

Coin and Money Problems

Problem 1. Bob has 60 coins consisting of quarters and dimes. The coins combined value is \$9.45. Find out how many of each quarters and dimes Bob has.

Solution

The description of unknowns:

x - number of dimes (\$0.10)
 y - number of quarter (\$0.25)

The system of equations:

$$\begin{cases} x + y = 60 \\ 0.10x + 0.25y = 9.45 \end{cases}$$

The solution of the system (by elimination method):

$$\begin{cases} x + y = 60 & / \times (-10) \\ 0.10x + 0.25y = 9.45 & / \times 100 \end{cases}$$

$$+ \begin{cases} -10x + 10y = -600 \\ 10x + 25y = 945 \end{cases}$$

$$15y = 345$$

$$y = 23$$

$$x = 37$$

Answer: Bob has 37 dimes and 23 quarters.

Problem 2. Eric has 130 coins consisting of nickels and quarters. The coins combined value comes to \$15.90. Find out how many of each coin Eric has.

Problem 3. Alice is counting a cash register at the end of the night. She has \$1015 in \$5 bills and \$10 bills. If she has 138 bills all together, how many of each type does she have?

Ticket problems and similar

Problem 4. 353 people attended a local play at private club. Members get tickets for \$2.75 while non-members have to pay \$6.50. If the total value for the play came to \$1762, how many members and non-members came to play?

Solution

The description of unknowns:

x - number of members (who pay \$2.75 per ticket)
 y - number of non-members (who pay \$6.50 per ticket)

The system of equations:

$$\begin{cases} x + y = 353 \\ 2.75x + 6.50y = 1762 \end{cases}$$

The solution of the system (by substitution method):

$$\begin{cases} x + y = 353 & /-y \\ 2.75x + 6.50y = 1762 & / \times 100 \end{cases}$$

$$\begin{cases} x = 353 - y \\ 275x + 650y = 176200 \end{cases}$$

$$\begin{cases} y = 60 - y \\ 275(353 - y) + 650y = 176200 \end{cases}$$

$$\begin{cases} x = 353 - y \\ 97075 - 275y + 650y = 176200 & /-97075 \end{cases}$$

$$\begin{cases} x = 353 - y \\ 375y = 79125 \end{cases}$$

$$\begin{cases} x = 353 - y \\ y = 211 \end{cases}$$

$$\begin{cases} x = 142 \\ y = 211 \end{cases}$$

Answer: 142 members and 211 non-members came to play.

Problem 5. Jim runs food cart and during a busy outdoor festival he sold \$7343.75 worth of food. He sells hot dogs for \$2.95 and steak sandwiches for \$9.95. If he sold a total of 985 items that day, how many of each item did he sell?

Problem 6. 586 people attend a banquet at Disney. Residents paid \$12.95 and non-residents paid \$17.95. If Disney made \$9423.70 from ticket sales for the events, how many residents and non-residents attended?

Bank Account Problems

Problem 7. Jane invests \$9885 into two accounts. A savings account earns 6% interest, while a money market account earns 9.5% interests. After one year she made \$696.35 interest from both accounts. How much did she invest into each account?

Solution

The description of unknowns:

x - the amount invested by Jane in the first account (6% interest)
 y - the amount invested by Jane in the second account (9.5% interest)

The system of equations:

$$\begin{cases} x + y = 9885 \\ \frac{6}{100}x + \frac{9.5}{100}y = 696.35 \end{cases}$$

The solution of the system (by elimination):

$$\begin{cases} x + y = 9885 & / \times (-6) \\ \frac{6}{100}x + \frac{9.5}{100}y = 696.35 & / \times 100 \end{cases}$$

$$+ \begin{cases} -6x - 6y = -59310 \\ 6x + 9.5y = 69635 \end{cases}$$

$$\begin{aligned} 3.5y &= 10325 \\ y &= 2950 \end{aligned}$$

$$\begin{aligned} x + y &= 9885 \\ x + 2950 &= 9885 \\ x &= 6935 \end{aligned}$$

Answer: Jane invested \$6935 in 6% account and \$2950 in 9.5% account.

Problem 8. Ralph invests \$15,600 into different accounts: a savings account and checking account. The savings account earns 8% interest and the checking earns 9%. After 1 year he has earned \$1,334.28 interest. How much Ralph invest into each account?

Problem 9. A group invested \$20,440 into two accounts. A secure bond account earned 2.5% interest and more risky stock earned 3.4% interest. The group earned \$623.05 for the investment in one year. How much did the group invest into each account?

Mixture Problems

Problem 10. Lou wants to make a coffee mixture to sell. He is going to mix Sumatra coffee which costs \$2.50 per pound with Columbia coffee which costs \$3.75 per pound. He wants to make 50 pounds of mix and he wants the cost of mix to be \$3.35 per pound. How many pound of each will he need?

Solution

The description of unknowns:

x - the amount of Sumatra coffee in pounds [lbs.] (at \$2.50 per pound)
 y - the amount of Columbia coffee in pounds [lbs.] (at \$3.75 per pound)

The system of equations:

$$\begin{cases} x + y = 50 \\ 2.50x + 3.75y = 3.35 \times 50 \end{cases}$$

Solution of the system:

$$\begin{cases} x = 16 \\ y = 34 \end{cases}$$

Answer: Lou will need to mix 16 lbs. of Sumatra coffee and 34 lbs. of Columbia coffee

Problem 11. Jackie wants to make a mixture of nuts to sell in her store consisting of hazelnuts and cashews. Hazelnuts cost \$6.50 per pound and cashews cost \$4.50 per pound. If Jackie wants 60 pounds total of mixture and the cost to be \$5.10 per pound, how many of each will she need?

