

1. The distance a car travels can be found using the formula $d = r \cdot t$, where d is distance, r is rate of speed, and t is time. How many miles does the car travel, if it drives at an average rate of speed of 60 miles per hour for a period of time of $\frac{3}{4}$ of an hour?

$$\text{RATE (R)} = 60 \text{ MPH}$$

$$\text{TIME (t)} = \frac{3}{4} \text{ HOUR}$$

$$d = r \cdot t$$

$$d = (60 \frac{\text{M}}{\text{H}}) (\frac{3}{4} \text{ H})$$

$$d = 45 \text{ MILES}$$

45

3. A person borrows money from a friend and they decide to use a simple interest formula. $I = P \cdot R \cdot T$ where I is the interest in dollars, P is the principle (original money loaned) in dollars, R is the interest rate, and T is the time in years. If the person borrowed \$2600 for 5 years at a rate of 3%, how much interest will they owe for the loan?

$$\text{PRINCIPLE} = 2600 \quad \text{TIME} = 5 \text{ YEARS}$$

$$\text{RATE} = 3\% = .03$$

$$I = P \cdot R \cdot T$$

$$I = (2600) (.03) (5)$$

$$I = 390$$

5. A certain population of bacteria has an average growth rate of 0.04 bacteria per hour. The formula for the growth of the bacteria's population is $A = P_0(2.718)^{0.04t}$, where P_0 is the original population, t is time in hours, and A is the new population. If we begin with 50 bacteria (P_0), about how many bacteria will there be after 20 hours?

$$P_0 = 50 \quad t = 20$$

$$A = P_0 (2.718)^{0.04t}$$

$$A = 50 \cdot (2.718)^{0.04(20)}$$

$$50 \cdot (2.718)^{(0.8)} \\ (20)$$

$$111.2678167$$

$$A \approx 111 \text{ BACTERIA}$$

$$(2.718)^{(0.06(30))} \\ = 6.048518514$$

2. The distance a car travels can be found using the formula $d = r \cdot t$, where d is distance, r is rate of speed, and t is time. What is the average rate of speed, if the person drives a distance of 208 miles in 4 hours?

$$d = 208 \text{ MILES} \quad t = 4 \text{ hours}$$

$$d = r \cdot t$$

$$(208 \text{ M}) = r \cdot (4 \text{ HRS})$$

$$\frac{208}{4} = \frac{4r}{4}$$

$$52 \text{ MPH} = r$$

4. A person borrows money from a friend and they decide to use a simple interest formula. $I = P \cdot R \cdot T$ where I is the interest in dollars, P is the principle (original money loaned) in dollars, R is the interest rate, and T is the time in years. If the person paid \$768 in interest for a loan over 5 years at a rate of 4%, how much money did they original borrow?

$$I = \$768 \quad T = 5 \text{ years} \quad R = 4\% = .04$$

$$I = P \cdot R \cdot T$$

$$768 = P \cdot (.04) \cdot (5)$$

$$\frac{768}{.2} = \frac{.2P}{.2}$$

$$\$3840 = P$$

6. A certain population of bacteria has an average growth rate of 0.06 bacteria per hour. The formula for the growth of the bacteria's population is $A = P_0(2.718)^{0.06t}$, where P_0 is the original population, t is time in hours, and A is the new population. If the current population of a culture was 3000 bacteria (A) and it started growing 30 hours ago, what was the original size of the bacteria (P_0)?

$$A = 3000 \quad t = 30$$

$$A = P_0 (2.718)^{0.06t}$$

$$3000 = P_0 \cdot (2.718)^{0.06(30)}$$

$$\frac{3000}{6.049} = \frac{6.049 \cdot P_0}{6.049}$$

$$496 \approx P_0$$

7. Find the dimensions of the rectangle if the perimeter is 20.

Diagram of a rectangle with dimensions labeled:

- Top: $2x+2$ (labeled "8 BY 2 UNITS")
- Right: $2x-4$
- Bottom: $(2x+2)$
- Left: $(2x-4)$

Handwritten calculations:

$$(2x-4) + (2x+2) + (2x-4) + (2x+2) = 20$$

$$2x-4 + 2x+2 + 2x-4 + 2x+2 = 20$$

$$8x - 4 = 20$$

$$8x = 24$$

$$x = 3$$

Additional notes: $6 + 2 = 8 \text{ UNITS}$, $2(3) + 2 = 8$, $2(3) - 4 = 2 \text{ UNITS}$

8. Find the each side of the triangle if the perimeter is 23.

Diagram of a triangle with side lengths labeled:

- Left side: $2x-5$
- Right side: $3x+1$
- Bottom side: $4x$

Handwritten calculations:

$$(2x-5) + (3x+1) + (4x) = 23$$

$$9x - 4 = 23$$

$$9x = 27$$

$$x = 3$$

Additional calculations:

$$2x-5 = 1 \text{ UNIT}$$

$$3x+1 = 10 \text{ UNITS}$$

$$4x = 12 \text{ UNITS}$$

9. One more than twice a number is 11. What is the number?

$$2x + 1 = 11$$

$$2x = 10$$

$$x = 5$$

10. 4 times the difference of 4 and a number is 24. What is the number?

$$4 \cdot (4 - x) = 24$$

$$16 - 4x = 24$$

$$-4x = 8$$

$$x = -2$$

11. My son is 9 less than $\frac{1}{2}$ my age. If I am 34 how old is my son?

Handwritten calculations:

$$x = \text{MY AGE} = 34$$

$$\text{MY SON'S AGE} = \frac{1}{2}x - 9$$

$$= \frac{1}{2}(34) - 9$$

$$= 17 - 9$$

$$= 8 \text{ years old}$$

12. Four less than a number tripled is the same number increased by ten. What is the number?

$$3x - 4 = x + 10$$

$$2x - 4 = 10$$

$$2x = 14$$

$$x = 7$$

13. If the difference of (twice a number and 8) is tripled the result is 18. What is the unknown number?

$$(2x - 8) \cdot 3 = 18$$

$$6x - 24 = 18$$

$$6x = 42$$

$$x = 7$$

14. The quotient of (a number and 2) is decreased by 3 and the result is 5. What is the number?

$$\left(\frac{x}{2}\right) - 3 = 5$$

$$\frac{x}{2} - 3 = 5$$

$$x - 6 = 10$$

$$x = 16$$

15. 5 subtracted from 4 times a number is 27. What is the number?

$$\begin{array}{r} 4x - 5 = 27 \\ +5 \quad +5 \\ \hline 4x = 32 \\ \frac{4x}{4} = \frac{32}{4} \\ \boxed{x = 8} \end{array}$$

16. 3 times a number plus 5 is the same number increased by 17. What is the number?

$$\begin{array}{r} 3x + 5 = x + 17 \\ -x \quad -x \\ \hline 2x + 5 = 17 \\ -5 \quad -5 \\ \hline 2x = 12 \\ \frac{2x}{2} = \frac{12}{2} \\ \boxed{x = 6} \end{array}$$

17. 4 less than number is the same as twice the number reduced by 12. What is the number?

$$\begin{array}{r} x - 4 = 2x - 12 \\ -x \quad -x \\ \hline -4 = x - 12 \\ +12 \quad +12 \\ \hline 8 = x \end{array}$$

18. Four less than the product of a number and 8 is twice the sum of the number and 10. What is the number?

$$\begin{array}{r} (8x) - 4 = 2(x + 10) \\ 8x - 4 = 2(x + 10) \\ 8x - 4 = 2x + 20 \\ -2x \quad -2x \\ \hline 6x - 4 = 20 \\ +4 \quad +4 \\ \hline 6x = 24 \\ \frac{6x}{6} = \frac{24}{6} \\ \boxed{x = 4} \end{array}$$

19. Five times the difference of twice a number and three is twenty-five. What is the number?

$$\begin{array}{r} 5 \cdot (2x - 3) = 25 \\ 10x - 15 = 25 \\ +15 \quad +15 \\ \hline 10x = 40 \\ \frac{10x}{10} = \frac{40}{10} \\ \boxed{x = 4} \end{array}$$

20. Three is subtracted from a number that is doubled this entire result is tripled which equals twenty one. What is the number?

$$\begin{array}{r} (2x - 3) \cdot 3 = 21 \\ 6x - 9 = 21 \\ +9 \quad +9 \\ \hline 6x = 30 \\ \frac{6x}{6} = \frac{30}{6} \\ \boxed{x = 5} \end{array}$$

21. The quotient of 3 less than twice a number and 5 is equal to the sum of 4 and the same number divided by 2. What is the number?

$$\frac{2x - 3}{5} = 4 + \frac{x}{2}$$

$$\begin{array}{l} \frac{10}{1} \cdot \frac{2x - 3}{5} = \frac{10}{1} \cdot 4 + \frac{10}{2} \cdot \frac{x}{2} \\ 2(2x - 3) = 40 + 5x \\ 4x - 6 = 40 + 5x \\ -4x \quad -4x \\ -6 = 40 + x \\ -40 \quad -40 \\ -46 = x \\ \boxed{x = -46} \end{array}$$

22. Two classrooms have a total of 45 people in them. The first class is a math class with 5 more students than the science class. How many are in each class?

$$\begin{array}{l} \text{MATH CLASS: } x \rightarrow 25 \\ \text{SCIENCE CLASS: } x - 5 \rightarrow 20 \end{array}$$

$$\begin{array}{r} (x) + (x - 5) = 45 \\ 2x - 5 = 45 \\ +5 \quad +5 \\ \hline 2x = 50 \\ \frac{2x}{2} = \frac{50}{2} \\ \boxed{x = 25} \end{array}$$

