

Write your name here

Surname

Other names

Centre Number

Candidate Number

Edexcel GCSE

Mathematics B

**Unit 2: Number, Algebra, Geometry 1
(Non-Calculator)**

Solutions from Dr. Belma ♥

Higher Tier

Friday 14 June 2013 – Morning

Time: 1 hour 15 minutes

Paper Reference

5MB2H/01

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- **Calculators must not be used.**



Information

- The total mark for this paper is 60
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed.

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

P43996A

©2013 Pearson Education Ltd.

6/6/6/



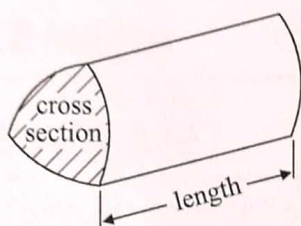
PEARSON

GCSE Mathematics 2MB01

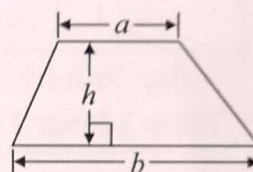
Formulae: Higher Tier

You must not write on this formulae page.
Anything you write on this formulae page will gain NO credit.

Volume of prism = area of cross section $\times$ length

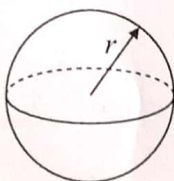


Area of trapezium = $\frac{1}{2} (a + b)h$



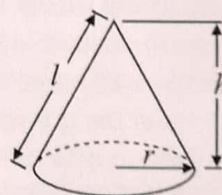
Volume of sphere = $\frac{4}{3} \pi r^3$

Surface area of sphere = $4\pi r^2$

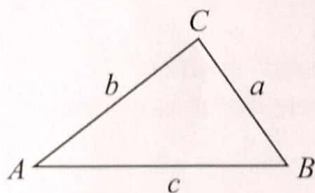


Volume of cone = $\frac{1}{3} \pi r^2 h$

Curved surface area of cone = $\pi r l$



In any triangle ABC



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$
where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Sine Rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine Rule $a^2 = b^2 + c^2 - 2bc \cos A$

Area of triangle = $\frac{1}{2} ab \sin C$



Answer ALL questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

You must NOT use a calculator.

- 1 A ticket to a theme park costs £35 plus 20% VAT.

Work out the total cost of the ticket.

$$\begin{array}{r} 7 \\ 35 \times \frac{120}{100} = 7 \times 6 = 42 \end{array}$$

£ 42

(Total for Question 1 is 3 marks)

- 2 (a) Simplify $\underbrace{2a + 4b} + \underbrace{3a - b} = 2a + 3a + 4b - b$
 $= 5a + 3b$

5a + 3b
(2)

- (b) Expand $5(m + 2) = 5 \times m + 5 \times 2$
 $= 5m + 10$

5m + 10
(1)

- (c) Simplify $a^5 \times a^4 = a^{5+4} = a^9$

$\begin{array}{c} 9 \\ a \end{array}$
(1)

(Total for Question 2 is 4 marks)



- 3 There are 200 counters in a bag.
The counters are blue or red or yellow.

35% of the counters are blue.

$\frac{1}{5}$ of the counters are red.

Work out the number of yellow counters in the bag.

$$\text{blue} \Rightarrow 200 \times \frac{35}{100} = 2 \times 35 = 70$$

$$\text{red} \Rightarrow 200 \times \frac{1}{5} = 40 \times 1 = 40$$

$$\text{yellow} \Rightarrow 200 - \underbrace{70}_{\text{blue}} - \underbrace{40}_{\text{red}} = 90$$

90

(Total for Question 3 is 4 marks)

- 4 Here are the first five terms of an arithmetic sequence.

