

Word Problems for Systems of Equations

Name KEY A

For each question, you will need to assess what is being asked of you to find, to define an appropriate pair of variables, to write a pair of equations for the scenario, and then to solve your system. Check your answers to be sure they make sense.

EX 1: I bought 3 small tapas dishes and 2 large ones on a visit to Café Ba-Ba-Reeba and spent \$14. I went back another day and got 4 small dishes and one big one for \$12. How much does each kind of dish cost?

Let x = the price of a small dish
 Let y = the price of a big dish

$$\begin{aligned} 3x + 2y &= 14 \rightarrow 3x + 2y = 14 \\ 2 \cdot (4x + 1y = 12) \cdot 2 &\rightarrow (8x + 2y = 24) \end{aligned}$$

$$\begin{array}{r} -5x \quad = -10 \\ -5 \quad \quad \quad -5 \end{array}$$

$x = 2$

$$\begin{aligned} 3(2) + 2y &= 14 \\ 6 + 2y &= 14 \\ 2y &= 8 \\ y &= 4 \end{aligned}$$

$$\begin{aligned} 4(2) + 1y &= 12 \\ 8 + y &= 12 \\ y &= 4 \end{aligned}$$

EX 2: I went to the store to buy rice & yogurt for my puppy who got sick & needed something mild to eat. I bought 3 1-pound bags of rice and 2 quarts of yogurt and spent \$8. The next week, he needed more rice and more yogurt! This time, I bought 4 pounds of rice and 3 quarts of yogurt and spent \$11.50. How much did each item cost?

Let x = the price of rice
 Let y = the price of yogurt

$$\begin{aligned} 1.5 \cdot (3x + 2y = 8) \cdot 1.5 &\rightarrow 4.5x + 3y = 12 \\ 4x + 3y &= 11.50 \end{aligned}$$

$$\begin{array}{r} 0.5x = 0.5 \\ 0.5 \quad 0.5 \end{array}$$

$x = 1$

$$\begin{aligned} 3(1) + 2y &= 8 \\ 3 + 2y &= 8 \\ 2y &= 5 \\ y &= 2.5 \end{aligned}$$

$$\begin{aligned} 4(1) + 3y &= 11.50 \\ 4 + 3y &= 11.50 \\ 3y &= 7.50 \\ y &= 2.5 \end{aligned}$$

EX 3: On a weekly basis I drive to work three days out of the week and take public transportation for the remaining days of the week. There has been no change in my transportation schedule the past two months. Last month my transportation expense totaled to \$225.76 where gas cost me \$3.09 per mile and bus fare was \$1.75. This month my transportation expense went up to \$235.68 because the price of gas increased to \$3.12 per mile and bus fare increased to \$2.25. How many miles did I drive my car each month? How many times did I pay for bus fare?

Let x = the number of miles driven each month
 Let y = the number of bus fares purchased

$$\begin{aligned} (3.09x + 1.75y = 225.76) \cdot 2.25 \\ (3.12x + 2.25y = 235.68) \cdot 1.75 \end{aligned}$$

$$\begin{aligned} 6.9525x + 3.9375y &= 507.96 \\ 5.46x + 3.9375y &= 412.44 \end{aligned}$$

$$1.4925x = 95.52$$

$x = 64$

$$\begin{aligned} 3.09(64) + 1.75y &= 225.76 \\ 197.76 + 1.75y &= 225.76 \\ 1.75y &= 28 \\ y &= 16 \end{aligned}$$

1. At an after season sale on winter clothes, I found a bunch of really cute hats & scarves. I decided to buy two hats and two scarves for myself to have for next year. I spent \$60. When I told my friends about the sale, they asked me to go back & get something for them. I ended up spending \$44 on one hat and two more scarves. What was the price of a single hat & a single scarf?

Let $h =$
Let $s =$

$$\begin{array}{r} 2h + 2s = 60 \\ 1h + 2s = 44 \\ \hline 1h = 16 \\ \hline h = 16 \end{array}$$

$$\begin{array}{r} 2(16) + 2s = 60 \\ 32 + 2s = 60 \\ 2s = 28 \\ s = 14 \end{array}$$

$$\begin{array}{r} 1(16) + 2s = 44 \\ 16 + 2s = 44 \\ 2s = 28 \\ s = 14 \end{array}$$

2. A youth group & their leaders visited Mammoth Cave. Two adults & 5 students in one van paid \$77 for the Grand Avenue Tour of the cave. Two adults & 7 students in another van paid \$95 for the same tour. Find the adult price & the student price of the tour.

Let $x = \text{adult}$
Let $y = \text{student}$

$$\begin{array}{r} 2x + 5y = 77 \\ 2x + 7y = 95 \\ \hline -2y = -18 \\ y = 9 \end{array}$$

$$\begin{array}{r} 2x + 5(9) = 77 \\ 2x + 45 = 77 \\ 2x = 32 \\ x = 16 \end{array}$$

$$\begin{array}{r} 2x + 7(9) = 95 \\ 2x + 63 = 95 \\ 2x = 32 \\ x = 16 \end{array}$$

3. Friends from the math department often pick up lunch for each other. When it was Mr. Linnenbringer's turn to make the food run, he bought 5 sandwiches and 3 bags of chips. He spent \$29.50. When Mr. Willms went, he got 4 sandwiches and 4 bags of chips for \$26. How much does a sandwich cost? How about a bag of chips?

Let $x = \text{sandwich}$
Let $y = \text{chips}$

$$\begin{array}{r} 4 \cdot (5x + 3y = 29.50) \cdot 4 \rightarrow 20x + 12y = 118 \\ 3 \cdot (4x + 4y = 26) \cdot 3 \rightarrow 12x + 12y = 78 \\ \hline 8x = 40 \\ x = 5 \end{array}$$

$$\begin{array}{r} 5(5) + 3y = 29.50 \\ 25 + 3y = 29.50 \\ 3y = 4.50 \\ y = 1.50 \end{array}$$

$$\begin{array}{r} 4(5) + 4y = 26 \\ 20 + 4y = 26 \\ 4y = 6 \\ y = 1.5 \end{array}$$

4. A website allows users to download individual songs or an entire album. All individual songs cost the same to download, and all albums cost the same to download. Ryan pays \$14.94 to download 5 individual songs and 1 album. Seth pays \$22.95 to download 3 individual songs and 2 albums. How much does the website charge to download a song? How about an entire album?

Let $x = \text{songs}$
Let $y = \text{albums}$

$$\begin{array}{r} 2 \cdot (5x + 1y = 14.94) \cdot 2 \rightarrow 10x + 2y = 29.88 \\ 3x + 2y = 22.95 \rightarrow \\ \hline 7x = 6.93 \\ x = .99 \end{array}$$

$$\begin{array}{r} 5(.99) + 1y = 14.94 \\ 2(.95) + 1y = 14.94 \\ y = 9.99 \end{array} \quad \left| \quad \begin{array}{r} 3(.99) + 2y = 22.95 \\ 2.97 + 2y = 22.95 \\ 2y = 19.98 \\ y = 9.99 \end{array} \right.$$