RATIOS

A DEFINITION

A.1 EXPRESSING RATIOS IN DIFFERENT FORMS

Ex 1: The ratio 3 to 2 is $\boxed{3}:\boxed{2}$.

Answer: The ratio 3 to 2 can be expressed as $3:2$ or $\frac{3}{2}$.

Ex 2: The ratio 5 to 4 is $\boxed{5}:\boxed{4}$.

Answer: The ratio 5 to 4 can be expressed as $5:4$ or $\frac{5}{4}$.

Ex 3: The ratio 7 to 3 is $\boxed{7}:\boxed{3}$.

Answer: The ratio 7 to 3 can be expressed as $7:3$ or $\frac{7}{3}$.

Ex 4: The ratio 8 to 5 is $\boxed{8}:\boxed{5}$.

Answer: The ratio 8 to 5 can be expressed as $8:5$ or $\frac{8}{5}$.

Ex 5: The ratio 10 to 6 is $\boxed{10}:\boxed{6}$.

Answer: The ratio 10 to 6 can be expressed as $10:6$ or $\frac{10}{6}$.

B PART-PART AND PART-WHOLE RATIOS

B.1 FINDING RATIOS IN PART-PART

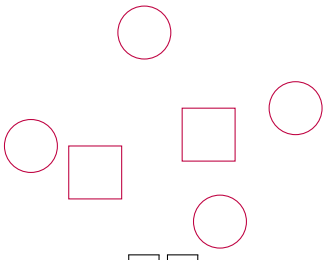
Ex 6: What is the ratio of girls to boys?

$\boxed{2}:\boxed{3}$

Answer:

- There are 2 girls.
- There are 3 boys.
- The ratio of girls to boys is $2:3$ or $\frac{2}{3}$.

Ex 7: What is the ratio of circles to rectangles?

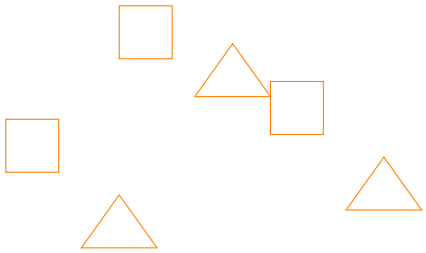


$\boxed{4}:\boxed{2}$

Answer:

- There are 4 circles.
- There are 2 rectangles.
- The ratio of circles to rectangles is $4:2$ or $\frac{4}{2}$.

Ex 8: What is the ratio of squares to triangles?



$\boxed{3}:\boxed{3}$

Answer:

- There are 3 squares.
- There are 3 triangles.
- The ratio of squares to triangles is $3:3$ or $\frac{3}{3}$.

Ex 9: What is the ratio of oranges to lemons?

$\frac{\boxed{4}}{\boxed{3}}$

Answer:

- There are 4 oranges.
- There are 3 lemons.
- The ratio of oranges to lemons is $\frac{4}{3}$, or $4:3$.

Ex 10: What is the ratio of girls to boys?

$\frac{\boxed{2}}{\boxed{4}}$

Answer:

- There are 2 girls.
- There are 4 boys.
- The ratio of girls to boys is $\frac{2}{4}$, or $2:4$.

B.2 FINDING RATIOS IN PART-WHOLE

Ex 11: What is the ratio of girls to kids?

$\boxed{2}:\boxed{5}$

Answer:

- There are 2 girls.
- There are 5 kids.
- The ratio of girls to kids is $2:5$ or $\frac{2}{5}$.

Ex 12: What is the ratio of boys to kids?

$\boxed{1}:\boxed{4}$

Answer:

- There is 1 boy.
- There are 4 kids.
- The ratio of boys to kids is $1:4$ or $\frac{1}{4}$.

Ex 13: Louis loves to play sports. In all, he has earned 5 swimming medals, 3 running medals, 6 cycling medals, and 2 triathlon medals.
What is the ratio of Louis's swimming medals to all of his medals?

$\boxed{5}:\boxed{16}$

Answer:

- Louis has earned 5 swimming medals.
- $$5+3+6+2=16$$
  Louis has earned 16 total medals.
- The ratio of swimming medals to all of his medals is $5:16$ or $\frac{5}{16}$.

