7 Proportional Reasoning–1

Page No. 165 - Figure it Out

Q1. Circle the following statements of proportion that are true.
Ans:
(i) 4 : 7 :: 12 : 21

4 × 21 = 84
7 × 12 =84
Therefore, True.

(ii) 8 : 3 :: 24 : 6

8×6=48
3×24=72
Therefore, False.

(iii) 7 : 12 :: 12 : 7

7×7=49
12×12=144
Therefore, False.

(iv) 21 : 6 :: 35 : 10

21×10=210
6×35=210
Therefore, True.

(v) 12 : 18 :: 28 : 12

12×12=144
18×28=504
Therefore, False.

(vi) 24 : 8 :: 9 : 3

24×3=72
8×9=72
Therefore, True.

2. Give 3 ratios that are proportional to 4 : 9.

Ans:

8 : 18, 12 : 27, 20 : 45

3. Fill in the missing numbers for these ratios that are proportional to 18 : 24.

3 : _____ 12 : _____ 20 : _____ 27 : _____

Ans:

(i)

18:24=3:4

3:x=3:4

Therefore: x=4

(ii)

12:x=3:4

12 is 4 times 3, so:

x=4×4=16

(iii)

20:x=3:4

$x = 20 \times \frac{4}{3}$

$= \frac{80}{3}$

(iv)

27:x=3:4

27 is 9 times 3:

x=9×4=36

3:4, 12:16, 20:$\frac{80}{3}$, 27:36

4. Look at the following rectangles. Which rectangles are similar to each other? You can verify this by measuring the width and height using a scale and comparing their ratios.

Ans:

The rectangles A and E look similar.

Lets measure width and height of each and find ratios to verify.

Ratios for given rectangles A, B, C, D, and E are respectively
1 : 3, 3 : 2, 5 : 2, 3 : 1 and 17 : 7.
The ratios of A and D are 1 : 3 and 3 : 1 respectively.
Thus A and D are similar.

5. Look at the following rectangle. Can you draw a smaller rectangle and a bigger rectangle with the same width to height ratio in your notebooks? Compare your rectangles with your classmates' drawings.
Are all of them the same? If they are different from yours, can you think why? Are they wrong?
Ans:
Students can do themselves. Rectangle can be different based on the number they select.

6. The following figure shows a small portion of a long brick wall with patterns made using coloured bricks. Each wall continues this pattern throughout the wall. What is the ratio of grey bricks to coloured bricks? Try to give the ratios in their simplest form.
Ans:
(a) First Brick Wall

Look at one complete repeating pattern.
Grey bricks = 2 + 3 + 4 = 9
Coloured bricks = 3 + 2 + 1 = 6
The ratio of Grey bricks : Coloured bricks = 9 : 6
Simplifying we get = 3 : 2
Simplest form of ratio = 3 : 2

(b) Second Brick Wall

For one complete repeating section:
Coloured bricks = 12
Grey bricks = 12
Therefore: Grey : Coloured=12:12
Simplifying we get = 1 : 1

<u>Page No. 170 - Figure it Out</u>

1. The Earth travels approximately 940 million kilometres around the Sun in a year. How many kilometres will it travel in a week?
Ans:

1 week = 7 days

1 year = $\frac{365}{7}$ weeks.

940 : $\frac{365}{7}$ :: x:1

x = 940 x $\frac{7}{365}$

=18.02739

Therefore, approximately: 18.03 million km

2. A mason is building a house in the shape shown in the diagram. He needs to construct both the outer walls and the inner wall that separates two rooms. To build a wall of 10-feet, he requires approximately 1450 bricks. How many bricks would he need to build the house? Assume all walls are of the same height and thickness.

Ans:

From the diagram on page 171, the outer wall has sides:
24, 12, 9, 9, 6, 9, 9, 12

because the total upper width is: 9+15=24 ft

Therefore outer wall length: 24+12+9+9+6+9+9+12=90 ft
The inner wall is: 12 + 6 ft
Total wall length: 90+18=108 ft

Given 10 ft requires 1450 bricks:

10:1450::108:x
x= 1450×108/10
x=15660
Total 15660 brick are required

Page No. 175 - Figure it Out

1. Divide ₹4,500 into two parts in the ratio 2 : 3.

Ans:

Total parts: 2+3=5
One part: 4500÷5=900

First share: 2×900=1800
Second share: 3×900=2700

Final division ₹1,800 and ₹2,700

2. In a science lab, acid and water are mixed in the ratio of 1 : 5 to make a solution. In a bottle that has 240 mL of the solution, how much acid and water does the solution contain?

