost never never even thought of it | | | **I try to start my homework immediately after math class.** | | |  | | --- | | always / almost always sometimes almost never never even thought of it | | | **I have a specific time to study math.** | | |  | | --- | | always / almost always sometimes almost never never even thought of it | | | **I have a specific place with few distractions to study math.** | | |  | | --- | | always / almost always sometimes almost never never even thought of it | | | **I am careful to keep up-to-date with math homework.** | | |  | | --- | | always / almost always sometimes almost never never even thought of it | | | **I study math eight to ten hours a week.** | | |  | | --- | | always / almost always sometimes almost never never even thought of it | | |
| |  |  | | --- | --- | | . | ***Section 3: Study strategies for the class*** | | **I read my textbook before I come to class.** | | |  | | --- | | always / almost always sometimes almost never never even thought of it | | | **If I have trouble understanding the text, I find an alternate text.** | | |  | | --- | | always / almost always sometimes almost never never even thought of it | | | **I take notes in class.** | | |  | | --- | | always / almost always sometimes almost never never even thought of it | | | **I am careful to copy all the steps of math problems in my notes.** | | |  | | --- | | always / almost always sometimes almost never never even thought of it | | | **I ask questions when I am confused.** | | |  | | --- | | always / almost always sometimes almost never never even thought of it | | | **I go to the instructor or tutor center when I am confused.** | | |  | | --- | | always / almost always sometimes almost never never even thought of it | | | **I try to determine exactly when I got confused            and exactly what confused me.** | | |  | | --- | | always / almost always sometimes almost never never even thought of it | | | **I review my notes and text before beginning the homework.** | | |  | | --- | | always / almost always sometimes almost never never even thought of it | | | **I work problems until I understand them, not just until I get the answers            listed in the back of the book.** | | |  | | --- | | always / almost always sometimes almost never never even thought of it | | | **I use flashcards for formulas and vocabulary.** | | |  | | --- | | always / almost always sometimes almost never never even thought of it | | | **I develop memory techniques to remember math concepts.** | | |  | | --- | | always / almost always sometimes almost never never even thought of it | | |
| |  |  | | --- | --- | | . | ***Section 4: Math tests*** | | **I preview the test before I begin.** | | |  | | --- | | always / almost always sometimes almost never never even thought of it | | | **Before I begin, I make notes on things such as formulas that I might need.** | | |  | | --- | | always / almost always sometimes almost never never even thought of it | | | **I begin with the easy questions first.** | | |  | | --- | | always / almost always sometimes almost never never even thought of it | | | **I take the full amount of time allotted for the test.** | | |  | | --- | | always / almost always sometimes almost never never even thought of it | | | **I carefully check or rework as many problems as I have time to.** | | |  | | --- | | always / almost always sometimes almost never never even thought of it | | | **When I get my tests back, I note the types of mistakes I made:             concept errors, application errors, or careless errors, for example.** | | |  | | --- | | always / almost always sometimes almost never never even thought of it | | | **I keep up-to-date, so I don't have to "cram" the night before the test.** | | |  | | --- | | always / almost always sometimes almost never never even thought of it | | |
| |  |  | | --- | --- | | . | ***Section 5: Anxiety*** | | **I believe that I can succeed in math class.** | | |  | | --- | | always / almost always sometimes almost never never even thought of it | | | **I have study partners in my math class.** | | |  | | --- | | always / almost always sometimes almost never never even thought of it | | | **I take practice tests.** | | |  | | --- | | always / almost always sometimes almost never never even thought of it | | | **I know several good relaxation techniques**. | | |  | | --- | | always / almost always sometimes almost never never even thought of it | | |

Bottom of Form

**SOME** GRE Math. Practice

**Introduction**

|  |
| --- |
| This test is what I call a warm-up test.  It is designed to show you what areas of math you are still needing to work on before you take the real GRE. |

|  |  |
| --- | --- |
| **THE REAL GRE TEST THAT YOU WILL BE TAKING ON THE COMPUTER IS AN ADAPTIVE TEST:**   |  | | --- | | Adaptive means that the level of the questions that you get are dependent on if you answer previous questions correctly or not.  The higher the level of question the higher the overall weight that problem has.  Also note that the design of the test is different from this practice test.  All the problems on this test are on the same page.  On the GRE test you will be taking, one problem at a time will appear on your computer screen.  When a problem appears, you will click on the answer at which point it proceeds to the next problem. | |

**Practice Test I**

|  |
| --- |
| **1.** |

|  |  |
| --- | --- |
| **Column A** https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob1a.gif | **Column B** https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob1b.gif |

|  |
| --- |
| **A)**Column A’s quantity is greater.  **B)**  Column B’s quantity is greater.  **C)**  The quantities are the same.  **D)**  The relationship cannot be determined from the information given. |

|  |
| --- |
| **2.**  *x* and *y* are integers: https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob2.gif |

|  |  |
| --- | --- |
| **Column A** *x* | **Column B** *y* |

|  |
| --- |
| **A)**Column A’s quantity is greater.  **B)**  Column B’s quantity is greater.  **C)**  The quantities are the same.  **D)**  The relationship cannot be determined from the information given. |

|  |
| --- |
| **3.** |

|  |  |
| --- | --- |
| **Column A** .25% of .25 | **Column B** https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob3d.gif |

|  |
| --- |
| **A)**Column A’s quantity is greater.  **B)**  Column B’s quantity is greater.  **C)**  The quantities are the same.  **D)**  The relationship cannot be determined from the information given. |

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| --- |
| **4.**If 25 students in one class had an average of 93% and 20 students from another class had an average of 98%, approximately what is the average in percent of all 45 students? |

|  |
| --- |
| **A)**94  **B)**  97  **C)**  95.5  **D)**  95.2  **E)**  93 |

|  |
| --- |
| **5.**A water treatment plant is built with two cylindrical tanks to contain water for a town.  Each tank has a radius of 10 feet and a depth of 20 feet.  If there are about 7.5 gallons in a cubic foot of water, approximately how many gallons of water can be treated at the plant at any one time? |

|  |
| --- |
| **A)**6280  **B)**  12560  **C)**  94200  **D)**  2000  **E)**  47100 |

|  |
| --- |
| **6.** |

|  |  |
| --- | --- |
| **Column A** Probability of randomly selecting  a given name out of a hat  containing 12 different names. | **Column B** .08 |

|  |
| --- |
| **A)**Column A’s quantity is greater.  **B)**  Column B’s quantity is greater.  **C)**  The quantities are the same.  **D)**  The relationship cannot be determined from the information given. |

|  |
| --- |
| **7.**If https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob7a.gif    what is the value of https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob7b.gif? |

|  |
| --- |
| **A)**-13  **B)**  -6  **C)**  -23  **D)**  23  **E)**  13 |

|  |
| --- |
| **8.** *x* is a positive integer: https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob8a.gif |

|  |  |
| --- | --- |
| **Column A** 5 | **Column B** *y* |

|  |
| --- |
| **A)**Column A’s quantity is greater.  **B)**  Column B’s quantity is greater.  **C)**  The quantities are the same.  **D)**  The relationship cannot be determined from the information given. |

|  |
| --- |
| **9.** |

|  |  |
| --- | --- |
| **Column A** https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob9a.gif | **Column B** https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob9b.gif |

|  |
| --- |
| **A)**Column A’s quantity is greater.  **B)**  Column B’s quantity is greater.  **C)**  The quantities are the same.  **D)**  The relationship cannot be determined from the information given. |

|  |
| --- |
| **10.** https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob10d.gif  What is the area of the rectangle above? |

|  |
| --- |
| **A)**https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob10a.gif  **B)**  120  **C)**https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob10b.gif  **D)**  60  **E)**https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob10c.gif |

|  |
| --- |
| **11.** |

|  |  |
| --- | --- |
| **Column A** https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob11a.gif | **Column B** https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob11b2.gif |

|  |
| --- |
| **A)**Column A’s quantity is greater.  **B)**  Column B’s quantity is greater.  **C)**  The quantities are the same.  **D)**  The relationship cannot be determined from the information given. |

|  |
| --- |
| **12.**What is the area of a circle that is inscribed in a square whose area is 81 square inches? |

|  |
| --- |
| **A) https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob12a.gif**square inches  **B)https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob12b.gif**square inches  **C)https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob12c.gif**square inches  **D)https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob12d.gif**square inches  **E)https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob12e.gif**square inches |

|  |
| --- |
| **13.**Being a conscientious driver, Suzy stayed at or below the speed limit while traveling down the interstate.  Overall, she went an average rate of 65 mph and it took her 10 hours to complete her journey.  If she traveled for 6 of her 10 hours at 70 mph, what constant speed did she go for the remaining 4 hours to obtain the overall 65 mph average? |

|  |
| --- |
| **A)**65 mph  **B)**  60 mph  **C)**  57.5 mph  **D)**  59.5 mph  **E)**  62.5 mph |

|  |
| --- |
| **14.**https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob14.gif |

|  |
| --- |
| **A)**4  **B)**  7/3  **C)**  1/4  **D)** -1/4  **E)**  3/7 |

|  |
| --- |
| **15.** https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob15.gif  Find the area of the graph above enclosed by figure ABCD. |

|  |
| --- |
| **A)**36  **B)**  30  **C)**  42  **D)**  72  **E)**  84 |

|  |
| --- |
| **16.**https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob16a.gif |

|  |  |
| --- | --- |
| **Column A** https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob16b.gif | **Column B** -10 |

|  |
| --- |
| **A)**Column A’s quantity is greater.  **B)**  Column B’s quantity is greater.  **C)**  The quantities are the same.  **D)**  The relationship cannot be determined from the information given. |

|  |
| --- |
| **17.**If account codes for a certain company are assigned as follows: two letters and then three one-digit numbers, how many different account codes can be made?  Note that letters and digits can be repeated. |

|  |
| --- |
| **A)**1,757,600  **B)**  676,000  **C)**  260  **D)**  67,600  **E)**  6,760 |

|  |
| --- |
| **18.** https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob18b.gif  In the figure above, *XY* is a line segment. What is the value of https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob18a.gif?  Note that *a* and *b* are measured in degrees. |

|  |
| --- |
| **A)**-1/7  **B)**  7  **C)**  3/4  **D)**  -7  **E)**  Not enough information is given to answer this question |

|  |
| --- |
| **19.**https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob19a.gif |

|  |
| --- |
| **A)**https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob19b.gif  **B)**https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob19c.gif  **C)**https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob19d.gif  **D)**https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob19e.gif  **E)**https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob19f.gif |

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| --- |
| **20.** https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob20.gif |

|  |  |
| --- | --- |
| **Column A** The ratio of juniors to seniors at  City College in the  Fall 2000 semester. | **Column B** The ratio of seniors to juniors at  City College in the  Fall 2000 semester. |

|  |
| --- |
| **A)**Column A’s quantity is greater.  **B)**  Column B’s quantity is greater.  **C)**  The quantities are the same.  **D)**  The relationship cannot be determined from the information given. |

|  |
| --- |
| **21.** https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob20.gif  If enrollment was 17% higher for freshmen at City College in the Fall 2000 semester than the Fall 1999 semester, approximately what was the enrollment of freshman in the Fall 1999 semester? |

|  |
| --- |
| **A)**3590  **B)**  4200  **C)**  2415  **D)**  1785  **E)**  4914 |

|  |
| --- |
| **22.** https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob20.gif  If the areas of sectors in the circle graphs are drawn in proportion to the percentages shown, what is the measure, in degrees, of the central angle sector representing the percentage of juniors enrolled in the Fall 2000 semester? |

|  |
| --- |
| **A)**180 degrees  **B)**  144 degrees  **C)**  90 degrees  **D)**  72 degrees  **E)**  50 degrees |

|  |
| --- |
| **23.** 3, 3, 4, 4, 5, 5 |

|  |  |
| --- | --- |
| **Column A** Mode of the numbers listed | **Column B** Standard deviation of the numbers listed |

|  |
| --- |
| **A)**Column A’s quantity is greater.  **B)**  Column B’s quantity is greater.  **C)**  The quantities are the same.  **D)**  The relationship cannot be determined from the information given. |

|  |
| --- |
| **24.** https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob24.gif  https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob24b.gif  What is the mean of the advertising costs from 1999 to 2002? |

|  |
| --- |
| **A)**$48,750  **B)**  $19,500  **C)**  $50,000  **D)**  $60,000  **E)**  $48.75 |

|  |
| --- |
| **25.** https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob24.gif  https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob24b.gif  The percent decrease in profits from 1999 to 2000 was approximately what percent? |

|  |
| --- |
| **A)**20  **B)**  30  **C)**  40  **D)**  50  **E)**  60 |

|  |
| --- |
| **26.** https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob26.gif  Looking at the figure above, if triangle ABC is an equilateral triangle and line BC is parallel to line DE, what is the measure of angle 5? |

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| **A)**60 degrees  **B)**  90 degrees  **C)**  120 degrees  **D)**  180 degrees  **E)**  Not enough information is given to answer this question |

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| **27.** https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob27.gif |

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| **Column A** Slope of the line on graph above. | **Column B** The *y* value of the *y*-intercept of the line on the graph above. |

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| **A)**Column A’s quantity is greater.  **B)**  Column B’s quantity is greater.  **C)**  The quantities are the same.  **D)**  The relationship cannot be determined from the information given. |

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| **28.**What is the solution(s) to https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob28.gif? |

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| **A)***x* = 0  **B)**  *x* = 2, *x* = -2  **C)**  *x* = 3, *x* = -3  **D)**  *x* = 6, *x* = -6  **E)**  *x* = 9, *x* = -9 |

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| |  | | --- | | Solutions worksheet | | |  | | --- | |  | |
| **1.** | |

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| **Column A** https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob1a.gif | **Column B** https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob1b.gif |

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| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/check.gif**Answer: B** https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad1a.gif  https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad1b.gif  Hey, they look a lot alike, but they are not the same.  Can you see the difference between the two?? Hopefully, you noticed that in Column B, there was a ( ) around the - and the 3. In Column A, there is no ( ). This means the - is NOT part of the base, so it will not get expanded like it did in Column B.  It is interpreted as finding the negative or opposite of 3 to the fourth power.  **Hence, Column B's value is greater than Column A's value.** |

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| **2.**  *x* and *y* are integers: https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob2.gif |

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| **Column A** *x* | **Column B** *y* |

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| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/check.gif**Answer: D**  The reason that the answer is D on this problem is that opposites have the same absolute value.  Since *x* and *y* are integers, *x* could be a positive or negative value or zero.  Since *y* is set equal to the absolute value of *x*, then *y*’s value will always be nonnegative.   Based on the information given, *x* could be a negative value, and in that case, *y* would always be greater.  But if *x* is a nonnegative value, then *x* and y will be the same value.   For example, *x* could be -5, then *y* = 5.  But *x* could be 5, where *y* = 5.  **So, the relationship cannot be determined from the information given.** |

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| **3.** |

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| **Column A** .25% of .25 | **Column B** https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob3d.gif |

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| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/check.gif**Answer: A**  https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad3a.gif  https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad3b.gif | **\*Move decimal on .25% two places to the left**    **\*Move decimal 5 places to the LEFT** |

