Exponential and logarithmic functions word problems worksheet

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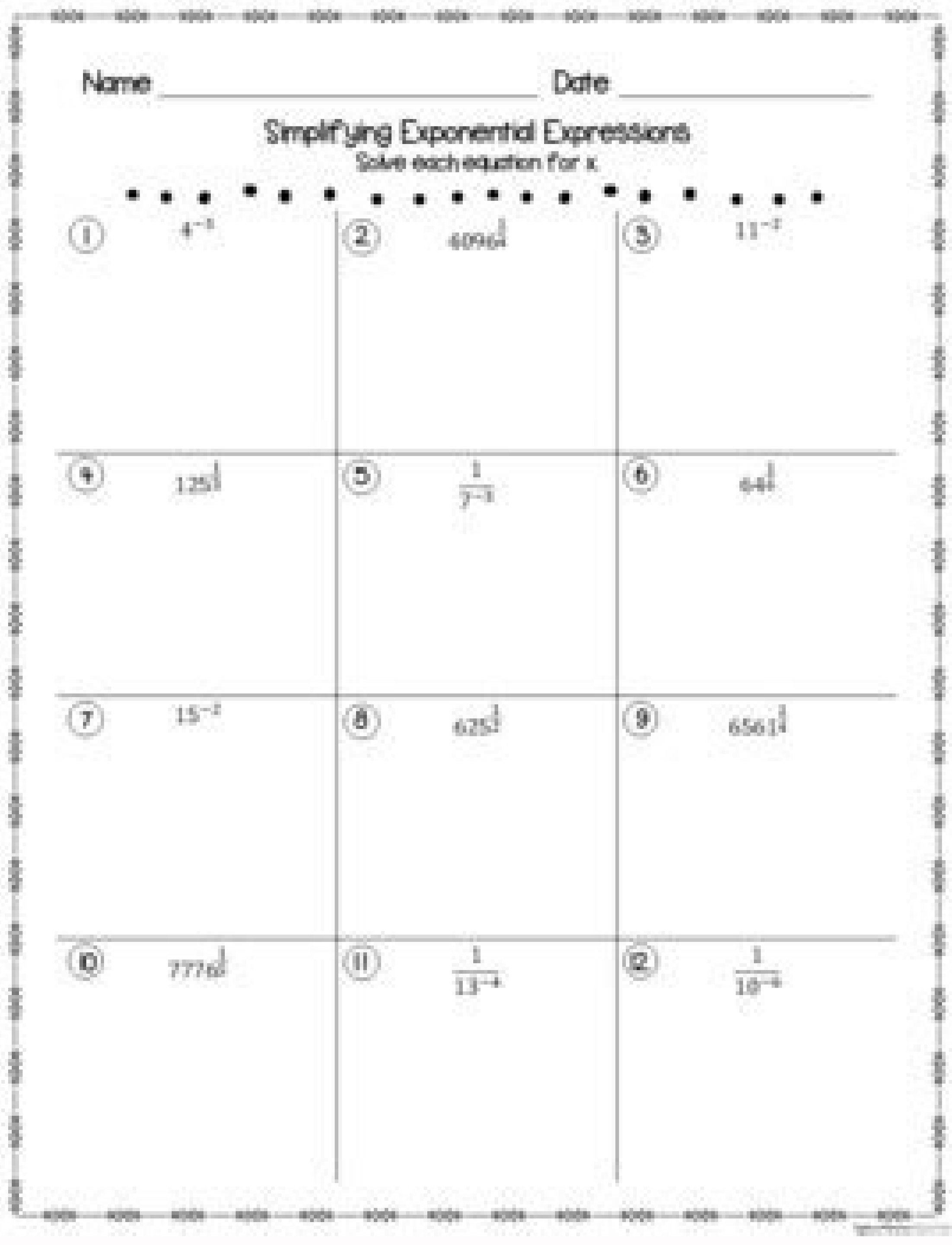

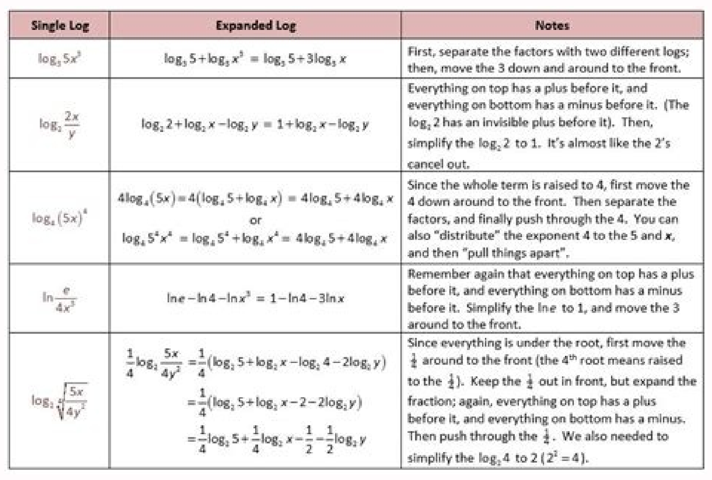

