# Practice Test
## Rates, Ratios, and Proportions

**1**

The density of an object is equal to the mass of the object divided by the volume of the object. What is the mass, in grams, of an object with a volume of $0.01 \text{ m}^3$ and a density of 4.54 grams per cubic centimeters? ($1 \text{ m} = 100 \text{ cm}$)

A) 454

B) 4,540

C) 45,400

D) 454,000

**2**

Jason and Donny painted a house and received $1,200. To complete the painting job Jason painted 4 hours 25 minutes and Donny spent 2 hours and 15 minutes. If they split the $1,200 in proportion to the amount of time each spent painting, how much did Donny receive?

A) $405.00

B) $443.00

C) $472.00

D) $492.00

**3**

The tennis balls in a bag are either white or yellow. If the ratio of white balls to yellow balls is $\frac{3}{10}$, which of the following could not be the number of balls in the bag?

A) 26

B) 39

C) 42

D) 52

**4**

A car is traveling at a constant rate of $x$ miles per hour. How many miles will the car travel in $y$ minutes?

A) $60xy$

B) $\frac{60x}{y}$

C) $\frac{xy}{60}$

D) $\frac{y}{60x}$

**5**

A tree is 8 feet tall and grows 8 inches each year. In how many years will the tree reach a height of 30 feet?

A) 27

B) 33

C) 45

D) 52

**6**

Aaron reads $x$ pages of a science fiction book in $m$ minutes. If he continues reading at this rate, what will be the number of pages he reads in $20\,m$ seconds?

A) $\frac{1}{3}x$

B) $\frac{1}{2}x$

C) $\frac{2}{3}x$

D) $2x$

**7**

If $\dfrac{x}{y} = 1$, what is the value of $x - y - 1$?

A)  $-1$

B)  0

C)  1

D)  The value cannot be determined from the information given.

**8**

In a certain room the ratio of males to females is 4 to 5. After 8 males enter the room, the ratio of males to females is 6 to 5. What is the total number of people in the room before the additional males enter the room?

A)  27

B)  36

C)  45

D)  54

**9**

A person is born every 5 seconds and a person dies every 12 seconds. How many seconds does it take for the population to grow by one person?

A)  7 sec

B)  $8\dfrac{4}{7}$ sec

C)  10.5 sec

D)  $10\dfrac{5}{7}$ sec

**10**

Steve is going to paint a wall that measures 9 feet by 12 feet. If one gallon of paint is needed for each $s$ square foot of wall and each gallon costs $g$ dollars, in terms of $s$ and $g$ how much does it cost to paint the entire wall?

A)  $\dfrac{108}{gs}$

B)  $\dfrac{gs}{108}$

C)  $\dfrac{108s}{g}$

D)  $\dfrac{108g}{s}$

**11**

If 2 inches are equivalent to 5 centimeters, how many square centimeters are in one square inch?

**12**

A large painting has a length of 18 inches and a width of 12 inches. If each dimension is reduced by $x$ inches to make the ratio of length to width 5 to 3, what is the value of $x$?

# Rates, Ratios, and Proportions

1. **C**

$1 \text{ m} = 100 \text{ cm}$

$1 \text{ m}^3 = (100 \text{ cm})^3 = 1,000,000 \text{ cm}^3$

$0.01 \text{ m}^3 = 0.01 \times 1,000,000 \text{ cm}^3 = 10,000 \text{ cm}^3$

$\text{Density} = \dfrac{\text{Mass}}{\text{Volume}}$

$4.54 \text{ grams} / \text{cm}^3 = \dfrac{\text{Mass}}{0.01 \text{ m}^3} = \dfrac{\text{Mass}}{10,000 \text{ cm}^3}$

$\text{Mass} = 4.54 \dfrac{\text{grams}}{\text{cm}^3} \cdot 10,000 \text{ cm}^3$

$\qquad = 45,400 \text{ grams}$

2. **A**

$\text{Total time} = \text{Jason's time} + \text{Donny's time}$

$\qquad\qquad = 4 \text{ hour } 25 \text{ min} + 2 \text{ hour } 15 \text{ min}$

$\qquad\qquad = 4\dfrac{5}{12} \text{ hour} + 2\dfrac{1}{4} \text{ hour} = 6\dfrac{2}{3} \text{ hour}$

The amount Donny received

$= 1,200 \times \dfrac{2\dfrac{1}{4} \text{ hour}}{6\dfrac{2}{3} \text{ hour}} = 1,200 \cdot \dfrac{\dfrac{9}{4}}{\dfrac{20}{3}} = 1,200 \cdot \dfrac{9}{4} \cdot \dfrac{3}{20}$

$= 405$

# Answers
## Rates, Ratios, and Proportions

$$60m \cdot p = 20m \cdot x \qquad \text{Cross Products}$$

$$p = \frac{20m \cdot x}{60m} = \frac{1}{3}x$$

**7. A**

$$\frac{x}{y} = 1$$

$$y \cdot \frac{x}{y} = y \cdot 1 \qquad \text{Multiply each side by } y.$$

$$x = y \qquad \text{Simplify.}$$

$$x - y = y - y \qquad \text{Subtract } y \text{ from each side.}$$

$$x - y = 0 \qquad \text{Simplify.}$$

$$x - y - 1 = 0 - 1 \qquad \text{Subtract 1 from each side.}$$

$$x - y - 1 = -1 \qquad \text{Simplify.}$$

**8. B**

Let $m$ = the number of males in the room and let $f$ = the number of females in the room.