Ex 14: Anna loves to read books. In all, she has read 12 mystery novels, 8 science fiction novels, 5 fantasy novels, and 3 historical novels.
What is the ratio of Anna's mystery novels to all of her books?

$\boxed{12}:\boxed{28}$

Answer:

- Anna has read 12 mystery novels.
- $$12+8+5+3=28$$
  Anna has read 28 books in total.
- The ratio of mystery novels to all of her books is $12:28$ or $\frac{12}{28}$.

Ex 15: The table shows the number of different types of birds that are swimming at a lake.

Bird	Number
Seagulls	1
Ducks	9
Geese	7
Swans	2

What is the ratio of swans to total birds?

$\boxed{2}:\boxed{19}$

Answer:

- There are 2 swans.
- There are $1+9+7+2=19$ birds.
- The ratio of swans to total birds is $2:19$ or $\frac{2}{19}$.

Ex 16: The table shows the number of different types of fruits in a basket.

Fruit	Number
Apples	3
Oranges	5
Bananas	4
Grapes	6

What is the ratio of apples to total fruits?

$\boxed{3}:\boxed{18}$

Answer:

- There are 3 apples.
- There are $3+5+4+6=18$ fruits.
- The ratio of apples to total fruits is $3:18$ or $\frac{3}{18}$.

Ex 17: The table shows the number of different types of vehicles in a parking lot.

Vehicle	Number
Cars	10
Bicycles	6
Motorcycles	4
Trucks	2

What is the ratio of trucks to total vehicles?

$\boxed{2}:\boxed{22}$

Answer:

- There are 2 trucks.
- There are $10+6+4+2=22$ vehicles.
- The ratio of trucks to total vehicles is $2:22$ or $\frac{2}{22}$.

C EQUAL RATIOS

C.1 MULTIPLYING THE RATIOS

Ex 18: Multiply the ratio by 2:

$$3 : 5 = \boxed{6} : \boxed{10}$$

Answer:

- $\frac{3}{5} \overset{\times 2}{=} \frac{6}{10}$ ($\times 2$ above and below)
- $\frac{3}{5} = \frac{3 \times 2}{5 \times 2} = \frac{6}{10}$
- $3 : 5 = 6 : 10$.

Ex 19: Multiply the ratio by 3:

$$4 : 7 = \boxed{12} : \boxed{21}$$

Answer:

- $\frac{4}{7} \overset{\times 3}{=} \frac{12}{21}$ ($\times 3$ above and below)
- $\frac{4}{7} = \frac{4 \times 3}{7 \times 3} = \frac{12}{21}$
- $4 : 7 = 12 : 21$.

Ex 20: Multiply the ratio by 4:

$$5 : 3 = \boxed{20} : \boxed{12}$$

Answer:

- $\frac{5}{3} \overset{\times 4}{=} \frac{20}{12}$ ($\times 4$ above and below)
- $\frac{5}{3} = \frac{5 \times 4}{3 \times 4} = \frac{20}{12}$
- $5 : 3 = 20 : 12$.

Ex 21: Multiply the ratio by 5:

$$2 : 5 = \boxed{10} : \boxed{25}$$

Answer:

- $\frac{2}{5} \overset{\times 5}{=} \frac{10}{25}$ ($\times 5$ above and below)
- $\frac{2}{5} = \frac{2 \times 5}{5 \times 5} = \frac{10}{25}$
- $2 : 5 = 10 : 25$.

C.2 FINDING THE MISSING VALUE

Ex 22:

$$1 : 2 = 2 : \boxed{4}$$

Answer:

- $\frac{1}{2} \overset{\times 2}{=} \frac{2}{4}$ ($\times 2$ above and below)
- $\frac{1}{2} = \frac{1 \times 2}{2 \times 2} = \frac{2}{4}$
- $1 : 2 = 2 : 4$.

Ex 23:

$$2 : 3 = \boxed{4} : 6$$

Answer:

- $\frac{2}{3} \overset{\times 2}{=} \frac{4}{6}$ ($\times 2$ above and below)
- $\frac{2}{3} = \frac{2 \times 2}{3 \times 2} = \frac{4}{6}$
- $2 : 3 = 4 : 6$.