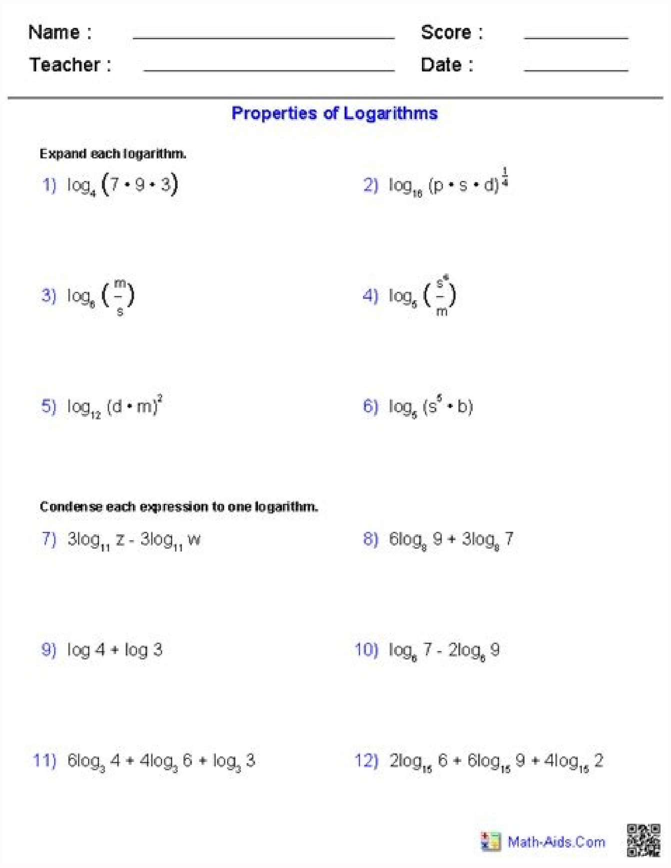

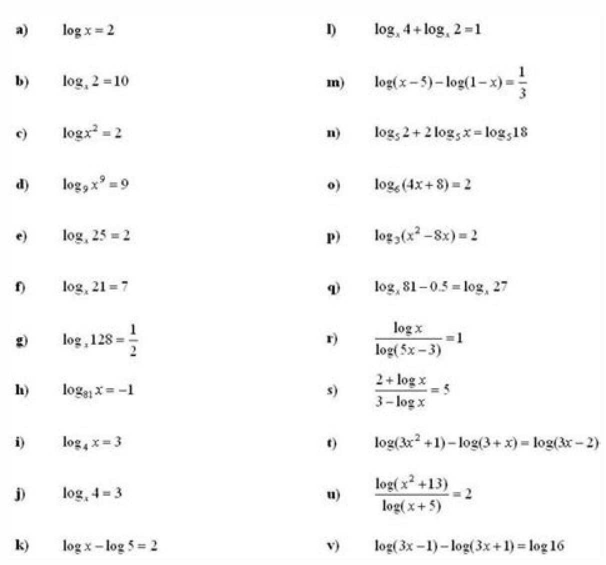

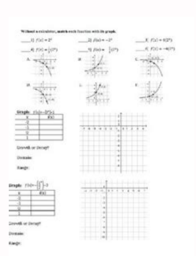

Exponential and logarithmic functions word problems worksheet answers.