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| **Since .000625 > .0000625, the answer is Column A’s quantity is greater.**  , |

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| **4.**If 25 students in one class had an average of 93% and 20 students from another class had an average of 98%, approximately what is the average in percent of all 45 students? |

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| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/check.gif**Answer: D**  In general, when finding the average of tests, you add the tests together and then divide by the number of tests.  On this problem we have two separate averages to start with. So, we need to find the total number of points we have using that information and then divide by the number of students, which in this case is 45.  If 25 students averaged 93, then the total number of points would be (25)(93) = 2325.  If 20 students averaged 98, then the total number of points would be (20)(98) = 1960.  So, the total number of points is 2325 + 1960 = 4285.  To find the average, **take the number of points and divide by the number of students:**  https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad4.gif  **The overall average percent is 95.2%.** |

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| **5.**A water treatment plant is built with two cylindrical tanks to contain water for a town.  Each tank has a radius of 10 feet and a depth of 20 feet.  If there are about 7.5 gallons in a cubic foot of water, approximately how many gallons of water can be treated at the plant at any one time? |

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| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/check.gif**Answer: C**  First, let’s find the volume of each cylindrical tank.  **The volume of a cylindrical tank is**  https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad5a.gif  **Filling in 10 for radius and 20 for height we get:**  https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad5b.gif  Next, we want to consider the fact that we have two tanks. **Multiplying the volume by two we get:**  https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad5c.gif  Next, we want to consider that there are about 7.5 gallons in a cubic foot of water.  **Multiplying the volume of the two cylinders by 7.5 we get:**  https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad5d.gif  Next notice that none of the answers has the pi symbol in them. **That means we will have to put in 3.14 for *pi* and see what we get:**  https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad5e.gif  **94,200 gallons of water can be treated at the water plant at one time.** |

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| **6.** |

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| **Column A** Probability of randomly selecting  a given name out of a hat  containing 12 different names. | **Column B** .08 |

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| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/check.gif**Answer: A**  In Column A, each name has an equally likely chance of being picked.  The probability of randomly selecting a given name out if a hat containing 12 different names can be found by taking the number of names being selected, which in this case is 1, and put that over the total number of names, which is 12:  https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad6.gif  **Since .08333... is larger than .08, then the probability of randomly selecting a given name out if a hat containing 12 different names is a larger value than .08.** |

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| **7.**If https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob7a.gif    what is the value of https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob7b.gif? |

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| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/check.gif**Answer: A**  The first step here is to find the value of *x*.  If we know that, then we can plug that in to the second expression and find out what 3*x* + 5 is.  **Solving the equation for *x* we get:** |

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| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad7a.gif | **\*Mult. BOTH sides by the LCD of -2**  **\*Inverse of sub. 10 is add 10 to BOTH sides** |

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| Now be careful, this is not our final answer.  **We still need to plug in -6 for *x* in the given expression:** |

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| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad7b.gif | **\*Plug in -6 for *x*** |

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| **So, when https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob7a.gif, the expression 3*x* + 5 is equal to -13.** |

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| **8.** *x* is a positive integer: https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob8a.gif |

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| **Column A** 5 | **Column B** *y* |

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| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/check.gif**Answer: D**  **If we did a cross multiplication, we would get:**  https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad8.gif  It is given that *x* is a positive integer.  That could mean *x* is 1, 2, 3, ....  If *x* is 1, then *y* would equal 5.  However, if *x* is an integer greater than or equal to 2 then *y* would be greater than 5.  **Since we don’t know *x*’s exact value, then we cannot determine the relationship between 5 and *y*.** |

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| **9.** |

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| **Column A** https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob9a.gif | **Column B** https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob9b.gif |

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| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/check.gif**Answer: C**  **Rationalizing the denominator in Column A we get:** |

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| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad9.gif | **\*Mult. num. and den. by square root of 5** |

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| **The two quantities are equal.** |

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| **10.** https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob10d.gif  What is the area of the rectangle above? |

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| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/check.gif**Answer: E**  The area of a rectangle is length times width.  So, we need the length and the width to get our answer.  It looks like we have the length which is 10, but we still need the width.  Note how we have the diagonal of the rectangle which is 12.  The diagonal, length and width of the rectangle make up an right triangle.  Anytime you are missing one side of a right triangle, you can use the Pythagorean theorem to find that long lost side.  **Using the Pythagorean Theorem, we get:** |

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| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad10a.gif | **\*Pythagorean Theorem**  **\*Plugging in 10 for one leg and 12 for the hypotenuse** **\*Subtract 100 form BOTH sides**  **\*Take the square root of BOTH sides**  **\*Square root of 4 is 2** |

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| 2 square root of 11 is the width of the rectangle.  **Putting the length and the width values of the rectangle into the area formula we get:** |

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| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad10b.gif | **\*Plugging in 10 for length and 2 sq. Root of 11 for width** |

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| **The area of the rectangle is 20 square roots of 11.** |

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| **11.** |

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| **Column A** https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob11a.gif | **Column B** https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob11b2.gif |

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| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/check.gif**Answer: C** |

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| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad11a.gif | **\*Factor the Perfect Square Trinomial**  **\*The sq. root of an expression squared is the abs. value of that expression**  **\*Since *x* squared plus 7 is ALWAYS positive it is equal to its abs. value** |

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| **The two values are the same.** |

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| **12.**What is the area of a circle that is inscribed in a square whose area is 81 square inches? |

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| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/check.gif**Answer: D**  Ultimately, we need to find the area of the circle.  That means we need the **area of a circle formula which is**  https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad12b.gif  Since we were not given the radius of the circle, it looks like we will have to go out and find it.  Since the area of a square is found by taking the side squared, this means the side of our square is going to be 9 inches, since its area is 81 square inches.  **Let's look at a visual of this:**  https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad12a.gif  It looks like the side of the square is also the diameter of the circle. Since the diameter is 9, the radius, which is half of the diameter, is going to be 9/2 or 4.5.  **Putting the radius into the area formula we get:** |

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| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad12c.gif | **\*Plugging in 4.5 for the radius** |

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| **The area of the circle is 20.25 *pi* square inches.** |

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| **13.**Being a conscientious driver, Suzy stayed at or below the speed limit while traveling down the interstate.  Overall, she went an average rate of 65 mph and it took her 10 hours to complete her journey.  If she traveled for 6 of her 10 hours at 70 mph, what constant speed did she go for the remaining 4 hours to obtain the overall 65 mph average? |

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| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/check.gif**Answer: C**  This problem has several parts to it. We will need to use the formula distance = (rate)(time) to help us out with this.  First let see how many miles Suzy traveled overall. **Plugging in the rate of 65 mph and the time of 10 hours we get:**  https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad13a.gif  Suzy traveled a total of 650 miles.  Next, we start breaking it down.  It says that she traveled for 6 hours at 70 mph.  **From this we can figure out how many of the 650 miles she traveled at this speed:**  https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad13b.gif  She traveled 420 miles at the 70 mph.  **How many miles does that leave us for the unknown speed?**  https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad13c.gif  For the last part, we are again going to use the distance/rate formula, but now we are looking for the rate.  **Plugging in 230 for the distance and 4 for the time we get:**  https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad13d.gif  **Suzy traveled 57.5 mph for 4 hours of her trip.** |

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| **14.**https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob14.gif |

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| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/check.gif**Answer: C** |

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| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad14.gif | **\*Change the division to mult. of the recip.**    **\*Find the products** |

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| **The answer is 1/4.** |

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| **15.** https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob15.gif  Find the area of the graph above enclosed by figure ABCD. |

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| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/check.gif**Answer: B**  From the picture, we can see that figure ABCD is a quadrilateral but doesn’t fit into a form like rectangle, parallelogram, etc...  We will have to take the area of triangle ABE and subtract from it the area of triangle CDE, this will leave us with figure ABCD.  Let’s look at triangle ABE first.  The area of a triangle is ½ (base)(height).  So, we need to know the base and the height of this triangle.  Since it is a right triangle, the base and height are going to be the lengths of the two legs, which are sides AB and AE.  Side AB can be found by taking the absolute value of the difference of the *y* values of their ordered pairs, which would be 12 - 0 = 12.  Side AE can be found by taking the absolute value of the difference of the *x* values of their ordered pairs, which would be 6 - 0 = 6.  **Plugging 6 in for the base and 12 in for the height into the formula for the area of a triangle we get:**  https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad15a.gif  **The area of triangle ABE is 36.**  Now let’s look at triangle CDE.  The area of a triangle is ½ (base)(height).  So, we need to know the base and the height of this triangle. The base of this triangle is side DE.  The height can be found by making a perpendicular line from C to the base.  Side DE can be found by taking the absolute value of the difference of the *x* values of their ordered pairs, which would be 6 - 3 = 3.  The height can be found by taking the absolute value of the difference of the *y* value of C and 0 (the *y* value on the base), which would be 4 - 0 = 4.  **Plugging 3 in for the base and 4 in for the height into the formula for the area of a triangle we get:**  https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad15b.gif  **The area of triangle CDE is 6.**  Last, we need to **take the difference of the areas of the two triangles:**  https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad15c.gif  **The area of the figure ABCD is 30.** |

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| **16.**https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob16a.gif |

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| **Column A** https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob16b.gif | **Column B** -10 |

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| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/check.gif**Answer: D**  Note how 6*x* - 2*y* is two times 3*x* - *y*.  **Taking 2 times the given inequality, we get:** |

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| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad16.gif | **\*Taking 2 times BOTH sides** |

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| It looks like 6*x* - 2*y* is less than -8.   6*x* - 2*y* could be -8.5 or it can be -12, in other words 6*x* - 2*y* can be either less than or greater than -10.  **Since this is our only given information, the relationship cannot be determined from the given information.** |

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| **17.**If account codes for a certain company are assigned as follows: two letters and then three one-digit numbers, how many different account codes can be made?  Note that letters and digits can be repeated. |

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| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/check.gif**Answer: B**  We can use the fundamental counting principle to answer this question.  Basically, we need to take the product of the number of ways each event can occur.  There are 5 stages or events:   letter 1, letter 2, digit 1, digit 2, and digit 3.  In general, there are 26 letters in the alphabet.  Neither letter has any restriction, so there are 26 possibilities for each letter.  In general, there are 10 digits: 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9.  There are no restriction on any of the digits, so each one of those has 10 possibilities.  **Putting that all together we get:** |

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| **Letter 1** |  | **Letter 2** |  | **Digit 1** |  | **Digit 2** |  | **Digit 3** |  | **Total** |
| **26** | **x** | **26** | **x** | **10** | **x** | **10** | **x** | **10** | **=** | **676000** |

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| **There are 676,000 different account codes possible.** |

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| **18.** https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob18b.gif  In the figure above, *XY* is a line segment.  What is the value of https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob18a.gif?  Note that *a* and *b* are measured in degrees. |

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| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/check.gif**Answer: D**  Since 4 angles of measure *a* make up *XY* and XY is a line segment that means, the 4 *a* angle would have to make up 180 degrees.  Similarly, the 3 *b* angles would be 180 degrees.  This would give us enough information to find out what *a* and *b* are equal to.  **Let’s start with *a*:** |

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| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad18a.gif | **\*The 4 *a* angles = 180 degrees**  **\*Divide BOTH sides by 4** |

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| **Next let’s look at *b*:** |

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| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad18b.gif | **\*The 3 *b* angles = 180 degrees**  **\*Divide BOTH sides by 3** |

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| **Putting those values in for *a* and *b* we get:** |

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| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad18c.gif | **\*Plug in 45 for *a* and 60 for *b*** |

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| **Our answer to this problem is -7.** |

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| **19.**https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob19a.gif |

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| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/check.gif**Answer: B** |

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| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad19.gif | **\*Use the FOIL method to mult. two binomials** **\*Make sure you add exponents when you mult. like bases** |

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| **20.** https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob20.gif |

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| **Column A** The ratio of juniors to seniors at City College in the  Fall 2000 semester. | **Column B** The ratio of seniors to juniors at  City College in the  Fall 2000 semester. |

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| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/check.gif**Answer: A**  You can do this problem two different ways.  You can either take the ratio of the percent for each classification or you can find the number of students that go with each one and take that ratio.  Either way you would end up with the same answer.  I’m going to use the percent that are given to set up each ratio.  For the ratio of juniors to seniors at City College in the Fall 2000 semester, **we need to make sure that the percent attached to juniors goes on top and the percent for seniors goes on bottom:**  https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad20a.gif  For the ratio of seniors to juniors at City College in the Fall 2000 semester, **we need to make sure that the percent attached to seniors goes on top and the percent for juniors goes on bottom:**  https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad20b.gif  **It looks like the ratio of juniors to seniors is greater than the ratio of seniors to juniors.**  **Need more help on this topic?** |

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| **21.** https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob20.gif  If enrollment was 17% higher for freshmen at City College in the Fall 2000 semester than the Fall 1999 semester, approximately what was the enrollment of freshman in the Fall 1999 semester? |

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| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/check.gif**Answer: A**  We need to be careful here, the temptation is to just take 40% - 17% = 23% of the enrollment of 10,500.   However, keep in mind that we are talking about 17% higher in terms of enrollment, not compared to the other classifications and enrollment may or may not have been the same overall for 1999 and 2000.  The first thing we need to find is the actual enrollment for freshmen in 2000.  According to the chart, freshmen made up 40% of the 10,500 enrolled.  **Taking 40% of 10,500 we get:**  https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad21a.gif  4200 is 17% higher than the enrollment of freshmen in 1999.  Letting *x* represent the 1999 freshmen enrollment and putting this into an equation we get: |

|  |  |
| --- | --- |
| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad21b.gif | **\*17% higher means we ADD 17% (or .17) of the amount**  **\*Divide BOTH sides by 1.17** |

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| --- |
| **Rounding this up we get 3590 for our answer.**  **Need more help on this topic?** |

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| **22.** https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob20.gif  If the areas of sectors in the circle graphs are drawn in proportion to the percentages shown, what is the measure, in degrees, of the central angle sector representing the percentage of juniors enrolled in the Fall 2000 semester? |

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| --- |
| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/check.gif**Answer: D**  On this problem, the key is to know that a circle measures 360 degrees. So if we know the percentage of the circle that a sector represents, then we can take that percentage of 360 degrees and find the measure of just that sector.  Since juniors were 20% of the enrollment, **we need to take 20% of 360:**  https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad22.gif  **The measurement of the central angle sector representing the percentage of juniors enrolled in the Fall 2000 semester is 72 degrees.** |

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| **23.** 3, 3, 4, 4, 5, 5 |

