Two- and Three-Variable Word Problems

A. All these problems can be solved using two variables.

1. The sum of two numbers is 97. Their difference is 7. Find the numbers.

2. One number exceeds another number by 25. Their sum is 59. What are the two numbers?

3. There were 326 students at the high school dance. There were 24 more girls than boys. How many girls and boys attended?

4. A newsstand sells the New York Times at 75¢ per copy and the Globe and Mail at 60¢ per copy. If the stand sells 177 newspapers and the total receipts are $118.80, how many of each paper were sold?

5. A number exceeds another by 13. The sum of 3 less than twice the greater number and 4 more than 3 times the lesser number is 112. What are the two numbers?

6. The sum of the digits of a two-digit number is 11. The new number obtained when the digits are reversed is 45 less than the original number. What is the original number?

7. Six years ago, Jack was three times older than Wade. In four years, Wade will be half as old as Jack. How old are they now?

8. If 1 is subtracted from both the numerator and denominator of a fraction, the resulting fraction equals ½. Find the fraction if the numerator is 4 less than the denominator.

9. Mike rows 6 km downstream in 40 minutes. It takes him 2 hours to row back. Find Mike's rowing rate in still water and the rate of the current.

10. A small plane flies against the wind from Calgary to Vancouver, a total distance of 960 km, in 6 hours. The return trip, with the wind, takes 4 hours. Find the wind speed and the speed of the plane in calm air.

Authored by Dave Branson

B. These problems can be solved using three variables.

1. The sum of the digits of a three-digit number is 21. If the digits are reversed, the new number is 198 greater than the original. The sum of the first and third digits is one more than three times the second digit. Find the number.

2. At Carl's Cambie Diner, there are three sizes of coffee drinks: regular (300 mL), large (500 mL) and extra large (800 mL), and they cost $2.25, $3.25 and $5.75, respectively. On a particular afternoon, the diner sold a total of 37 coffees. The total volume of coffee sold was 19,100 mL and the amount of money made in coffee sales was $133.25. How many of each size of drink did customers buy that afternoon?

SOLUTIONS

A. (1) $x + y = 97$, $x - y = 7$; $x = 52$, $y = 45$

(2) $x - y = 25$, $x + y = 59$; $x = 42$, $y = 17$

(3) $g + b = 326$, $g - b = 24$; $g = 175$, $b = 151$

(4) $N + G = 177$, $.75N + .60G = 118.80$; $N = 84$, $G = 93$

(5) $x - y = 13$, $(2x - 3) + (3y + 4) = 112$; $x = 30$, $y = 17$

(6) $t + u = 11$, $(10t + u) - 45 = (10u + t)$; $t = 8$, $u = 3$, the number is 83.

(7) $(J - 6) = 3(W - 6)$, $(J + 4) = 2(W + 4)$; $J = 36$, $W = 16$

(8) $2(n - 1) = (d - 1)$, $d - 4 = n$; $n = 5$, $d = 9$, the fraction is $\frac{5}{9}$.

(9) $M + c = 6 \div \frac{2}{3}$, $M - c = 6 \div 2$; M, Mike's speed = 6 km/h; c, current = 3 km/h

(10) $p - w = \frac{960}{6}$, $p + w = \frac{960}{4}$; $p = 200$ km/h; w, wind speed = 40 km/h

B. (1) $h + t + u = 21$, $(100h + 10t + u) + 198 = (100u + 10t + h)$, $h + u = 3t + 1$;
$h = 7$, $t = 5$, $u = 9$, the number is 759.

(2) $x + y + z = 37$; $300x + 500y + 800z = 19,100$; $2.25x + 3.25y + 5.75z = 133.25$.
The diner sold 12 regular, 15 large and 10 extra large coffees.