Ex 24:

$$3 : 5 = 9 : \boxed{15}$$

Answer:

- $\frac{3}{5} \overset{\times 3}{=} \frac{9}{15}$ ($\times 3$ above and below)
- $\frac{3}{5} = \frac{3 \times 3}{5 \times 3} = \frac{9}{15}$

- $3:5=9:15$.

Ex 25:

$$4:7=\boxed{8}:14$$

Answer:

- $\frac{4}{7} \overset{\times 2}{=} \frac{8}{14}$
- $$\begin{aligned}\frac{4}{7} &= \frac{4\times 2}{7\times 2}\\ &= \frac{8}{14}\end{aligned}$$
- $4:7=8:14$.

Ex 26:

$$2:3=8:\boxed{12}$$

Answer:

- $\frac{2}{3} \overset{\times 4}{=} \frac{8}{12}$
- $$\begin{aligned}\frac{2}{3} &= \frac{2\times 4}{3\times 4}\\ &= \frac{8}{12}\end{aligned}$$
- $2:3=8:12$.

Ex 27:

$$3:2=\boxed{30}:20$$

Answer:

- $\frac{3}{2} \overset{\times 10}{=} \frac{30}{20}$
- $$\begin{aligned}\frac{3}{2} &= \frac{3\times 10}{2\times 10}\\ &= \frac{30}{20}\end{aligned}$$
- $3:2=30:20$.

D PROPORTION

D.1 IDENTIFYING THE PROPORTION

MCQ 28: Two vinaigrettes are being prepared:

- Vinaigrette A is made with 2 mL of oil and 1 mL of vinegar.
- Vinaigrette B is made with 4 mL of oil and 2 mL of vinegar.

Will these two vinaigrettes taste the same?

☒ Yes

☐ No

Answer:

- $\frac{2}{1} \overset{\times 2}{=} \frac{4}{2}$
- Since both ratios are equal, there is a proportion. So, the vinaigrettes will taste the same.

MCQ 29: On the cement package, it is indicated: 2 kilos of cement for 3 liters of water.
A worker prepares a mixture with 4 kilos of cement and 6 liters of water.
Did he follow the recommended proportions?

☒ Yes

☐ No

Answer:

- $\frac{2}{3} \overset{\times 2}{=} \frac{4}{6}$
- Since the two ratios are equal, the worker followed the recommended proportions.

MCQ 30: Two smoothie recipes are being prepared:

- Smoothie A is made with 3 cups of fruit and 2 cups of yogurt.
- Smoothie B is made with 6 cups of fruit and 4 cups of yogurt.

Will these two smoothies taste the same?

☒ Yes

☐ No

Answer:

- $\frac{3}{2} \overset{\times 2}{=} \frac{6}{4}$
- Since both ratios are equal, the proportions are the same. Therefore, the smoothies will taste the same.

MCQ 31: A gardener uses a fertilizer mix:

- The recommended mix is 5 grams of fertilizer per 2 liters of water.
- The gardener prepares a mixture with 10 grams of fertilizer and 4 liters of water.

Did the gardener follow the recommended proportions?

☐ Yes

☐ No

Answer:

- $\frac{5}{2} \overset{\times 2}{=} \frac{10}{4}$

- Since both ratios are equals, the gardener followed the recommended proportions.

E UNITARY METHOD

E.1 BRINGING TO THE UNIT

Ex 32: A satellite makes 4 orbits around the Earth in 24 hours. How many hours does it take to complete one orbit?

$\boxed{6}$ hours

Answer: For 4 orbits, it takes 24 hours. Therefore, to maintain this proportion for 1 orbit, we divide both the number of orbits and the number of hours by 4:

$$\frac{24}{4} \overset{\div 4}{=} \frac{6}{1}$$

Thus, to make 1 orbit, it takes 6 hours.

Ex 33: A car travels 500 kilometers in 5 hours. How many kilometers does it travel in 1 hour?

$\boxed{100}$ kilometers

Answer: For 5 hours, the car travels 500 kilometers. Therefore, to maintain this proportion for 1 hour, we divide both the number of kilometers and the number of hours by 5:

$$\frac{500}{5} \overset{\div 5}{=} \frac{100}{1}$$

Thus, to travel 1 hour, the car covers 100 kilometers.

Ex 34: A factory produces 720 widgets in 8 hours. How many widgets does it produce in 1 hour?