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| --- | --- |
| **Column A** Mode of the numbers listed | **Column B** Standard deviation of the numbers listed |

|  |
| --- |
| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/check.gif**Answer: A**  The mode of a set of data is the value(s) that occurs most often.  In this case, all three values occur twice.  **So, the mode is 3, 4, and 5.**  **For the standard deviation, we need to first find the mean:** |

|  |  |
| --- | --- |
| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad23a.gif | **\*(sum of values)/(number of values)** |

|  |
| --- |
| **The mean of these values is 4.**  Next we need to find the difference between the mean and each separate value of the data set,  AND square each difference found AND add up all of the squared values found: |

|  |  |  |
| --- | --- | --- |
| *x* | *x* - 4 | https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad23b.gif |
| 3 | -1 | 1 |
| 3 | -1 | 1 |
| 4 | 0 | 0 |
| 4 | 0 | 0 |
| 5 | 1 | 1 |
| 5 | 1 | 1 |
|  | **SUM:** | 4 |

|  |
| --- |
| Next we need to divide the sum found by the number of data values in the set AND find the nonnegative square root of the quotient found.  https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad23c.gif  On the test you will not have a calculator, so on a problem like this you need to estimate.  You can see that you are taking the square root of a number that is between 0 and 1, so your answer will be between 0 and 1.   **This means that the mode, whether it is 3, 4, or 5, is always greater than the standard deviation.** |

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| **24.** https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob24.gif  https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob24b.gif  What is the mean of the advertising costs from 1999 to 2002? |

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| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/check.gif**Answer: A**  Since we are looking for the mean of advertising costs, we need to look at the 2nd bar graph.  Keep in mind that the advertising costs are in thousands of dollars.  In 1999, the advertising cost is $50000, in 2000 it is $30000, in 2001 it is $55000, and in 2002 it is $60000.  To find the mean we need to sum up all the values and then divide by the number of values. |

|  |  |
| --- | --- |
| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad24.gif | **\*(sum of values)/(number of values)** |

|  |
| --- |
| **The mean of the advertising costs from 1999 to 2002 is $48,750.** |

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| --- |
| **25.** https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob24.gif  https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob24b.gif  The percent decrease in profits from 1999 to 2000 was approximately what percent? |

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| --- |
| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/check.gif**Answer: C**  Since we are looking at the decrease in profits, we need to look at the 1st bar graph.  1999 had a profit of $250,000,000 and 2000 had a profit of $150,000,000.  We are needing to find the percent decrease in profits from 1999 to 2000.  **First lets see what the decrease in dollar amount was:**  https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad25a.gif  There was a $100,000,000 decrease in profits from 1999 to 2000.  From this we need to find out what percent 100,000,000 is of 250,000,000, since that is the amount we are decreasing from: |

|  |  |
| --- | --- |
| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad25b.gif | **\**x* represents the percent we are looking for** |

|  |
| --- |
| **$100,000,000 is 40% of $250,000,000.** |

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| --- |
| **26.** https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob26.gif  Looking at the figure above, if triangle ABC is an equilateral triangle and line BC is parallel to line DE, what is the measure of angle 5? |

|  |
| --- |
| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/check.gif**Answer: C**  Lets see what the information that was given to us means.  If ABC is an equilateral triangle, that means all three sides are equal and all three angles have the same measurement.  That means, angles 1, 2, and 3 are each 60 degrees.  The reason for that is the degrees of all three angles of any triangle sum up to be 180 degrees.  If all three angels are the same, then they would each have to be 60 degrees, because 60 + 60 + 60 = 180.  Now we have a value to work with.  We have to work our way to angle 5.  Next, we can use the fact that lines BC and DE are parallel to each other and ray AE is a transversal that intersects these two lines.  This means angles 3 and 4 are equal to each other because they are corresponding angles.  So, this means angle 4 is also 60 degrees.  We are getting closer.  Note how angles 4 and 5 together make a straight angle.  This means their sum is 180 degrees.  Well if angle 4 is 60 degrees, this means angle 5 must equal 180 - 60 = 120 degrees.  **Angle 5 is 120 degrees.** |

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| **27.** https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob27.gif |

|  |  |
| --- | --- |
| **Column A** Slope of the line on graph above. | **Column B** The *y* value of the *y*-intercept of the line on the graph above. |

|  |
| --- |
| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/check.gif**Answer: B**  The slope can be found by using rise/run.  I prefer to go left to right.  I’m going to start with the point that is on the *x*-axis, which is (-4, 0) and then step up to the point that is on the y-axis (0, 2).  If we do that, we rise up 2 and go over to the right 4.  **So, the slope is rise/run which is  2/4 = 1/2.**  The *y*-intercept is the point where the graph crosses the *y*-axis.  In this case that is (0, 2).  The *y*-value of that point is 2.  **This means the *y* value of the *y*-intercept of the graph is greater than the slope of the line.** |

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| **28.**What is the solution(s) to https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1prob28.gif? |

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| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/check.gif**Answer: B** |

|  |  |
| --- | --- |
| https://www.wtamu.edu/academic/anns/mps/math/mathlab/gre/gre_test1ad28.gif | **\*Multiply BOTH sides by the LCD 10**      **\*Factor out a GCF of 9**  **\*Factor the difference of squares**  **\*Set 1st factor = 0**        **\*Set 2nd factor = 0** |

|  |
| --- |
| **This problem has two solutions, *x* = 2 and *x* = -2.** |

   
**Definitions**

|  |  |  |  |
| --- | --- | --- | --- |
| http://www.thea.nesinc.com/images/math/tasp_image213.gif | is equal to | http://www.thea.nesinc.com/images/math/tasp_image227.gif | is perpendicular to |
| http://www.thea.nesinc.com/images/math/tasp_image214.gif | is not equal to | http://www.thea.nesinc.com/images/math/tasp_image228.gif | is parallel to |
| http://www.thea.nesinc.com/images/math/tasp_image215.gif | is approximately equal to | ~ | is similar to |
| http://www.thea.nesinc.com/images/math/tasp_image216.gif | is greater than | http://www.thea.nesinc.com/images/math/tasp_image229.gif | is congruent to |
| http://www.thea.nesinc.com/images/math/tasp_image217.gif | is less than | http://www.thea.nesinc.com/images/math/tasp_image230.gif | is not congruent to |
| http://www.thea.nesinc.com/images/math/tasp_image218.gif | is greater than or equal to | http://www.thea.nesinc.com/images/math/tasp_image232.gif | plus or minus |
| http://www.thea.nesinc.com/images/math/tasp_image219.gif | is less than or equal to | http://www.thea.nesinc.com/images/math/tasp_image233.gif | line segment joining points *A* and *B* |
| http://www.thea.nesinc.com/images/math/tasp_image222.gif | http://www.thea.nesinc.com/images/math/tasp_image215.gif 3.14 | http://www.thea.nesinc.com/images/math/tasp_image234.gif | line containing points *A* and *B* |
| http://www.thea.nesinc.com/images/math/tasp_image224.gif | angle | M (http://www.thea.nesinc.com/images/math/tasp_image233.gif) | length of http://www.thea.nesinc.com/images/math/tasp_image233.gif |
| mhttp://www.thea.nesinc.com/images/math/tasp_image224.gif | measure of angle | *AB* | length of http://www.thea.nesinc.com/images/math/tasp_image233.gif |
| wpe1.jpg (724 bytes) | right angle | Ab.gif (181 bytes) | length of http://www.thea.nesinc.com/images/math/tasp_image233.gif |
| http://www.thea.nesinc.com/images/math/tasp_image226.gif | triangle | http://www.thea.nesinc.com/images/math/tasp_image231.gif or *a*:*b* | ratio of *a* to *b* |

**Abbreviations for Units of Measurement**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **U.S. Standard** | | | **Metric** | | |
| **Distance** | in. | inch |  | | m | meter |
|  | ft. | foot |  | | km | kilometer |
|  | mi. | mile |  | | cm | centimeter |
|  |  |  |  | | mm | millimeter |
|  |  |  |  | |  |  |
|  |  |  |  | |  |  |
| **Volume** | gal. | gallon |  | | L | liter |
|  | qt. | quart |  | | mL | milliliter |
|  | oz. | ounce |  | | cc | cubic centimeter |
|  |  |  |  | |  |  |
|  |  |  |  | |  |  |
| **Weight/Mass** | lb. | pound |  | | g | gram |
|  | oz. | ounce |  | | kg | kilogram |
|  |  |  |  | | mg | milligram |
|  |  |  |  | |  |  |
|  |  |  |  | |  |  |
| **Temperature** | http://www.thea.nesinc.com/images/math/tasp_image235.gif | degree Fahrenheit |  | | http://www.thea.nesinc.com/images/math/tasp_image236.gif | degree Celsius |
|  |  |  |  | |  |  |
|  |  |  |  | |  |  |
| **Time** | sec. | second |  | |  |  |
|  | min. | minute |  | |  |  |
|  | hr. | hour |  | |  |  |
|  |  |  |  | |  |  |
|  |  |  |  | |  |  |
| **Speed** | mph | miles per hour |  | |  |  |

**Conversions for Units of Measurement**

|  |  |  |  |
| --- | --- | --- | --- |
| **U.S. Standard** | | **Metric** | |
| **Length** | 12 inches = 1 foot | **Length** | 10 millimeters = 1 centimeter |
|  | 3 feet = 1 yard |  | 100 centimeters = 1 meter |
|  | 5280 feet = 1 mile |  | 1000 meters = 1 kilometer |
|  |  |  |  |
| **Volume** | 8 ounces = 1 cup | **Volume** | 1000 milliliters = 1 liter |
| **(liquid)** | 2 cups = 1 pint |  | 1000 liters = 1 kiloliter |
|  | 2 pints = 1 quart |  |  |
|  | 4 quarts = 1 gallon |  |  |
|  |  |  |  |
| **Weight** | 16 ounces = 1 pound | **Weight** | 1000 milligrams = 1 gram |
|  | 2000 pounds = 1 ton |  | 1000 grams = 1 kilogram |

|  |  |
| --- | --- |
|  |  |
|  |  |
| **Time** | 60 seconds = 1 minute |
|  | 60 minutes = 1 hour |
|  | 24 hours = 1 day |

**Formulas**

**Quadratic formula: If http://www.thea.nesinc.com/images/math/tasp_image237.gif, and *a* http://www.thea.nesinc.com/images/math/tasp_image238.gif0,**

***x* = http://www.thea.nesinc.com/images/math/tasp_image239.gif**

|  |  |
| --- | --- |
| **Line**  **Slope = *m* = http://www.thea.nesinc.com/images/math/tasp_image240.gif**  **Slope-intercept form for the equation of a line *y* = *mx* + *b***  **Point-slope form for the equation of a line** Ps.gif (272 bytes)    **Distance = http://www.thea.nesinc.com/images/math/tasp_image242.gif**  **Midpoint =**Mp.gif (433 bytes)  **Distance**  ***d* = *rt***    **Geometric Figures** | http://www.thea.nesinc.com/images/math/tasp_image244.gif |

|  |  |
| --- | --- |
| **Square**  **Area = S2.gif (109 bytes) Perimeter = 4*s*** | http://www.thea.nesinc.com/images/math/tasp_image252.gif |
| **Rectangle**  **Area = http://www.thea.nesinc.com/images/math/tasp_image246.gif*w* Perimeter = 2http://www.thea.nesinc.com/images/math/tasp_image247.gif + 2*w*** | http://www.thea.nesinc.com/images/math/tasp_image253.gif |
| **Triangle**  **Area = http://www.thea.nesinc.com/images/math/tasp_image248.gif *bh*** | http://www.thea.nesinc.com/images/math/tasp_image254.gif |
| **Right triangle**  **Pythagorean formula:**Pyth.gif (213 bytes) | tri.bmp (1440054 bytes) |
| **Circle**  **Area = http://www.thea.nesinc.com/images/math/tasp_image250.gifR2.gif (107 bytes) Circumference = 2http://www.thea.nesinc.com/images/math/tasp_ptmath1.gif*r* Diameter = 2*r*** | http://www.thea.nesinc.com/images/math/tasp_image256.gif |
| **Sphere**  **Surface area = 4http://www.thea.nesinc.com/images/math/tasp_image250.gifR2.gif (107 bytes) Volume = http://www.thea.nesinc.com/images/math/tasp_image258.gifhttp://www.thea.nesinc.com/images/math/tasp_image250.gif**R3.gif (110 bytes) | http://www.thea.nesinc.com/images/math/tasp_image267.gif |
| **Cube**  **Surface area = 6s2.gif (124 bytes) Volume =**S3.gif (112 bytes) | http://www.thea.nesinc.com/images/math/tasp_image268.gif |
| **Rectangular solid**  **Surface area = 2http://www.thea.nesinc.com/images/math/tasp_image262.gif*w* + 2http://www.thea.nesinc.com/images/math/tasp_image262.gif*h* + 2*wh* Volume = http://www.thea.nesinc.com/images/math/tasp_image262.gif*wh*** | http://www.thea.nesinc.com/images/math/tasp_image269.gif |
| **Right circular cylinder**  **Surface area = 2http://www.thea.nesinc.com/images/math/tasp_image250.gif*rh* + 2http://www.thea.nesinc.com/images/math/tasp_image250.gifR2.gif (107 bytes) Volume = http://www.thea.nesinc.com/images/math/tasp_image250.gifR2.gif (107 bytes)*h*** | http://www.thea.nesinc.com/images/math/tasp_image270.gif |

**Basic Math exercises.**

1. A machine in a soft drink bottling factory caps 3 bottles per second. How many bottles can it cap in 15 hours?

A. http://www.thea.nesinc.com/images/math/tasp_image271.gif

B. http://www.thea.nesinc.com/images/math/tasp_image272.gif

C. http://www.thea.nesinc.com/images/math/tasp_image273.gif

D. http://www.thea.nesinc.com/images/math/tasp_image274.gif

2. A truck has a full 50-gallon gas tank. It uses 7http://www.thea.nesinc.com/images/math/tasp_image275.gif gallons on the first part of its journey, 13http://www.thea.nesinc.com/images/math/tasp_image276.gif gallons on the second part of its journey, and 15http://www.thea.nesinc.com/images/math/tasp_image275.gif gallons on the third part of its journey. How many gallons of gas remain in the gas tank?

A. 14

B. 14http://www.thea.nesinc.com/images/math/tasp_image275.gif

C. 15

D. 36

3. A rancher is planning to put up 220 yards of fencing. In the morning she puts up 80 yards, and in the afternoon, she puts up 40% of the remaining fence. What percent of the fence did she put up that day?

A. 36%

B. 51%

C. 62%

D. 76%

4. During a bike-a-thon a local company pledges to donate $1.25 for every $4.00 pledged by the public. If the public pledges a total of $156.00 dollars per mile, how much will the company donate per mile?

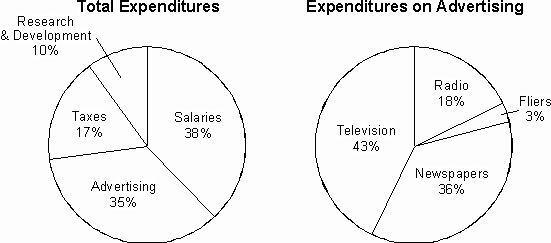
A. $2.75

B. $48.75

C. $195.00

D. $499.20

5. Use the pie charts below to answer the question that follows.



The first pie chart represents a company's expenditures, and the second pie chart shows a breakdown of the company's advertising expenditures. What percent of the company's expenditures is spent on radio advertising?