1 5 9 13 17

- (a) Write down an expression, in terms of n , for the n th term of this sequence.

$$\begin{array}{ccccccc} -3 & 1 & 5 & 9 & 13 & 17 & \\ & \swarrow & \downarrow & \downarrow & \downarrow & \downarrow & \\ & +4 & +4 & +4 & +4 & +4 & \end{array}$$

$4n - 3$

$4n - 3$
(2)

The n th term of a different number sequence is $3n^2 + 7$

- (b) Find the 10th term of this sequence.

$$\begin{aligned} 3n^2 + 7 &= 3(10)^2 + 7 \\ &= 3 \times 100 + 7 \\ &= 300 + 7 \\ &= 307 \end{aligned}$$

307
(2)

(Total for Question 4 is 4 marks)



5 Here are the ingredients needed to make 16 chocolate biscuits.

Chocolate biscuits

Makes **16** chocolate biscuits

100 g of butter
50 g of caster sugar
120 g of flour
15 g of cocoa

Sabrina has 250 g of butter
300 g of caster sugar
600 g of flour
and 60 g of cocoa

Work out the greatest number of chocolate biscuits Sabrina can make.
You must show your working.

$$\begin{array}{l} \text{1 biscuit} \\ \hline \text{butter} \Rightarrow \frac{100}{16} \end{array}$$

$$\text{sugar} \Rightarrow \frac{50}{16}$$

$$\text{flour} \Rightarrow \frac{120}{16}$$

$$\text{cocoa} \Rightarrow \frac{15}{16}$$

$$\begin{array}{l} \text{Sabrina} \\ \hline 250 \div \frac{100}{16} = 250 \times \frac{16}{100} = 40 \leftarrow \text{min} \end{array}$$

$$300 \div \frac{50}{16} = 300 \times \frac{16}{50} = 96$$

$$600 \div \frac{120}{16} = 600 \times \frac{16}{120} = 80$$

$$60 \div \frac{15}{16} = 60 \times \frac{16}{15} = 64$$

40

(Total for Question 5 is 3 marks)



