Simplifying and Equivalent Ratios - Worksheet

Skill

Group A - Simplifying ratios

Simplify the ratio to the lowest terms

1) $2:4$

2) $4:6$

3) $9:3$

4) $6:3:9$

5) $12a:18a$

6) $21x:35x^2$

7) $2.5:10$

8) $1.4:1.8$

9) $0.04:0.3$

10) $\frac{1}{5}:\frac{4}{5}$

11) $\frac{3}{4}:\frac{1}{2}$

12) $6.2:5\frac{2}{5}$

Group B - Simplifying ratios to the form $1:n$

Simplify the ratio to the form $1:n$

1) $3:6$

2) $8:12$

3) $21:7$

4) $5b:2b$

5) $4x:2xy$

6) $3x^2:9x$

7) $4.2:5$

8) $3.2:4.2$

9) $1.05:1.5$

10) $\frac{3}{7}:\frac{4}{7}$

11) $4.4:5\frac{1}{2}$

12) $\frac{3}{5}:\frac{1}{8}$

Group C - Equivalent ratios

Calculate the missing quantity in each equivalent ratio

1) $1:2 = 4:a$

2) $2:5 = 6:b$

3) $3:8 = 15:c$

4) $4:1 = 16:d$

5) $5:12 = e:36$

6) $6:15 = 2:f$

7) $2.5:7 = g:21$

8) $\frac{1}{2}:1 = 4:h$

9) $0.8:1.5 = 3.2:i$

10) $3.\dot{3}:2.4 = 10:j$

11) $\frac{3}{5}:\frac{5}{8} = 9:k$

12) $\frac{3}{4}:\frac{1}{2} = 4:l$

Simplifying and Equivalent Ratios - Worksheet

Applied

1) **(a)** A television has a width and height in the ratio $16:9$.
If the width of the television is 32 inches, what is the height of the television?

(b) A picture frame has a height to width ratio of $7:5$.
The width of the picture frame is $80cm$.
What is the height of the picture frame?

2) **(a)** A company is researching the number of drinks consumed during a large marathon event.
The ratio of still water to isotonic drink to fruit juice consumed during the race is $160:800:240$.
Write the ratio in its simplest form.

(b) At the end of the race, a further 120 drinks were consumed.
One quarter of these further drinks were isotonic drinks, the rest were still water.
What is the new ratio of drinks consumed in the simplest form?

3) **(a)** A map scale has the ratio of $1:25000$.
Write the equivalent ratio in the form $1\ cm:n\ km$.

(b) The distance between two churches in real life is $4.8km$.
How far is this on the map?

4) **(a)** A vertically bouncing ball loses its height in the ratio of $5:4$.
If the ball is dropped from a height of $60cm$, what is the maximum height the ball reaches after the first bounce?

(b) The ball continues to bounce.
How many bounces will it take for the ball to reach a height of under $30cm$?

Simplifying and Equivalent Ratios - Exam Questions

1) **(a)** In a game of basketball, you can win, lose or draw. In 24 games, the team won three times as many games than they lost. They drew 4 games. Write the ratio of wins to loses to draws in the simplest form.

.....

(2)

(b) After the next game, the ratio is 3: 1: 1. What was the result of the game?

.....

(4)

(6 marks)

Simplifying and Equivalent Ratios - Exam Questions

2) **(a)** A glass inside a window frame has dimensions in the ratio of height to width of 7: 4. The window frame has an outside height of $97cm$. If the frame is $3cm$ wide, what is the width of the window frame?