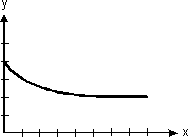
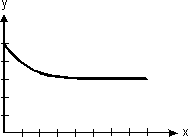
A. 6.3%

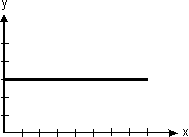
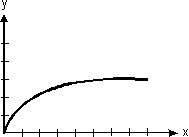
B. 11.7%

C. 18.0%

D. 35.0%

6. Scientists have stocked Wilson's pond with a species of fish. The scientists note that the population has steadily decreased over a period until the population is approximately half the number of fishes originally stocked. If the number of fishes is plotted on the *y-*axis and the amount of time on the *x-*axis, which of the following could result?

A.   B.     

C.   D.     

7. A student has received scores of 88, 82, and 84 on three quizzes. If tests count twice as much as quizzes, what is the lowest score the student can get on the next test to achieve an average score of at least 70?

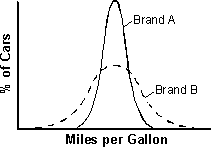
A. 13

B. 48

C. 70

D. 96

8. Use the distribution curves below to answer the question that follows.



The distribution curves above show data on the gas mileage for two different brands of car. Which of the following correctly analyzes the information presented in these distributions?

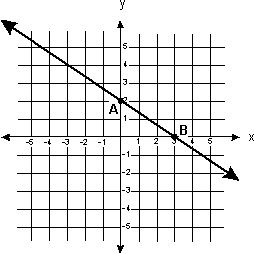
A. The mean gas mileage of brand *A* is greater than the mean gas mileage of brand *B.*

B. Data was collected for more cars of brand *A* than of brand *B.*

C. Brand *A* cars have smaller variability in gas mileage than brand *B* cars.

D. Brand *A* cars get poorer gas mileage than brand *B* cars.

9. Use the graph below to answer the question that follows.



Which of the following equations represents line *AB*?

A. *y* = http://www.thea.nesinc.com/images/math/tasp_image284.gif*x* + 2

B. *y* = http://www.thea.nesinc.com/images/math/tasp_image285.gif*x* + 3

C. *y* = http://www.thea.nesinc.com/images/math/tasp_image286.gif+ 3

D. *y* = 3*x* + 2

10. What is the slope of the line passing through http://www.thea.nesinc.com/images/math/tasp_image287.gif, and http://www.thea.nesinc.com/images/math/tasp_image288.gif?

A. http://www.thea.nesinc.com/images/math/tasp_image289.gif

B. http://www.thea.nesinc.com/images/math/tasp_image290.gif

C. 3

D. http://www.thea.nesinc.com/images/math/tasp_image291.gif

11. Which of the following is an equation of the line passing through http://www.thea.nesinc.com/images/math/tasp_image292.gif and (6, 0)?

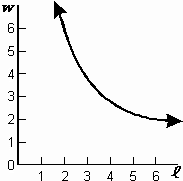
A. *y* = http://www.thea.nesinc.com/images/math/tasp_image293.gif*x* + 3

B. *y* = http://www.thea.nesinc.com/images/math/tasp_image294.gif*x* + 3

C. *y* = http://www.thea.nesinc.com/images/math/tasp_image295.gif + 3

D. *y* = http://www.thea.nesinc.com/images/math/tasp_image296.gif*x* + 6

12. Use the graph below to answer the question that follows.



The graph shows how the width (*w*) depends on the length (L) for a rectangle of constant area. What is the value of *w* for L= 8?

A. 1

B. http://www.thea.nesinc.com/images/math/tasp_image298.gif

C. 4

D. 96

13. If http://www.thea.nesinc.com/images/math/tasp_image299.gif*x* + 7 = 16, what is the value of 2*x* + 1?

A. http://www.thea.nesinc.com/images/math/tasp_image300.gif

B. http://www.thea.nesinc.com/images/math/tasp_image301.gif

C. http://www.thea.nesinc.com/images/math/tasp_image302.gif

D. http://www.thea.nesinc.com/images/math/tasp_image303.gif

14. If 5*r* = 9*t* + 7, what is the value of *t*?

A. *t* = http://www.thea.nesinc.com/images/math/tasp_image304.gif

B. *t* = http://www.thea.nesinc.com/images/math/tasp_image305.gif

C. *t* = http://www.thea.nesinc.com/images/math/tasp_image306.gif http://www.thea.nesinc.com/images/math/tasp_image307.gif

D. *t* = http://www.thea.nesinc.com/images/math/tasp_image306.gif + 7

15. What is the solution to the system of equations http://www.thea.nesinc.com/images/math/tasp_image308.gif and http://www.thea.nesinc.com/images/math/tasp_image309.gif?

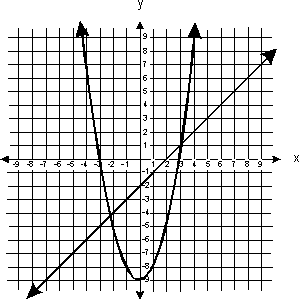
A. (0, 6), (9, 9)

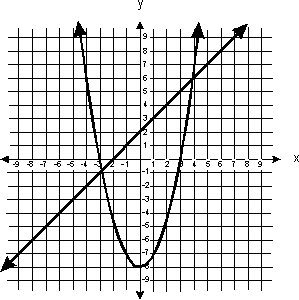
B. http://www.thea.nesinc.com/images/math/tasp_image310.gif

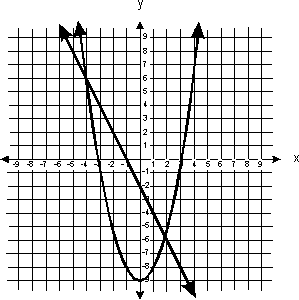
C. an infinite number of solutions

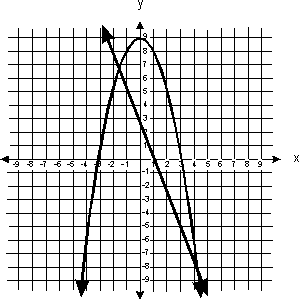
D. no solution

16. Which of the following graphs shows the solution of *y* + 2*x* + 2 = 0 and *y* = http://www.thea.nesinc.com/images/math/tasp_image311.gif?

A.  

B.  

C.  

D.  

17. *C* is 10 more than the square of the quotient of the sum of *x* and *y* and the product of *x* and *y*. Which equation expresses this relationship?

A. http://www.thea.nesinc.com/images/math/tasp_image316.gif

B. http://www.thea.nesinc.com/images/math/tasp_image317.gif

C. http://www.thea.nesinc.com/images/math/tasp_image318.gif

D. http://www.thea.nesinc.com/images/math/tasp_image319.gif

18. The number *P* is 50 less than the square of the difference of http://www.thea.nesinc.com/images/math/tasp_image320.gif and *n*. Which of the following equations expresses this relationship?

A. http://www.thea.nesinc.com/images/math/tasp_image321.gif

B. http://www.thea.nesinc.com/images/math/tasp_image322.gif

C. http://www.thea.nesinc.com/images/math/tasp_image323.gif

D. http://www.thea.nesinc.com/images/math/tasp_image324.gif

19. A ten-foot-long board is cut into three pieces. The second piece is half as long as the first. The third piece is 4http://www.thea.nesinc.com/images/math/tasp_image325.gif feet longer than the second. How long is the first piece?

A. 1http://www.thea.nesinc.com/images/math/tasp_image326.gif feet

B. 2http://www.thea.nesinc.com/images/math/tasp_image327.gif feet

C. 2http://www.thea.nesinc.com/images/math/tasp_image328.gif feet

D. 3http://www.thea.nesinc.com/images/math/tasp_image329.gif feet

20. Angel has $1.80 in nickels, dimes, and quarters in his pocket. He has twice as many quarters as nickels. The number of dimes in his pocket is one more than the number of nickels and quarters put together. Which set of three equations could be used to determine how many nickels, dimes, and quarters Angel has?

* 1. 5N + 10D + 25Q = 180  
     Q = 2N  
     D = N + Q + 1
  2. 5N + 10D + 25Q = 180  
     N = 2Q  
     D = N + Q + 1
  3. 5N + 10D + 25Q = 1.80  
     Q = 2N  
     D + 1 = N + Q
  4. 0.05N + 0.10D + 0.75Q = 180  
     Q = 2N  
     D + 1 = N + Q

21. Robin Chang collected $175 in the second week of her school charity drive. This was $35 more than she collected in the first week. How much did she collect in the two weeks?

A. $210

B. $315

C. $385

D. $420

22. One factor of http://www.thea.nesinc.com/images/math/tasp_image330.gifis:

A. http://www.thea.nesinc.com/images/math/tasp_image331.gif

B. http://www.thea.nesinc.com/images/math/tasp_image332.gif

C. http://www.thea.nesinc.com/images/math/tasp_image333.gif

D. http://www.thea.nesinc.com/images/math/tasp_image334.gif

23. http://www.thea.nesinc.com/images/math/tasp_image335.gif=

A. http://www.thea.nesinc.com/images/math/tasp_image336.gif

B. 1

C. http://www.thea.nesinc.com/images/math/tasp_image337.gif

D. http://www.thea.nesinc.com/images/math/tasp_image338.gif

24. http://www.thea.nesinc.com/images/math/tasp_image339.gif

A. http://www.thea.nesinc.com/images/math/tasp_image340.gif

B. http://www.thea.nesinc.com/images/math/tasp_image341.gif

C. http://www.thea.nesinc.com/images/math/tasp_image342.gif

D. http://www.thea.nesinc.com/images/math/tasp_image343.gif

25. http://www.thea.nesinc.com/images/math/tasp_image344.gif

A. http://www.thea.nesinc.com/images/math/tasp_image345.gif

B. http://www.thea.nesinc.com/images/math/tasp_image346.gif

C. http://www.thea.nesinc.com/images/math/tasp_image347.gif

D. http://www.thea.nesinc.com/images/math/tasp_image348.gif

26. If http://www.thea.nesinc.com/images/math/tasp_image349.gif, what is http://www.thea.nesinc.com/images/math/tasp_image350.gif?

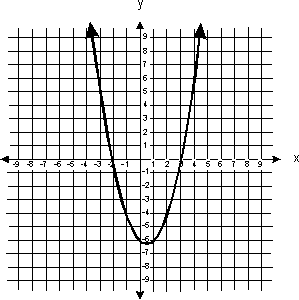
A. http://www.thea.nesinc.com/images/math/tasp_image351.gif

B. 5

C. http://www.thea.nesinc.com/images/math/tasp_image352.gif

D. 3

27. Use the graph below to answer the question that follows.



Which equation is represented by this graph?

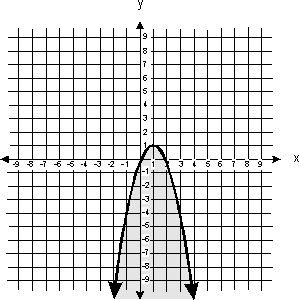
A. http://www.thea.nesinc.com/images/math/tasp_image354.gif

B. http://www.thea.nesinc.com/images/math/tasp_image355.gif

C. http://www.thea.nesinc.com/images/math/tasp_image356.gif

D. http://www.thea.nesinc.com/images/math/tasp_image357.gif

28. Use the graph below to answer the question that follows.



Which of the following inequalities describes the shaded region?

A. http://www.thea.nesinc.com/images/math/tasp_image359.gif

B. http://www.thea.nesinc.com/images/math/tasp_image360.gif

C. http://www.thea.nesinc.com/images/math/tasp_image361.gif

D. http://www.thea.nesinc.com/images/math/tasp_image362.gif

29. Which of the following expressions should be placed in each set of parentheses below in order to solve the equation by completing the square?

http://www.thea.nesinc.com/images/math/tasp_image363.gif

A. http://www.thea.nesinc.com/images/math/tasp_image364.gif

B. 3

C. 6

D. 9

30. Which of the following expressions appear as a step in solving http://www.thea.nesinc.com/images/math/tasp_image365.gif using the quadratic formula?

A. http://www.thea.nesinc.com/images/math/tasp_image366.gif

B. http://www.thea.nesinc.com/images/math/tasp_image367.gif

C. http://www.thea.nesinc.com/images/math/tasp_image368.gif

D. http://www.thea.nesinc.com/images/math/tasp_image369.gif

31. The height of a rocket in feet is given by the equation http://www.thea.nesinc.com/images/math/tasp_image370.gifwhere *t* is the time in seconds after it is fired, and *h* is the height in feet. At what time is the rocket at a height of 128 feet?

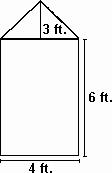
A. 1 second

B. 2 seconds

C. 3 seconds

D. 4 seconds

32. Use the diagram below to answer the question that follows.



A window is rectangular with a triangular top section. What is the total area of glass needed for the window?

A. 24 square feet

B. 30 square feet

C. 36 square feet

D. 48 square feet

33. Use the diagram below to answer the question that follows.



The drawing above represents a race track. The ends are semicircular. What is the approximate distance in meters a runner runs in 8 laps around the track?

A. 560 m

B. 4000 m

C. 4460 m

D. 5710 m

34. An observatory dome is hemispherical in shape with a radius of 18 meters and is built using 12 equal sections. Which of the following formulas describes the surface area of each section?

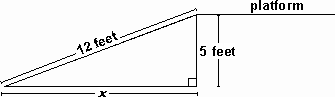
A. http://www.thea.nesinc.com/images/math/tasp_image373.gif

B. http://www.thea.nesinc.com/images/math/tasp_image374.gif

C. http://www.thea.nesinc.com/images/math/tasp_image375.gif

D. http://www.thea.nesinc.com/images/math/tasp_image376.gif

35. Use the diagram below to answer the question that follows.



A ramp 12 feet long is leaning against a raised platform which is 5 feet above the ground. What is the distance from the ramp's contact point with the ground and the base of the platform?

A. 7 feet

B. 8.5 feet

C. http://www.thea.nesinc.com/images/math/tasp_image378.gif feet

D. 13 feet

36. Figure *ABCDE* is similar to figure *FGHIJ*. If *AE* = 5, *FJ* = 20, and *BC* = 40, what is *GH*?

A. 10

B. 25

C. 45

D. 160

37. If pentagon *ABCDE* is similar to pentagon *GHIDF*, and *DI* = 20, *CD* = 50, and *DE* = 45, what is *DF*?

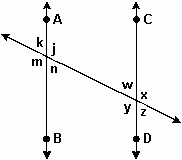
A. 112.5

B. 25

C. 18

D. 15

38. Use the diagram below to answer the question that follows.



Line *AB* is parallel to line *CD*. What is the sum of the measure of angle *k* and the measure of angle *y*?

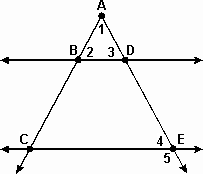
A. 90°

B. 100°

C. 180°

D. 360°

39. Use the diagram below to answer the question that follows.



If http://www.thea.nesinc.com/images/math/tasp_ptmath3.gif*ABD* is an equilateral triangle, and line *BD* is parallel to line *CE*, what is the measure of angle 5?

A. 60°

B. 90°

C. 120°

D. 180°

40. Use the statements below to answer the question that follows.

1. All people wearing hats have brown hair.

2. Some of the people have red hair.

3. All people who have brown hair like pizza.

4. People who have red hair like hamburgers.

5. Carl has brown hair.

Which of the following statements must be true?

