



Coordinates, straight-line graphs, volume and surface area, and pie charts

Year 8 About 85 minutes Calculator allowed
93 marks

Name _____

Class _____

Date _____

A Before you start

Recall

You will need these in every question below.

A1 Work out the value of $3x - 4$ when $x = -2$.

[2 marks]

Answer

A2 A rectangle is 8.5 cm long and 6 cm wide. Work out its area.

[1 mark]

Answer

A3 What fraction of a full turn is 120° ? Give your answer in its simplest form.

[1 mark]

Answer

A4 Work out $7 - (-5) + (-3)$.

[1 mark]

Answer

A5 Work out $\frac{2}{5}$ of 360.

[1 mark]

Answer

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

EXAMPLE 1

Find the midpoint of $A(-3, 4)$ and $B(5, -2)$.

Hint The midpoint is halfway across and halfway up. Find the mean of the two x -coordinates and the mean of the two y -coordinates.

B1 Find the midpoint of $P(-6, -1)$ [2 marks] and $Q(2, 9)$.

Answer (.....,)

EXAMPLE 2

Find the equation of the straight line through $(1, 2)$ and $(4, 14)$.

Hint The gradient is the rise divided by the run. Then put one point into $y = mx + c$ to find c .

B2 Find the equation of the straight [3 marks] line through $(2, 1)$ and $(5, -8)$.

Answer $y = \dots\dots$

EXAMPLE 3

A cylinder has a radius of 5 cm and a height of 12 cm. Work out its volume. Give your answer to 1 decimal place.

Hint A cylinder is a prism. Its volume is the area of the circle on the end times the height.

B3 A cylinder has a diameter of 16 [2 marks] cm and a height of 7 cm. Work out its volume. Give your answer to 1 decimal place.

Answer

EXAMPLE 4

72 pupils choose a school lunch: 30 choose pasta, 18 choose curry and 24 choose salad. Work out the angle for each sector of a pie chart.

Hint The whole circle is 360° , shared between 72 pupils. Find the angle for one pupil first.

B4 45 pupils choose a sport: 18 choose football, 12 choose netball and 15 choose hockey. Work out the angle for each sector of a pie chart. [3 marks]

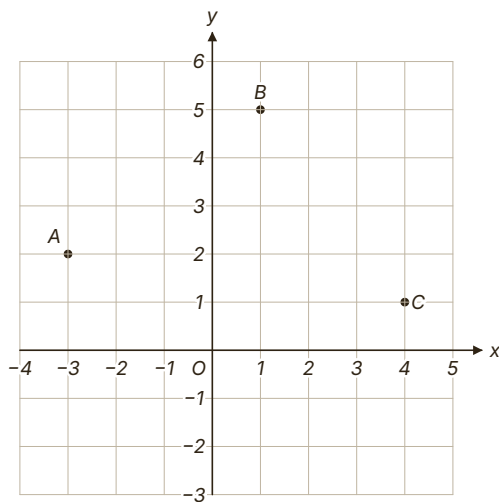
Answer football netball hockey

C Practice

Core

Each question asks for something different. Show your working.

C1 A , B and C are three corners of the parallelogram $ABCD$. Write down the coordinates of D . [2 marks]



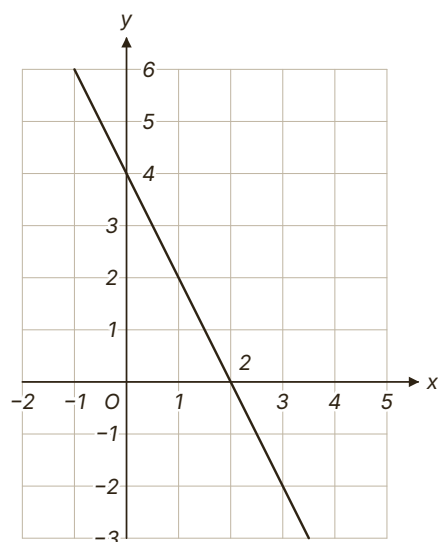
Answer (.....,)

C2 $M(2, -1)$ is the midpoint of the line AB . A is the point $(-4, 3)$. Find the coordinates of B . [2 marks]

Answer (.....,)

C3 Write down the equation of the straight line drawn on the grid.

[2 marks]



Answer $y = \dots\dots$

C4 Find the equation of the line that is parallel to $y = 4x - 3$ and passes through the point $(2, 11)$. [2 marks]

Answer $y = \dots\dots$

C5 The points in this table all lie on one straight line.

x	-1	0	1	2	3
y	7	5	3	1	-1

(a) Find the equation of the line. [2 marks]

Answer $y = \dots\dots$

(b) Write down the coordinates of the point where the line crosses the x -axis. [1 mark]

Answer $(\dots\dots, \dots\dots)$

Total for C5: 3 marks

C6 A cuboid measures 8 cm by 6 cm by 2.5 cm. Work out its total surface area.

