**Determine whether each pair of ratios are equivalent ratios. Write** *yes* **or** *no***.**

55. $\dfrac{27}{45}, \dfrac{3}{5}$

*SOLUTION:*

Simplify each ratio. $\dfrac{3}{5}$ is already in simplest form.

$$\dfrac{27}{45} = \dfrac{27 \div 9}{45 \div 9}$$
$$= \dfrac{3}{5}$$

Yes, the ratios are equivalent.

56. $\dfrac{18}{32}, \dfrac{3}{4}$

*SOLUTION:*

Simplify each ratio. $\dfrac{3}{4}$ is already in simplest form.

$$\dfrac{18}{32} = \dfrac{18 \div 2}{32 \div 2}$$
$$= \dfrac{9}{16}$$
$$\dfrac{3}{4} \neq \dfrac{9}{16}$$

No, the ratios are not equivalent.

**Solve each proportion. If necessary, round to the nearest hundredth.**

57. $\dfrac{4}{9} = \dfrac{a}{45}$

*SOLUTION:*

$\dfrac{4}{9} = \dfrac{a}{45}$    Original equation

$4(45) = 9a$    Find the cross products.

$180 = 9a$    Simplify.

$\dfrac{180}{9} = \dfrac{9a}{9}$    Divide each side by 9.

$20 = a$    Simplify.

58. $\dfrac{3}{8} = \dfrac{21}{t}$

*SOLUTION:*

$\dfrac{3}{8} = \dfrac{21}{t}$    Original equation.

$3t = 8(21)$    Find the cross products.

$3t = 168$    Simplify.

$\dfrac{3t}{3} = \dfrac{168}{3}$    Divide each side by 3.

$t = 56$    Simplify.

59. $\dfrac{9}{12} = \dfrac{g}{16}$

*SOLUTION:*

$\dfrac{9}{12} = \dfrac{g}{16}$    Original equation

$9(16) = 12g$    Find the cross products.

$144 = 12g$    Simplify.

$\dfrac{144}{12} = \dfrac{12g}{12}$    Divide each side by 12.

$12 = g$    Simplify.

60. **CONSTRUCTION** A new gym is being built at the Greenfield Middle School. The length of the gym as shown on the builder's blueprints is 12 inches. Find the actual length of the new gym.

SCALE

$\dfrac{3}{4}$ in = 5 ft

*SOLUTION:*

To solve the problem, let $x$ represent the length of the gym in feet. Write a proportion.

$\dfrac{\frac{3}{4}}{5} = \dfrac{12}{x}$    Original equation

$\dfrac{3}{4}x = 5(12)$    Find the cross products.

$\dfrac{3}{4}x = 60$    Simplify.

$\dfrac{4}{3} \cdot \dfrac{3}{4}x = \dfrac{4}{3} \cdot 60$    Multiply each side by $\dfrac{4}{3}$.

$x = \dfrac{240}{3}$    Simplify.

$x = 80$

The actual length of the gym is 80 feet.

**State whether each percent of change is a percent of *increase* of a percent of *decrease*. Then find the percent of change. Round to the nearest whole percent.**

61. original: 40, new: 50

*SOLUTION:*

Since the new amount is greater than the original, this is a percent of increase. Subtract to find the amount of change: $50 - 40 = 10$.

$$\frac{10}{40} = \frac{r}{100} \qquad \text{Percent proportion}$$
$$10(100) = r(40) \qquad \text{Find the cross products.}$$
$$1000 = 40r \qquad \text{Simplify.}$$
$$\frac{1000}{40} = \frac{40r}{40} \qquad \text{Divide each side by 40.}$$
$$25 = r \qquad \text{Simplify.}$$

The percent of increase is 25%.

62. original: 36, new: 24

*SOLUTION:*

Since the new amount is less than the original, this is a percent of decrease. Subtract to find the amount of change: $24 - 36 = -12$.

$$\frac{-12}{36} = \frac{r}{100} \qquad \text{Percent proportion}$$
$$-12(100) = r(36) \qquad \text{Find the cross products.}$$
$$-1200 = 36r \qquad \text{Simplify.}$$
$$\frac{-1200}{36} = \frac{36r}{36} \qquad \text{Divide each side by 36.}$$
$$-33.\overline{3} = r \qquad \text{Simplify.}$$

The percent of decrease is about 33%.

63. original: $72, new: $60

    *SOLUTION:*

    Since the new amount is less than the original, this is a percent of decrease. Subtract to find the amount of change: $60 - 72 = -12$.

    $$\frac{-12}{72} = \frac{r}{100} \quad \text{Percent proportion}$$
    $$-12(100) = r(72) \quad \text{Find the cross products.}$$
    $$-1200 = 72r \quad \text{Simplify.}$$
    $$-\frac{1200}{72} = \frac{72r}{72} \quad \text{Divide each side by 72.}$$
    $$-16.\overline{6} = r \quad \text{Simplify.}$$

    The percent of decrease is about 17%.