$\boxed{90}$ widgets

Answer: For 8 hours, the factory produces 720 widgets. Therefore, to maintain this proportion for 1 hour, we divide both the number of widgets and the number of hours by 8:

$$\frac{720}{8} \overset{\div 8}{=} \frac{90}{1}$$

Thus, in 1 hour, the factory produces 90 widgets.

Ex 35: A baker uses 2 kilograms of flour to make 4 loaves of bread. How many kilograms of flour does it take to make 1 loaf of bread?

$\boxed{0.5}$ kilograms

Answer: For 4 loaves, the baker uses 2 kilograms of flour. Therefore, to maintain this proportion for 1 loaf, we divide both the number of kilograms and the number of loaves by 4:

$$\frac{2}{4} \overset{\div 4}{=} \frac{0.5}{1}$$

Thus, to make 1 loaf of bread, it takes 0.5 kilograms of flour.

E.2 CALCULATING FROM THE UNIT

Ex 36: To make 1 chocolate cake, 4 eggs are needed. How many eggs are needed to make 2 cakes?

$\boxed{8}$ eggs

Answer: For 1 cake, it takes 4 eggs. Therefore, to maintain this proportion for 2 cakes, you multiply both the number of cakes and the number of eggs by 2:

$$\frac{4}{1} \overset{\times 2}{=} \frac{8}{2}$$

Thus, to make 2 chocolate cakes, you need 8 eggs.

Ex 37: The price of 1 kilogram of apples is \$2.5. What is the price for 3 kilograms of apples?

\$ $\boxed{7.5}$

Answer: The price for 1 kilogram of apples is \$2.5. Therefore, to maintain this proportion for 3 kilograms, you multiply the price by 3:

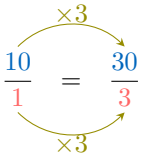
$$\frac{2.5}{1} \overset{\times 3}{=} \frac{7.5}{3}$$

Thus, the price for 3 kilograms of apples is \$7.5.

Ex 38: To build 1 bookshelf, 10 wooden planks are needed. How many wooden planks are needed to build 3 bookshelves?

$\boxed{30}$ wooden planks

Answer: For 1 bookshelf, it takes 10 wooden planks. Therefore, to maintain this proportion for 3 bookshelves, you multiply both the number of bookshelves and the number of wooden planks by 3:

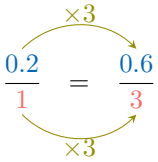


Thus, to build 3 bookshelves, you need 30 wooden planks.

Ex 39: To paint 1 m^2, 0.2 liters of paint are needed. How many liters of paint are needed to paint 3 m^2?

$\boxed{0.6}$ liters of paint

Answer: For 1 m^2, it takes 0.2 liters of paint. Therefore, to maintain this proportion for 3 m^2, you multiply both the area and the number of liters of paint by 3:



Thus, to paint 3 m^2, you need 0.6 liters of paint.

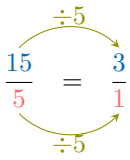
E.3 CONVERTING TO AND FROM THE UNIT

Ex 40: To make a special juice mix, you need 5 apples for every 15 oranges. How many oranges do you need if you have 3 apples?

$\boxed{9}$ oranges

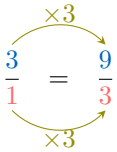
Answer:

- **To the unit**: For 5 apples, you need 15 oranges. Therefore, to maintain this proportion for 1 apple, we divide both the number of oranges and the number of apples by 5:

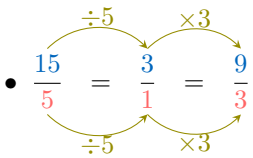


Thus, for 1 apple, you need 3 oranges.

- **From the unit**: For 1 apple, you need 3 oranges. Therefore, to maintain this proportion for 3 apples, we multiply both the number of oranges and the number of apples by 3:



Thus, for 3 apples, you need 9 oranges.

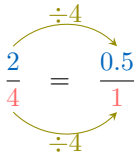
- 

Ex 41: A baker uses 2 kilograms of flour to make 4 loaves of bread. How many kilograms of flour does it take to make 3 loaf of bread?