A. Carl likes pizza.

B. Carl has red hair.

C. Carl is wearing a hat.

D. Carl likes hamburgers.

41. Use the pattern sequence below to answer the question that follows.

http://www.thea.nesinc.com/images/math/tasp_image389.gif

What is the missing design in the sequence?

A. http://www.thea.nesinc.com/images/math/tasp_image390.gif

B. http://www.thea.nesinc.com/images/math/tasp_image391.gif

C. http://www.thea.nesinc.com/images/math/tasp_image392.gif

D. http://www.thea.nesinc.com/images/math/tasp_image393.gif

42. Bess, Tara, Gerard, and Clifton all work for the same company. One is a writer, one a researcher, one an artist, and one an engineer. Use the statements below to answer the question that follows.

I. Bess and Gerard eat lunch with the engineer.

II. Clifton and Tara carpool with the researcher.

III. Gerard works in the same building as the writer and researcher.

Who is the researcher?

A. Tara

B. Bess

C. Clifton

D. Gerard

43. Use the pattern below to answer the question that follows.

http://www.thea.nesinc.com/images/math/tasp_image394.gif

What is the missing figure?

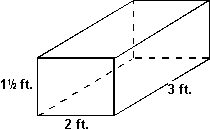
A. http://www.thea.nesinc.com/images/math/tasp_image395.gif

B. http://www.thea.nesinc.com/images/math/tasp_image396.gif

C. http://www.thea.nesinc.com/images/math/tasp_image397.gif

D. http://www.thea.nesinc.com/images/math/tasp_image398.gif

44. Use the diagram below to answer the question that follows.



A rectangular box has dimensions 1http://www.thea.nesinc.com/images/math/tasp_image400.gif feet http://www.thea.nesinc.com/images/math/tasp_image401.gif 2 feet http://www.thea.nesinc.com/images/math/tasp_image402.gif 3 feet. What is the length of the longest object that can be put in the box, if the object can be placed in any position?

A. 3.6 feet

B. 3.9 feet

C. 6.5 feet

D. 15.25 feet

45. Sarah is planning to rent an apartment. She makes the table below in order to compare the monthly cost of renting two different apartments.

|  |  |  |  |
| --- | --- | --- | --- |
| **Apartment** | **Rent ($)** | **Average Monthly Electricity Use (kWh)** | **Commuting Cost ($/day)** |
| A | 575 | 250 | 1.50 |
| B | 600 | 225 | .75 |

If electricity costs 5¢ per kilowatt-hour (kWh), which of the following statements is true?

A. Apartment A will be cheaper.

B. Apartment B will be cheaper.

C. Apartments A and B will cost the same per month.

D. She cannot determine which apartment will be cheaper.

Use the information below to answer the three questions that follow.

A water treatment plant is built with three cylindrical tanks to contain the water for a town. Each tank has a radius of 15 feet and a depth of 25 feet.

46. If there are about 7.5 gallons in a cubic foot of water, approximately how many gallons of water can be treated at the plant at any one time?

A. 7.1 http://www.thea.nesinc.com/images/math/tasp_image403.gif http://www.thea.nesinc.com/images/math/tasp_image404.gif

B. 1.3 http://www.thea.nesinc.com/images/math/tasp_image405.gif http://www.thea.nesinc.com/images/math/tasp_image406.gif

C. 4.1 http://www.thea.nesinc.com/images/math/tasp_image407.gif http://www.thea.nesinc.com/images/math/tasp_image406.gif

D. 4.1 http://www.thea.nesinc.com/images/math/tasp_image407.gif http://www.thea.nesinc.com/images/math/tasp_image408.gif

47. Engineers know that the amount of water lost due to evaporation is directly proportional to the surface area of the holding tanks and that the local climate causes water to evaporate at the rate of about http://www.thea.nesinc.com/images/math/tasp_image409.gif gallon of water per hour for each square foot of water exposed to the air. About how many total gallons of waste water may enter the three tanks each day to maintain full capacity?

A. 2.1 http://www.thea.nesinc.com/images/math/tasp_image407.gif http://www.thea.nesinc.com/images/math/tasp_image410.gif

B. 1.7 http://www.thea.nesinc.com/images/math/tasp_image407.gif http://www.thea.nesinc.com/images/math/tasp_image404.gif

C. 5.0 http://www.thea.nesinc.com/images/math/tasp_image407.gif http://www.thea.nesinc.com/images/math/tasp_image404.gif

D. 5.0 http://www.thea.nesinc.com/images/math/tasp_image407.gif http://www.thea.nesinc.com/images/math/tasp_image411.gif

48. The three tanks are occasionally cleaned by draining them. The following table gives the depth of water as the tanks are being drained:

|  |  |
| --- | --- |
| **Time (hours)** | **Depth (feet)** |
| 0 | 25 |
| 1 | 17 |
| 2 | 9 |
| 3 | 1 |

Which of the following equations will give the depth (*D*) at any time (*t*)?

A. http://www.thea.nesinc.com/images/math/tasp_image412.gif

B. http://www.thea.nesinc.com/images/math/tasp_image413.gif

C. *D* = 8*t* + 25

D. http://www.thea.nesinc.com/images/math/tasp_image415.gif

1. D

2. A

3. C

4. B

5. A

6. A

7. B

8. C

9. A

10. B

11. B

12. B

13. C

14. A

15. B

16. C

17. B

18. A

19. C

20. A

21. B

22. C

23. D

24. A

25. D

26. C

27. B

28. C

29. D

30. B

31. B

32. B

33. C

34. D

35. C

36. D

37. C

38. C

39. C

40. A

41. A

42. B

43. C

44. B

45. A

46. C

47. C

48. D

INTERMEDIATE ALGEBRA SECTION

|  |
| --- |
| **Rational Exponents and Roots**  **If *x* is positive, *p* and *q* are integers and *q*is positive,**  exponent |

|  |
| --- |
| **In other words, when you have a rational exponent, the denominator of that exponent is your index or root number and the numerator of the exponent is the exponential part.**  **.**  Here is a quick review of those exponential rules: |

|  |
| --- |
| **Review of Exponential Rules**  exponent product  exponent quotient  negative exponent  two exponents  exponent product  exponent quotient |

   
 Note: Fractional Exponents produce Radicals

|  |
| --- |
| notebook**Example 1**: Evaluate ex1a. |

|  |  |
| --- | --- |
| ex1b |  |

|  |
| --- |
| We are looking for the square root of 49 raised to the 1 power, which is the same as just saying the square root of 49.  If your exponent's numerator is 1, you are basically just looking for the root (the denominator's exponent).  **Our answer is 7** since the square root of 49 is 7. |

|  |
| --- |
| notebook**Example 2**: Evaluate ex2a. |

|  |  |
| --- | --- |
| ex2b | **\***  **\*Cube root of -125 = -5** |

|  |
| --- |
| In this problem we are looking for the cube root of -125 squared.  Again, I think it is easier to do the root part first if possible.  The numbers will be easier to work with.  **The cube root of -125 is -5 and (-5) squared is 25.** |

|  |
| --- |
| notebook**Example 3**: Evaluate ex3a. |

|  |  |
| --- | --- |
| ex3b | **\***  **\*DO NOT take the reciprocal of the exponent, only the base**  **\***       **\*Square root of 49/36 = 7/6** |

|  |
| --- |
| In this problem we have a **negative exponent** to start with.  That means we need to take the reciprocal of the base. **Note that we DO NOT take the reciprocal of the exponent, only the base.**  From there we are looking for the square root of 49/36 cubed.  Again, I think it is easier to do the root part first if possible.  The numbers will be easier to work with.  **The square root of 49/36 is 7/6 and 7/6 cubed is 343/216.** |

|  |
| --- |
| notebook**Example 4**: Simplify ex4a. |

|  |  |
| --- | --- |
| ex4b | **\*** |

|  |
| --- |
| notebook**Example 5**: Simplify ex5a. |

|  |  |
| --- | --- |
| ex5b | **\***           **\***  **\*Cube root of 8 = 2** |

|  |
| --- |
| notebook**Example 6**: Simplify ex6a. |

|  |  |
| --- | --- |
| ex6b | **\*** |

|  |
| --- |
| notebook**Example 7**:  Simplify ex7aby reducing the index of the radical. *x* represents positive real numbers. |

|  |  |
| --- | --- |
| ex7b | **\***Rewrite tenth root of x squared as x to the 2/10 power  **\*Simplify exponent** **\***Rewrite exponent 1/5 as a fifth root |

**desk Practice Problems**

|  |
| --- |
| These are practice problems to help bring you to the next level.  It will allow you to check and see if you understand these types of problems. **Math works just like anything else, if you want to get good at it, then you need to practice it.  Even the best athletes and musicians had help along the way and lots of practice, practice, practice, to get good at their sport or instrument.**  In fact, there is no such thing as too much practice.  To get the most out of these, **you should work the problem out on your own and then check your answer by clicking on the link for the answer/discussion for that problem**.  At the link you will find the answer as well as any steps that went into finding that answer. |

pencil **Practice Problems 1a - 1b:** **Evaluate the expression.**

|  |  |
| --- | --- |
| 1a. prob1a | 1b. prob 1b |

pencil **Practice Problems 2a - 2c:** **Simplify the expression.**

|  |  |
| --- | --- |
| 2a. prob 2a | 2b. prob 2b |

|  |
| --- |
| 2c. prob 2c |

pencil **Practice Problem 3a:** **Simplify the expression** **by reducing the index of the radical. *x* represents positive real numbers.**

|  |
| --- |
| 3a. prob 3a |

Some Exponent Problems

pencil**Practice Problem 1a - 1d: Simplify.**

|  |  |
| --- | --- |
| 1a. problem 1a | 1b. problem 1b |

|  |  |
| --- | --- |
| 1c. problem 1c | 1d. problem 1d |

pencil**Practice Problem 2a: Write the number in scientific notation.**

|  |  |
| --- | --- |
| 2a.      .00000146 |  |

pencil**Practice Problem 3a: Write the number in standard notation, without exponents.**

|  |  |
| --- | --- |
| 3a. problem 3a |  |

**desk Tutorial**

* \*\*\* Developmental Mathematics.

|  |
| --- |
| **Adding Real Numbers** |

|  |
| --- |
| **Adding Real Numbers** **with the Same Sign** |

|  |
| --- |
| **Step 1:Add the absolute values.**  **Step 2:Attach their common sign to sum.**      notebook**Example 1:**   Find the sum -6 + (-8). |

|  |
| --- |
| -6 + (-8) = -14  The sum of the absolute values would be 14 and their common sign is -.  **That is how we get the answer of -14.**  **You can also think of this as money - I know we can all relate to that.** Think of the negative as a loss.  In this example, you can think of it as having lost 6 dollars and then having lost another 8 dollars for a total loss of 14 dollars. |

|  |
| --- |
| notebook**Example 2:**   Find the sum -5.5 + (-8.7). |

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| -5.5 + (-8.7) = -14.2  The sum of the absolute values would be 14.2 and their common sign is -. **That is how we get the answer of -14.2.**  **You can also think of this as money - I know we can all relate to that.** Think of the negative as a loss.  In this example, you can think of it as having lost 5.5 dollars and then having lost another 8.7 dollars for a total loss of 14.2 dollars. |

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| **Adding Real Numbers** **with Opposite Signs** |

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| **Step 1:   Take the difference of the absolute values.**  **Step 2:  Attach the sign of the number that has the higher absolute value.** |

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| notebook**Example 3:**   Find the sum -8 + 6. |

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| -8 + 6 = -2.  The difference between 8 and 6 is 2 and the sign of 8 (the larger absolute value) is -.  **That is how we get the answer of -2.**  **Thinking in terms of money:**we lost 8 dollars and got back 6 dollars, so we are still in the hole 2 dollars. |

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| notebook**Example 4:**   Find the sum example 4a. |

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| example 4b | **\*Multiply top and bottom of first fraction** **by 2 to get the LCD of 6**    **\*Take the difference of the numerators** **and write over common denominator 6**  **\*Reduce fraction** |

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| The difference between 4/6 and 1/6 is 3/6 = 1/2 and the sign of 4/6 (the larger absolute value) is +.  **That is how we get the answer of 1/2.**  **Thinking in terms of money:**we had 2/3 of a dollar and lost 1/6 of a dollar, so we would come out ahead 1/2 of a dollar. |

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| **Subtracting Real Numbers** *a - b = a + (-b)* *or* *a - (-b) = a + b* |

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| In other words, to subtract *b*, you add the opposite of*b*.  Now, you do not have to write it out like this if you are already comfortable with it. This just gives you the thought behind it. |

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| notebook**Example 5:** Find the difference   -3 - 5. |

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| -3 - 5 = -3 + (-5) = -8.  Subtracting 5 is the same as adding a -5.  Once it is written as addition, I justfollow the rules for addition as shown above, to complete **for an answer of -8.** |

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| notebook**Example 6:** Find the difference -3 - (-5). |

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| -3 - (-5) = -3 + 5 = 2.  Subtracting -5 is the same as adding 5.  Once it is written as addition, I just follow the rules for addition as shown above, to complete **for an answer of 2.** |

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| **Multiplying or Dividing Real Numbers** |

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| Since dividing is the same as multiplying by the reciprocal, dividing and multiplying have the same sign rules.  **Step 1:   Multiply or divide their absolute values.**  **Step 2:   Put the correct sign.**   |  | | --- | | If the two numbers have the **same sign**, the **product or quotient is positive**.  If they have **opposite signs**, the **product or quotient is negative**. | |

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| notebook**Example 7:**Find the product(-4)(3). |

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| (-4)(3) = -12.  The product of the absolute values 4 x 3 is 12 and they have opposite signs, so **our answer is -12.** |

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| notebook**Example 8:**Find the product example 8a. |

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| example 8b | **\*Multiply numerator together** **\*Multiply denominator together** **\*(-)(-) = (+)** **\*Reduce fraction** |

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| The product of the absolute values -2/3 x -9/10 is 18/30 = 3/5 and they have the same sign, so that is how we **get the answer 3/5.**  , |

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| notebook**Example 9:**Find the quotient (-10)/(-2). |

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| (-10) / (-2) = 5  The quotient of the absolute values 10/2 is 5 and they have the same signs, so **our answer is 5.** |

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| notebook**Example 10:**Find the quotient example 10a. |

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| --- | --- |
| example 10b | **\*Division is the same as multiplication by reciprocal**  **\*Multiply numerator together** **\*Multiply denominator together** **\*(+)(-) = -**  **\*Reduce fraction** |

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| The quotient of the absolute values 4/5 and 8 is 4/40 = 1/10 and they have opposite signs, so **our answer is -1/10.** |

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| **Multiplying by and** **Dividing into Zero**  *a(0) = 0*  *and*  *0/a = 0*   (when *a* does not equal 0) |

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| In other words, zero (0) times any real number is zero (0) and zero (0) divided by any real number other than zero (0) is zero (0). |

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| notebook**Example 11:**   Find the product   0(½). |

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| 0(½) = 0  Multiplying any expression by 0 **results in an answer of 0.** |

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| notebook**Example 12:**   Find the quotient 0/5. |

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| 0/5 = 0  Dividing 0 by any expression other than 0 **results in an answer of 0.** |

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| **Dividing by Zero**  *a/0 is undefined* |