[2 marks]

Answer

C7 A cylinder stands upright on a table. Its diameter is 10 cm and its height is 4 cm.

(a) What shape is the plan view of the cylinder?

[1 mark]

Answer

(b) Work out the area of the front elevation.

[1 mark]

Answer

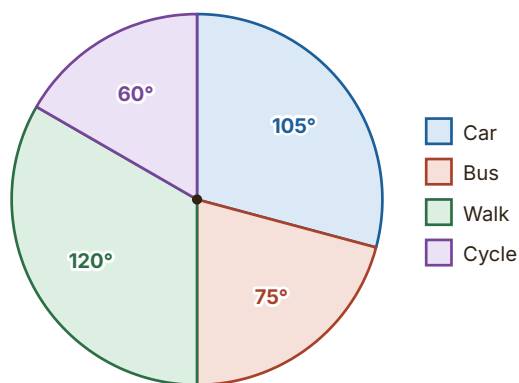
(c) Work out the area of the plan view. Give your answer to 1 decimal place.

[2 marks]

Answer

Total for C7: 4 marks

C8 The pie chart shows how 120 pupils travel to school.



(a) How many pupils walk to school?

[2 marks]

Answer

(b) How many more pupils walk than cycle?

[1 mark]

Answer

Total for C8: 3 marks

C9 A cube has a volume of 343 cm^3 . Work out its total surface area.

[2 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 Leo says, "The Swimming sectors are the same size, so the same number of pupils chose swimming in each year." [3 marks]

60 pupils in Year 7 and 150 pupils in Year 8 were asked their favourite sport. Each year group's results are shown in its own pie chart. In both pie charts the Swimming sector is 48° . Explain why Leo is wrong, and work out how many more Year 8 pupils than Year 7 pupils chose swimming.

Answer more

D2 The straight line L passes through $A(-1, 9)$ and $B(3, -7)$.

(a) Work out the gradient of L .

[1 mark]

Answer

(b) Find the equation of L .

[2 marks]

Answer $y = \dots\dots$

(c) Does the point $(10, -36)$ lie on L ? You must show how you decide.

[1 mark]

Answer

Total for D2: 4 marks

D3 A water tank is a cylinder. It has a diameter of 1.2 m and a height of 1.5 m.

(a) Work out the volume of the tank. Give your answer in m^3 to 2 decimal places.

[2 marks]

Answer

(b) 1 m^3 is 1000 litres. Water flows into the empty tank at 15 litres a minute. How long does the tank take to fill? Give your answer to the nearest minute.

[2 marks]

Answer

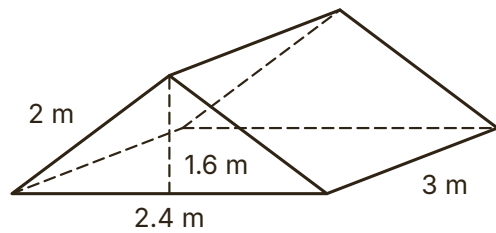
(c) A second tank is a cuboid with a square base 1.1 m by 1.1 m. It holds the same volume of water as the cylinder. Work out its height. Give your answer to the nearest centimetre.

[2 marks]

Answer

Total for D3: 6 marks

- D4** A tent is a triangular prism. Its cross-section is an isosceles triangle with a base of 2.4 m, a height of 1.6 m and sloping sides of 2 m. The tent is 3 m long.



Not drawn accurately

- (a)** Work out the volume of the tent.

[2 marks]

Answer

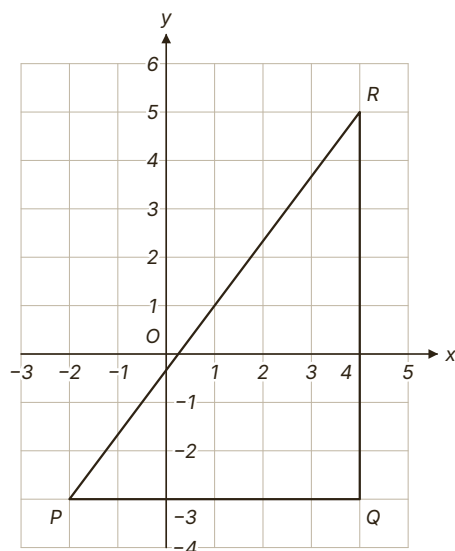
- (b)** The tent is made from fabric: the two ends, the two sloping sides and the floor.
Work out the total area of fabric.

[3 marks]

Answer

Total for D4: 5 marks

D5 The grid shows the triangle PQR .



(a) Work out the area of triangle PQR .

[2 marks]

Answer

(b) Find the coordinates of the midpoint of PR .

