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Algebra practice problems

Welcome to the Algebra worksheets page at Math-Drills.com, where unknowns are common and variables are the norm. On this page, you will find Algebra worksheets for middle school students on topics such as algebraic expressions, equations and graphing functions. This page starts off with some missing numbers worksheets for younger students. We then get right into algebra by helping students recognize and understand the basic language related to algebra. The rest of the page covers some of the main topics you'll encounter in algebra units. Remember that by teaching students algebra, you are helping to create the future financial whizzes, engineers, and scientists that will solve all of our world's problems. Algebra is much more interesting when things are more real. Solving linear equations is much more fun with a two pan balance, some mystery bags and a bunch of jelly beans. Algebra tiles are used by many teachers to help students understand a variety of algebra topics. And there is nothing like a set of co-ordinate axes to solve systems of linear equations. Algebraic Properties, Rules and Laws Worksheets The commutative law or commutative property states that you can change the order of the numbers in an arithmetic problem and still get the same results. In the context of arithmetic, it only works with addition or multiplication operations, but not mixed addition and multiplication. For example, 3 + 5 = 5 + 3 and 9 × 5 = 5 × 9. A fun activity that you can use in the classroom is to brainstorm non-numerical things from everyday life that are commutative and non-commutative. Putting on socks, for example, is commutative because you can put on the right sock then the left sock or you can put on the left sock then the right sock and you will end up with the same result. Putting on underwear and pants, however, is non-commutative. The Commutative Law Worksheets The associative law or associative property allows you to change the grouping of the operations in an arithmetic problem with two or more steps without changing the result. The order of the numbers stays the same in the associative law. As with the commutative law, it applies to addition-only or multiplication-only problems. It is best thought of in the context of order of operations as it requires that parentheses must be dealt with first. An example of the associative law is: (9 + 5) + 6 = 9 + (5 + 6). In this case, it doesn't matter if you add 9 + 5 first or 5 + 6 first, you will end up with the same result. Students might think of some examples from their experience such as putting items on a tray at lunch. They could put the milk and vegetables on their tray first then the sandwich or they could start with the vegetables and sandwich then put on the milk. If their tray looks the same both times, they will have modeled the associative law. Reading a book could be argued as either associative or nonassociative as one could potentially read the final chapters first and still understand the book as well as someone who read the book the normal way. The Associative Law Worksheets Inverse relationships worksheets cover a pre-algebra skill meant to help students understand the relationship between multiplication and division and the relationship between addition and subtraction. Inverse Mathematical Relationships with One Blank Inverse Mathematical Relationships with Two Blanks The distributive property is an important skill to have in algebra. In simple terms, it means that you can split one of the factors in multiplication into addends, multiply each addend separately, add the results, and you will end up with the same answer. It is also useful in mental math, an example of which should help illustrate the definition. Consider the question, 35 × 12. Splitting the 12 into 10 + 2 gives us an opportunity to complete the question mentally using the distributive property. First multiply 35 × 10 to get 350. Second, multiply 35 × 2 to get 70. Lastly, add 350 + 70 to get 420. In algebra, the distributive property becomes useful in cases where one cannot easily add the other factor before multiplying. For example, in the expression, 3(x + 5), x + 5 cannot be added without knowing the value of x. Instead, the distributive property can be used to multiply 3 × x and 3 × 5 to get 3x + 15. Distributive Property Worksheets Students should be able to substitute known values in for an unknown(s) in an expression and evaluate the expression's value. Evaluating Expressions with Known Values The exponent rules covered in this section include: product, quotient, power of a product, power of a quotient and power of a power rules. Product Rule: aman = am+n Quotient Rule: am/an = am-n Power of a Product Rule: (ab)m = ambm Power of a Quotient Rule: (a/b)m = am/bm Power of a Power Rule: (am)n = amn Depending on the worksheet, students might also want to be familiar with basic