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| Zero (0) does not go into any number, so whenever you are dividing by zero (0) your answer is undefined.   notebook**Example 13:**   Find the quotient 5/0. |

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| 5/0 = undefined.  Dividing by 0 **results in an undefined answer.** |

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| **Definition of Exponents** exponent (note there are n *x*'s in the product)  *x = base,   n = exponent* |

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| **Exponents are another way to write multiplication.**  **The exponent tells you how many times a base appears in a PRODUCT.**    notebook**Example 14:**Evaluate example 14a. |

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| --- | --- |
| example 14b | **\*Write the base -2 in a product 3 times** **\*Multiply** |

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| --- |
| notebook**Example 15:**Evaluate example 15a. |

|  |  |
| --- | --- |
| example 15b | **\*Write the base -5 in a product 2 times** **\*Multiply** |

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| **Note how I included the - when I expanded this problem out.  If the - is inside the ( ) of an exponent, then it is included as part of the base.** |

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| notebook**Example 16:**Evaluate example 16a. |

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| --- | --- |
| example 16b | **\*Negate 5 squared** **\*Put a - in front of 5 written in a product 2 times** **\*Multiply** |

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| **Hey, this looks a lot like example 15!!!!  It may look alike, but they ARE NOT the same.  Can you see the difference between the two??  Hopefully, you noticed that in example 15, there was a ( ) around the - and the 5.  In this problem, there is no (  ).  This means the - is NOT part of the base, so it will not get expanded like it did in example 15.  It is interpreted as finding the negative or opposite of 5 squared.** |

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| **Principal nth Root**  square root |

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| **Things to note about radicals in general**,   1. When there is no index number *n*, it is understood to be a 2 or square root. 2. When looking for the nth radical or nth root, you want the expression that when you raise it to the nth power you would get the radicand (what is inside the radical sign). |

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| notebook**Example 17:**  Find the root: example 17a. |

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| The thought behind this is that we are looking for the square root of 9.   This means we are looking for a number that when we square it we get 9.   **Since 3 squared is 9, 3 is the square root of 9.**  Note that we are only interested in the principal root and since 9 is positive and there is not a sign in front of the radical, our answer is positive 3.  If there had been a negative in front of the radical our answer would have been -3. |

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| notebook**Example 18:**  Find the root: example 18a. |

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| Contrary to popular belief, not every radical is a square root.  If there is an index or root number written, make sure you take the appropriate root.  Now we are looking for the third or cube root of -1/8, which means we are looking for a number that when we cube it we get -1/8.  **Since -1/2 cubed is -1/8, our answer is going to be -1/2.** |

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| **Order of Operations**  **Please   Parenthesis or grouping symbols** **Excuse   Exponents (and radicals)** **My Dear   Multiplication/Division left to right** **Aunt Sally  Addition/Subtraction left to right** |

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| As you know, life (as well as algebra) is not always as cut and dry like the above examples.  It is very important for you to understand each individual operation first (that is what we were doing in the above examples) and now we will put them together and mix them all about.  When you do have more than one mathematical operation, you need to use the order of operations as listed above. You may have already heard of the saying "Please Excuse My Dear Aunt Sally".  It is just a way to help you remember the order you need to go in when applying the order of operations.  notebook**Example 19:**    Simplify example 19a. |

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| **Using the Order of operations, we get:** |

|  |  |
| --- | --- |
| example 19b | **\*Work inside ( )** **\*Exponents** **\*Subtraction** |

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| notebook**Example 20:**     Simplify example 20a. |

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| **An absolute value is like a fancy grouping symbol.  So, if you have one, you need to do what is inside first, before tackling the other operations that are on the outside of it, as shown below.**  **Using the Order of operations, we get:** |

|  |  |
| --- | --- |
| example 20b | **\*Work inside |   |**  **\*Multiply** **\*Add** |

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| notebook**Example 21:**   Find the value of the expression when *x* = -1 and *y* = 5.  example 21a |

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| **When you have a fraction, like the one in this example, there are hidden grouping symbols.  The fraction bar separates the numerator from the denominator.  You need to think of it as if there is a (  ) around the numerator and one around the denominator.  In other words, when you have a problem like this one, you need to find the numerator and denominator first, before you deal with the fraction bar (division).**  **Plugging in values of the variables and evaluating the expression using the order of operations we get:** |

|  |  |
| --- | --- |
| example 21b | **\*Replace x with -1 and y with 5**  **\*Exponent in num.**  **\*Multiply in num. and den.**  **\*Add in num. and subtract in den.** |

   
**desk Practice Problems**

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| These are practice problems to help bring you to the next level.  It will allow you to check and see if you have an understanding of these types of problems. **Math works just like anything else, if you want to get good at it, then you need to practice it.  Even the best athletes and musicians had help along the way and lots of practice, practice, practice, to get good at their sport or instrument.**  In fact there is no such thing as too much practice.  To get the most out of these, **you should work the problem out on your own and then check your answer by clicking on the link for the answer/discussion for that problem**.  At the link you will find the answer as well as any steps that went into finding that answer. |

pencil**Practice Problems 1a - 1c: Find the sum or difference.**

|  |  |
| --- | --- |
| 1a. -5 + (-16) | 1b.    7 + (-3) |

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| --- |
| 1c.   -10 - (-2) |

pencil**Practice Problems 2a - 2b: Find the product or quotient.**

|  |  |
| --- | --- |
| 2a.   (-4)(9) | 2b. problem 2b |

pencil**Practice Problems 3a - 3c: Evaluate.**

|  |  |  |
| --- | --- | --- |
| 3a. problem 3a | 3b. problem 3b | 3c. problem 3c |

pencil**Practice Problems 4a - 4b: Find the root.**

|  |  |
| --- | --- |
| 4a. problem 4a | 4b. problem 4b |

pencil**Practice Problems 5a - 5b: Simplify the expression.**

|  |  |
| --- | --- |
| 5a. problem 5a | 5b. problem 5b |

pencil**Practice Problem 6a: Find the value of the expression** **when *a*= 3 and *b*= -2.**

**Learning Objectives**

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| After completing this tutorial, you should be able to:   1. Know what a linear equation is. 2. Know if a value is a solution or not. 3. Use the addition, subtraction, multiplication, and division properties of equalities to solve linear equations. 4. Know when an equation has no solution. 5. Know when an equation has all real numbers as a solution. |

**desk Introduction**

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| This is where we start getting into the heart of what algebra is about - solving equations.  In this tutorial we will be looking specifically at linear equations and their solutions.  We will start off slow and solve equations that use only one property to make sure you have the individual concepts down.  Then we will pick up the pace and mix up some where you need to use several properties and steps to get the job done.  Equations can be used to help us solve a variety of problems. In later tutorials, we will put them to use to solve word problems.  Then you can answer those tricky math questions. |

**desk Tutorial**

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| **Equation**  Two expressions set equal |

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| **Linear Equation**  An equation that can be written in the form  *ax + b = c* *where a, b, and c are constants* |

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| **Note that the exponent on the variable of a linear equation is always 1.** |

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| The following is an example of a linear equation: 3*x* - 4 = 5 |

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| **Solution**  A value, such that, when you replace the variable with it, it makes the equation true.  (the left side comes out equal to the right side) |

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| **Solution Set**  Set of all solutions |

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| **notebook Example 1**: Determine if any of the following values for x are solutions to the given equation.    3*x* - 4 = 5;   *x* = 3, 5. |

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| **Checking 3** 3*x* - 4 = 5 3(3) - 4 = 5  9 - 4 = 5  5 = 5  **True**          **3 is a solution** | **Checking 5** 3*x* - 4 = 5 3(5) - 4 = 5  15 - 4 = 5  11 = 5  **False**         **5 is not a solution** |

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| **Solving a Linear Equation** **in General**  Get the variable you are solving for alone on one side and everything else on the other side using INVERSE operations. |

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| The following will give us the tools that we need to solve linear equations. |

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| **Addition and Subtraction Properties of Equality**  *If a = b, then a + c = b + c*  *If a = b, then a - c = b - c* |

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| **In other words, if two expressions are equal to each other and you add or subtract the exact same thing to both sides, the two sides will remain equal.**  Note that addition and subtraction are inverse operations of each other.  For example, if you have a number that is being added that you need to move to the other side of the equation, then you would subtract it from both sides of that equation.     **notebook Example 2**:  Solve for the variable.     *x* - 5 = 2. |

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| --- | --- |
| *x* - 5 = 2 *x* - 5 + 5 = 2 + 5 *x* = 7 | **\*Inverse of sub. 5 is add. 5** |

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| Note that if you put 7 back in for *x*in the original problem you will see that **7 is the solution to our problem.** |

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| **notebook Example 3**: Solve for the variable.      *y* + 4 = -7. |

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| *y* + 4 = -7 *y* + 4 - 4 = -7 - 4 *y* = -11 | **\*Inverse of add. 4 is sub. 4** |

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| Note that if you put -11 back in for *y* in the original problem you will see that **-11 is the solution we are looking for**. |

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| **Multiplication and Division Properties of Equality**  *If a = b, then a(c) = b(c)*  *If a = b, then a/c = b/c where c is not equal to 0.* |

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| In other words, **if two expressions are equal and you multiply or divide (except for 0) the exact same constant to both sides, the two sides will remain equal.**  **Note that multiplication and division are inverse operations of each other.  For example, if you have a number that is being multiplied that you need to move to the other side of the equation, then you would divide it from both sides of that equation.**  Note, for multiplication and division, it is not guaranteed that if you multiply by the variable you are solving for that the two sides are going to be equal.  But is guaranteed that the two sides are going to be equal if you are multiplying or dividing by a constant or another variable that you are not solving for.  We will talk more about this in a later tutorial.  For this tutorial just note you can use this property with constants and variables you are not solving for.   **notebook Example 4**:  Solve for the variable.     *x*/2 = 5. |

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| example 4 | **\*Inverse of division by 2 is multiplication  by 2** |

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| If you put 10 back in for *x*in the original problem, you will see that **10 is the solution we are looking for.** |

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| **notebook Example 5**:   Solve for the variable.    5*x* = 7. |

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| example 5 | **\*Inverse of multiplication by 5 is division by 5** |

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| If you put 7/5 back in for*x* in the original problem, you will see that **7/5 is the solution we are looking for.** |

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| **The examples above were using only one property at a time to help you understand the different properties that we use to solve equations.  However, most times, we have to use several properties to get the job done.  The following is a strategy that you can use to help you solve linear equations that are a little bit more involved.** |

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| **Strategy for Solving a Linear Equation** |

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| **Note that your teacher or the book you are using may have worded these steps a little differently than I do, but it all boils down to the same concept -   get your variable on one side and everything else on the other using inverse operations.**  **Step 1: Simplify each side, if needed.**   |  | | --- | | This would involve things like removing ( ), removing fractions, adding like terms, etc.  **To remove ( ):** Just use the **distributive properties of real numbers.**  **To remove fractions**: Since fractions are another way to write division, and the inverse of divide is to multiply, you remove fractions by multiplying both sides by the LCD of all of your fractions. |     **Step 2: Use Add. /Sub. Properties to move the variable term to one side and all other terms to the other side.**  **Step 3: Use Multiply /Div. Properties to remove any values that are in front of the variable.**  **Step 4:  Check your answer.**  **I find this is the quickest and easiest way to approach linear equations.**      **notebook Example 6**:  Solve for the variable.     10 - 3*x* = 7. |

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| example 6 | **\*Inverse of add. 10 is sub. 10**    **\*Inverse of multiply by -3 is division by -3** |

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| **Be careful going from line 4 to line 5.  Yes, there is a negative sign. But, the operation between the -3 and *x* is multiplication not subtraction.** So, if you were to add 3 to both sides you would have ended up with -3*x* + 3 instead of the desired *x*.  If you put 1 back in for x in the original problem, you will see that **1 is the solution we are looking for.** |

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| **notebook Example 7**:  Solve for the variable.     2(*x* + 5) - 7 = 3(*x* - 2). |

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| example 7 | **\*Remove ( ) by using dist. prop.**  **\*Get all *x* terms on one side**  **\*Inverse of add. 3 is sub. 3**    **\*Inverse of multiply by -1 is division by -1** |

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| If you put 9 back in for x in the original problem, you will see that**9 is the solution we are looking for.** |

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| **notebook Example 8**:   Solve for the variable: example 8a. |

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| example 8b | **\*To get rid of the fractions,** **multiply both sides by the LCD of 4**  **\*Get all the *x* terms on one side**  **\*Inverse of add. 2 is sub. 2**    **\*Inverse of multiplication by -3 is division by -3** |

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| If you put 4/3 back in for x in the original problem you will see that **4/3 is the solution we are looking for.** |

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| **Contradiction**  A contradiction is an equation with one variable that has no solution. |

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| **notebook Example 9**:   Solve for the variable.   4*x* - 1 = 4(*x* + 3). |

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| --- | --- |
| example 9 | **\*Remove ( ) by using dist. prop.**  **\*Get all the *x* terms on one side** |

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| --- |
| Where did our variable, *x,* go???  It disappeared on us.  Also note how we ended up with a FALSE statement, -1 is not equal to 12.  This does not mean that *x* = 12 or*x* = -1.  **Whenever your variable drops out AND you end up with a false statement, then after all your hard work, there is NO SOLUTION.**  So, **the answer is no solution.** |

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| **Identity**  An identity is an equation with one variable that has all real numbers as a solution. |

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| **notebook Example 10**:   Solve for the variable.   5*x* + 10 = 5(*x* + 2). |

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| --- | --- |
| example 10 | **\*Remove ( ) by using dist. prop.**  **\*Get all the *x* terms on one side** |

|  |
| --- |
| **This time when our variable dropped out, we ended up with a TRUE statement.  Whenever that happens your answer is ALL REAL NUMBERS.**  So, **the answer is all real numbers**. |

   
  
   
**desk Practice Problems**

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| --- |
| These are practice problems to help bring you to the next level.  It will allow you to check and see if you understand these types of problems. **Math works just like anything else, if you want to get good at it, then you need to practice it.  Even the best athletes and musicians had help along the way and lots of practice, practice, practice, to get good at their sport or instrument.**  In fact there is no such thing as too much practice.  To get the most out of these, **you should work the problem out on your own and then check your answer by clicking on the link for the answer/discussion for that problem**.  At the link you will find the answer as well as any steps that went into finding that answer. |

pencil**Practice Problems 1a - 1e: Solve for the variable.**

|  |  |
| --- | --- |
| 1a. problem 1a | 1b. problem 1b |

|  |  |
| --- | --- |
| 1c. problem 1c | 1d. problem 1d |

|  |  |
| --- | --- |
| 1e.  7(*x* - 3) = 7*x* + 2 |  |

**Tutorial**

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| --- | --- | --- | --- | --- |
| **Note that your math teacher or math book may word it a little differently, but you will see it all basically means the same thing.**  If you follow these steps, it will help you become more successful in the world of problem solving.  Polyad created his famous **four-step process for problem solving,** which is used all over to aid people in problem solving:  **Step 1: Understand the problem.**   |  | | --- | | Sometimes the problem lies in **understanding the problem**.  If you are unclear as to what needs to be solved, then you are probably going to get the wrong results.  In order to show an understanding of the problem, you, of course, need to read the problem carefully.  Sounds simple enough, but some people jump the gun and try to start solving the problem before they have read the whole problem.  Once the problem is read, you need to list all the components and data that are involved. This is where you will be assigning your variable. |     **Step 2:  Devise a plan (translate).**   |  | | --- | | When you **devise a plan (translate)**, you come up with a way to solve the problem.  Setting up an equation, drawing a diagram, and making a chart are all ways that you can go about solving your problem.  In this tutorial, we will be setting up equations for each problem. |     **Step 3:  Carry out the plan (solve).**   |  | | --- | | The next step, **carry out the plan (solve)**, is big. This is where you solve the equation you came up with in your 'devise a plan' step.  The equations in this tutorial will all be linear equations. |     **Step 4:  Look back (check and interpret).**   |  | | --- | | You may be familiar with the expression 'don't look back'.  In problem solving it is good to **look back (check and interpret).**.  Basically, check to see if you used all your information and that the answer makes sense.  If your answer does check out, make sure that you write your final answer with the correct labeling. | |