$\boxed{1.5}$ kilograms

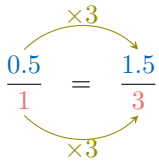
Answer:

- **To the unit**: For 4 loaves, the baker uses 2 kilograms of flour. Therefore, to maintain this proportion for 1 loaf, we divide both the number of kilograms and the number of loaves by 4:

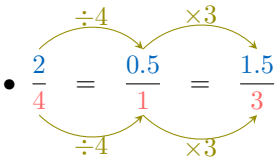


Thus, to make 1 loaf of bread, it takes 0.5 kilograms of flour.

- **From the unit**: For 1 loaves, the baker uses 0.5 kilograms of flour. Therefore, to maintain this proportion for 3 loaf, we multiply both the number of kilograms and the number of loaves by 3:



Thus, to make 3 loaf of bread, it takes 1.5 kilograms of flour.

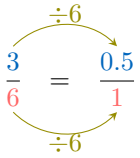
- 

Ex 42: An artist mixes 3 liters of red paint with 6 liters of blue paint to create a purple shade. How many liters of red paint are needed to mix with 9 liters of blue paint to maintain the same shade of purple?

$\boxed{4.5}$ liters

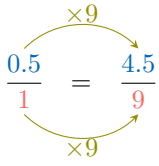
Answer:

- **To the unit**: For 6 liters of blue paint, the artist uses 3 liters of red paint. Therefore, to maintain this proportion for 1 liter of blue paint, we divide both the number of liters of red paint and blue paint by 6:



Thus, to mix with 1 liter of blue paint, it takes 0.5 liters of red paint.

- **From the unit**: For 1 liter of blue paint, the artist uses 0.5 liters of red paint. Therefore, to maintain this proportion for 9 liters of blue paint, we multiply both the number of liters of red paint and blue paint by 9:



Thus, to mix with 9 liters of blue paint, it takes 4.5 liters of red paint.

- $\frac{3}{6} \overset{\div 6}{\underset{\div 6}{=}} \frac{0.5}{1} \overset{\times 9}{\underset{\times 9}{=}} \frac{4.5}{9}$

Ex 43: To make a magic potion, you need 10 drops of dragon's blood for every 5 drops of phoenix tears. How many drops of phoenix tears do you need if you have 4 drops of dragon's blood?

$\boxed{2}$ drops of phoenix tears

Answer:

- **To the unit**: For 10 drops of dragon's blood, you need 5 drops of phoenix tears. Therefore, to maintain this proportion for 1 drop of dragon's blood, we divide both the number of drops of phoenix tears and the number of drops of dragon's blood by 10:

$\frac{5}{10} \overset{\div 10}{\underset{\div 10}{=}} \frac{0.5}{1}$

Thus, for 1 drop of dragon's blood, you need 0.5 drops of phoenix tears.

- **From the unit**: For 1 drop of dragon's blood, you need 0.5 drops of phoenix tears. Therefore, to maintain this proportion for 4 drops of dragon's blood, we multiply both the number of drops of phoenix tears and the number of drops of dragon's blood by 4:

$\frac{0.5}{1} \overset{\times 4}{\underset{\times 4}{=}} \frac{2}{4}$

Thus, for 4 drops of dragon's blood, you need 2 drops of phoenix tears.

- $\frac{5}{10} \overset{\div 10}{\underset{\div 10}{=}} \frac{0.5}{1} \overset{\times 4}{\underset{\times 4}{=}} \frac{2}{4}$

E.4 SOLVING NUMERATOR

Ex 44:

$$\frac{6}{2} = \frac{\boxed{9}}{3}$$

Answer:

$\frac{6}{2} \overset{\div 2}{\underset{\div 2}{=}} \frac{3}{1} \overset{\times 3}{\underset{\times 3}{=}} \frac{9}{3}$

Ex 45:

$$\frac{8}{4} = \frac{\boxed{10}}{5}$$

Answer:

$\frac{8}{4} \overset{\div 4}{\underset{\div 4}{=}} \frac{2}{1} \overset{\times 5}{\underset{\times 5}{=}} \frac{10}{5}$

Ex 46:

$$\frac{3}{2} = \frac{\boxed{7.5}}{5}$$

Answer:

$\frac{3}{2} \overset{\div 2}{\underset{\div 2}{=}} \frac{1.5}{1} \overset{\times 5}{\underset{\times 5}{=}} \frac{7.5}{5}$

