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Simultaneous equations worksheet and answers

September 5, 2019 corbettmaths FreeThree section, different levels of difficulty in solving simultaneous elimination equations. Nothing fancy, just a load of questions (and answers). Read moreFreeReport problemThe following resource is intended for teachers in the UK. View the U.S. version . Are you looking for high-quality mathematical sheets that are aligned with common basic standards for K-8 grades? Our premium worksheet packages include 10 activities and a key to answer to challenge students and help them understand every topic within their class level. The related ResourcesEaland resources listed below are aligned with the same standard (8EE08) taken from the Common Core Standards for Mathematics (CCSM) worksheet as the Expressions and Equations sheet above. Analyze and solve pairs of simultaneous linear equations. Understand that solving a system of two linear equations in two variables corresponds to the intersections of their graphs, because the intersections meet both equations at the same time. Solve the systems of two linear equations in two variables algebraically and estimate the solution with a graph of equations. Solve simple cases by checking. For example, 3x + 2y = 5 and 3x + 2y = 6 do not have a solution, because 3x + 2y can not be simultaneously 5 and 6.Solve real and mathematical problems leading to two linear equations in two variables. For example, given coordinates for two pairs of points determine whether a line crosses the first pair of points that crosses the line over the second pair. Example/InstructionsSolve simultaneous equations Follow the steps to resolve the variables in the problem, and then check the answers: x + y = 9, x - y = 3 Page 2 [Home] This worksheet is a PDF document. You'll need Adobe Acrobat Reader to view a worksheet or answers. Each sheet can consist of several pages, scroll down to everything. Simultaneous equations are multiple equations that share the same variables and that are all true at the same time. If the equation has 2 variables, its much harder to solve, if you have 2 equations with 2 variables, such as 2x + y = 10\\\\text{ and }\\,\\,x +y=4, then there is a solution that can find that works for both equations. These equations are called simultaneous for this reason. There are 2 main types of equations that you need to be able to solve. Make sure you are satisfied with the following topics before proceeding. To do this, we use a process called elimination – we remove one of the variables by subtracting one equation from another. On the other, we write one equation and draw a line under it, as with normal subtraction. Example: Find solutions to the following simultaneous equations. 4x + 3y = 14 \\,\\\\\\\\ 5x+7y=11 Step 1: Type one equation above the other. Both equations must be ax+by=c, so rearrange if necessary. \begin{aligned}4x + 3y &= 14 \\ 5x+7y &= 11 \end{aligned} Step 2: Get coefficients to match Coefficients are numbers x and y to give coefficients x the same scaling of both equations (\times5) \,\\\\\\\\\\\\\\\\3y = 14\\20x + 15y = 70 \,\, (\times5)\\\\\\\\\\\,\,\\5x+7y = 11 \\\\, gives \,\\,, 20x+28y=44 Step 3: Add or subtract equations to eliminate conditions with the same coefficients. Since both equations are +20x, we have to subtract the equations. \begin{aligned}20x + 15y &= 70 \\ (-)\\\\\\\\\\\\\\\\\\\\20x+28y&=44 \\ \hline-13y&=26\end{aligned} Step 4: Resolve 4 Step Solutions 4 resulting equation \begin{aligned}(\div-13)\\\\\\\\\\\\\\\\\\\\\\\\13y&=26 \\ y &=-2\end{aligned} Step 5: Replace the answer in the simplest of the two equations and locate the second variable. \begin{aligned}4x + 3y &= 14 \\ 4x +3(-2) &=14 \\ 4x -6 &= 14 \\ 4x &= 20 \\ x &= 5 \end{aligned} This gives the final answer; x = 5, \\\\\\\\\\\\\\\\\\\\\\\\y = -2 Because one of these equations is quadratic (nonlinear), we cannot use elimination as before. Instead, we have to use substitution. Example: Solving the following simultaneous equations. x^2+2y=9,\\\\,y-x=3 Step 1: Rearrange the linear equation so that it acquires one of the unknown separately and equals the sign on one side. \begin{aligned}(+x)\\\\\\\\\\\\\\3 \\ y &= x+3\end{aligned} Step 2: Replace the linear equation into a nonlinear equation. We know y = x + 3, so we can replace y in the first equation with x + 3: \begin{aligned} x ^2 +2y&=9 \\ x ^2+2(x+3)&=9\end{aligned} Step 3: Expand and solve the new quadratic shape. \begin{aligned}x^2+2(x+3)&=9 \\ x^2 + 2x+6 &= 9 \\ x^2+2x-3&=0 \\ (x-1)(x+3)&amp;0\end{aligned} x=1 \,\\\\ and \,\\\,x=3. Step 4: Replace both values back into the simplest equation and find both versions of the second variable. \text{When }x=1, \\3=3=3+3=3=0. Therefore, we have two pairs of solutions: x = 1, y = 4 and x = -3, y = 0. The shop sells milkshakes and ice creams. 2 milkshakes and 2 ice creams, costing £7 4 milkshakes and 3 ice creams, cost £12 Work out the cost of an individual milkshake and individual ice cream. [4 brands] Step 1: we need to do is make up two simultaneous equations. Let's say the price of a milkshake is and the price of ice cream is b. This creates the following two equations. 2a+2b=7 4a+3b=12 Step 2: Now we need to get the coefficients, in this case, we can multiply the first equation by 2 (\times 2) \,\\\ \begin{aligned}4a+4b &= 14 \\ (-)\\4a+3b&=12 \\ \hline b&=2\end{aligned} Step 4: Replace the answer into the simplest of the two equations and locate the second variable. \begin{aligned}2a+2b&=7 \\ 2a + 2(2) &=7 \\ 2a+4&=7 \\ 2a &=3 \\ and & = 1.5\end{aligned} This gives the final answer to Milkshake (a) = £1.50 Ice Cream (b) = £2.00 we can subtract equation 2 from equation 1 so that, \begin{aligned}y&=2x-6\\ y&=\dfrac{1}{2}x+6 \\ \\ \\ 0&= \dfrac{3}{2}x-12 \end{aligned} If we rearrange to find x subject, x=\dfrac{2\times12}{3}=\dfrac{24}{3}=8 Replace x=8 back to the original first equation, \begin{aligned}y&=2(8)-6 \\ y&=10\end{aligned} The solution is x=8, y=10 If we multiply the second equation 2 , we have two equations with both with 2x the term , i.e. subtracting our new equation 2 from equation 1, you get, \begin{aligned}2x-3y&=16\\ 2x+4y&=-12 \\ \\ (2x-2x)+(-3y-4y)&=16-(-12) \\ 0x -7y &=28\end{aligned}If we rearrange, to find y theme, y=\dfrac{28}{-7}=-4 Replace y=-4 back to the original second equation, \begin{aligned} x)+2(-4)=-6 \\ x-8&=-6 \\ &=2\end{aligned} , the solution is, x=2, y=-4 If we multiply the first equation 3, we have two equations with 3x term, i.e. by subtracting our new equation 2 from equation 1 we get, \begin{aligned}3x+6y+30&=0 \\ 3 x-5y-14&=0 \end{aligned}If we rearrange, \begin{aligned} {3x-3x)+(6y-(-5y)+(30-(-14)) = 0 \begin{aligned} 11y &= -44 \\ y &= - 4\end{end{3 , \begin{aligned}x+2(-4)+10&=0\\ x-8+10 &=0 \\ x&=-2 \end{aligned} The solution is , x =-2, y=-4 Flight A is the price of the adult ticket and let C be the cost of the children's ticket, so we have two simultaneous equations, \begin{aligned} 2A+3C&30 \\ A+C=8.5 \end{aligned} If we multiply the second equation by 2 A+3C=20 , we have two equations with both with the term 2A, i.e. subtracting our new equation 2 from equation 1, which we get , \begin{aligned} 2A+3C&=20 \\ 2A+2C&=17 \\ \\ (2A-2A)+(3C-2C) &(20-17) \\ C&=3\end{aligned} Then replace this value back into the original equation 2, \begin{aligned} A+3&=8.5 \\ A &; =5.5\end{aligned} Therefore, the child ticket price is £3. , and the price of an adult ticket is £5.50. If we multiply the first equation by 2, we have two equations with the term 2y, so we add our new equation 1 and equation 2, we get, \begin{aligned} 2x^2-2y&=28 \\ 2y-4&=12x \\ \\ C2x^2+(-4)+(-2y+2y)&=28+12x \\ C2x^2+(-4)+(-2y+2y)&=28+12x \\ 2x^2-12x-32&=0end{aligned} After regrouping to create quadratic , we can solve for x, \begin{aligned} 2x^2-12x-32&=0 \\ 2(x^2-6x-16)&=0 \\ 2(x^2-6x-16)&=0 \\ (x-8)(x+2)&=0end{aligned} Therefore , 2 solutions for x are x=8, x=-2. To find two solutions y, we can replace these values back into the original second equation. When x=8, \begin{aligned}4&4&=96 \\ y&=50\end{aligned} When x=-2, \begin{aligned}2y-4&=-10end{aligned} So the two pairs of solutions are, x=8,y=50 and x=-2,y=-10 arrow_back Back to solving simultaneous equations Whether you want homework, some cover work or a beautiful extra piece of exercise , it's the place for you. And best of all (well, most!) come with answers. 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