rules: a0 = 1 a1 = a a-m = 1/am -am = am when m is even Exponent Rules With Numbers Knowing the language of algebra can help to extract meaning from word problems and to situations outside of school. In these worksheets, students are challenged to convert phrases into algebraic expressions. Translating Algebraic Phrases into Expressions Combining like terms is something that happens a lot in algebra. Students can be introduced to the topic and practice a bit with these worksheets. The bar is raised with the adding and subtracting versions that introduce parentheses into the expressions. For students who have a good grasp of fractions, simplifying simple algebraic fractions worksheets present a bit of a challenge over the other worksheets in this section. Simplifying Expressions by Combining Like Terms Simplifying Expressions by Combining Like Terms with Some Arithmetic Rewriting Linear Equations Rewriting Formulas Linear Expressions and Equations Missing Numbers in Equations with Blanks as Unknowns Missing Numbers in Equations with Symbols as Unknowns Solving Equations with Addition and Symbols as Unknowns Solving Simple Linear Equations with Letters as Unknowns (All Operations) Solving Simple Linear Equations with Letters as Unknowns (Addition and Subtraction) Solving Simple Linear Equations with Letters as Unknowns (Addition and Subtraction with Negative Numbers) Solving Simple Linear Equations with Letters as Unknowns (Multiplication and Division) Determining Linear Equations from Slopes, y-intercepts and Points Graphing linear equations and reading existing graphs give students a visual representation that is very useful in understanding the concepts of slope and y-intercept. Graphing Linear Equations Graph Slope-Intercept Equations Determining Linear Equations from Graphs Solving linear equations with jelly beans is a fun activity to try with students first learning algebraic concepts. Ideally, you will want some opaque bags with no mass, but since that isn't quite possible (the no mass part), there is a bit of a condition here that will actually help students understand equations better. Any bags that you use have to be balanced on the other side of the equation with empty ones. Probably the best way to illustrate this is through an example. Let's use 3x + 2 = 14. You may recognize the x as the unknown which is actually the number of jelly beans we put in each opaque bag. The 3 in the 3x means that we need three bags. It's best to fill the bags with the required number of jelly beans out of view of the students, so they actually have to solve the equation. On one side of the two-pan balance, place the three bags with x jelly beans in each one and two loose jelly beans to represent the + 2 part of the equation. On the other side of the balance, place 14 jelly beans and three empty bags which you will note are required to "balance" the equation properly. Now comes the fun part... if students remove the two loose jelly beans from one side of the equation, things become unbalanced, so they need to remove two jelly beans from the other side of the balance to keep things even. Eating the jelly beans is optional. The goal is to isolate the bags on one side of the balance without any loose jelly beans while still balancing the equation. The last step is to divide the loose jelly beans on one side of the equation into the same number of groups as there are bags. This will probably give you a good indication of how many jelly beans there are in each bag. If not, eat some and try again. Now, we realize this won't work for every linear equation as it is hard to have negative jelly beans, but it is another teaching strategy that you can use for algebra. Despite all appearances, equations of the type a/x are not linear. Instead, they belong to a different kind of equations. They are good for combining them with linear equations, since they introduce the concept of valid and invalid answers for an equation (what will be later called the domain of a function). In this case, the invalid answers for equations in the form a/x, are those that make the denominator become 0. Solving Linear Equations Algebra rectangles are rectangles that use linear expressions for the side measurements. With a known value (such as the perimeter), students create an algebraic equation that they can solve to determine the value of the unknown (x) and use it to determine the side lengths and area of the rectangle. The terminology in identifying the various options for worksheets use the standard equation y = mx + b where m is the coeffient of x that is generally a known value. Algebra Rectangles Algebra Rectangles -- Determining the Value of x, Length, Width and Area Using Algebraic Sides and the Perimeter -- m Range [1,1] Algebra Worksheet -{}- Algebra Rectangles -- Determining the Value of x, Length, Width and Area Using Algebraic Sides and the Perimeter -- m Range [2,9] Algebra Worksheet -{}- Algebra Rectangles -- Determining the Value of x, Length, Width and Area Using Algebraic Sides and the Perimeter -- m Range [2,9] or [-9,-2] Algebra Worksheet -{}- Algebra Rectangles -- Determining the Value of x, Length, Width and Area Using Algebraic Sides and the Perimeter -- m Range [2,9] or [-9,-2] -- Inverse m Possible Quadratic Expressions and Equations Simplifying (Combining Like Terms) Quadratic Expressions Adding/Subtracting and Simplifying Quadratic Expressions Multiplying Factors to Get Quadratic Expressions The factoring quadratic expressions worksheets in this section provide many practice questions for students to hone their factoring strategies. If you would rather worksheets with quadratic equations, please see the next section. These worksheets come in a variety of levels with the easier ones are at the beginning. The 'a' coefficients referred to below are the coefficients of the x2 term as in the general quadratic expression: ax2 + bx + c. There are also worksheets in this section for calculating sum and product and for determining the operands for sum and product pairs. Factoring Quadratic Expressions Whether you use trial and error, completing the square or the general quadratic formula, these worksheets include a plethora of practice questions with answers. In the first section, the worksheets include questions where the quadratic expressions equal 0. This makes the process similar to factoring quadratic expressions, with the additional step of finding the values for x when the expression is equal to 0. In the second section, the expressions are generally equal to something other than x, so there is an additional step at the beginning to make the quadratic expression equal zero. Solving Quadratic Equations that Equal Zero Solving Quadratic Equations that Equal an Integer Other Polynomial and Monomial Expressions & Equations Simplifying Polynomials That Involve Addition And Subtraction Simplifying Polynomials That Involve Multiplication And Division Simplifying Polynomials That Involve Addition, Subtraction, Multiplication And Division Factoring Expressions That Do Not Include A Squared Variable Factoring Expressions That Always Include A Squared Variable Factoring Expressions That Sometimes Include Squared Variables Multiplying Polynomials With Two Factors Multiplying Polynomials With Three Factors Free intermediate and college algebra questions and problems are presented along with answers and explanations. Free worksheets to download are also included. Intermediate Algebra Questions with Answers Intermediate Algebra Problems with Detailed Solutions Algebra Problems. Algebra 2 Problems with Solutions - Part 1 . Algebra 2 Problems with Solutions - Part 2 . Intermediate Algebra Problems With Answers - sample 1: equations, system of equations, percent problems, relations and functions. Intermediate Algebra Problems With Answers - sample 2:Find equation of line, domain and range from graph, midpoint and distance of line segments, slopes of perpendicular and parallel lines. Intermediate Algebra Problems With Answers - sample 3: equations and system of equations, quadratic equations, function given by a table, intersections of lines, problems. Intermediate Algebra Problems With Answers - sample 4. Functions, domain, range, zeros. Intermediate Algebra Problems With Answers - sample 5. Scientific Notation Intermediate Algebra Problems With Answers - sample 6. Equations of Lines Intermediate Algebra Problems With Answers - sample 7. Slopes of Lines Intermediate Algebra Problems With Answers - sample 8. Absolute Value Expressions Intermediate Algebra Problems With Answers - sample 9. Solve Absolute Value Equations Intermediate Algebra Problems With Answers - sample 10. Solve Absolute Value Inequalities Intermediate Algebra Problems With Answers - sample 11. Simplify Algebraic Expressions by Removing Brackets Intermediate Algebra Problems With Answers - sample 12. Simplify Algebraic Expressions with Exponents Intermediate Algebra Worksheets College Algebra Questions with Answers College Algebra Problems with Answers sample 1: Quadratic Functions. sample 2: Composite and Inverse Functions. sample 3: Exponential and Logarithmic Functions. sample 4: Graphs of Functions . sample 5: Find Domain and Range of Functions. sample 6: Problems on Polynomials: Graphs, Factoring, Finding, Multiplying, Dividing, Factor theorem, Zeros sample 7: Equation of Circle: Finding equations, center, radius of circles sample 8: Equation of Ellipse: Finding equations, foci, center, vertices of ellipses sample 9: Equation of Parabola: Finding equations, focus, vertex, axis, directrix of parabola. sample 10: Equation of Hyperbola: Finding equations, foci, center and vertices of hyperbola. College Algebra Worksheets Mathworksheetsgo.com is now a part of Mathwarehouse.com. All of your worksheets are now here on Mathwarehouse.com. Please update your bookmarks! Enjoy these free printable sheets. Each one has model