6 On the grid, draw the graph of $y = 2x - 1$ for values of x from -2 to 3

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

$$y = 2(-2) - 1 = -4 - 1 = -5$$

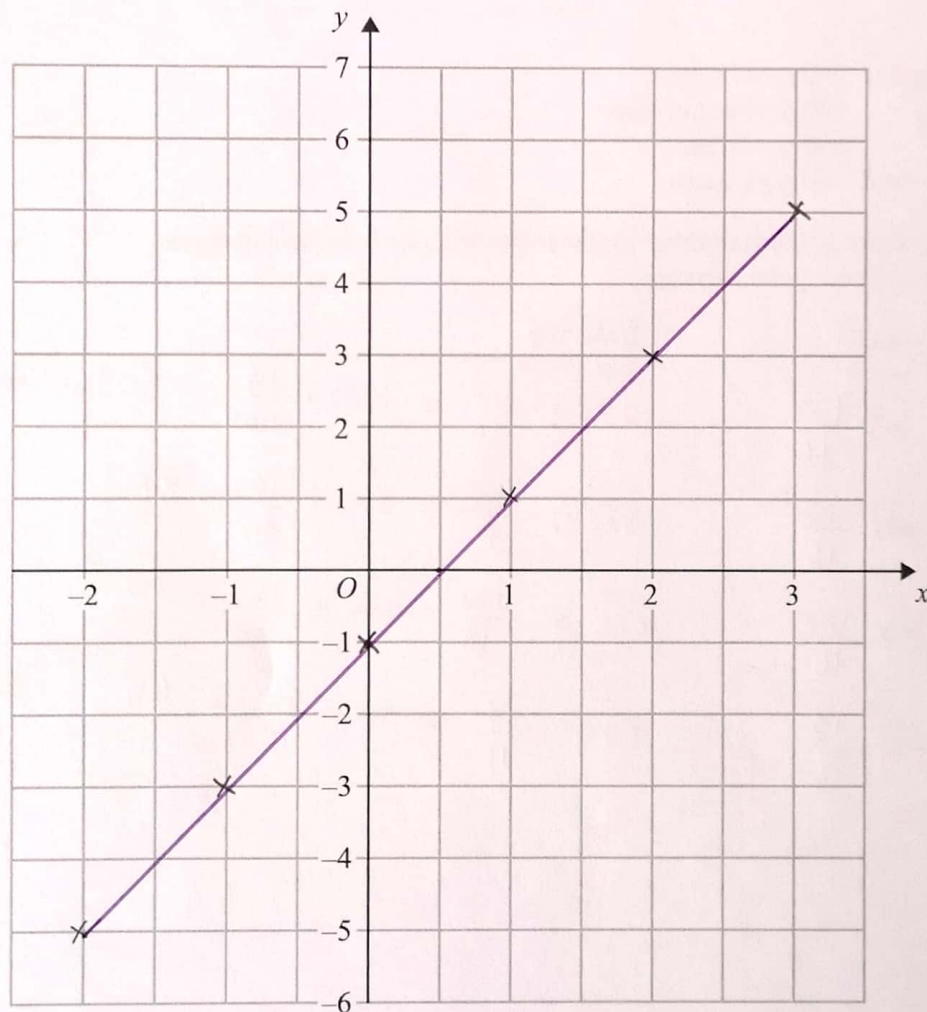
$$y = 2(-1) - 1 = -2 - 1 = -3$$

$$y = 2(0) - 1 = 0 - 1 = -1$$

$$y = 2(1) - 1 = 2 - 1 = 1$$

$$y = 2(2) - 1 = 4 - 1 = 3$$

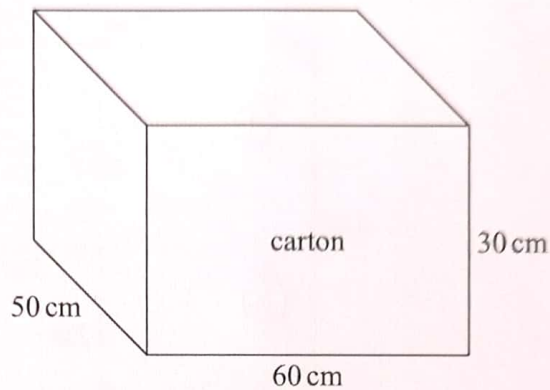
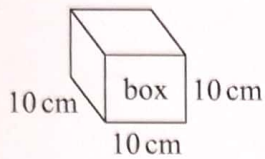
$$y = 2(3) - 1 = 6 - 1 = 5$$



(Total for Question 6 is 3 marks)



7



Diagrams **NOT**
accurately drawn

Terry fills a carton with boxes.
Each box is a cube of side 10 cm.

The carton is a cuboid with

length	60 cm
width	50 cm
height	30 cm

Work out the number of boxes Terry needs to fill one carton completely.

$$\text{volume of carton} = 50 \times 60 \times 30$$

$$\text{volume of box} = 10 \times 10 \times 10$$

$$\frac{50 \times 60 \times 30}{10 \times 10 \times 10} = 5 \times 6 \times 3 = 90$$

90

(Total for Question 7 is 3 marks)



*8 The diagram shows the floor plan of Jill's dining room.

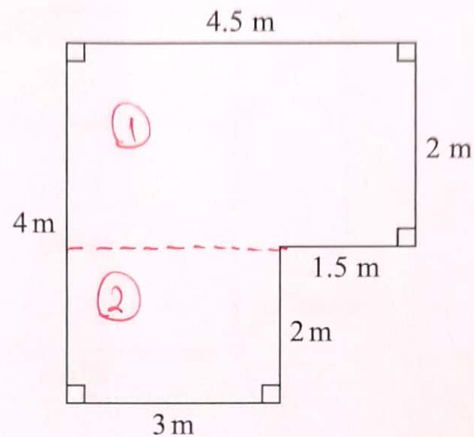


Diagram **NOT**
accurately drawn

Jill is going to cover the floor with wooden floorboards.

The floorboards are sold in packs.

One pack of floorboards will cover 2.25 m^2 .

Work out how many packs Jill needs.

You must show all your working.

$$\begin{aligned} \textcircled{1} &\Rightarrow 4.5 \times 2 = 9 \\ \textcircled{2} &\Rightarrow 3 \times 2 = 6 \end{aligned} \quad \left. \vphantom{\begin{aligned} \textcircled{1} &\Rightarrow 4.5 \times 2 = 9 \\ \textcircled{2} &\Rightarrow 3 \times 2 = 6 \end{aligned}} \right\} \Rightarrow \text{total area} = 9 + 6 = 15$$
$$15 \div 2.25 = 6.66\ldots$$

7 packs

(Total for Question 8 is 4 marks)



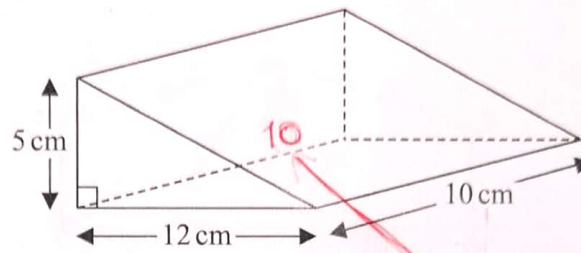


Diagram **NOT**
accurately drawn

Work out the volume of the triangular prism.