    **Find the total price of each item.**

64. boots: $64, tax: 7%

    *SOLUTION:*

    Find the tax.
    $0.07 \times 64 = 4.48$
    Add the tax and original amount to find the total cost.
    $\$4.48 + \$64 = \$68.48$
    The total cost of the boots is $68.48.

65. GPS: $98, tax: 6.5%

    *SOLUTION:*

    Find the tax.
    $0.065 \times 98 = 6.37$
    Rounded to the nearest cent, the tax is $3.19. Add the tax and original amount to find the total cost.
    $\$6.37 + \$98 = \$104.37$
    The total cost of the GPS is $104.37.

66. hockey skates: $199, tax: 5.25%

    *SOLUTION:*

    Find the tax.
    $0.0525 \times 199 = 10.4475$
    Rounded to the nearest cent, the tax is $10.45. Add the tax and original amount to find the total cost.
    $\$10.45 + \$199 = \$209.45$
    The total cost of the hockey skates is $209.45.

**Find the discounted price of each item.**

67. tablet: $275, discount: 20%

   *SOLUTION:*

   Find the discount.
   $0.2 \times 275 = 55$
   Subtract the discount from the original price.
   $275 - \$55 = \$220$
   The discounted price of the tablet is $220.

68. jacket: $129, discount: 15%

   *SOLUTION:*

   Find the discount.
   $0.15 \times 129 = 19.35$
   Subtract the discount from the original price.
   $129 - \$19.35 = \$109.65$
   The discounted price of the jacket is $109.65.

69. backpack: $45, discount: 25%

   *SOLUTION:*

   Find the discount.
   $0.25 \times 45 = 11.25$
   Subtract the discount from the original price.
   $459 - \$11.25 = \$33.75$
   The discounted price of the backpack is $33.75.

70. **ATTENDANCE** An amusement park recorded attendance of 825,000 one year. The next year, the attendance increased to 975,000. Determine the percent of increase in attendance.

   *SOLUTION:*

   To determine the percent of increase, subtract to find the amount of change: $975,000 - 825,000 = 150,000$

   $$\frac{150,000}{825,000} = \frac{r}{100} \qquad \text{Original equation}$$
   $$150,000(100) = r(825,000) \qquad \text{cross products.}$$
   $$15,000,000 = 825,000r \qquad \text{Simplify.}$$
   $$\frac{15,000,000}{825,000} = \frac{825,000r}{825,000} \qquad \text{Divide by 825,000.}$$
   $$18.\overline{18} = r \qquad \text{Simplify.}$$

   The percent of increase in attendance is about 18.2%.

**Solve each equation or formula for the variable indicated.**

71. $3x + 2y = 9$, for $y$

*SOLUTION:*

$$3x + 2y = 9 \qquad \text{Original equation}$$
$$3x - 3x + 2y = 9 - 3x \qquad \text{Subtraxt 3xfrom each side.}$$
$$2y = 9 - 3x \qquad \text{Simplify.}$$
$$\frac{2y}{2} = \frac{9 - 3x}{2} \qquad \text{Divide each side by 2.}$$
$$y = \frac{9 - 3x}{2} \qquad \text{Simplify.}$$

72. $P = 2\ell + 2w$, for $\ell$

*SOLUTION:*

$$P = 2\ell + 2w \qquad \text{Original equation}$$
$$P - 2w = 2\ell \qquad \text{Subtract 2wfrom each side.}$$
$$P - 2w = 2\ell \qquad \text{Simplify.}$$
$$\frac{2\ell}{2} = \frac{P - 2w}{2} \qquad \text{Divide each side by 2.}$$
$$\ell = \frac{P - 2w}{2} \qquad \text{Simplify.}$$

73. $-5m + 9n = 15$, for $m$

*SOLUTION:*

$$-5m + 9n = 15$$
$$-5m + 9n - 9n = 15 - 9n \qquad \text{Subtract } -9n.$$
$$-5m = 15 - 9n \qquad \text{Simplify.}$$
$$\frac{-5m}{-5} = \frac{15 - 9n}{-5} \qquad \text{Divide by } -5.$$
$$m = \frac{15 - 9n}{-5} \qquad \text{Simplify.}$$

74. $14w + 15x = y - 21w$, for $w$

    *SOLUTION:*

    $$14w + 15x = y - 21w$$
    $$14w + 15x - 15x = y - 21w - 15x \qquad \text{Subtract } 15x.$$
    $$14w = y - 21w - 15x \qquad \text{Simplify.}$$
    $$14w + 21w = y - 15x - 21w + 21w \qquad \text{Add } 21w.$$
    $$35w = y - 15x \qquad \text{Simplify.}$$
    $$\frac{35w}{35} = \frac{y - 15x}{35} \qquad \text{Divide by 35.}$$
    $$w = \frac{y - 15x}{35} \qquad \text{Simplify.}$$