problems worked out step by step, practice problems, as well as challenge questions at the sheets end. Plus each one comes with an answer key. You've found something even better! That's because Khan Academy has over 100,000 free practice questions. And they're even better than traditional math worksheets – more instantaneous, more interactive, and more fun! Counting and place value Addition and subtraction Measurement and geometry Place value Addition and subtraction Measurement, data, and geometry Khan Academy's 100,000+ free practice questions give instant feedback, don't need to be graded, and don't require a printer. Math WorksheetsKhan AcademyMath worksheets take forever to hunt down across the internetKhan Academy is your one-stop-shop for practice from arithmetic to calculusMath worksheets can vary in quality from site to siteEvery Khan Academy question was written by a math expert with a strong education backgroundMath worksheets can have ads or cost moneyKhan Academy is a nonprofit whose resources are always free to teachers and learners – no ads, no subscriptionsPrinting math worksheets use up a significant amount of paper and are hard to distribute during virtual learningKhan Academy practice requires no paper and can be distributed whether your students are in-person or onlineMath worksheets can lead to cheating or a lack of differentiation since every student works on the same questionsKhan Academy has a full question bank to draw from, ensuring that each student works on different questions – and at their perfect skill levelMath worksheets can slow down student learning since they need to wait for feedbackKhan Academy gives instant feedback after every answer – including hints and video support if students are stuckMath worksheets take up time to collect and take up valuable planning time to gradeKhan Academy questions are graded instantly and automatically for you Here's an example: "My students love Khan Academy because they can immediately learn from their mistakes, unlike traditional worksheets." Biology teacher, Houston, TX Khan Academy's practice questions are 100% free—with no ads or subscriptions. Our 100,000+ practice questions cover every math topic from arithmetic to calculus, as well as ELA, Science, Social Studies, and more. Khan Academy is a nonprofit with a mission to provide a free, world-class education to anyone, anywhere. Then be sure to check out our teacher tools. They'll help you assign the perfect practice for each student from our full math curriculum and track your students' progress across the year. Plus, they're also 100% free — with no subscriptions and no ads. Get your free teacher tools April 29, 2025 April 21, 2025 April 17, 2025 Find resources to prepare for Algebra tests, with study guides, flash cards, practice tests, online courses and more. Students may face basic Algebra tests from elementary school through high school. For more information, see Tests.com's Algebra Test Guide. Show Mobile Notice Show All Notes Hide All Notes Mobile Notice You appear to be on a device with a "narrow" screen width (i.e. you are probably on a mobile phone). Due to the nature of the mathematics on this site it is best viewed in landscape mode. If your device is not in landscape mode many of the equations will run off the side of your device (you should be able to scroll/swipe to see them) and some of the menu items will be cut off due to the narrow screen width. Here are a set of practice problems for the Algebra notes. Click on the "Solution" link for each problem to go to the page containing the solution. Note that some sections will have more problems than others and some will have more or less of a variety of problems. Most sections should have a range of difficulty levels in the problems although this will vary from section to section. Here is a listing of sections for which practice problems have been written as well as a brief description of the material covered in the notes for that particular section. Preliminaries - In this chapter we will do a quick review of some topics that are absolutely essential to being successful in an Algebra class. We review exponents (integer and rational), radicals, polynomials, factoring polynomials, rational expressions and complex numbers. Integer Exponents – In this section we will start looking at exponents. We will give the basic properties of exponents and illustrate some of the common mistakes students make in working with exponents. Examples in this section we will be restricted to integer exponents. Rational exponents will be discussed in the next section. Rational Exponents – In this section we will define what we mean by a rational exponent and extend the properties from the previous section to rational exponents. We will also discuss how to evaluate numbers raised to a rational exponent. Radicals – In this section we will define radical notation and relate radicals to rational exponents. We will also