In order to continue enjoying our site, we ask that you confirm your identity as a human. Thank you very much for your cooperation. Logarithm worksheets for high school students cover the skills based on converting between logarithmic form and exponential form, evaluating logarithmic expressions, finding the value of the variable to make the equation correct, solving logarithmic equations, single logarithm, expanding logarithm using power rule, product rule and quotient rule, expressing the log value in algebraic expression, logarithms using calculator and more. Explore some of these exercises for free! These math lessons has been written especially to meet the requirements of higher grade students. I've tried my best to present the work in a clear, simple and easy style so that students may not face any difficulty. Each lesson has solved examples and practice problems with answers. While adding new topics is an ongoing process, efforts has been made to put the concepts in a logical sequence. In spite of my best efforts to make these lessons error free, some typing errors might have gone unnoticed. I shall be grateful to generous fellows if same are brought to my notice. Worthy suggestions for improvement of these math lessons are always welcome. Celestial team is working hard to update content regularly, still if you feel any topic is left ,please do let us know. All valuable suggestions to make this site more meaningful and useful are appreciated. © 2019 Celestial Tutors All Rights Reserved This word problems worksheet will produce addition, multiplication, subtraction and division problems with 1 or 2 digit numbers. This word problems worksheet will produce ten problems per worksheet. Click here for More Word Problems Worksheets Finding the inverse of a log function is as easy as following the suggested steps below. You will realize later after seeing some examples that most of the work boils down to solving an equation. The key steps involved include isolating the log expression and then rewriting the log equation into an exponential equation. You will see what I mean when you go over the worked examples below. Steps to Find the Inverse of a Logarithm STEP 1: Replace the function notation f\left(x \right) by y. f\left(x \right) \to y STEP 2: Switch the roles of x and y. x \to y y \to x STEP 3: Isolate the log expression on one side (left or right) of the equation. STEP 4: Convert or transform the log equation into its equivalent exponential equation. Notice that the subscript b in the \log form becomes the base with exponent N in exponential form. The variable M stays in the same place. STEP 5: Solve the exponential equation for y to get the inverse. Then replace y by {f^{ - 1}}\left(x \right) which is the inverse notation to write the final answer. Rewrite \color{blue}y as \color{red}{f^{ - 1}}\left(x \right) Examples of How to Find the Inverse of a Logarithm Example 1: Find the inverse of the log equation below. f\left(x \right) = {\log _2}\left({x + 3} \right) Start by replacing the function notation f\left(x \right) by y. Then, interchange the roles of \color{red}x and \color{red}y. Proceed by solving for y and replacing it by {f^{ - 1}}\left(x \right) to get the inverse. Part of the solution below includes rewriting the log equation into an exponential equation. Here's the formula again that is used in the conversion process. Notice how the base 2 of the log expression becomes the base with an exponent of x. The stuff inside the parenthesis remains in its original location. Once the log expression is gone by converting it into an exponential expression, we can finish this off by subtracting both sides by 3. Don't forget to replace the variable y by the inverse notation {f^{ - 1}}\left(x \right) the end. One way to check if we got the correct inverse is to graph both the log equation and inverse function in a single xy-axis. If their graphs are symmetrical along the line \large{\color{green}y = x}, then we can be confident that our answer is indeed correct. Example 2: Find the inverse of the log function f\left(x \right) = {\log _5}\left({2x - 1} \right) - 7 Let's add up some level of difficulty to this problem. The equation has a log expression being subtracted by 7. I hope you can assess that this problem is extremely doable. The solution will be a bit messy but definitely manageable. So I begin by changing the f\left(x \right) into y, and swapping the roles of \color{red}x and \color{red}y. Now, we can solve for y. Add both sides of the equation by 7 to isolate the logarithmic expression on the right side. By successfully isolating the log expression on the right, we are ready to convert this into an exponential equation. Observe that the base of log expression which is 6 becomes the base of the exponential expression on the left side. The expression 2y-1 inside the parenthesis on the right is now by itself without the log operation. After doing so, proceed by solving for \color{red}y to obtain the required inverse function. Do that by adding both sides by 1, followed by dividing both sides by the coefficient of \color{red}y which is 2. Let's sketch the graphs of the log and inverse