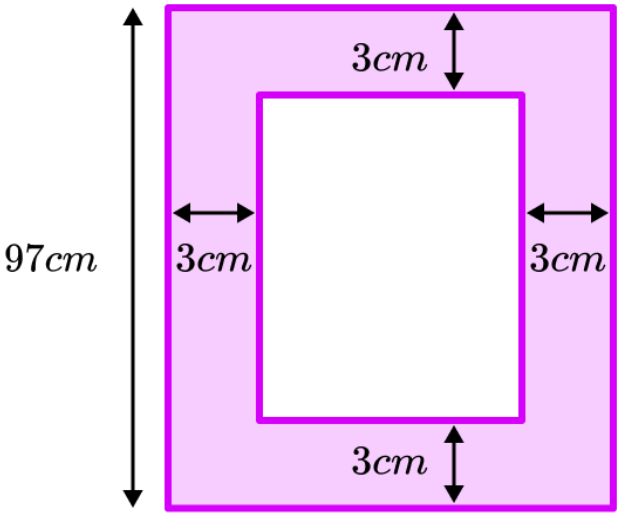


Diagram NOT to scale

.....

(4)

(b) Glass is made from mixing sand, limestone and sodium carbonate in the ratio 18: 3: 4. What percentage of the glass is made from limestone?

.....

(3)

(7 marks)

Simplifying and Equivalent Ratios - Exam Questions

3) **(a)** A right angle triangle has a base of 4cm and a height of $9cm$. Another right angle triangle has a base of $10cm$ and a height of $22cm$. Are the triangles similar? Explain your answer.

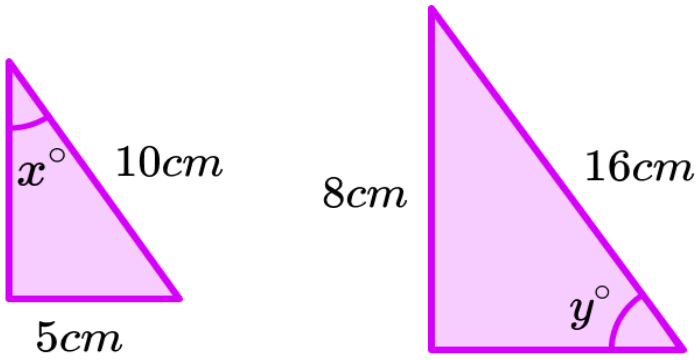
.....

(3)

(b) The sine ratio is the ratio of the length of the opposite side divided by the hypotenuse of a right angle triangle.

This is written as $\sin(\theta) = \frac{opp}{hyp}$ where θ is the included angle.

Show that $\sin(x) = \sin(y)$.



.....

(3)

(6 marks)

Simplifying and Equivalent Ratios - Exam Questions

4) **(a)** A television has an aspect ratio of 16: 9. The diagonal length of the television is 51 inches. What is the width of the television?

.....

(3)

(b) The area of the screen for a different television with the same aspect ratio is 900 square inches. What is the width of the television?

.....

(4)

(7 marks)

Simplifying and Equivalent Ratios - Answers

	Question	Answer
	Skill Questions	
Group A	Simplify the ratio to the lowest terms **1)** $2:4$ **2)** $4:6$ **3)** $9:3$ **4)** $6:3:9$ **5)** $12a:18a$ **6)** $21x:35x^2$ **7)** $2.5:10$ **8)** $1.4:1.8$ **9)** $0.04:0.3$ **10)** $\frac{1}{5}:\frac{4}{5}$ **11)** $\frac{3}{4}:\frac{1}{2}$ **12)** $6.2:5\frac{2}{5}$	**1)** $1:2$ **2)** $2:3$ **3)** $3:1$ **4)** $2:1:3$ **5)** $2:3$ **6)** $3:5x$ **7)** $1:4$ **8)** $7:9$ **9)** $2:15$ **10)** $1:4$ **11)** $3:2$ **12)** $31:27$
Group B	Simplify the ratio to the form $1:n$ **1)** $3:6$ **2)** $8:12$ **3)** $21:7$ **4)** $5b:2b$ **5)** $4x:2xy$ **6)** $3x^2:9x$ **7)** $4.2:5$ **8)** $3.2:4.2$	**1)** $1:2$ **2)** $1:1.5$ **3)** $1:\frac{1}{3}$ **4)** $1:\frac{2}{5}$ **or** $1:0.4$ **5)** $1:\frac{1}{2}y$ **or** $1:0.5y$ **6)** $1:\frac{3}{x}$ **7)** $1:\frac{25}{21}$ **8)** $1:\frac{21}{16}$ **or** $1:1.3125$