give the properties of radicals and some of the common mistakes students often make with radicals. We will also define simplified radical form and show how to rationalize the denominator. Polynomials – In this section we will introduce the basics of polynomials a topic that will appear throughout this course. We will define the degree of a polynomial and discuss how to add, subtract and multiply polynomials. Factoring Polynomials – In this section we look at factoring polynomials a topic that will appear in pretty much every chapter in this course and so is vital that you understand it. We will discuss factoring out the greatest common factor, factoring by grouping, factoring quadratics and factoring polynomials with degree greater than 2. Rational Expressions – In this section we will define rational expressions. We will discuss how to reduce a rational expression lowest terms and how to add, subtract, multiply and divide rational expressions. Complex Numbers – In this section we give a very quick primer on complex numbers including standard form, adding, subtracting, multiplying and dividing them. Solving Equations and Inequalities - In this chapter we will look at one of the most important topics of the class. The ability to solve equations and inequalities is vital to surviving this class and many of the later math classes you might take. We will discuss solving linear and quadratic equations as well as applications. In addition, we will discuss solving polynomial and rational inequalities as well as absolute value equations and inequalities. Solutions and Solution Sets – In this section we introduce some of the basic notation and ideas involved in solving equations and inequalities. We define solutions for equations and inequalities and solution sets. Linear Equations – In this section we give a process for solving linear equations, including equations with rational expressions, and we illustrate the process with several examples. In addition, we discuss a subtlety involved in solving equations that students often overlook. Applications of Linear Equations – In this section we discuss a process for solving applications in general although we will focus only on linear equations here. We will work applications in pricing, distance/rate problems, work rate problems and mixing problems. Equations With More Than One Variable – In this section we will look at solving equations with more than one variable in them. These equations will have multiple variables in them and we will be asked to solve the equation for one of the variables. This is something that we will be asked to do on a fairly regular basis. Quadratic Equations, Part I – In this section we will start looking at solving quadratic equations. Specifically, we will look at factoring and the square root property in this section. Quadratic Equations, Part II – In this section we will continue solving quadratic equations. We will use completing the square to solve quadratic equations in this section and use that to derive the quadratic formula. The quadratic formula is a quick way that will allow us to quickly solve any quadratic equation. Quadratic Equations : A Summary – In this section we will summarize the topics from the last two sections. We will give a procedure for determining which method to use in solving quadratic equations and we will define the discriminant which will allow us to quickly determine what kind of solutions we will get from solving a quadratic equation. Applications of Quadratic Equations – In this section we will revisit some of the applications we saw in the linear application section, only this time they will involve solving a quadratic equation. Included are examples in distance/rate problems and work rate problems. Equations Reducible to Quadratic Form – Not all equations are in what we generally consider quadratic equations. However, some equations, with a proper substitution can be turned into a quadratic equation. These types of equations are called quadratic in form. In this section we will solve this type of equation. Equations with Radicals – In this section we will discuss how to solve equations with square roots in them. As we will see we will need to be very careful with the potential solutions we get as the process used in solving these equations can lead to values that are not, in fact, solutions to the equation. Linear Inequalities – In this section we will start solving inequalities. We will concentrate on solving linear inequalities in this section (both single and double inequalities). We will also introduce interval notation. Polynomial Inequalities – In this section we will continue solving inequalities. However, in this section we move away from linear inequalities and move on to solving inequalities that involve polynomials of degree at least 2. Rational Inequalities – We continue solving inequalities in this section. We now will solve inequalities that involve rational