functions in the same Cartesian plane to verify that they are indeed symmetrical along the line \large{\color{green}y=x}. Example 3: Find the inverse of the log function So this is a little more interesting than the first two problems. Observe that the base of log expression is missing. If you encounter something like this, the assumption is that we are working with a logarithmic expression with base 10. Always remember this concept to help you get around problems with the same setup. I hope you are already more comfortable with the procedures. We start again by making f\left(x \right) as y, then switching around the variables \color{red}x and \color{red}y in the equation. Our next goal is to isolate the log expression. We can do that by subtracting both sides by 1 followed by dividing both sides by -3. The log expression is now by itself. Remember, the "missing" base in the log expression implies a base of 10. Transform this into an exponential equation, and start solving for y. Notice that the entire expression on the left side of the equation becomes the exponent of 10 which is the implied base as pointed out before. Continue solving for y by subtracting both sides by 1 and dividing by -4. After y is fully isolated, replace that by the inverse notation \large{\color{blue}{f^{ - 1}}\left(x \right)}. Done! Graphing the original function and its inverse on the same xy-axis reveals that they are symmetrical about the line \large{\color{green}y=x}. You might also be interested in: Inverse of a 2×2 Matrix Inverse of Absolute Value Function Inverse of Constant Function Inverse of Exponential Function Inverse of Linear Function Inverse of Quadratic Function Inverse of Rational Function Inverse of Square Root Function You might know that the bacterial colony grows exponentially. But what does that mean? Exponential growth means doubling quantities every second, every hour, or day depending on independent and dependent variables. For instance, the mathematical expression for the exponential growth of a colony after t hours is given by y(t) is: dy / dt = 2y This is the first-order equation showing the exponential growth of any quantity. Exponential Function – Definition An exponential function is one in which the exponent is a variable, the base is positive and not equivalent to one. F (x) =4x, for example, is an exponential function since the exponent is a fixed constant rather than a mutable. f (x) = x3 is a fundamental polynomial function rather than an exponential function. Exponential functions feature uninterrupted curved graphs that never reach a horizontal asymptote. Several practical phenomena are governed by logarithmic or exponential functions. Exponential growth Exponential growth is a mathematical transformation that grows indefinitely using an exponential function. The shift that has occurred can be either positively or negatively directed. The key premise would be that the pace of changes is increasing. When not bound by environmental constraints such as accessible space and nourishment, populations of developing microorganisms, and indeed any expanding population of any species, may be described as an exponential growth function. Another application of an exponential growth function is the growth of savings with compound interest. Exponential decay Exponential decay occurs in mathematical functions when the pace by which changes are occurring are decreasing and must thus reach a limitation, which is the horizontal asymptote of an exponential function. The asymptote is the position on the x-axis at which the speed of changes reached near zero. Exponential decay may be observed in a variety of systems. The reduction in radioactive particles as its fissions and decomposes into some other atoms follows an exponential decay curve. A hot item starts to cool to a constant ambient temperature, or a cold item heat, will demonstrate an exponentially decaying curve. Exponential decay may be used to determine the discharges of an electric capacitor across a resistance. Exponential growth and decay formula The exponential growth formula is used to find compound interest, find the doubling time, and find the population growth. Exponential growth is given by, f (x) = a (1 + r)x Where, f (x) = exponential growth function a = initial amount r = growth rate x = number of time intervals In exponential growth, the quantity increases, slowly at first, and then very rapidly. The rate of change increases over time. Hence, the exponential growth graph can be described as The amount drops gradually, followed by a quick reduction in the speed of change and increases over time. The exponential decay formula is used to determine the decrease in growth. The exponential decay formula can take one of three forms: f (x) = abx f (x) = a (1 – r)x P = P0 e-k t Where, a (or) P0 = Initial amount b = decay factor e = Euler's constant r = Rate of decay (for exponential decay) k = constant of proportionality x (or) t = time intervals (time can be in years, days, (or) months, whatever you are using should be consistent throughout the problem). In exponential decay, the quantity decreases very rapidly at first, and then