$$\frac{m}{f} = \frac{4}{5} \qquad \text{The ratio of males to females is 4 to 5.}$$

$$5m = 4f \qquad \text{Cross Products}$$

$$\frac{m+8}{f} = \frac{6}{5} \qquad \text{After 8 males enter the room, the ratio of males to females is 6 to 5.}$$

$$5(m+8) = 6f \qquad \text{Cross Products}$$

$$5m + 40 = 6f \qquad \text{Simplify.}$$

$$4f + 40 = 6f \qquad \text{Substitute } 4f \text{ for } 5m.$$

$$40 = 2f \qquad \text{Subtract } 2f \text{ from each side.}$$

$$20 = f \qquad \text{Divide each side by 2.}$$

Substituting 20 for $f$ in the equation $5m = 4f$ gives $5m = 4 \cdot 20$. Solving for $m$ yields $m = 16$.

The total number of people in the room before the additional males enter the room is $m + f = 16 + 20 = 36$.

**9. B**

If a person is born every 5 seconds, 12 people are born per minute. If a person dies every 12 seconds, 5 people die per minute. Every minute the population grows by $12 - 5$, or 7, people.

Therefore, it takes $\frac{60}{7}$ seconds, or $8\frac{4}{7}$ seconds, for the population to grow by one person.

**3. C**

If the ratio of white balls to yellow balls is $\frac{3}{10}$,

$3n$ represents the number of white balls and $10n$ represents the number of yellow balls ($n$ is a positive integer).
Since the total number of balls in the bag is $3n + 10n$, or $13n$, and $n$ is a positive integer, the number of balls will be a multiple of 13.

Choice C is correct, because 42 is not a multiple of 13.

**4. C**

Let $m$ = the number of miles traveled in $y$ minutes. Substitute 60 minutes for 1 hour and set up a proportion.

$$\frac{x}{60} = \frac{m}{y} \quad \begin{array}{l} \leftarrow \text{ number of miles} \\ \leftarrow \text{ number of minutes} \end{array}$$

$$60m = xy \qquad \text{Cross Products}$$

$$m = \frac{xy}{60}$$

**5. B**

Let $x$ = the number of years it will take the tree to reach a height of 30 feet.

Also, 8 inches = $\frac{8}{12}$ feet.

$$8 + \frac{8}{12}x = 30 \qquad \text{The tree is 8 feet tall and will grow } \frac{8}{12}x \text{ feet in } x \text{ years.}$$

$$\frac{8}{12}x = 22$$

$$x = 22 \cdot \frac{12}{8} = 33$$

**6. A**

$m$ minutes = $60m$ seconds
Let $p$ = the number of pages he reads in $20m$ seconds.
Set up a proportion.

$$\frac{x}{60m} = \frac{p}{20m} \quad \begin{array}{l} \leftarrow \text{ number of pages} \\ \leftarrow \text{ number of seconds} \end{array}$$

4

10. D

Total area of the wall $= 9 \times 12 = 108 \text{ ft}^2$.

Let it take $p$ gallons of paint to paint $108 \text{ ft}^2$.

Set up a proportion.

$\dfrac{1}{s} = \dfrac{p}{108}$  $\leftarrow$ number of gallons
$\phantom{\dfrac{1}{s} = \dfrac{p}{108}}$ $\leftarrow$ number of square feet

$sp = 108$ $\qquad$ Cross Products

$p = \dfrac{108}{s}$

It takes $\dfrac{108}{s}$ gallons of paint to paint $108 \text{ ft}^2$.

Since each gallon costs $g$ dollars, the total cost

will be $\dfrac{108}{s} \cdot g$ dollars.

11. $\dfrac{25}{4}$ or 6.25

$2 \text{ in} = 5 \text{ cm}$

$1 \text{ in} = \dfrac{5}{2} \text{ cm}$ $\qquad$ Divide each side by 2.

$(1 \text{ in})^2 = (\dfrac{5}{2} \text{ cm})^2$ $\qquad$ Square both sides.

$1 \text{ in}^2 = \dfrac{25}{4} \text{ cm}^2$ $\qquad$ Simplify.

There are $\dfrac{25}{4}$ square centimeters in 1 square inch.

12. 3

The reduced length of the painting is $18 - x$ and the reduced width of the painting is $12 - x$.

$\dfrac{18 - x}{12 - x} = \dfrac{5}{3}$ $\qquad$ The new ratio is 5 to 3.

$3(18 - x) = 5(12 - x)$ $\qquad$ Cross Products

$54 - 3x = 60 - 5x$ $\qquad$ Distributive Property

$54 + 2x = 60$ $\qquad$ Add $5x$ to each side.

$2x = 6$ $\qquad$ Subtract 54 from each side.

$x = 3$ $\qquad$ Divide each side by 2.