Ex 47: You can use a calculator.

$$\frac{5}{4} = \frac{\boxed{3.75}}{3}$$

Answer:

$\frac{5}{4} \overset{\div 4}{\underset{\div 4}{=}} \frac{1.25}{1} \overset{\times 3}{\underset{\times 3}{=}} \frac{3.75}{3}$

E.5 SOLVING DENOMINATOR

Ex 48:

$$\frac{5}{10} = \frac{2}{\boxed{4}}$$

Answer:

$\frac{5}{10} \overset{\div 5}{\underset{\div 5}{=}} \frac{1}{2} \overset{\times 2}{\underset{\times 2}{=}} \frac{2}{4}$

Ex 49:

$$\frac{3}{6} = \frac{2}{\boxed{4}}$$

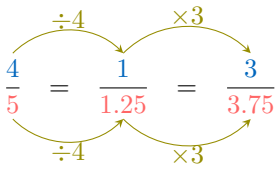
Answer:

$\frac{3}{6} \overset{\div 3}{\underset{\div 3}{=}} \frac{1}{2} \overset{\times 2}{\underset{\times 2}{=}} \frac{2}{4}$

Ex 50: You can use a calculator.

$$\frac{4}{5} = \frac{3}{\boxed{3.75}}$$

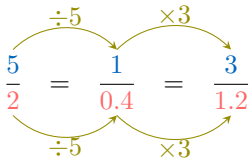
Answer:



Ex 51: You can use a calculator.

$$\frac{5}{2} = \frac{3}{\boxed{1.2}}$$

Answer:



F CROSS-MULTIPLICATION METHOD

F.1 FINDING A QUANTITY

Ex 52: 4 tickets cost 28 dollars. Find the cost of 6 tickets (you can use a calculator).

$\boxed{42}$ dollars

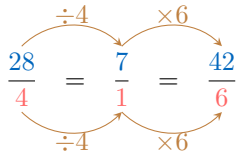
Answer:

- **Method 1: Cross Multiplication in a Table**

Price	$\frac{28}{\div 4}$	$\frac{6\times 28}{4} = 42$
Number of tickets	4	$\times$ 6

So, 6 tickets cost 42 dollars.

- **Method 2: Unitary Rate with Equivalent Ratios**



So, 6 tickets cost 42 dollars.

- **Method 3: Cross Multiplication Equation**

$$\begin{aligned} \frac{28}{4} &= \frac{x}{6} \\ 4 \times x &= 28 \times 6 \quad \text{(cross multiplication)} \\ x &= \frac{28 \times 6}{4} \\ x &= 42 \end{aligned}$$

So, 6 tickets cost 42 dollars.

- **Method 4: Unit Rate in Words**
  - 4 tickets cost 28 dollars, so 1 ticket costs $28 \div 4 = 7$ dollars.
  - 6 tickets cost $7 \times 6 = 42$ dollars.

Ex 53: A recipe requires 200 grams of flour to make 8 cookies. How much flour is needed to make 12 cookies (you can use a calculator).

$\boxed{300}$ grams

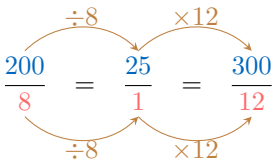
Answer:

- **Method 1: Cross Multiplication in a Table**

Flour (grams)	$\frac{200}{\div 8}$	$\frac{12\times 200}{8} = 300$
Number of cookies	8	$\times$ 12

So, 12 cookies need 300 grams of flour.

- **Method 2: Unitary Rate with Equivalent Ratios**



So, 12 cookies need 300 grams of flour.

- **Method 3: Cross Multiplication Equation**

$$\begin{aligned} \frac{200}{8} &= \frac{x}{12} \\ 8 \times x &= 200 \times 12 \quad \text{(cross multiplication)} \\ x &= \frac{200 \times 12}{8} \\ x &= 300 \end{aligned}$$

So, 12 cookies need 300 grams of flour.

- **Method 4: Unit Rate in Words**
  - 8 cookies need 200 grams of flour, so 1 cookie needs $200 \div 8 = 25$ grams of flour.
  - 12 cookies need $25 \times 12 = 300$ grams of flour.