more slowly. The rate of change decreases over time. The rate of decay becomes slower as time passes. Hence, the exponential decay graph is denoted as Understanding the exponential growth and decay graph   The graph of exponential growth and decay is not linear. In a straight-line graph, the rate of change is constant, which is not the case in the exponential growth and decay functions. Therefore, the exponential growth and decay graph are not straight lines. Observe the graphs based on the functional values a and b. x y = f (x) -22-2 = ¼ -12-1 = ½ 020 = 1121 = 2222 = 4323= 8 Features of the exponential growth and decay graph The domain is all Real numbers.The range is all positive real numbers (not zero).Graph has a y-intercept at (0,1). Remember any number to the zero power is 1.When b > 1, the graph increases. The greater the base, b, the faster the graph rises from left to right.When 0 < b < 1, the graph decreases.Has an asymptote (a line that the graph gets very, very close to, but never crosses or touches). For this graph the asymptote is the x-axis (y = 0). How to calculate exponential growth or decay rate? The formula for exponential growth and decay is: y = a bx Where a ≠ 0, the base b ≠ 1 and x is any real number A show the initial integer in this function, like the initial population or the initial dose amount. The growth or decay factor is represented by the parameter b. If b is greater than one, the function indicates exponential growth. If the function is 0 < b < 1, it depicts exponential decline. If a percent of growth or decay is given to you and it is said to calculate the growth/decay factor, add or subtract the percent, expressed in the decimal form, from 1. Generally, if r is a decimal representation of the growth or decay factor, then: b = 1 – r Decay Factor b = 1 + r Growth Factor The variable x denotes how many times the growth/decay factor is compounded. Exponential growth and decay word problems Example 1: Carbon-14 has a half-life of 5,730 years. Find the carbon-14, exponential decay model. Please round your answer to the nearest decimal point. Solution: Use the formula of exponential decay P = P0 e– k t P0 = initial amount of carbon Half-life of carbon-14 is 5,730 years, P = P0 / 2 = Half of the initial amount of carbon when t = 5, 730. P0 / 2 =P0 e– k (5730) Divide both sides by P0 0.5 = e– k (5730) Take "ln" on both sides, ln 0.5 = -5730k Divide both sides by -5730, k = ln 0.5 / (-5730) ≈ 1.2097 The exponential decay model of carbon-14 is P = P0 e– 1.2097k Example 2: Andrew spent $350,000 on a new couch. The sofa's worth falls exponentially at a pace of 5% every year. So, how much is the sofa worth after two years? Please round your answer to the nearest decimal point. Solution: Initial value of Sofa= $350,000 Rate of decay r = 5% = 0.05 Time t = 2 years Use the exponential decay formula, A = P (1 – r)t A = 350000 x (1 – 0.05)2 A = 315,875 The value of the sofa after 2 years = $315,875 Example 3: Maria paid around $20,000 on a fashionable pocketbook. The worth of the pocketbook decreases exponentially (depreciates) at a yearly rate of 8%. So, what is the value of the pocketbook after 5 years? Give your answer to the nearest decimals. Solution: Initial value P = $20,000. Rate of decay r = 8% = 0.08. Time t = 5 years. Use the exponential decay formula: A = P (1 – r)t A = 20000 x (1 – 0.08)5 = 13181.63 The value of the pocketbook after 5 years = $13,181.63. Frequently asked questions on Exponential Growth And Decay Q1. What Is the Decay Rate of an Exponential Function? The formula for exponential decay is f(x) = abx, where b denotes the decay factor. In the exponential decay function, the decay rate is given as a decimal. The decay rate is expressed as a percentage. We convert it to a decimal by simply reducing the percent and dividing it by 100. Then calculate the decay factor b = 1-r. For instance, if the rate of decay is 25%, the exponential function's decay rate is 0.25 and the decay factor b = 1- 0.25 = 0.75. Q2. What exactly is the Exponential Decay Formula? The amount gradually reduces by a predetermined percentage at regular periods. The exponential decay formula is used to determine this decrease in growth. f(x) = a (1 – r)x is the generic form. Where, a = The initial value r = decay rate x = time period Q3. Do we need exponential growth and decay calculator? Exponential growth and decay calculator is useful when we have to do quick calculations in a generalized manner. However, you must not use it frequently as it can affect your calculation speed to solve problems. You must practice exponential growth and decay word problems on pen and paper to enhance your understanding. Q4. How effective is it to practice from exponential growth and decay worksheets? The exponential growth and decay worksheet answers three questions for every exponential growth and decay problems – does this function represent exponential growth and decay, what is your initial value, and what is the growth rate or decay rate for the given problem. If these answers are known, then you can master any exponential growth and decay problem.

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