expressions, although as we'll see the process here is pretty much identical to the process used when solving inequalities with polynomials. Absolute Value Equations – In this section we will give a geometric as well as a mathematical definition of absolute value. We will then proceed to solve equations that involve an absolute value. We will also work an example that involved two absolute values. Absolute Value Inequalities – In this final section of the Solving chapter we will solve inequalities that involve absolute value. As we will see the process for solving inequalities with a \(\) (i.e. greater than). Graphing and Functions - In this chapter we'll look at two very important topics in an Algebra class. First, we will start discussing graphing equations by introducing the Cartesian (or Rectangular) coordinates system and illustrating use of the coordinate system to graph lines and circles. We will also formally define a function and discuss graph functions and combining functions. We will also discuss inverse functions. Graphing – In this section we will introduce the Cartesian (or Rectangular) coordinate system. We will define/introduce ordered pairs, coordinates, quadrants, and x and y-intercepts. We will illustrate these concepts with a couple of quick examples Lines – In this section we will discuss graphing lines. We will introduce the concept of slope and discuss how to find it from two points on the line. In addition, we will introduce the standard form of the line as well as the point-slope form and slope-intercept form of the line. We will finish off the section with a discussion on parallel and perpendicular lines. Circles – In this section we discuss graphing circles. We introduce the standard form of the circle and show how to use completing the square to put an equation of a circle into standard form. The Definition of a Function – In this section we will formally define relations and functions. We also give a "working definition" of a function to help understand just what a function is. We introduce function notation and work several examples illustrating how it works. We also define the domain and range of a function. In addition, we introduce piecewise functions in this section. Graphing Functions – In this section we discuss graphing functions including several examples of graphing piecewise functions. Combining functions – In this section we will discuss how to add, subtract, multiply and divide functions. In addition, we introduce the concept of function composition. Inverse Functions – In this section we define one-to-one and inverse functions. We also discuss a process we can use to find an inverse function and verify that the function we get from this process is, in fact, an inverse function. Common Graphs - In this chapter we will look at graphing some of the more common functions you might be asked to graph. We graph parabolas, ellipses, hyperbolas and rational functions in this chapter. We will also look at transformations of functions and introduce the concept of symmetry. Lines, Circles and Piecewise Functions – This section is here only to acknowledge that we've already talked about graphing these in a previous chapter. Parabolas – In this section we will be graphing parabolas. We introduce the vertex and axis of symmetry for a parabola and give a process for graphing parabolas. We also illustrate how to use completing the square to put the parabola into the form \(f(x)=a(x-h)^{2}+k\). Ellipses – In this section we will graph ellipses. We introduce the standard form of an ellipse and how to use it to quickly graph an ellipse. Hyperbolas – In this section we will graph hyperbolas. We introduce the standard form of a hyperbola and how to use it to quickly graph a hyperbola. Miscellaneous Functions – In this section we will graph a couple of common functions that don't really take all that much work to do but will be needed in later sections. We'll be looking at the constant function, square root, absolute value and a simple cubic function. Transformations – In this section we will be looking at vertical and horizontal shifts of graphs as well as reflections of graphs about the \(x\) and \(y\)-axis. Collectively these are often called transformations and if we understand them they can often be used to allow us to quickly graph some fairly complicated functions. Symmetry – In this section we introduce the idea of symmetry. We discuss symmetry about the x-axis, y-axis and the origin and we give methods for determining what, if any symmetry, a graph will have without having to actually graph the function. Rational Functions – In this section we will discuss a process for graphing rational functions. We will also introduce the ideas of vertical and horizontal asymptotes as well as how to determine if the graph of a rational function will have them. Polynomial Functions - In this chapter we will take a more detailed look at polynomial functions. We will