Ans:

Total parts: 1+5=6
One part: 240÷6=40 mL

Acid: 1×40=40 mL
Water: 5×40=200 mL

∴ the solution contains 40 mL acid and 200 mL water

3. Blue and yellow paints are mixed in the ratio of 3 : 5 to produce green paint. To produce 40 mL of green paint, how much of these two colours are needed? To make the paint a lighter shade of green, I added 20 mL of yellow to the mixture. What is the new ratio of blue and yellow in the paint?

Ans:

Total parts: 3+5=8
One part: 40÷8=5 mL
Blue: 3×5=15 mL
Yellow: 5×5=25 mL
So initially: 15:25=3:5

20 mL yellow is added.

New yellow: 25+20=45
New ratio: 15:45=1:3

4. To make soft idlis, you need to mix rice and urad dal in the ratio of 2 : 1. If you need 6 cups of this mixture to make idlis tomorrow morning, how many cups of rice and urad dal will you need?

Ans:

Total parts: 2+1=3
One part:6÷3=2
Rice:2×2=4
Urad dal:1×2=2

we need 4 cups rice and 2 cups urad dal

5. I have one bucket of orange paint that I made by mixing red and yellow paints in the ratio of 3 : 5. I added another bucket of yellow paint to this mixture. What is the ratio of red paint to yellow paint in the new mixture?

Ans:

Assuming the original mixture occupies one bucket:

Original red: $\frac{3}{8}$

Original yellow: $\frac{5}{8}$

After adding another full bucket of yellow:

Yellow= $\frac{5}{8}$ + 1= $\frac{13}{8}$

Therefore: Red:Yellow= $\frac{3}{8} : \frac{13}{8}$

Simplifying we get new ratio as 3:13

Page No. 176 - Figure it Out

1. Anagh mixes 600 mL of orange juice with 900 mL of apple juice to make a fruit drink. Write the ratio of orange juice to apple juice in its simplest form.

Ans:

600 mL : 900 mL
600 : 900
Simplifying we get 2:3

2. Last year, we hired 3 buses for the school trip. We had a total of 162 students and teachers who went on that trip and all the buses were full. This year we have 204 students. How many buses will we need? Will all the buses be full?

Ans:

3 buses carry 162 people.
People per bus: 162÷3=54

For 204 people: 204÷54= $\frac{34}{9}$

Since a fraction of a bus is impossible, 4 buses are required.
Capacity of 4 buses: 4×54=216
Students and teachers: 204
Empty places: 216−204=12

No, all buses will not be full. There will be 12 empty places.

3. The area of Delhi is 1,484 sq. km and the area of Mumbai is 550 sq. km. The population of Delhi is approximately 30 million and that of Mumbai is 20 million people. Which city is more crowded? Why do you say so?

Ans:

Delhi:
Area = 1484 km²
Population = 30 million = 3,00,00,000

Population density: $\frac{30000000}{1484}$ ≈20,215 people/km²

Mumbai:
Area = 550 km²
Population = 20 million = 2,00,00,000

Population density: $\frac{20000000}{550}$ ≈36,364 people/km²

Mumbai is more crowded as there are more people per km²

4. A crane of height 155 cm has its neck and the rest of its body in the ratio 4 : 6. For your height, if your neck and the rest of the body also had this ratio, how tall would your neck be?

Ans:

Ratio Neck : Rest of body 4:6 Total parts: 4+6=10
My total height H is 170 cm

My Neck height is : $\frac{4}{10}$ H = $\frac{4}{10}$ x 170 = 68 cm (neck height)

5. Let us try an ancient problem from Lilavati. At that time weights were measured in a unit named palas and niskas was a unit of money. "If 2 1/2 palas of saffron costs 3/7 niskas, O expert businessman! tell me quickly what quantity of saffron can be bought for 9 niskas?"