75. $m = \frac{2}{5}y + n$, for $y$

    *SOLUTION:*

    $$m = \frac{2}{5}y + n \qquad \text{Original eqation.}$$
    $$m - n = \frac{2}{5}y + n - n \qquad \text{Subtract } n.$$
    $$m - n = \frac{2}{5}y \qquad \text{Simplify.}$$
    $$\frac{5}{2}(m - n) = \frac{5}{2} \cdot \frac{2}{5}y \qquad \text{Multiply by} \frac{5}{2}.$$
    $$\frac{5}{2}(m - n) = y \qquad \text{Simplify.}$$

76. $7d - 3c = f + 2d$, for $d$

    *SOLUTION:*

    $$7d - 3c = f + 2d$$
    $$7d - 2d - 3c = f + 2d - 2d \qquad \text{Subtract } 2d.$$
    $$5d - 3c = f \qquad \text{Simplify.}$$
    $$5d - 3c + 3c = f + 3c \qquad \text{Add } 3c.$$
    $$5d = f + 3c \qquad \text{Simplify.}$$
    $$\frac{5d}{5} = \frac{f + 3c}{5} \qquad \text{Divide by 5.}$$
    $$d = \frac{f + 3c}{5} \qquad \text{Simplify.}$$

77. **GEOMETRY** The formula for the area of a trapezoid is $A = \frac{1}{2}h(a+b)$, where $h$ represents the height and $a$ and $b$ represent the lengths of the bases. Solve for $h$.

*SOLUTION:*

$$A = \tfrac{1}{2}h(a+b) \qquad \text{Original equation}$$
$$2A = 2 \cdot \tfrac{1}{2}h(a+b) \qquad \text{Multiply each side by 2.}$$
$$2A = h(a+b) \qquad \text{Simplify.}$$
$$\frac{2A}{(a+b)} = \frac{h(a+b)}{(a+b)} \qquad \text{Divide each side by } a+b.$$
$$\frac{2A}{a+b} = h \qquad \text{Simplify.}$$

78. **CANDY** Michael is mixing two types of candy for a party. The chocolate pieces cost $0.55 per ounce, and the hard candy costs $0.35 per ounce. Michael purchases 20 ounces of the chocolate pieces, and the total cost of his candy was $18. How many ounces of hard candy did he purchase?

*SOLUTION:*

To write an equation, let $x$ represent the number of ounces of hard candy purchased.

|  | Number of Ounces | Price per ounce ($) | Total Price |
|---|---|---|---|
| Candy 1 | 20 | 0.55 | 0.55(20) |
| Candy 2 | $x$ | 0.35 | 0.35$x$ |
| Candy 1 + Candy 2 | $20 + x$ | $0.55 + 0.35$ | 18 |

$$20(0.55) + x(0.35) = 18$$
$$11 + 0.35x = 18 \qquad \text{Simplify.}$$
$$11 - 11 + 0.35x = 18 - 11 \qquad \text{Subtract 11.}$$
$$0.35x = 7 \qquad \text{Simplify.}$$
$$\frac{0.35x}{0.35} = \frac{7}{0.35} \qquad \text{Divide by 0.35.}$$
$$x = 20 \qquad \text{Simplify.}$$

Michael purchased 20 ounces of hard candy.

79. **TRAVEL** A car travels 100 miles east in 2 hours and 30 miles north in half an hour. What is the average speed of the car?

*SOLUTION:*

The average speed is the total distance traveled divided by the total time.
$$\frac{100+30}{2+0.5} = \frac{130}{2.5}$$
$$= 52$$
The car's average speed is 52 miles per hour.

80. **FINANCIAL LITERACY** AA candle supply store sells votive wax and low-shrink wax. How many pounds of low shrink wax should be mixed with 8 pounds of votive wax to obtain a blend that sells for $1.50 a pound?



Votive Wax
$1.35/lb

Low Shrink Wax
$1.80/lb

*SOLUTION:*

To write an equation, let $w$ represent the amount of low-shrink wax.

| | Pounds of Wax | Price per pound ($) | Total Price |
|---|---|---|---|
| Votive Wax | 8 | 1.35 | 1.35(8) |
| Low Shrink Wax | $w$ | 1.80 | 1.80$w$ |
| Blend | $8 + w$ | 1.50 | 1.50( 8 + $w$) |

$$1.35(8) + 1.80w = 1.50(8 + w)$$
$$10.8 + 1.80w = 12 + 1.50w$$
$$10.8 - 10.8 + 1.80w = 12 - 10.8 + 1.5w$$
$$1.80w = 1.2 + 1.5w$$
$$1.8w - 1.5w = 1.2 + 1.5w - 1.5w$$
$$0.3w = 1.2$$
$$\frac{0.3w}{0.3} = \frac{1.2}{0.3}$$
$$w = 4$$

4 pounds of low-shrink wax is needed.