discuss dividing polynomials, finding zeroes of polynomials and sketching the graph of polynomials. We will also look at partial fractions (even though this doesn't really involve polynomial functions). Dividing Polynomials – In this section we'll review some of the basics of dividing polynomials. We will define the remainder and divisor used in the division process and introduce the idea of synthetic division. We will also give the Division Algorithm. Zeroes/Roots of Polynomials – In this section we'll define the zero or root of a polynomial and whether or not it is a simple root or has multiplicity \(k\). We will also give the Fundamental Theorem of Algebra and The Factor Theorem as well as a couple of other useful Facts. Graphing Polynomials – In this section we will give a process that will allow us to get a rough sketch of the graph of some polynomials. We discuss how to determine the behavior of the graph at \(x\)-intercepts and the leading coefficient test to determine the behavior of the graph as we allow x to increase and decrease without bound. Finding Zeroes of Polynomials – As we saw in the previous section in order to sketch the graph of a polynomial we need to know what it's zeroes are. However, if we are not able to factor the polynomial we are unable to do that process. So, in this section we'll look at a process using the Rational Root Theorem that will allow us to find some of the zeroes of a polynomial and in special cases all of the zeroes. Partial Fractions – In this section we will take a look at the process of partial fractions and finding the partial fraction decomposition of a rational expression. What we will be asking here is what "smaller" rational expressions did we add and/or subtract to get the given rational expression. This is a process that has a lot of uses in some later math classes. It can show up in Calculus and Differential Equations for example. Exponential and Logarithm Functions - In this chapter we will introduce two very important functions in many areas : the exponential and logarithm functions. We will look at their basic properties, applications and solving equations involving the two functions. If you are in a field that takes you into the sciences or engineering then you will be running into both of these functions. Exponential Functions – In this section we will introduce exponential functions. We will give some of the basic properties and graphs of exponential functions. We will also discuss what many people consider to be the exponential function, \(f(x) = {\bf e}^{x}\). Logarithm Functions – In this section we will introduce logarithm functions. We give the basic properties and graphs of logarithm functions. In addition, we discuss how to evaluate some basic logarithms including the use of the change of base formula. We will also discuss the common logarithm, \(\log(x)\), and the natural logarithm, \(\ln(x)\). Solving Exponential Equations – In this section we will discuss a couple of methods for solving equations that contain exponentials. Solving Logarithm Equations – In this section we will discuss a couple of methods for solving equations that contain logarithms. Also, as we'll see, with one of the methods we will need to be careful of the results of the method as it is always possible that the method gives values that are, in fact, not solutions to the equation. Applications – In this section we will look at a couple of applications of exponential functions and an application of logarithms. We look at compound interest, exponential growth and decay and earthquake intensity. Systems of Equations - In this chapter we will take a look at solving systems of equations. We will solve linear as well as nonlinear systems of equations. We will also take a quick look at using augmented matrices to solve linear systems of equations. Linear Systems with Two Variables – In this section we will solve systems of two equations and two variables. We will use the method of substitution and method of elimination to solve the systems in this section. We will also introduce the concepts of inconsistent systems of equations and dependent systems of equations. Linear Systems with Three Variables – In this section we will work a couple of quick examples illustrating how to use the method of substitution and method of elimination introduced in the previous section as they apply to systems of three equations. Augmented Matrices – In this section we will look at another method for solving systems. We will introduce the concept of an augmented matrix. This will allow us to use the method of Gauss-Jordan elimination to solve systems of equations. We will use the method with systems of two equations and systems of three equations. More on the Augmented Matrix – In this section we will revisit the cases of inconsistent and dependent solutions to systems and how to identify them using the augmented matrix method. Nonlinear Systems – In this section we will take a quick look at solving nonlinear systems of equations. A nonlinear system of equations is a system in which at least one of the equations is not linear, i.e. has degree of two or more. Note as well that the discussion here does not cover all the possible solution methods for nonlinear systems. Solving nonlinear systems is often a much more involved process than solving linear systems. 