Problem 12. A chemist wants to make 40 liters of 22.5% acid solution. He is going to make it by mixing a 10% acid and a 30% acid solution. How many liters of each will he need?

Problem 13. A chemist wants to make 75 liters of 16% acid solution. He is going to make it by mixing a 10% acid and a 25% acid solution. How many liters of each will she need?

Distance, Rate and Time Problems

Problem 14. A plane can travel 1,015 miles in 7 hours travelling against the wind. Travelling with the same wind, the plane can travel 820 miles in 4 hours. How fast can the plane travel in still air and how fast is the wind current?

Solution

The description of unknowns:

x - the speed of the plane in still air in mph (miles per hour)
 y - the wind current speed in mph

The system of equations:

$$\begin{cases} x - y = \frac{1015}{7} \\ x + y = \frac{820}{4} \end{cases}$$

Solution of the system by elimination:

$$\begin{array}{r} \begin{cases} x - y = 145 \\ x + y = 205 \end{cases} \\ + \\ \hline 2x = 350 \\ x = 175 \\ \\ \begin{cases} x = 175 \\ y = 30 \end{cases} \end{array}$$

Answer: The plane travels 175 mph in still air and the speed of the wind current is 30 mph.

Problem 15. Lance Armstrong can ride 162 miles on flat ground in 6 hours with a good breeze at his back. It takes him 10 hours to go 90 miles with the same breeze working against him. How fast is Lance going on a bike and how fast is the wind speed?

Problem 16. It takes Bob the scout 10 hours to paddle upstream (against current) a distance of 15 miles. When he turns around he finds it only takes him 5 hours to paddle 22.5 miles with the current. What is the speed of the boat in still water and what is the speed of the current of the river?

Problem 17. A boat going upstream (against the current) travels 105 miles in 15 hours. It takes the same boat 7.5 hours to make the same trip when it is travelling back downstream (with the current) . What is the speed of the boat in still water and what is the speed of the current of the river?

Problem 18. Flying from Tokyo to London is approximately 6175 miles. On the way to London from Tokyo (against the wind) the flight took 13 hours. The return flight (with the wind) took 9.88 hours. Find the speed of the plane in still air and the speed of the current.

Miscellaneous types of Problems

Problem 19. Bo ate 10 carrots and 7 Hershey's Kisses and the total calories were 263. Fred ate 4 carrots and 8 Hershey's Kisses and the total calories were 230. How many calories are in a carrot and a Hershey's Kiss?

Problem 20. During a Techno-Geek-Store sale 6 blank video tapes and 12 blank DVD's cost \$35.10. During the same sale, 8 blank video tapes and 3 blank DVD's cost \$27.95. What was the cost of the blank videotape and the cost of a blank DVD?

Problem 21. 40 adults and 26 kids went to see a movie on the open screening and the revenue for the showing was \$486.70. The next showing 20 adults and 31 kids went to see the same movie and the revenue was \$332.45 . How much was an adult ticket and how much was a kid ticket?

Problem 22. On one day Fred's Sports World sold 9 Pittsburgh Steelers jerseys and 3 Cleveland Browns jerseys for a total \$899.40. The next day they sold 12 Steelers jerseys and only 2 Browns jerseys for a total of \$1139.30. How much is the Steelers jersey and how much is the Browns jersey?

Class 1 | Chapter 5.08| System of equations and word problems

Answers:

1	23 quarters and 37 dimes	2	83 nickels and 47quarters
3	73 fives and 65 tens	4	142 members and 211 non-members
5	35 hot dogs and 634 steak sandwiches	6	219 residents and 367 non residents
7	\$2950 in 9.5% and \$6935 in 6%	8	\$6972 in 8% and \$8628 in 9%
9	\$7990 in 2.5% and \$12450 in 3.4%	10	16 lbs. of Sumatra and 34 lbs. of Columbian
11	18 lbs. Hazelnuts and 42 lbs. Cashews	12	15 liters 10% and 25 liters 30%
13	30 liters 25% and 45 liters 10%	14	plane speed = 175mph and wind speed = 30mph
15	Lance = 18 mph and wind speed= 9mph	16	Bob 3mph and current 1.5 mph
17	boat speed = 10.5 mph and water current = 3.5 mph	18	Plane speed = 550mph and wind speed = 3.5mph
19	Carrot 9.5 calories and Hershey Kiss 24 calories	20	Video \$2.95 and DVD \$1.45
21	Adult \$8.95 and kid \$4.95	22	Steelers \$89.95 and Browns \$29.95

Glossary

dime	a coin worth 10 cents	moneta dziesięciocentowa
quarter	a coin worth 25 cents	moneta dwudziestopięciocentowa
nickel	a coin worth 5 cents	moneta pięciocentowa
bill	a piece of paper money	banknot
lbs.	pound (the unit of the weight 0.45359237 kg)	funt (jako jednostka wagowa)
the speed of the current of the river		prędkość prądu rzeki
the speed of a boat in still water		prędkość własna łódki
the speed of a plane in still water		prędkość własna samolotu
upstream		pod prąd (w górę rzeki)
downstream		z prądem (w dół rzeki)