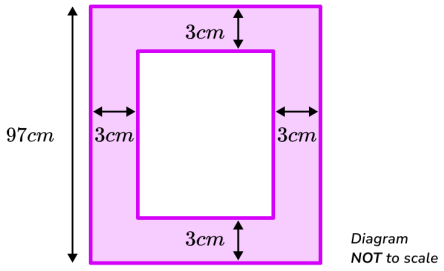
Simplifying and Equivalent Ratios - Answers

Group B	**9)** $1.05 : 1.5$ **10)** $\frac{3}{7} : \frac{4}{7}$ **11)** $4.4 : 5\frac{1}{2}$ **12)** $\frac{3}{5} : \frac{1}{8}$	**9)** $1 : \frac{10}{7}$ **10)** $1 : \frac{4}{3}$ **11)** $1 : \frac{5}{4}$ **12)** $1 : \frac{5}{24}$
Group C	Calculate the missing quantity in each equivalent ratio **1)** $1 : 2 = 4 : a$ **2)** $2 : 5 = 6 : b$ **3)** $3 : 8 = 15 : c$ **4)** $4 : 1 = 16 : d$ **5)** $5 : 12 = e : 36$ **6)** $6 : 15 = 2 : f$ **7)** $2.5 : 7 = g : 21$ **8)** $\frac{1}{2} : 1 = 4 : h$ **9)** $0.8 : 1.5 = 3.2 : i$ **10)** $3.\dot{3} : 2.4 = 10 : j$ **11)** $\frac{3}{5} : \frac{5}{8} = 9 : k$ **12)** $\frac{3}{4} : \frac{1}{2} = 4 : l$	**1)** $a = 8$ **2)** $b = 15$ **3)** $c = 40$ **4)** $d = 4$ **5)** $e = 15$ **6)** $f = 5$ **7)** $g = 7.5$ **8)** $h = 8$ **9)** $i = 6$ **10)** $j = 7.2$ **11)** $k = 9.375$ **12)** $l = \frac{8}{3}$ or $2\frac{2}{3}$

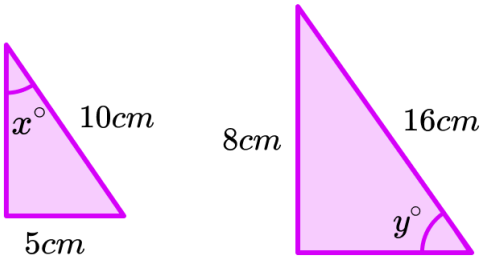
Simplifying and Equivalent Ratios - Answers

	Question	Answer
	Applied Questions	
1)	**a)** A television has a width and height in the ratio $16:9$. If the width of the television is 32 inches, what is the height of the television?	**a)** $9 \times 2 = 18$ inches
	b) A picture frame has a height to width ratio of $7:5$. The width of the picture frame is $80cm$. What is the height of the picture frame?	**b)** $80 \div 5 = 16$ $16 \times 7 = 112cm$
2)	**a)** A company is researching the number of drinks consumed during a large marathon event. The ratio of still water to isotonic drink to fruit juice consumed during the race is $160 : 800 : 240$. Write the ratio in its simplest form.	**a)** $160 : 800 : 240$. $16:80:24$ $2:10:3$
	b) At the end of the race, a further 120 drinks were consumed. One quarter of the drinks were isotonic drinks, the rest were still water. What is the new ratio of drinks consumed in the simplest form?	**b)** $120 \div 4 = 30$ isotonic $120 - 30 = 90$ water $250:830:240$ $= 25:83:24$
3)	**a)** A map scale has the ratio of $1:25000$. Write the equivalent ratio in the form $1\ cm:n\ km$.	**a)** $25000 \div 100000 = 0.25km$ $1cm:0.25km$
	b) The distance between two churches in real life is $4.8km$. How far is this on the map?	**b)** $4.8 \div 0.25 = 19.2cm$
4)	**a)** A vertically bouncing ball loses its height in the ratio of $5:4$. If the ball is dropped from a height of $60cm$, what is the maximum height the ball reaches after the first bounce?	**a)** $60 \div 5 \times 4 = 48cm$
	b) The ball continues to bounce. How many bounces will it take for the ball to reach a maximum height of under $30cm$?	**b)** $48,\ 38.4,\ 30.72,\ 24.576,\ ....$ 4 bounces.

