



Ratio, percentage change, circles, trapezia and inequalities

Year 8 About 85 minutes Calculator allowed
98 marks

Name	Class	Date

A Before you start	Recall
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You will need these in every question below.

A1 Write $\frac{35}{56}$ in its simplest form. [1 mark]

Answer

A2 Work out 15% of £260. [2 marks]

Answer

A3 A triangle has a base of 9 cm and a perpendicular height of 7 cm. Work out its area. [2 marks]

Answer

A4 Solve $4x + 7 = 31$. [2 marks]

Answer $x = \dots\dots$

A5 Round 47.256 to 1 decimal place. [1 mark]

Answer

Your teacher works through each example with you. Then try the one beside it on your own.

EXAMPLE 1

Share £120 in the ratio 3 : 5.

Hint Add the numbers in the ratio to find how many equal parts there are. Find one part, then multiply.

B1 Share £162 in the ratio 4 : 5. [3 marks]

Answer £ and £

EXAMPLE 2

A bike costs £180. Its price goes up by 15%.
Use a multiplier to work out the new price.

Hint An increase of 15% leaves 115% of the price, so the multiplier is 1.15.

B2 A phone costs £340. In a sale its price goes down by 25%. Use a multiplier to work out the sale price. [2 marks]

Answer

EXAMPLE 3

A circular plate has a diameter of 22 cm. Work out its area. Give your answer to 1 decimal place.

Hint The area is πr^2 , and r is the radius. Halve the diameter first.

B3 A circular rug has a diameter of 34 cm. Work out its area. Give your answer to 1 decimal place. [2 marks]

Answer

EXAMPLE 4

Solve $7x - 9 = 3x + 11$.

Hint Take $3x$ from both sides so the unknown is on one side only. Then add 9 to both sides.

B4 Solve $5(x - 2) = 2x + 14$. [3 marks]

Answer $x = \dots\dots$

C Practice

Core

Each question asks for something different. Show your working.

C1 A 750 g jar of honey costs £4.20. A 450 g jar of the same honey costs £2.61. Which jar is better value? You must show your working. [3 marks]

Answer The $\dots\dots$ g jar

C2 Ali and Ben share some sweets in the ratio 4 : 7. Ben gets 18 more sweets than Ali. How many sweets are there altogether? [3 marks]

Answer

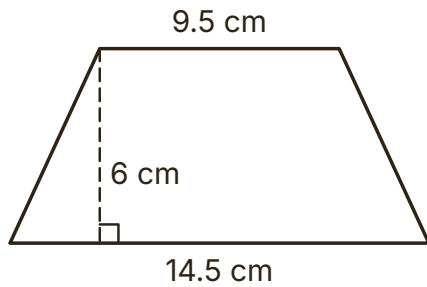
C3 After a 15% increase, a train ticket costs £27.60. Work out the price of the ticket before the increase. [3 marks]

Answer

- C4** A car is worth £15 000. Its value falls by 12% every year. Work out its value after 3 years. [3 marks]

Answer

- C5** The diagram shows a trapezium.



Not drawn accurately

- (a)** Work out the area of the trapezium.

[2 marks]

Answer

- (b)** A second trapezium has the same area and a height of 8 cm. One of its parallel sides is 7 cm. Work out the length of the other parallel side.

[2 marks]

Answer

Total for C5: 4 marks

- C6** The circumference of a circular pond is 44 m. Work out the diameter of the pond. Give your answer to 1 decimal place. [2 marks]

Answer

C7 Here is an inequality: $9 - 2x > 3x - 11$.

(a) Solve the inequality.

[2 marks]

Answer

(b) Write down every positive whole number that satisfies the inequality.

[1 mark]

Answer

Total for C7: 3 marks

C8 Asha thinks of a number. She multiplies it by 6 and then subtracts 13. She gets the same answer when she multiplies the number by 2 and then adds 15. Work out the number. [3 marks]

Answer

D Test-style questions

Stretch

Answer every question in the space given. Show your working: most of the marks are for method.

D1 Zoe says, "If a price goes up by 25% and then down by 25%, it ends up where it started." [3 marks]

A games console costs £320. In March its price goes up by 25%. In April the new price goes down by 25%. Work out the price in April, and explain why Zoe is wrong.

Answer £

D2 A fruit drink is made from orange, mango and apple juice in the ratio 5 : 2 : 3.

(a) Lena makes 1.5 litres of the drink. How many millilitres of mango juice does she use? [2 marks]

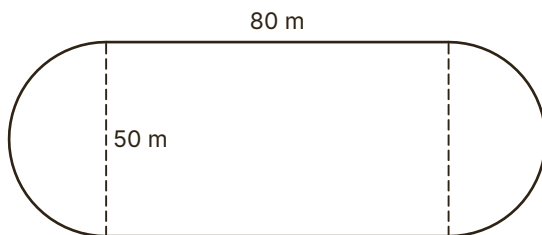
Answer

(b) Kai has only 400 ml of orange juice, and plenty of mango and apple juice. What is the greatest amount of the drink he can make? [2 marks]

Answer

Total for D2: 4 marks

D3 A running track is made of two straight sides, each 80 m long, and a semicircle at each end. The semicircles have a diameter of 50 m.



Not drawn accurately

(a) Work out the distance once round the track. Give your answer to 1 decimal place. [3 marks]

Answer

(b) The grass inside the track is the rectangle and the two semicircles. Work out the area of the grass. Give your answer to 1 decimal place. [3 marks]

Answer

Total for D3: 6 marks

- D4** A trapezium has parallel sides of length $(x + 3)$ cm and $(2x - 1)$ cm. The perpendicular height is 6 cm. The area is 60 cm^2 .

