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## Answers

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**Question 1**

A. Write each ratio in its simplest form:

i)  $35 : 15$

$$35 \div 5 : 15 \div 5$$

$$= 7 : 3$$

ii)  $1/3 : 3/4$

Multiply both terms by 12:

$$(1/3 \times 12) : (3/4 \times 12)$$

$$= 4 : 9$$

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B. €58.50 is divided between Ann and Barry in the ratio 8 : 5.

How much does each person receive?

$$\text{Total parts} = 8 + 5 = 13$$

$$\text{Ann's share} = (8/13) \times 58.50 = €36.00$$

$$\text{Barry's share} = (5/13) \times 58.50 = €22.50$$

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C. Sam and Tina share a bag of sweets in the ratio 2 : 3.

If Sam receives 18 sweets, how many sweets will Tina receive?

$$2 \text{ parts} = 18 \text{ sweets}$$

$$1 \text{ part} = 9 \text{ sweets}$$

$$\text{Tina} = 3 \times 9 = 27 \text{ sweets}$$

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**Question 2**

12 men can paint a school building in 10 days.

$$\text{Total work} = 12 \times 10 = 120 \text{ man-days}$$

a) How long would it take one man to paint the same school by himself?

$$= 120 \text{ days}$$

b) How many men would it take to paint the same school in 15 days?

$$120 \div 15 = 8 \text{ men}$$

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**Question 4**

A. Find the angles  $x$  and  $y$  in the diagram, giving reasons for each answer.

In triangle ACB:

$$55^\circ + 80^\circ + y = 180^\circ$$

$$y = 45^\circ$$

Since  $AC \parallel BE$ , corresponding angles are equal:

$$x = 55^\circ$$

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B. Find the value of  $x$  and the value of  $y$ .

Triangle angles:

$$72^\circ + 2x^\circ + 4y^\circ = 180^\circ$$

$$\rightarrow x + 2y = 54$$

Straight line angles:

$$4y + 5x = 180$$

Solving simultaneously:  
 $x = 24^\circ$ ,  $y = 15^\circ$

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### Question 5

A. Simplify:

$$\begin{aligned}4(2x + 1) + 3(5x - 2) \\= 8x + 4 + 15x - 6 \\= 23x - 2\end{aligned}$$

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B. Simplify:

$$\begin{aligned}-2a(a - 3y) - a(a + 4y) \\= -2a^2 + 6ay - a^2 - 4ay \\= -3a^2 + 2ay\end{aligned}$$

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C. Simplify:

$$\begin{aligned}(x + 4)(x - 3) \\= x^2 + x - 12\end{aligned}$$

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### Question 6

If  $t = 4$  and  $p = -3$ , find the value of:

$$\begin{aligned}2t - 3p^2 \\= 2(4) - 3(9) \\= 8 - 27 \\= -19\end{aligned}$$

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### Question 7

A. Solve for  $x$ :

$$\begin{aligned}2x + 7 &= 4x - 5 \\2x &= 12 \\x &= 6\end{aligned}$$

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B. Solve for  $y$ :

$$\begin{aligned}5(y - 2) + 12 &= 2(y - 5) \\5y + 2 &= 2y - 10 \\3y &= -12 \\y &= -4\end{aligned}$$

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### Question 8

Bart has  $x$  euro.

Lisa has  $x + 12$  euro.

Maggie has  $4x$  euro.

Equation:

$$x + (x + 12) = 4x$$

$$2x + 12 = 4x$$

$$x = 6$$

Bart has €6

(Lisa €18, Maggie €24)

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### Question 9

The length of a rectangle is 3 cm longer than its width.

Let width =  $x$  cm

a) Length =  $x + 3$  cm

b) Perimeter

$$= 2(x + x + 3)$$

$$= 4x + 6 \text{ cm}$$

c) If the perimeter is 26 cm:

$$4x + 6 = 26$$

$$x = 5 \text{ cm}$$

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### Question 10

A. Solve:

$$5x - 7 > 3, \quad x \in \mathbb{N}$$

$$5x > 10$$

$$x > 2$$

$$x \geq 3$$

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B. Solve:

$$7x + 1 \leq 3x - 15, \quad x \in \mathbb{R}$$

$$4x \leq -16$$

$$x \leq -4$$

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### Question 11

A. Solve:

$$x + y = 5$$

$$x - y = -7$$

$$2x = -2$$

$$x = -1$$

$$y = 6$$

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B. Solve:

$$3x + 4y = 5$$

$$5x - 6y = 2$$

$$x = 1, y = \frac{1}{2}$$

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### Question 12

A. Use Pythagoras' Theorem to find side length  $a$ .

$$a^2 = 10^2 + 12^2$$

$$a = \sqrt{244}$$

$$a = 2\sqrt{61}$$

B. Find side length  $f$ .

$$f^2 = 5^2 - 2^2$$

$$f = \sqrt{21}$$

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Question 13

$$\text{Area} = \text{base} \times \text{height} = 88 \text{ cm}^2$$

$$\text{Base} = 11 \text{ cm}$$

$$h = 88 \div 11$$

$$h = 8 \text{ cm}$$

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Question 14

Find the circumference of a circle with diameter 18 cm.

$$C = \pi d$$

$$= 18\pi$$

$$\approx 56.5 \text{ cm (to 1 d.p.)}$$

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Question 15

a) Work out the area of the front face of the shed.

$$\text{Rectangle area} = 8 \times 7 = 56 \text{ m}^2$$

$$\text{Triangle area} = \frac{1}{2} \times 8 \times 3 = 12 \text{ m}^2$$

$$\text{Total area} = 68 \text{ m}^2$$

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b) Hence work out the capacity of the shed in litres

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

$$\text{Volume} = 68 \times 20 = 1,360 \text{ m}^3$$

$$= 1,360,000 \text{ litres}$$

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Question 16

A cylinder with radius 15 cm and height 24 cm

$$\text{Volume} = \pi r^2 h$$

$$= \pi \times 15^2 \times 24$$

$$= 5400\pi \text{ cm}^3$$

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Question 17

A sphere of radius 7 cm fits exactly into a cube.

A. Volume of the sphere

$$= (4/3)\pi r^3$$

$$= (4/3)\pi(7^3)$$

$$= (1372/3)\pi \text{ cm}^3$$

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B. Volume of the box

$$\text{Side length} = 14 \text{ cm}$$

$$14^3 = 2744 \text{ cm}^3$$

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C. Volume not occupied by the sphere  
 $2744 - (1372/3)\pi$   
 $\approx 1307 \text{ cm}^3$  (nearest  $\text{cm}^3$ )

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D . Percentage of the box not occupied  
 $(1307 \div 2744) \times 100$   
 $\approx 47.6\%$