1. This year, a salesman sells a total of $60,000 worth of steak knives by going door-to-door. This represents a 20% increase from the year before. What was the value of his sales last year?A. $45,000 B. $48,000 C. $50,000 D. $52,500 E. $56,0002. Solve the equation for x. x/3 = (2x + 3)/7A. –3 B. 2 C. 3 D. 3/7 E. 93. Solve the equation for y. 3(2y + 4) = 8yA. –8 B. –6 C. –2 D. 2 E. 64. Solve the equation for x. |x + 5| = 3A. -8 B. -3 C. -2 D. -8 and -3 E. -8 and -25. If 3x + 8x + 4x = 6x + 63, then what is 5x + 23?A. 28 B. 35 C. 38 D. 58 E. 626. What is the reciprocal of -3?A. –3 B. -1/3 C. 1/3 D. 3 E. undefined 7. If the positive square root of x is between 3 and 11, then what inequality represents all possible values of x?A. 3 < x < 11 B. 9 < x < 11 C. 9 < x < 121 D. x < 3 or x < 11 E. x < 9 or x < 1218. Carol is three times older than Andrew. Brad is two years older than Andrew. In six years, the sum of Andrew's and Brad's ages will be the same as Carol's age. How old is Carol?A. 24 years old B. 27 years old C. 30 years old D. 36 years old E. 42 years old9. A cab ride costs $3.25 for the first half-mile and $0.70 for each mile after the first half-mile. How far can someone travel for $12?A. 9 miles B. 13 miles C. 14 miles D. 26 miles E. 27 miles10. Solve the equation for x. 13 – 2(2x + 1) = 1A. B. C. D. E. Answer Key1. C. Let x represent the total value of last year's sales, Set up an equation and solve it for x. Since the salesman's sales increased by 20% since last year's, his current sales 120% of x, or 1.2x. So, 1.2x = 60,000Solve the equation for x by dividing both sides by 1.2.x = 50,000Therefore, the salesman sold $50,000 worth of steak knives last year.2. E. This equation is a proportion, so it can be solved by cross-multiplication. Form a new equation by multiplying the numerator of each fraction by the denominator of the fraction on the other side. Then, simplify the result and solve for x.x/3 = (2x + 3)/7 7x = 3(2x + 3) 7x = 6x + 9 x = 93. E. To begin, simplify the right side of the equation by distributing the 3.3(2y + 4) = 8y 6y + 12 = 8yThen, solve the equation by isolating the variable and dividing both sides by the coefficient.12 = 2y y = 64. E. This equation involves an absolute value function. The absolute value of a number is its distance from zero on a number line. Since distances are never negative, the absolute value of a number is always positive (or equal to zero). In order to make the equation true, the expression inside the absolute value, x + 5, can equal either -3 or 3 since the absolute value of both values is 3. Write two equations and solve each.x + 5 = -3x = -8x + 5 = 3x = -25. D. To begin, solve the given equation for x.3x + 8x + 4x = 6x + 63 15x = 6x + 63 9x = 63 x = 7 Next, substitute 7 for x in the expression 5x + 23 and simplify the result.5(7) + 23 = 35 + 23 = 586. B. The product of a number and its reciprocal, or multiplicative inverse, is 1. For a fraction, the reciprocal can be found by inverting (or switching) the numerator and denominator. Since –3 can be written as , its reciprocal is .7. C. Since the square root of x is between 3 and 11, we know that the inequality 3 11 is true. To find the value of x, square each part of the inequality. The result is the inequality 9 < x < 121.8. A. Write each piece of information as an equation using the variables A, B, and C for the current ages of Andrew, Brad, and Carol, respectively.C = 3A B = A + 2 (A + 6) + (B + 6) = C + 6This is a system of equations. Since the first two equations are already solved for C and B, substitute the expressions on the right side into the third equation. Then, solve for A.(A + 6) + (B + 6) = C + 6 (A + 6) + [(A + 2) + 6) = (3A) + 6 2A + 14 = 3A + 6 A = 8Therefore, Andrew is 8 years old. To find Carol's age, multiply Andrew's age by three. Thus, Carol is currently 24 years old.9. B. To begin, write an equation relating the cost C to the distance D. If one travels more than half a mile, the cost is $3.25 plus the $0.70 times the distance in miles, excluding the first half-mile. Because the first half-mile is excluded, ½, or 0.5 must be subtracted from the distance when multiplying by 0.70.C = 3.25 + 0.70(D – 0.5)To find how far someone can travel with $12, substitute 12 for C and solve for D.12 = 3.25 + 0.70(D – 0.5) 12 = 3.25 + 0.7D – 0.35 9.1 = 0.7D D = 13Therefore, someone can travel 13 miles on $12.10. D. First, simplify the left side of the equation.13 – 2(2x + 1) = 1 13 – 4x – 2 = 1 –4x + 11 = 1Then, isolate the variable and solve for x.–4x = –10 Last Updated: June 4, 2019