(a) Work out the value of x . You must show your working.

[3 marks]

Answer $x = \dots\dots$

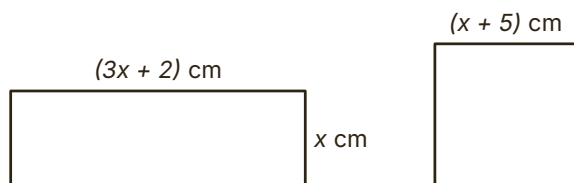
(b) Write down the lengths of the two parallel sides.

[1 mark]

Answer $\dots\dots$ cm and $\dots\dots$ cm

Total for D4: 4 marks

- D5** The rectangle and the square have the same perimeter. All lengths are in centimetres. [4 marks]
Work out the area of the square. You must show your working.



Not drawn accurately

Answer

- D6** A school trip costs £180 for the coach and £12 for each pupil's ticket. The school charges each pupil £18. There are n pupils on the trip.

(a) Write an expression, in terms of n , for the total cost of the trip in pounds.

[1 mark]

Answer

- (b) The money the school collects must be more than the total cost. Write an inequality and solve it. [2 marks]

Answer $n \dots\dots$

- (c) Write down the smallest number of pupils that will do this. [1 mark]

Answer

Total for D6: 4 marks

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- D7** Mina's pocket money goes up by 8% every year. This year she gets £12.50 a week. [3 marks]
Work out how much a week she will get in 3 years' time. Give your answer to the nearest penny.

Answer

-
- D8** Phone plan A costs £12 a month plus 5p for each minute of calls. Phone plan B costs £18 a month plus 3p for each minute of calls.

- (a) Write an equation and solve it to find the number of minutes in a month for which the two plans cost the same. [3 marks]

Answer

- (b) Jo uses 420 minutes of calls in a month. Which plan is cheaper for her, and by how much? [2 marks]

Answer Plan ... , by £

Total for D8: 5 marks

D9 A circular flower bed has an area of 60 m^2 .

(a) Work out the diameter of the flower bed. Give your answer to 1 decimal place. [3 marks]

Answer

(b) Edging is put all the way round the flower bed. Edging is sold in whole metres and costs £4.50 a metre. Work out the cost of the edging. [3 marks]

Answer

Total for D9: 6 marks

D10 Write down every integer n that satisfies $-7 \leq 2n + 1 < 9$. [3 marks]

Answer

E Challenge

UKMT level

No route is given. Spend five minutes on a problem before you look at a hint. The hints are on the last page of the worksheet, and you can use one at a time.

E1 In a box, the ratio of red counters to blue counters is $5 : 3$. Ten red counters are taken out and two blue counters are put in. Now there are the same number of red and blue counters. How many counters were in the box at the start? [4 marks]

Answer

E2 A shop raises the price of a jacket by $x\%$. Later it lowers the new price by $x\%$. The final price is 4% less than the price at the start. Work out x . [4 marks]

Answer $x = \dots\dots$

E3 A circle and a square have the same perimeter. The square has sides of 9 cm. Work out the area of the circle. Give your answer to 1 decimal place. [3 marks]

Answer

E4 Work out the sum of all the integers n that satisfy both $2(n - 3) < 5n + 9$ and $4n - 1 \leq n + 17$. [3 marks]

Answer

F How did it go?

Colour one circle on each line.

	Not yet	Nearly	Yes
I can share an amount in a ratio and decide which pack is better value.	☐	☐	☐
I can use a multiplier for a percentage change, repeated changes and reverse percentages.	☐	☐	☐
I can work out the area and circumference of a circle and the area of a trapezium.	☐	☐	☐
I can solve equations and inequalities with the unknown on both sides.	☐	☐	☐

Extension hints

Use one hint at a time. Cover the ones below it with a sheet of paper.

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- E1**
- Hint 1** Call one part of the ratio k . Then there are $5k$ red and $3k$ blue counters at the start.
- Hint 2** After the change there are $5k - 10$ red and $3k + 2$ blue, and these are equal.
- Hint 3** $5k - 10 = 3k + 2$ gives $2k = 12$, so $k = 6$. At the start there were 30 red and 18 blue, which is 48 counters.
-
- E2**
- Hint 1** Try a value. A rise of 10% and then a fall of 10% multiplies the price by 1.1×0.9 .
- Hint 2** $1.1 \times 0.9 = 0.99$, which is 1% less. You want a multiplier of 0.96.
- Hint 3** A rise and fall of $x\%$ multiplies by $(1 + \frac{x}{100})(1 - \frac{x}{100}) = 1 - (\frac{x}{100})^2$. This is 0.96 when $(\frac{x}{100})^2 = 0.04$, so $\frac{x}{100} = 0.2$ and $x = 20$. Check: $1.2 \times 0.8 = 0.96$.
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- E3**
- Hint 1** The circumference of the circle is the same as the perimeter of the square.
- Hint 2** The circumference is 36 cm, so $2\pi r = 36$.
- Hint 3** $r = \frac{36}{2\pi} = 5.729 \dots$ cm. The area is $\pi r^2 = \pi \times 5.729 \dots^2 = 103.1 \text{ cm}^2$.
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- E4**
- Hint 1** Solve each inequality on its own. Watch the sign when the n terms are collected.
- Hint 2** The first gives $n > -5$. The second gives $n \leq 6$.
- Hint 3** The integers are $-4, -3, \dots, 5, 6$. The numbers from -4 to 4 add to 0, so the sum is $5 + 6 = 11$.