Simplifying and Equivalent Ratios - Mark Scheme

	Question	Answer	
	Exam Questions		
1) (a)	In a game of basketball, you can win, lose or draw. In 24 games, the team won three times as many games than they lost. They drew 4 games. Write the ratio of wins to loses to draws in the simplest form.	**(a)** $20 \times 0.75 = 15$ $15 : 5 : 4$	**(1)** **(1)**
(b)	After the next game, the ratio is $3 : 1 : 1$. What was the result of the game?	**(b)** 25 games and $3 + 1 + 1 = 5$ $25 \div 5 = 5$ $15 : 5 : 5$ Draw	**(1)** **(1)** **(1)** **(1)**
2) (a)	A glass inside a window frame has dimensions in the ratio of height to width of $7 : 4$. The window frame has an outside height of $97cm$. If the frame is $3cm$ wide, what is the width of the window frame? 	**(a)** $97 - 6 = 91$ $91 \div 7 = 13$ $13 \times 4 = 52$ $52 + 6 = 58cm$	**(1)** **(1)** **(1)** **(1)**
(b)	Glass is made from mixing sand, limestone and sodium carbonate in the ratio $18 : 3 : 4$. What percentage of the glass is made from limestone?	**(b)** $18 + 3 + 4 = 25$ $100 \div 25 = 4$ $4 \times 3 = 12\%$	**(1)** **(1)** **(1)**
3) (a)	A right angle triangle has a base of $4cm$ and a height of $9cm$. Another right angle triangle has a base of $10cm$ and a height of $22cm$. Are the triangles similar? Explain your answer.	**(a)** Possible solution: Ratio of bases = $4 : 10 = 2 : 5$ Ratio of heights = $9 : 22$ The ratios are not the same and so the triangles are not similar.	 **(1)** **(1)** **(1)**

Simplifying and Equivalent Ratios - Mark Scheme

(b)	The sine ratio is the ratio of the lengths of the opposite side divided by the hypotenuse of a right angle triangle. This is written as $\sin(\theta) = \frac{opp}{hyp}$ where θ is the included angle. Show that $\sin(x) = \sin(y)$. 	**(b)** $\sin(x) = \frac{5}{10} = \frac{1}{2}$ $\sin(y) = \frac{8}{16} = \frac{1}{2}$ The ratio of sides for each triangle is the same and so angle is the same for both triangles.	**(1)** **(1)** **(1)**
4) (a)	A television has an aspect ratio of 16: 9. The diagonal length of the television is 27. 54 inches. What is the width of the television?	**(a)** $\sqrt{16^2 + 9^2} = \sqrt{337}$ $\sqrt{337} \div 27.54 = 1.500\ (3dp)$ $16 \times 1.500 = 24\ inches$	**(1)** **(1)** **(1)**
(b)	The area of the screen for a different television with the same aspect ratio is 900 square inches. What is the width of the television?	**(b)** $16 \times 9 = 144$ $900 \div 144 = 6.25$ $\sqrt{6.25} = 2.5$ $2.5 \times 16 = 40\ inches$	**(1)** **(1)** **(1)** **(1)**