Solving Systems of Linear Equations Algebraically – Word Problems

1. The perimeter of a rectangle is 32 cm. The length is 1 cm more than twice the width. Find the dimensions of the rectangle.

$2l + 2w = 32$
$l = 1 + 2w$

$2(1+2w) + 2w = 32$
$2 + 4w + 2w = 32$
$2 + 6w = 32$
$6w = 30$
$w = 5$

$l = 1 + 2(5)$
$l = 11$

$l = 11$ cm
$w = 5$ cm

2. The cost of 5 boxes of envelopes and 6 boxes of note paper is \$16.75. Three boxes of envelopes and 4 boxes of note paper cost \$10.75. Find the cost of each box of envelope and each box of note paper.

$2(5e + 6p = 16.75)$
$-3(3e + 4p = 10.75)$

$10e + 12p = 33.5$
$-9e - 12p = -32.25$
$e = 1.25$

$3(1.25) + 4p = 10.75$
$3.75 + 4p = 10.75$
$4p = 7$
$p = 1.75$

envelopes = \$1.25
paper = \$1.75

3. To raise money for new football uniforms, your school sells silk-screened T-shirts. Short sleeve T-shirts cost the school \$5 each and are sold for \$8 each. Long sleeve T-shirts cost the school \$7 each and are sold for \$12 each. The school spends a total of \$2500 on T-shirts and sells all of them for \$4200. How many of the short sleeve T-shirts are sold?

$8(5s + 7l = 2500)$
$-5(8s + 12l = 4200)$

$40s + 56l = 20000$
$-40s - 60l = -21000$
$-4l = -1000$
$l = 250$

$5s + 7(250) = 2500$
$5s + 1750 = 2500$
$5s = 750$
$s = 150$

150 short sleeve shirts

4. The class president is organizing a class trip to a nearby amusement park for 314 students. The regular price is \$35 per ticket. However, some students can receive a discount due to volunteer community service work that they took part in on Saturdays. The students who are eligible for the discount will pay \$21.50. The total ticket cost for the class trip will be \$10,072. How many students are eligible for the discount?

$35r + 21.50d = 10072$
$r + d = 314$
$r = -d + 314$

$35(-d + 314) + 21.50d = 10072$
$-35d + 10990 + 21.50d = 10072$
$-13.50d + 10990 = 10072$
$-13.50d = -918$
$d = 68$

68 students are eligible for discount

5. You want to have a pizza party this weekend for some friends and family. You have \$48 budgeted for the pizza and plan on having 56 pieces available. A large pizza has 16 pieces and costs \$14. A medium pizza has 12 pieces and costs \$10. How many large and medium pizzas do you need to buy?

$6(14l + 10m = 48)$
$-5(16l + 12m = 56)$

$84l + 60m = 288$
$-80l - 60m = -280$
$4l = 8$
$l = 2$

$14(2) + 10m = 48$
$28 + 10m = 48$
$10m = 20$
$m = 2$

2 large and 2 medium pizzas

6. In one week, a music store sold 9 guitars for a total of $3611. Electric guitars sold for $479 each and acoustic guitars sold for $339 each. How many of each type of guitar were sold?

4 electric
5 acoustic

$e + a = 9$
$479e + 339a = 3611$
$e = -a + 9$

$479(-a+9) + 339a = 3611$
$-479a + 4311 + 339a = 3611$
$-140a + 4311 = 3611$
$-140a = -700$
$a = 5$

$e + 5 = 9$
$e = 4$

7. One evening, 76 people gathered to play doubles and singles table tennis. There were 26 games in progress at one time. A doubles game requires 4 players and a singles game requires 2 players. How many games of each kind were in progress at one time if all 76 people were playing?

12 doubles
14 singles

$-2(d + s = 26)$
$4d + 2s = 76$

$-2d - 2s = -52$
$4d + 2s = 76$
$2d = 24$
$d = 12$

$12 + s = 26$
$s = 14$

8. An adult pass for a county fair costs $2 more than a children's pass. When 378 adult and 214 children's passes were sold, the total revenue was $2384. Find the cost of an adult pass.

$a = 2 + c$
$375a + 214c = 2384$

$375(2+c) + 214c = 2384$
$750 + 375c + 214c = 2384$
$589c = 1634$
$c = 2.77$

$a = 2 + 2.77$
$a = \$4.77$

9. The cost of 11 gallons of regular gasoline and 16 gallons of premium gasoline is $58.55. Premium costs $.20 more per gallon than regular. What is the cost of a gallon of premium gasoline?

Premium = $2.25

$p = .20 + r$
$11r + 16p = 58.55$

$11r + 16(.20 + r) = 58.55$
$11r + 3.2 + 16r = 58.55$
$27r + 3.2 = 58.55$
$27r = 55.35$
$r = 2.05$

$p = .20 + 2.05$
$p = 2.25$

10. For a recent job, an electrician earned $50 per hour, and the electrician's apprentice earned $20 per hour. The electrician worked 4 hours more than the apprentice, and together they earned a total of $550. How much money did each person earn?

Electrician = 18 hours
Apprentice = 14 hours

$e = 4 + a$
$50e + 20a = 550$

$50(4+a) + 20a = 550$
$200 + 5a + 20a = 550$
$200 + 25a = 550$
$25a = 350$
$a = 14$

$e = 4 + 14$
$e = 18$