23. Two numbers total 44. The first number is 1 less than twice the second. What are the two numbers?

$$\text{FIRST NUMBER} = 2x - 1 \rightarrow 29$$

$$\text{SECOND NUMBER} = x \rightarrow 15$$

$$\begin{array}{r} (2x - 1) + (x) = 44 \\ 3x - 1 = 44 \\ +1 \quad +1 \\ \hline 3x = 45 \\ \frac{3x}{3} = \frac{45}{3} \\ \boxed{x = 15} \end{array}$$

24. A husband and wife have a combined income of \$74,000 a year. The wife makes \$10,000 less than twice as much as her husband makes. How much do they each earn?

$$\text{WIFE SALARY} = 2x - 10000 \rightarrow 46000$$

$$\text{HUSBAND SALARY} = x \rightarrow 28000$$

$$\begin{array}{r} (2x - 10000) + (x) = 74000 \\ 3x - 10000 = 74000 \\ +10000 \quad +10000 \\ \hline 3x = 84000 \\ \frac{3x}{3} = \frac{84000}{3} \\ \boxed{x = 28000} \end{array}$$

ANY 2 ANGLES THAT SUM TO 180 ARE CALLED SUPPLEMENTS

25. The difference of two numbers is 20. The larger of the two numbers is 2 more than twice the smaller. What are the two numbers?

$$\begin{aligned} \text{LARGER NUMBER} &= 2x + 2 \longrightarrow 38 \\ \text{SMALLER NUMBER} &= x \longrightarrow 18 \\ (2x+2) - (x) &= 20 \\ 2x+2 - x &= 20 \\ x+2 &= 20 \\ x &= 18 \end{aligned}$$

26. Mark is 3 less than 4 times as old as Tim. Together their ages total 42. How old is each person?

$$\begin{aligned} \text{MARK} &= 4x - 3 \longrightarrow 33 \\ \text{TIM} &= x \longrightarrow 9 \\ (4x-3) + (x) &= 42 \\ 4x-3 + x &= 42 \\ 5x-3 &= 42 \\ 5x &= 45 \\ x &= 9 \end{aligned}$$

27. An angle's is equal to 30 less than twice its supplement. What is the angle?

$$\begin{aligned} \text{ANGLE} &= x \longrightarrow 110 \\ \text{SUPPLEMENT} &= 180 - x \longrightarrow 70 \\ x &= 2(180-x) - 30 \\ x &= 360 - 2x - 30 \\ x &= 330 - 2x \\ 3x &= 330 \\ x &= 110 \end{aligned}$$

28. An angle is equal to 24 more than twice its complement. What is the angle?

$$\begin{aligned} \text{ANGLE} &= x \longrightarrow 68 \\ \text{COMPLEMENT} &= 90 - x \longrightarrow 22 \\ x &= 2(90-x) + 24 \\ x &= 180 - 2x + 24 \\ x &= 204 - 2x \\ 3x &= 204 \\ x &= 68 \end{aligned}$$

29. Jessica is 4 years older than Jeff. Keisha is twice as old as Jeff. The total of all three of their ages is 60. How old is each person?

$$\begin{aligned} \text{JESSICA} &= x + 4 \longrightarrow 18 \\ \text{JEFF} &= x \longrightarrow 14 \\ \text{KEISHA} &= 2x \longrightarrow 28 \\ (x+4) + (x) + (2x) &= 60 \\ 4x+4 &= 60 \\ 4x &= 56 \\ x &= 14 \end{aligned}$$

30. Consider the 3 interior angles of a triangle. The second angle is 30 less than twice the first. The third is 10 more than twice the first. What are the three angle measures?

$$\begin{aligned} (x) + (2x-30) + (2x+10) &= 180 \\ 5x-20 &= 180 \\ 5x &= 200 \\ x &= 40 \end{aligned}$$

Angles: $x^\circ = 40^\circ$, $(2x-30)^\circ = 50^\circ$, $(2x+10)^\circ = 90^\circ$

31. The check for a restaurant comes and due to a coupon it was reduced by 5 dollars. Four friends split the tab evenly after the coupon. Each friend paid \$6.50. How much was the original check?

$$\text{ORIGINAL CHECK} = x$$

$$\frac{x-5}{4} = 6.50$$

$$\frac{x-5}{4} = 6.50$$

$$x-5 = 26$$

$$x = 31$$

32. A person purchased 4 tires. The person had a coupon for 10% off. In the end each tire ended up costing \$44.00 a piece. How much was the original total bill before the coupon?

$$\text{TOTAL COST} = x$$

$$\frac{x - .10x}{4} = 44$$

$$x - .10x = 176$$

$$.90x = 176$$

$$x = 195.56$$