[1 mark]

Answer (.....,

(c) $PQRS$ is a rectangle. Write down the coordinates of S .

[1 mark]

Answer (.....,

Total for D5: 4 marks

D6 A taxi charges a fixed fee plus the same amount for each mile. A 4-mile journey costs £9.60. A 10-mile journey costs £18.60.

(a) Work out the cost for each mile.

[1 mark]

Answer

(b) Work out the fixed fee.

[1 mark]

Answer

(c) Write a formula for the cost, C pounds, of a journey of m miles. [1 mark]

Answer $C = \dots\dots$

(d) Lin has £24. What is the greatest whole number of miles she can travel? [2 marks]

Answer

Total for D6: 5 marks

D7 A pie chart shows the favourite fruit of a group of people. The Apple sector has an angle of 84° and stands for 21 people. The Banana sector has an angle of 132° .

(a) How many people are in the group? [2 marks]

Answer

(b) The rest of the people chose grapes or oranges in the ratio 1 : 3. How many people chose oranges? [2 marks]

Answer

Total for D7: 4 marks

D8 A cuboid is 9 cm long and 4 cm wide. Its total surface area is 202 cm^2 . Work out the height of the cuboid, and then its volume. [4 marks]

Answer height cm volume cm^3

D9 The line L has equation $y = 3x - 6$.

(a) Write down the coordinates of the point where L crosses the y -axis. [1 mark]

Answer (.....,)

(b) Work out the coordinates of the point where L crosses the x -axis.

[1 mark]

Answer (.....,)

(c) L and the two axes make a triangle. Work out its area.

[2 marks]

Answer

Total for D9: 4 marks

D10 A is the point $(-5, 2)$. The midpoint of AB is $M(1, -3)$. N is the midpoint of MB . Find the coordinates of N . [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 Three corners of a parallelogram are at $(0, 0)$, $(4, 1)$ and $(1, 3)$. There are three different places the fourth corner could be. Work out the sum of the x -coordinates of all three places. [3 marks]

Answer

E2 The line $y = mx + 12$ makes a triangle with the positive x -axis and the positive y -axis. The area of the triangle is 48 square units. Work out m . [3 marks]

Answer $m = \dots\dots$

E3 A cuboid has a square base. Its height is 3 cm more than the side of the base. Its volume is 324 cm^3 . Work out its total surface area. [4 marks]

Answer

E4 A pie chart has four sectors. The Red sector is 90° and the Blue sector is 126° . The Green sector stands for 18 people and the Yellow sector for 22 people. How many people were asked? [3 marks]

Answer

F How did it go?

Colour one circle on each line.

	Not yet	Nearly	Yes
I can plot and read points in all four quadrants and find a midpoint.	☐	☐	☐
I can find the gradient and equation of a straight line, and spot parallel lines.	☐	☐	☐
I can work out the volume and surface area of prisms and cylinders, and draw plans and elevations.	☐	☐	☐
I can draw a pie chart and read numbers back off one.	☐	☐	☐

Extension hints

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

E1	Hint 1	Sketch the three points. Any two of them could be the ends of a diagonal, or the ends of a side.
	Hint 2	Opposite sides of a parallelogram are the same move. So the fourth corner is one point plus a second point, minus the third point.
	Hint 3	The three places are $(4, 1) + (1, 3) - (0, 0) = (5, 4)$, then $(0, 0) + (4, 1) - (1, 3) = (3, -2)$, then $(0, 0) + (1, 3) - (4, 1) = (-3, 2)$. The x -coordinates add to $5 + 3 - 3 = 5$.

E2	Hint 1	The line crosses the y -axis at $(0, 12)$, so the height of the triangle is 12.
	Hint 2	The area is $\frac{1}{2} \times \text{base} \times 12 = 48$, so the base is 8. The line crosses the x -axis at $(8, 0)$.
	Hint 3	The line goes from $(0, 12)$ to $(8, 0)$: down 12 as it goes 8 across. So $m = -\frac{12}{8} = -1.5$.

E3	Hint 1	Call the side of the base s . The volume is $s \times s \times (s + 3)$.
	Hint 2	Try whole numbers for s : $s = 5$ gives $25 \times 8 = 200$, which is too small.
	Hint 3	$s = 6$ gives $36 \times 9 = 324$. The base and top are 36 cm^2 each and the four sides are $6 \times 9 = 54 \text{ cm}^2$ each, so the surface area is $72 + 216 = 288 \text{ cm}^2$.

E4	Hint 1	Green and Yellow together use the angle that Red and Blue leave over.
	Hint 2	$360 - 90 - 126 = 144^\circ$, and this stands for $18 + 22 = 40$ people.
	Hint 3	Each person has $144 \div 40 = 3.6^\circ$, so the whole circle is $360 \div 3.6 = 100$ people.