Ans:

Ratio weight : cost = $2\frac{1}{2} : \frac{3}{7}$

Find the quantity for 9 niskas.

$2\frac{1}{2} : \frac{3}{7} :: x : 9 \quad = \frac{5}{2} : \frac{3}{7} :: x : 9$

$\therefore x = \frac{\frac{5}{2} \times 9}{\frac{3}{7}}$

$\therefore x = \frac{45}{2} \times \frac{7}{3} \qquad \therefore x = \frac{105}{2}$

$\therefore x = 52.5$ palas

6. Harmain is a 1-year-old girl. Her elder brother is 5 years old. What will be Harmain's age when the ratio of her age to her brother's age is 1 : 2?

Ans:

Harmain = 1 year.
Brother = 5 years.
After x years:
Harmain: 1+x
Brother: 5+x
Given ratio: 1:2

Therefore: $\frac{1+x}{5+x} = \frac{1}{2}$

Cross multiply:

2(1+x)=5+x
2+2x=5+x
x=3

Harmain's age: 1+3=4

7. The mass of equal volumes of gold and water are in the ratio 37 : 2. If 1 litre of water is 1 kg in mass, what is the mass of 1 litre of gold?

Ans:

Gold : Water = 37 : 2

1 litre water = 1 kg.

Therefore: $\frac{\text{Gold}}{1} = \frac{37}{2}$

=18.5

mass of 1 litre of gold is 18.5 kg

8. It is good farming practice to apply 10 tonnes of cow manure for 1 acre of land. A farmer is planning to grow tomatoes in a plot of size 200 ft by 500 ft. How much manure should he buy?

Ans:

Land: 200 × 500 = 1,00,000 ft^2

One acre: 43,560 ft^2

Area in acres: $\frac{100000}{43560} \approx 2.296$

Manure required: 2.296×10 ≈22.96 tonnes

9. A tap takes 15 seconds to fill a mug of water. The volume of the mug is 500 mL. How much time does the same tap take to fill a bucket of water if the bucket has a 10-litre capacity?

Ans:

500 ml takes 15 seconds.

10 litres: 10 L = 10,000 ml

Factor: 10000 ÷ 500 = 20 times

Time: 15 × 20 = 300 seconds

300 seconds = 5 minutes

It will take 5 minutes to fill a bucket of 10 litre

10. One acre of land costs ₹15,00,000. What is the cost of 2,400 square feet of the same land?

Ans:

1 acre : 43,560 ft^2

Cost : ₹15,00,000

Cost of 2400 ft^2: ₹15,00,000 × $\frac{2400}{43560}$

≈₹82,644.63

Approximately ₹82,645

11. A tractor can plough the same area of a field 4 times faster than a pair of oxen. A farmer wants to plough his 20-acre field. A pair of oxen takes 6 hours to plough an acre of land. How much time would it take if the farmer used a pair of oxen to plough the field? How much time would it take him if he decides to use a tractor instead?

Ans:

Oxen take 6 hours for 1 acre.

For 20 acres:

20 × 6 = 120 hours

The tractor is 4 times faster.

Therefore: 120 ÷ 4 = 30 hours

12. The ₹10 coin is an alloy of copper and nickel called 'cupro-nickel'. Copper and nickel are mixed in a 3 : 1 ratio to get this alloy. The mass of the coin is 7.74 grams. If the cost of copper is ₹906 per kg and the cost of nickel is ₹1,341 per kg, what is the cost of these metals in a ₹10 coin?

Ans:

Total mass: 7.74 g

Copper : Nickel: 3:1

Total parts: 4

Total mass: 7.74 g

Copper : Nickel: 3:1
Total parts: 4

Copper: $\frac{3}{4}$ ×7.74=5.805 g

Nickel: $\frac{1}{4}$ ×7.74=1.935 g

Copper price: ₹906/kg = ₹0.906/g
Copper cost: 5.805 × 0.906 = ₹5.260

Nickel: ₹1,341/kg = ₹1.341/g
Nickel cost: 1.935 × 1.341 = ₹2.594

Total: ≈₹7.85