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| **Numeric** **Word Problems** |

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| A lot of numeric types of word problems revolve around translating English statements into mathematical ones. **Just read and translate it left to right to set up your equation** |

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| **notebook Example 1**:  Twice the difference of a number and 1 is 4 more than that number.  Find the number. |

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| **Step 1:**Understand the problem |

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| Make sure that you read the question carefully several times.  Since we are looking for a number, we will let  ***x* = a number** |

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| --- |
| **Step 2:**Devise a plan(**translate**) |

|  |
| --- |
| example 1a |

|  |
| --- |
| **Step 3:**Carry out the plan (Solve) |

|  |  |
| --- | --- |
| example 1b | **\*Remove ( ) by using dist. prop.**  **\*Get all the *x* terms on one side**  **\*Inv. of sub. 2 is add 2** |

|  |
| --- |
| **Step 4:**[**Look back (check and interpret)**](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut8_probsol.htm#step4)**.** |

|  |
| --- |
| If you take twice the difference of 6 and 1, that is the same as 4 more than 6, so this does check.  **FINAL ANSWER:** **The number is 6.** |

|  |
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| **notebook Example 2**:  One number is 3 less than another number.  If the sum of the two numbers is 177, find each number. |

|  |
| --- |
| **Step 1:**[**Understand the problem**](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut8_probsol.htm#step1)**.** |

|  |
| --- |
| Make sure that you read the question carefully several times.  We are looking for two numbers, and since we can write the one number in terms of another number, we will let  ***x* = another number**    ne number is 3 less than another number:  ***x* - 3 = one number** |

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| **Step 2:**[**Devise a plan (translate)**](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut8_probsol.htm#step2)**.** |

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| --- |
| example 2a |

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| --- |
| **Step 3:**[**Carry out the plan (solve)**](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut8_probsol.htm#step3)**.** |

|  |  |
| --- | --- |
| example 2b | **\*Combine like terms**  **\*Inv. of sub 3 is add 3**  **\*Inv. of mult. 2 is div. 2** |

|  |
| --- |
| **Step 4:**[**Look back (check and interpret)**](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut8_probsol.htm#step4)**.** |

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| --- |
| If we add 90 and 87 (a number 3 less than 90) we do get 177.    **FINAL ANSWER:** **One number is 90.** **Another number is 87.** |

|  |
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| **Percent Problems** |

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| Whenever you are working with a percent problem, you need to make sure you write your percent in decimal form.  You do this by moving the decimal place of the percent two to the left.  For example, 32% in decimal form is .32  When you are wanting to find the percentage of some number, **remember that ‘of ’ represents multiplication** - so you would multiply the percent (in decimal form) times the number you are taking the percent of. |

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| --- |
| **notebook Example 3**:  Find 45% of 125. |

|  |
| --- |
| **Step 1:**[**Understand the problem**](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut8_probsol.htm#step1)**.** |

|  |
| --- |
| Make sure that you read the question carefully several times.  We are looking for a number that is 45% of 125,  we will let  ***x* = the value we are looking for** |

|  |
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| **Step 2:**[**Devise a plan (translate)**](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut8_probsol.htm#step2)**.** |

|  |
| --- |
| example 3a |

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| **Step 3:**[**Carry out the plan (solve)**](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut8_probsol.htm#step3)**.** |

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| --- | --- |
| example 3b | **\*Multiply** |

|  |
| --- |
| **Step 4:**[**Look back (check and interpret)**](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut8_probsol.htm#step4)**.** |

|  |
| --- |
| 56.25 is 45% of 125.  **FINAL ANSWER:** **The number is 56.25.** |

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| **notebook Example 4**:  A math class has 30 students.  Approximately 70% passed their last math test.  How many students passed the last math test? |

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| **Step 1:**[**Understand the problem**](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut8_probsol.htm#step1)**.** |

|  |
| --- |
| Make sure that you read the question carefully several times.  We are looking for how many students passed the last math test,  we will let  ***x* = number of students** |

|  |
| --- |
| **Step 2:**[**Devise a plan (translate)**](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut8_probsol.htm#step2)**.** |

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| --- |
| example 4a |

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| **Step 3:**[**Carry out the plan (solve)**](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut8_probsol.htm#step3)**.** |

|  |  |
| --- | --- |
| example 4b | **\*Multiply** |

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| --- |
| **Step 4:**[**Look back (check and interpret)**](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut8_probsol.htm#step4)**.** |

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| --- |
| 21 is 70% of 30.  **FINAL ANSWER:** **21 students passed the last math test.** |

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| **notebook Example 5**:  I purchased a new tv at a local electronics store for $541.25, which included tax.  If the tax rate is 8.25%, find the price of the tv before they added the tax. |

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| **Step 1:**[**Understand the problem**](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut8_probsol.htm#step1)**.** |

|  |
| --- |
| Make sure that you read the question carefully several times.  We are looking for the price of the tv before they added the tax,  we will let  ***x* = price of the tv before tax was added.** |

|  |
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| **Step 2:**[**Devise a plan (translate)**](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut8_probsol.htm#step2)**.** |

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| --- |
| example 5a |

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| **Step 3:**[**Carry out the plan (solve)**](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut8_probsol.htm#step3)**.** |

|  |  |
| --- | --- |
| example 5b | **\*Combine like terms**  **\*Inv of mult. 1.0825 is div. by 1.0825** |

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| --- |
| **Step 4:**[**Look back (check and interpret)**](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut8_probsol.htm#step4)**.** |

|  |
| --- |
| If you add on 8.25% tax to 500, you would get 541.25.  **FINAL ANSWER:** **The original price is $500.** |

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| **Rectangle Problem** |

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| The following formula will come in handy for solving example 6:  **Perimeter of a Rectangle = 2(length) + 2(width)** |

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| **notebook Example 6**:  In a blueprint of a rectangular room, the length is 1 inch more than 3 times the width.  Find the dimensions if the perimeter is to be 26 inches. |

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| **Step 1:**[**Understand the problem**](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut8_probsol.htm#step1)**.** |

|  |
| --- |
| Make sure that you read the question carefully several times.   We are looking for the length and width of the rectangle.  Since length can be written in terms of width, we will let  ***w* = width**    length is 1 inch more than 3 times the width:  **1 + 3*w =*length** |

|  |
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| **Step 2:**[**Devise a plan (translate)**](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut8_probsol.htm#step2)**.** |

|  |
| --- |
| example 6a |

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| **Step 3:**[**Carry out the plan (solve)**](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut8_probsol.htm#step3)**.** |

|  |  |
| --- | --- |
| example 6b | **\*Remove ( ) by using dist. prop.** **\*Combine like terms**  **\*Inv. of add. 2 is sub. 2**  **\*Inv. of mult. by 8 is div. by 8** |

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| **Step 4:**[**Look back (check and interpret)**](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut8_probsol.htm#step4)**.** |

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| If width is 3, then length, which is 1 inch more than 3 times the width would have to be 10.  The perimeter of a rectangle with width of 3 inches and length of 10 inches does come out to be 26.  **FINAL ANSWER:** **Width is 3 inches.** **Length is 10 inches.** |

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| **Supplementary and Complementary angles** |

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| **Supplementary angles sum up to be 180 degrees.**  **Complimentary angles sum up to be 90 degrees.** |

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| **notebook Example 7:**  Find the measure of each angle in the figure below.  Note that since the angles make up a straight line, they are supplementary to each other.  example 7c |

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| **Step 1:**[**Understand the problem**](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut8_probsol.htm#step1)**.** |

|  |
| --- |
| Make sure that you read the question carefully several times.  We are already given in the figure that  ***x* = one angle**  **5*x* = other angle** |

|  |
| --- |
| **Step 2:**[**Devise a plan (translate)**](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut8_probsol.htm#step2)**.** |

|  |
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| example 7a |

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| **Step 3:**[**Carry out the plan (solve)**](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut8_probsol.htm#step3)**.** |

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| example 7b | **\*Combine like terms**  **\*Inv. of mult. by 6 is div. by 6** |

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| **Step 4:**[**Look back (check and interpret)**](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut8_probsol.htm#step4)**.** |

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| If *x* is 30, then 5*x* = 5(30) = 150.  150 and 30 do add up to be 180, so they are supplementary angles.  **FINAL ANSWER:** **The two angles are 30 degrees and 150 degrees.** |

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| **Consecutive Integers** |

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| **Consecutive integers** are integers that follow one another in order.      |  | | --- | | For example,  5, 6, and 7 are three consecutive integers.  If we let *x* represent the first integer, how would we represent the second consecutive integer in terms of*x*?  Well if we look at 5, 6, and 7 - note that 6 is one more than 5, the first integer.  In general, **we could represent the second consecutive integer by *x* + 1**.  And what about the third consecutive integer.  Well, note how 7 is 2 more than 5.  In general, **we could represent the third consecutive integer as *x* + 2.** |     **Consecutive EVEN integers**are even integers that follow one another in order.      |  | | --- | | For example, 4, 6, and 8 are three consecutives even integers.  If we let *x* represent the first EVEN integer, how would we represent the second consecutive even integer in terms of *x*?   Note that 6 is two more than 4, the first even integer.  In general, **we could represent the second consecutive EVEN integer by *x* + 2**.  And what about the third consecutive even integer?  Well, note how 8 is 4 more than 4.  In general, **we could represent the third consecutive EVEN integer as *x* + 4.** |     **Consecutive ODD integers**are odd integers that follow one another in order.      |  | | --- | | For example, 5, 7, and 9 are three consecutive odd integers.  If we let *x* represent the first ODD integer, how would we represent the second consecutive odd integer in terms of *x*?   Note that 7 is two more than 5, the first odd integer.  In general, **we could represent the second consecutive ODD integer by *x* + 2.**  And what about the third consecutive odd integer?  Well, note how 9 is 4 more than 5.  In general, **we could represent the third consecutive ODD integer as *x* + 4.**  Note that a common misconception is that because we want an odd number that we should not be adding a 2 which is an even number.  Keep in mind that *x* is representing an ODD number and that the next odd number is 2 away, just like 7 is 2 away form 5, so we need to add 2 to the first odd number to get to the second consecutive odd number. | |

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| **notebook Example 8:**  The sum of 3 consecutive integers is 258.  Find the integers. |

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| **Step 1: Understand the problem.** |

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| Make sure that you read the question carefully several times.  We are looking for 3 consecutive integers, we will let  ***x* = 1st consecutive integer**  ***x* + 1 = 2nd consecutive integer**  ***x* + 2 = 3rd consecutive integer** |

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| **Step 2:  Devise a plan (translate).** |

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| --- |
| example 8a |

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| **Step 3:  Carry out the plan(solve)** |

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| --- | --- |
| example 8b | **\*Combine like terms** **\*Inv. of add 3 is sub. 3**  **\*Inv. of mult. by 3 is div. by 3** |

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| **Step 4:  Look back (check and interpret).** |

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| The sum of 85, 86 and 87 does check to be 258.  **FINAL ANSWER:** **The three consecutive integers are 85, 86, and 87.** |

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| **notebook Example 9:**  The ages of 3 sisters are 3 consecutives even integers.  If the sum of twice the 1st even integer, 3 times the 2nd even integer, and the 3rd even integer is 34, find each age. |

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| **Step 1: Understand the problem.** |

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| Make sure that you read the question carefully several times.  We are looking for 3 EVEN consecutive integers, we will let  ***x* = 1st consecutive even integer**  ***x* + 2 = 2nd consecutive even integer**  ***x* + 4  = 3rd  consecutive even integer** |

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| **Step 2:  Devise a plan** (translate) |

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| example 9a2 |

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| **Step 3:**[**Carry out the plan (solve)**](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut8_probsol.htm#step3)**.** |

|  |  |
| --- | --- |
| example 9b | **\*Remove ( ) by using dist. prop.** **\*Combine like terms**  **\*Inv. of add. 10 is sub. 10**  **\*Inv. of mult. by 6 is div. by 6** |

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| **Step 4:**[**Look back (check and interpret)**](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut8_probsol.htm#step4)**.** |

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| --- |
| If we take the sum of two times 4, three times 6, and 8, we do get 34  **FINAL ANSWER: The ages of the three sisters are 4, 6, and 8.** |

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| **Business Problem: Breaking Even** |

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| In a business-related problem, the cost equation, *C* is the cost of manufacturing a product.  In the revenue equation, *R* is the amount of money the manufacturer makes on a product.  **If a manufacturer wants to know how many items must be sold to break even, that can be found by setting the cost equal to the revenue.** |

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| **notebook Example 10:**  The cost *C* to produce *x* number of cd’s is *C* = 50 + 5*x*.  The cd’s are sold wholesale for $15 each, so revenue *R* is given by *R* = 15*x*.  Find how many cd’s the manufacturer needs to produce and sell to break even. |

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| **Step 1: Understand the problem** |

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| Make sure that you read the question carefully several times.  We are looking for the number of cd’s needed to be sold to break even, we will let  ***x* = the number of cd’s** |

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| **Step 2:  Devise a plan ( translate)** |

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| --- |
| example 10a |

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| --- |
| **Step 3:  Carry out the plan (solve)** |

|  |  |
| --- | --- |
| example 10b | **\*Get all *x* terms on one side**  **\*Inv. of mult. by 10 is div. by 10** |

|  |
| --- |
| **Step 4:  Look Back (check and interpret)** |

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| --- |
| When *x* is 5 the cost and the revenue both equal 75.  **FINAL ANSWER:** **5 cd’s.** |

   
   
**desk Practice Problems**

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| These are practice problems to help bring you to the next level.  It will allow you to check and see if you have an understanding of these types of problems. **Math works just like anything else, if you want to get good at it, then you need to practice it.  Even the best athletes and musicians had help along the way and lots of practice, practice, practice, to get good at their sport or instrument.**  In fact, there is no such thing as too much practice.  To get the most out of these, **you should work the problem out on your own and then check your answer by clicking on the link for the answer/discussion for that problem**.  At the link you will find the answer as well as any steps that went into finding that answer. |

pencil**Practice Problems 1a - 1g: Solve the word problem.**

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| 1a.  The sum of a number and 2 is 6 less than twice that number. |

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| 1b.  Find 72% of 35. |

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| 1c.  A local furniture store is having a terrific sale.  They are marking down every price 45%.  If the couch you have our eye on is $440 after the markdown, what was the original price?   How much would you save if you bought it at this sale? |

