Answers - Ratio and proportion

Year: Year 8

Answer to Question 1

Divide every part by the highest common factor. Clear decimals or fractions first by multiplying all parts by the same number, and use the same units before simplifying.

a. Divide by 6: $3 : 4$
b. Divide by 15: $3 : 4 : 5$
c. Multiply by 2: $5 : 20$, divide by 5: $1 : 4$
d. Multiply by 4: $2 : 3$, so $2 : 3$
e. 1.5 kg = 1500 g, so $200 : 1500$, divide by 100: $2 : 15$

Answer to Question 2

a. Divide both parts by 4 to get $1 : 2.5$; divide both by 10 to get $0.4 : 1$.
b. Divide by 5: $1 : 2.4$; divide by 12: $0.417 : 1$ (to 3 d.p.).
c. Divide by 8: $1 : 2.5$; divide by 20: $0.4 : 1$.
d. Divide by 3: $1 : 5$; divide by 15: $0.2 : 1$.

To write a ratio as $1 : n$ divide both parts by the first number; for $n : 1$ divide both by the second number.

Answer to Question 3

a. 5 parts, one part $= 60 \div 5 = 12$. Shares: **£24 and £36**
b. 7 parts, one part $= 12$. Shares: **£48 and £36**
c. 9 parts, one part $= 20$. Shares: **100 kg, 60 kg and 20 kg**
d. 5 parts, one part $= 1.50$. Shares: **£1.50 and £6.00**

Answer to Question 4

a. 3 parts = 24, so 1 part $= 8$ and girls $= 5 \times 8 =$ **40**
b. 7 parts = 35 L, so 1 part $= 5$ and red $= 4 \times 5 =$ **20 litres**
c. 7 parts = 63, so 1 part $= 9$. Cats **45** and dogs **18**.
d. $B - A$ is 3 parts $= 36$, so 1 part $= 12$. $A =$ **24** and $B =$ **60**.

Answer to Question 5

The unitary method has two steps: divide to find the value for one item, then multiply by the number you need.

a. 1 pen $= 3.20 \div 5 = £0.64$, so 8 pens = **£5.12**
b. 1 mile $= 18 \div 150 = 0.12$ litres, so 400 miles = **48 litres**
c. 1 biscuit $= 70$ cal, so 7 biscuits = **490 cal**
d. 1 minute $= 75$ bottles, so 14 minutes = **1050 bottles**

Answer to Question 6

a. Total work $4 \times 9 = 36$ worker-days; 6 workers share it: $36 \div 6 =$**6 days**.
b. $3 \times 40 = 120$ pipe-minutes; $120 \div 5 =$**24 minutes**.
c. The number of sweets is fixed: $12 \times 8 = 96$. $96 \div 16 =$**6 each**.
d. $6 \times 10 = 60$ pump-hours; to finish in 4 hours: $60 \div 4 =$**15 pumps**.

In each case more workers, pipes or pumps means less time, so the answers get smaller as the number increases.

Answer to Question 7

a. $300 : 150 : 90 = 10 : 5 : 3$
b. Multiplier $30 \div 12 = 2.5$: oats **750 g**, butter **375 g**, syrup **225 g**, sugar **187.5 g**.
c. Butter per flapjack $= 150 \div 12 = 12.5$ g. $200 \div 12.5 = 16$, so **16 flapjacks**.
d. Oats per flapjack $= 25$ g. $28 \times 25 = 700$ g, so **700 g**.

Answer to Question 8

a. $1 + 2 + 4 =$ **7 parts**
b. 1 part $= 0.7 \div 7 = 0.1$ m³: cement **0.1 m³**, sand **0.2 m³**, gravel **0.4 m³**.
c. $0.1 \times 48 + 0.2 \times 30 + 0.4 \times 36 = 4.80 + 6.00 + 14.40 =$ **£25.20**
d. $1 + 3 + 5 = 9$ parts, 1 part $= 0.7 \div 9 = 0.0778$ m³, sand $= 3 \times 0.0778 = 0.2333$ m³. That is $0.2333 - 0.2 =$ **0.033 m³** more.

Answer to Question 9

a. $6.4 \times 50000 = 320000$ cm. Divide by 100 000 to change to km: **3.2 km**.
b. 3.5 km $= 350000$ cm, and $350000 \div 50000 =$**7 cm** on the map.
c. 50 000 cm $= 500$ m $= 0.5$ km, so **1 cm represents 0.5 km**.
d. Time = distance ÷ speed: $3.2 \div 4 = 0.8$ hours, and $0.8 \times 60 =$**48 minutes**.

Answer to Question 10

a. $350 \times 1.15 =$ **€402.50**
b. Left $= 402.50 - 280 = 122.50$ euros. $122.50 \div 1.25 =$ **£98**

c. $60 \div 1.15 =$ **£52.17**
d. At £1 = €1.15 one euro is worth £0.870. At £1 = €1.25 one euro is worth only £0.800. The first rate is better for changing euros into pounds.