$$\text{volume of prism} = \text{area of cross section} \times \text{length}$$

$$30 \times 10 = 300$$

area of cross section

$$\frac{5 \times 12}{2} = 30$$

300 cm³

(Total for Question 9 is 2 marks)



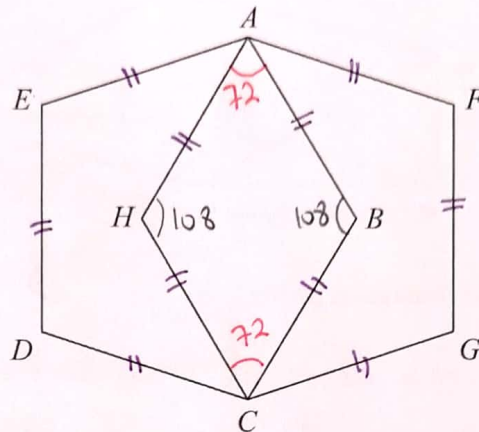


Diagram **NOT**
accurately drawn

$ABCDE$ and $AFGCH$ are regular pentagons.
The two pentagons are the same size.

Work out the size of angle EAH .
You must show how you got your answer.

exterior angle of regular pentagon



$$360 \div 5 = 72$$

interior angle of regular pentagon

$$180 - 72 = 108$$

$$\text{angle } HAB = \text{angle } HCB = 72$$

$$360 - 108 - 108 = 144$$

$$144 \div 2 = 72$$

$$\text{angle } EAB = 108$$

$$\text{angle } EAH = \text{angle } EAB - \text{angle } HAB$$

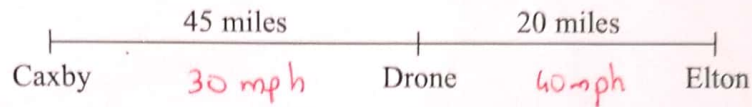
$$\text{angle } EAH = 108 - 72 = 36$$

36

(Total for Question 10 is 4 marks)



- 11 The distance from Caxby to Drone is 45 miles.
The distance from Drone to Elton is 20 miles.



Colin drives from Caxby to Drone.
Then he drives from Drone to Elton.

Colin drives from Caxby to Drone at an average speed of 30 mph.
He drives from Drone to Elton at an average speed of 40 mph.

Work out Colin's average speed for the whole journey from Caxby to Elton.

$$\text{Caxby to Drone time} \Rightarrow \frac{45}{30} = 1.5 \text{ hour}$$

$$\text{Drone to Elton time} \Rightarrow \frac{20}{40} = 0.5 \text{ hour}$$

$$\text{Average speed} = \frac{45+20}{1.5+0.5} = \frac{65}{2} = 32.5$$

32.5 mph

(Total for Question 11 is 3 marks)

- 12 Simplify fully $(x+5)^2 - (x-5)^2$

$$\begin{aligned} & ((x^2 + 10x + 25) - (x^2 - 10x + 25)) \\ &= (x^2 + 10x + 25 - x^2 + 10x - 25) \\ &= 0x^2 + 20x + 0 = 20x \end{aligned}$$

20x

(Total for Question 12 is 2 marks)



*13

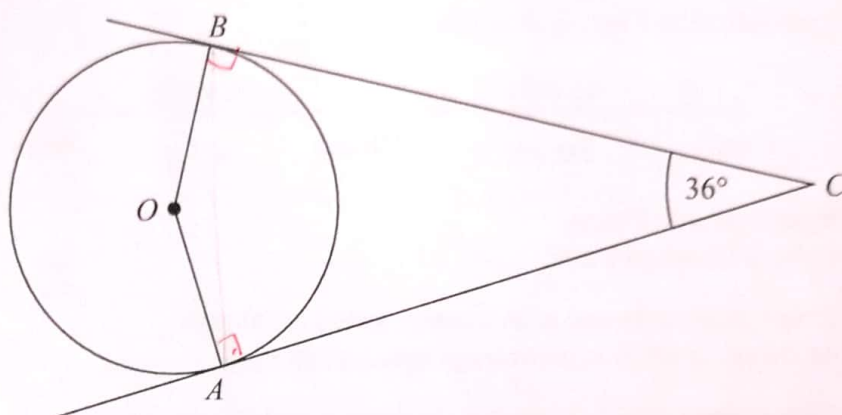


Diagram NOT accurately drawn

A and B are points on the circumference of a circle, centre O .
 AC and BC are tangents to the circle.