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| 1d.  A rectangular garden has a width that is 8 feet less than twice the length.  Find the dimensions if the perimeter is 20 feet. |

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| 1e.  Complimentary angles sum up to be 90 degrees.  Find the measure of each angle in the figure below.  Note that since the angles make up a right angle, they are complementary to each other.  problem 1 |

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| --- |
| 1f.  The sum of 3 consecutive odd integers is 57.  Find the integers. |

|  |
| --- |
| 1g.  The cost *C* to produce *x* numbers of VCR’s is*C* = 1000 + 100*x*.  The VCR’s are sold wholesale for $150 each, so the revenue is given by *R* = 150*x*.  Find how many VCR’s the manufacturer needs to produce and sell to break even. |

 **Learning Objectives**

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| After completing this tutorial, you should be able to:   1. Identify and use the addition and multiplication identity properties. 2. Identify and use the addition and multiplication inverse properties. 3. Identify and use the addition and multiplication commutative properties. 4. Identify and use the addition and multiplication associative properties. 5. Identify and use the distributive property. 6. Know the key words that translate into an equal sign. 7. Know the symbol for 'not equal to'. 8. Know the symbol for and the meaning of ’less than', 'greater than', 'less than or equal to', and 'greater than or equal to'. 9. Write mathematical expressions that have an equal, less than, greater than, less than or equal to, or greater than or equal to sign. |

**desk Introduction**

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| It is important to be familiar with the properties in this tutorial.  They lay the foundation that you need to work with equations, functions, and formulas all of which are covered in later tutorials, as well as, your algebra class.   We will start with the properties for real numbers and then look at writing out equalities and inequalities in mathematical statements. |

**desk Tutorial**

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| **Identity Properties** |

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| **Addition**  *The additive identity is 0*  *a + 0 = 0 + a = a* |

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| In other words, when you add 0 to any number, you end up with that number as a result. |

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| **Multiplication**  *Multiplication identity is 1*  *a(1) = 1(a) = a* |

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| And when you multiply any number by 1, you wind up with that number as your answer. |

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| **The Inverse Properties** |

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| **Additive Inverse (or negative)**  *For each real number a, there is a unique real number, denoted -a,* *such that*  *a + (-a) = 0.* |

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| In other words, when you add a number to its additive inverse, the result is 0. Other terms that are synonymous with additive inverse are negative and opposite. |

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| **Multiplicative Inverse** **(or reciprocal)**  *For each real number a, except 0, there is a unique real number reicprocal such that*  reciprocal 2 |

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| In other words, when you multiply a number by its multiplicative inverse the result is 1.  A more common term used to indicate a multiplicative inverse is the **reciprocal**.  A multiplicative inverse or reciprocal of a real number *a* (except 0) is found by "flipping" *a*upside down.  The numerator of *a*becomes the denominator of the reciprocal of *a* and the denominator of *a* becomes the numerator of the reciprocal of *a*.  **These two inverses will come in big time handy when you go to solve equations later on.  Keep them in your memory bank until that time.**  notebook**Example 1:**   Write the opposite (or additive inverse) of -3. |

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| --- |
| **The opposite of -3 is 3,**since -3 + 3 = 0. |

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| --- |
| notebook**Example 2:**  Write the opposite (or additive inverse) of 1/5. |

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| --- |
| **The opposite of 1/5 is -1/5**, since 1/5 + (-1/5) = 0. |

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| --- |
| notebook**Example 3:**   Write the reciprocal (or multiplicative inverse) of -3. |

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| **The reciprocal of -3 is -1/3**, since -3(-1/3) = 1.  When you take the reciprocal, the sign of the original number stays intact.  Remember that you need a number that when you multiply times the given number you get 1.  If you change the sign when you take the reciprocal, you would get a -1, instead of 1, and that is a no no. |

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| notebook**Example 4:**   Write the reciprocal (or multiplicative inverse) of 1/5. |

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| **The reciprocal of 1/5 is 5**, since 5(1/5) = 1. |

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| **The Commutative Properties of** **Addition and Multiplication**  *a + b = b + a       and      ab = ba* |

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| The Commutative Property, in general, states that changing the ORDER of  two numbers either being added or multiplied, does NOT change the value of it.  The two sides are called equivalent expressions because they look different but have the same value. |

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| notebook**Example 5:**  Use the commutative property to write an equivalent expression to 2.5x + 3y. |

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| Using the commutative property of addition (where changing the order of a sum does not change the value of it) we get  **2.5x + 3y = 3y + 2.5x.** |

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| notebook**Example 6:**  Use the commutative property to write an equivalent expression to example 6a. |

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| Using the communicative property of multiplication (where changing the order of a product does not change the value of it), we get  example 6b |

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| **The Associative Properties of** **Addition and Multiplication**  *a + (b + c) = (a + b) + c     and    a(bc) = (ab)c* |

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| The Associative property, in general, states that changing the GROUPING of numbers that are either being added or multiplied does NOT change the value of it.  Again, the two sides are equivalent to each other.  **At this point it is good to remind you that both the commutative and associative properties do NOT work for subtraction or division.**  notebook**Example 7:**   Use the associative property to write an equivalent expression to  (a + 5b) + 2c. |

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| --- |
| Using the associative property of addition (where changing the grouping of a sum does not change the value of it) we get  **(a + 5b) + 2c = a + (5b + 2c).** |

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| --- |
| notebook**Example 8:**   Use the associative property to write an equivalent expression to  (1.5x)y. |

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| Using the associative property of multiplication (where changing the grouping of a product does not change the value of it) we get  **(1.5x) y = 1.5(xy)** |

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| **Distributive Properties**  *a(b + c) = ab + ac* or  *(b + c)a = ba + ca* |

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| In other words, when you have a term being multiplied times two or more terms that are being added (or subtracted) in a ( ), multiply the outside term times EVERY term on the inside.  Remember terms are separated by + and -.  This idea can be extended to more than two terms in the ( ).  notebook**Example 9:**Use the distributive property to find the product - (5*x*+ 7). |

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| example 9 | **\*A - outside a ( ) is the same as times (-1)** **\*Distribute the (-1) to EVERY term inside ( )** **\*Multiply** |

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| Basically, when you have a negative sign in front of a ( ), like this example, you can think of it as taking a -1 times the ( ).  What you end up doing in the end is taking the opposite of every term in the ( ). |

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| notebook**Example 10:**Use the distributive property to find the product  3(2*a* + 3*b* + 4*c*). |

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| As mentioned above, you can extend the distributive property to as many terms as are inside the ( ).  The basic idea is that you multiply the outside term times EVERY term on the inside. |

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| example 10 | **\*Distribute the 3 to EVERY term** **\*Multiply** |

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| notebook**Example 11:**Simplify (hint use the distributive property): 2(6*x* - 5) - 3(5*x* + 4). |

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| **Let's first apply the distributive property and see what we get:** |

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| example 11 | **\*Distribute 2 to EVERY term of 1st ( )** **\*Distribute -3 to EVERY term of 2nd ( )** **\*Multiply** |

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| You can use any of these properties’ forwards or backwards, and that includes the distributive property.  When it says to simplify, that means we want to write it in equivalent form that is more compact - get it down to as few terms as possible.  Of course, we can combine the -10 and -12.  But with the help of the distributive property in reverse, we can also combine 12*x*and -15*x*.  **Let's check it out:** |

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| example 11b | **\**x* is distributed to the 1st 2 terms** **\*Reverse Dist. Prop with*x*** **\*Subtract** |

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| **Now the above properties will all eventually help you when you are solving equations and inequalities.  Since that is the case, this is a good time to introduce the concept of equality and inequality and look at them in mathematical statements.** |

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| **Equality** **=** |

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| It makes sense that an equality involves an equal sign.  Here are some key words that translate into an  =  when writing out mathematical statements:  **Equals, is, represents, is the same as,** **gives, yields, amounts to, is equal to.**  FYI, when you put an = between two mathematical expressions, you have yourself an equation. |

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| **Not Equal** not equal |

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| The above symbol is used when you want to say that two expressions are not equal to each other. |

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| **Inequality**  **Read left to right:**  ***a* < *b*    *a* is less than *b***  ***a* < *b*    *a* is less than or equal to *b***  ***a* >*b*      *a* is greater than *b***  ***a* >** ***ba* is greater than or equal to *b*** |

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| If *a*is less than *b*, that means *a* lies to the left of *b*on the real number line.  If *a* is greater than *b*, that means *a* lies to the right of *b* on the real number line. |

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| notebook**Example 12:**Write the statement using mathematical symbols. The product of 5 and x is the same as 15. |

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| As covered in tutorial 2, **product**translates into multiplication.  What will we use for **the same as**?  If you said **=**, you are correct!!  **Let's put everything together going left to right:**  **The product of 5 and x is the same as 15** example 12 |

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| notebook**Example 13:**Write the statement using mathematical symbols. The sum of 3 and*y* is less than 12. |

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| Do you remember what **sum** translates into?   If you said **add**, you are doing great.  **Is less than** will need to be replaced by the symbol <.  **Let's put everything together going left to right:**  **The sum of 3 and y is less than 12.** example 13 |

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| notebook**Example 14:**Write the statement using mathematical symbols. Twice the difference of 4 and *a* is less than or equal to the reciprocal of 5. |

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| I**s less than or equal** to will need to be replaced by the symbol <**.**  The reciprocal of 5 is 1/5.  **Let's put everything together going left to right:**  **Twice the difference of 4 and *a* is less than or equal to the reciprocal of 5.** example 14 |

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| notebook**Example 15:**Write the statement using mathematical symbols. The quotient of *x*and 2 is greater than the opposite of 1. |

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| Do you remember what **quotient** translates into?  I believe that it is **division**, don't you agree?  **Is greater than**will need to be replaced by the symbol **>**.  What is the **opposite of 1**?  Why, it is **-1**.  **Let's put everything together going left to right:**  **The quotient of *x* and 2 is greater than the opposite of 1.** example 15 |

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| notebook**Example 16:**Write the statement using mathematical symbols. 3 times the sum of 2 and x is greater than or equal to 10. |

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| **Times** will translate as**multiplication** and **sum** as **addition.**  **Is greater than or equal to** will need to be replaced by the symbol **>**  **Let's put everything together going left to right:**  **3 times the sum of 2 and x is greater than or equal to 10.** example 16 |

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| notebook**Example 17:**Write the statement using mathematical symbols. The difference of x and 5 is not equal to 10. |

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| **Difference** is translated into **subtraction**.  **Is not equal to** will need to be replaced by the symbol not equal  **Let's put everything together going left to right:**  **The difference of x and 5 is not equal to 10.** example 17 |

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| notebook**Example 18:**Write the following as an algebraic expression: The cost of *x*pizzas, if each pizza costs $8.55. |

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| If each pizza costs 8.55, then, in order to find the cost, we would have to multiply the number of pizzas (*x*) by the cost per pizza (8.55).  **Hence, we would get the algebraic expression 8.55*x*.** |

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| notebook**Example 19:**Insert <, > , or = to form a true statement. -5 ?  0. |

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| Since -5 is to the left of 0 on the number line, then -5 is less than 0:  **-5 < 0** |

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| notebook**Example 20:**Insert <, > , or = to form a true statement.  -3.5 ?  - 4.5. |

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| Since -3.5 is to the right of - 4.5 on the number line, then -3.5 is greater than - 4.5:  **-3.5 > - 4.5** |

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| notebook**Example 21:**Insert <, > , or = to form a true statement.  10/2 ? 15/3. |

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| Since both 10/2 and 15/3 simplify to be 5, then 10/2 equals 15/3:  **10/2 = 15/3** |

   
  
   
**desk Practice Problems**

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| These are practice problems to help bring you to the next level.  It will allow you to check and see if you understand these types of problems. **Math works just like anything else, if you want to get good at it, then you need to practice it.  Even the best athletes and musicians had help along the way and lots of practice, practice, practice, to get good at their sport or instrument.**  In fact, there is no such thing as too much practice.  To get the most out of these, **you should work the problem out on your own and then check your answer by clicking on the link for the answer/discussion for that problem**.  At the link you will find the answer as well as any steps that went into finding that answer. |

pencil**Practice Problems 1a - 1b: Write the opposite (additive inverse) and the reciprocal (multiplicative inverse) of each number.**

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| 1a.  -7 [(answer/discussion to 1a)](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut5_prop_ans.htm#ad1a) | 1b.  3/5 [(answer/discussion to 1b)](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut5_prop_ans.htm#ad1b) |

pencil**Practice Problems 2a - 2b: Use a commutative property to write an equivalent expression.**

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| 2a.  *xy* [(answer/discussion to 2a)](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut5_prop_ans.htm#ad2a) | 2b.  .1 + 3*x* [(answer/discussion to 2b)](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut5_prop_ans.htm#ad2b) |

pencil**Practice Problems 3a - 3b: Use an associative property to write an equivalent expression.**

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| 3a. (*a* + *b*) + 1.5 [(answer/discussion to 3a)](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut5_prop_ans.htm#ad3a) | 3b.  5(*xy*) [(answer/discussion to 3b)](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut5_prop_ans.htm#ad3b) |

pencil**Practice Problems 4a - 4b: Use the distributive property to find the product.**

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| 4a.  -2(*x*- 5) [(answer/discussion to 4a)](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut5_prop_ans.htm#ad4a) | 4b.  7(5*a*+ 4*b* + 3*c*) [(answer/discussion to 4b)](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut5_prop_ans.htm#ad4b) |

pencil**Practice Problem 5a: Simplify the expression.**

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| 5a.   2(*x* + 3) - 3*x* + 4 [(answer/discussion to 5a)](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut5_prop_ans.htm#ad5a) |  |

pencil**Practice Problems 6a - 6d: Write each statement using mathematical symbols.**

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| 6a.  The difference of *x* and 5 is greater than or equal to 7. [(answer/discussion to 6a)](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut5_prop_ans.htm#ad6a) |

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| 6b.  Twice the sum of *y*and 3 is the opposite of 10. [(answer/discussion to 6b)](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut5_prop_ans.htm#ad6b) |

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| 6c.  The product of -3 and *x* is not equal to the reciprocal of 9. [(answer/discussion to 6c)](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut5_prop_ans.htm#ad6c) |

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| 6d.  The quotient of x and 11 is less than - 4. [(answer/discussion to 6d)](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut5_prop_ans.htm#ad6d) |

pencil**Practice Problem 7a: Write the following as an algebraic expression.**

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| 7a.  Two angles are complimentary if the sum of their measures is 90 degrees.  If the measure of one angle is *x* degrees, represent the measure of the other angle as an expression of *x*.  [(answer/discussion to 7a)](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut5_prop_ans.htm#ad7a) |

pencil**Practice Problems 8a - 8c: Insert <, > or = to form a true statement.**

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| 8a.   ½   ?  .5 [(answer/discussion to 8a)](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut5_prop_ans.htm#ad8a) | 8b.  -3.5   ?   1.5 [(answer/discussion to 8b)](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut5_prop_ans.htm#ad8b) |

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| 8c.  4.3    ?   4.21 [(answer/discussion to 8c)](https://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut5_prop_ans.htm#ad8c) |