Ex 54: To make a certain shade of paint, you need 1.5 liters of blue paint for every 3 liters of base paint. How much blue paint is needed if you have 4.5 liters of base paint (you can use a calculator).

$\boxed{2.25}$ liters

Answer:

- **Method 1: Cross Multiplication in a Table**

Blue paint (liters)	$\frac{1.5}{\div 3}$	$\frac{4.5\times 1.5}{3} = 2.25$
Base paint (liters)	3	$\times$ 4.5

So, you need 2.25 liters of blue paint.

- **Method 2: Unitary Rate with Equivalent Ratios**

$$\frac{1.5}{3} \overset{\div 3}{=} \frac{0.5}{1} \overset{\times 4.5}{=} \frac{2.25}{4.5}$$

So, you need 2.25 liters of blue paint.

- **Method 3: Cross Multiplication Equation**

$$\begin{aligned} \frac{1.5}{3} &= \frac{x}{4.5} \\ 3 \times x &= 1.5 \times 4.5 \quad \text{(cross multiplication)} \\ x &= \frac{1.5 \times 4.5}{3} \\ x &= 2.25 \end{aligned}$$

So, you need 2.25 liters of blue paint.

- **Method 4: Unit Rate in Words**
  - 3 liters of base paint need 1.5 liters of blue paint, so 1 liter of base paint needs $1.5 \div 3 = 0.5$ liters of blue paint.
  - 4.5 liters of base paint need $0.5 \times 4.5 = 2.25$ liters of blue paint.

Ex 55: A car travels 120 kilometers on 7.5 liters of fuel. Assuming the car's fuel consumption rate is constant, how much fuel is needed to travel 200 kilometers (you can use a calculator).

$\boxed{12.5}$ liters

Answer:

- **Method 1: Cross Multiplication in a Table**

Fuel (liters)	$\overset{\div}{7.5}$	$\frac{200 \times 7.5}{120} = 12.5$
Distance (kilometers)	120	$\overset{\times}{200}$

So, you need 12.5 liters of fuel.

- **Method 2: Unitary Rate with Equivalent Ratios**

$$\frac{7.5}{120} \overset{\div 120}{=} \frac{0.0625}{1} \overset{\times 200}{=} \frac{12.5}{200}$$

So, you need 12.5 liters of fuel.

- **Method 3: Cross Multiplication Equation**

$$\begin{aligned} \frac{7.5}{120} &= \frac{x}{200} \\ 120 \times x &= 7.5 \times 200 \quad \text{(cross multiplication)} \\ x &= \frac{7.5 \times 200}{120} \\ x &= 12.5 \end{aligned}$$

So, you need 12.5 liters of fuel.

- **Method 4: Unit Rate in Words**
  - 120 kilometers need 7.5 liters of fuel, so 1 kilometer needs $7.5 \div 120 = 0.0625$ liters of fuel.
  - 200 kilometers need $0.0625 \times 200 = 12.5$ liters of fuel.

Ex 56: On a map, 4 centimeters represents a real distance of 10 kilometers. If two cities are 6 centimeters apart on the map, what is the actual distance between them in kilometers (you can use a calculator).

$\boxed{15}$ kilometers

Answer:

- **Method 1: Cross Multiplication in a Table**

Real Distance (km)	$\overset{\div}{10}$	$\frac{6 \times 10}{4} = 15$
Map Distance (cm)	4	$\overset{\times}{6}$

So, the actual distance is 15 kilometers.

- **Method 2: Unitary Rate with Equivalent Ratios**

$$\frac{10}{4} \overset{\div 4}{=} \frac{2.5}{1} \overset{\times 6}{=} \frac{15}{6}$$

So, the actual distance is 15 kilometers.

- **Method 3: Cross Multiplication Equation**

$$\begin{aligned} \frac{10}{4} &= \frac{x}{6} \\ 4 \times x &= 10 \times 6 \quad \text{(cross multiplication)} \\ x &= \frac{10 \times 6}{4} \\ x &= 15 \end{aligned}$$

So, the actual distance is 15 kilometers.

- **Method 4: Unit Rate in Words**
  - 4 centimeters on the map represent 10 kilometers in reality, so 1 centimeter represents $10 \div 4 = 2.5$ kilometers.
  - 6 centimeters on the map represent $2.5 \times 6 = 15$ kilometers in reality.