Answer to Question 11

a. Small: $85 \div 5 = 17.0$p. Medium: $210 \div 15 = 14.0$p. Large: $375 \div 25 = 15.0$p per 100 ml.
b. **Medium** at 14p per 100 ml.
c. 3 medium bottles give 4.5 litres for $3 \times 2.10 =$ **£6.30**. (A large and a medium would give 4 litres for £5.85; two larges and a small give 5.5 litres for £8.35.)
d. A small bottle has the lowest price but the highest price per 100 ml. Value for money depends on the price for the same amount.

Answer to Question 12

a. 5 parts, 1 part $= 0.5$ L. Blue **1.5 L**, yellow **1.0 L**.
b. Blue is $\frac{3}{5}$ of the mix: $\frac{3}{5} \times 12 =$ **7.2 L**
c. 1 part of yellow $= 0.4$ L, so the total is $5 \times 0.4 =$ **2 litres**.
d. $1.5 \times 6 + 1.0 \times 8 = 9 + 8 =$ **£17**

Check (a): $1.5 + 1.0 = 2.5$ litres and $1.5 : 1.0 = 3 : 2$.

Answer to Question 13

a. Work needed = workers × days: $4 \times 6 =$**24 caretaker-days**.
b. $24 \div 3 =$**8 days**, longer because there are fewer people.
c. $24 \div 2 =$**12 caretakers**.
d. In 2 days alone he does 2 caretaker-days, leaving 22. Four people then take $22 \div 4 = 5.5$ days. Total $2 + 5.5 =$**7.5 days**.

Answer to Question 14

a. $14 : 18 : 8 = 7 : 9 : 4$
b. 20 parts, 1 part $= 14$. Jo **£98**, Kai **£126**, Lee **£56**.
c. Equal share: $280 \div 3 = 93.33$, so Lee would receive about **£37.33 more**.
d. 1 part $= 420 \div 20 = 21$. Jo **£147**, Kai **£189**, Lee **£84**.

Answer to Question 15

a. 10 parts, 1 part $= 45$. Library **£225**, sports club **£135**, food bank **£90**.

b. The rest is $450 - 150 = 300$, in 8 parts, so 1 part $= 37.50$. Library **£187.50**, sports club **£112.50**, food bank **£150**.
c. Income $= 150 \times 4 = 600$. Costs : income $= 120 : 600 = 1 : 5$.
d. Profit $= 4n - 120 = 450 \Rightarrow n = 142.5$, so **143 tickets**.

Answer to Question 16

a. Length: $3600 \div 72 =$ **50 cm**. Wingspan: $3840 \div 72 =$ **53.3 cm**.
b. $7.5 \times 72 = 540$ cm $=$ **5.4 m**
c. $180 \div 12 =$ **15 figures**
d. The scale factor for areas is $72^2 = 5184$. 90 m² $= 900000$ cm², and $900000 \div 5184 =$ **173.6 cm²**.

Lengths are divided by 72, but areas are divided by 72^2, because an area has two dimensions that are both scaled.

Answer to Question 17

a. $12 : 20 = 3 : 5$
b. 8 parts, 1 part $= 6$. Ali **£18**, Beth **£30**.
c. $48 \times 1.15 =$ **£55.20**. 1 part $= 6.90$. Ali **£20.70**, Beth **£34.50**.
d. Yes: $30 \times 1.15 = 34.50$. The ratio does not change, so each share rises by the same 15%.

Answer to Question 18

a. Gran: $240 : 400 = 1 : 1.67$. Cookbook: $300 : 450 = 1 : 1.5$.
b. The **cookbook** recipe has more flour for each ml of milk (0.667 g/ml against 0.6 g/ml), so it is thicker.
c. 6 eggs is twice 3 eggs, so double everything: flour **480 g** and milk **800 ml**.
d. $600 : 1000 : 7.5$, which is $240 : 400 : 3$, simplest form $240 : 400 : 3$ (no common factor).

Answer to Question 19

a. $1120 \div 8 =$ **£140**
b. $1120 \div 12 =$ **£93.33**
c. If the number of people goes up, the share per person goes down, and the product (people × share = £1120) is constant.
d. $1120 \times 0.9 = 1008$, and $1008 \div 12 =$ **£84**
e. Second: $1500 \div 10 = £150$ per person. The first villa costs £140, so the **first** is cheaper per person.

Answer to Question 20

a. Green is 3 in the first ratio and 4 in the second. Use the LCM 12: red:green $= 8 : 12$ and green:blue $= 12 : 15$. So $8 : 12 : 15$.
b. $8 + 12 + 15 = 35$ parts, 1 part $= 6$. Red **48**, green **72**, blue **90**.
c. $2 : 3$ (the original red : green ratio is unchanged).
d. $\frac{15}{35} =$ **42.9%**