Angle $ACB = 36^\circ$.

Find the size of angle OBA .
 Give reasons for your answer.

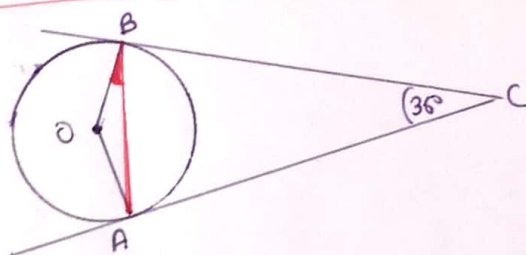
tangent is perpendicular to the radius



$$\text{angle } OAC = \text{angle } OBC = 90^\circ$$

angles in a quadrilateral add up to 360°

$$\text{angle } AOB = 360 - 90 - 90 - 36 = 144$$



AOB is an isosceles triangle and
 the sum of its interior angle is
 360°

$$\text{angle } OBA = \text{angle } OAB =$$

$$360 - 144 = 72$$

$$72 \div 2 = 36$$

(Total for Question 13 is 4 marks)



14 The diagram shows a cuboid on a 3-D grid.

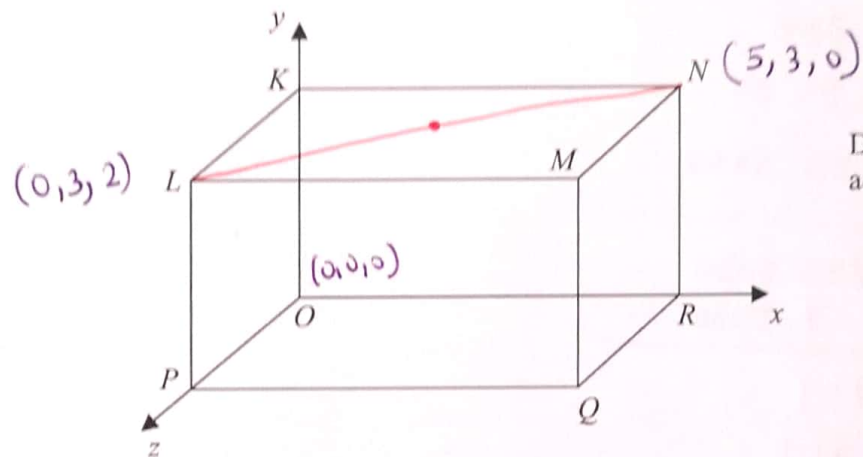


Diagram **NOT** accurately drawn

The coordinates of the vertex M are $(5, 3, 2)$.

Work out the coordinates of the midpoint of LN .

$$\frac{0+5}{2} = 2.5$$

$$\frac{3+3}{2} = 3$$

$$\frac{2+0}{2} = 1$$

(2.5 , 3 , 1)

(Total for Question 14 is 2 marks)



15 Express the recurring decimal $0.7\dot{5}\dot{0}$ as a fraction.

$$\begin{aligned}
 x &= 0.7\dot{5}\dot{0} \\
 10x &= 7.5050\dots \\
 1000x &= 750.5050\dots \\
 \hline
 1000x &= 750.5050\dots \\
 - 10x &= 7.5050\dots \\
 \hline
 990x &= 743 \\
 x &= \frac{743}{990}
 \end{aligned}$$

$$\frac{743}{990}$$

(Total for Question 15 is 3 marks)

16 (a) Write down an equation of a straight line that is parallel to the straight line $y = 3x - 5$

$$\begin{aligned}
 y &= 3x - 5 & y &= 3x + k \quad (k \neq -5) & y &= 3x + 7 \\
 \text{gradient} &= 3 & \text{ex: } y &= 3x + 7 & (1)
 \end{aligned}$$

A straight line, L, is perpendicular to the straight line $y = 3x - 5$ and passes through the point (6, 5)

(b) Find an equation of L.

$$\begin{aligned}
 y &= 3x - 5 \rightarrow \text{gradient} = 3 \\
 L \text{ is perpendicular} &= -\frac{1}{3} \\
 y &= -\frac{1}{3}x + k \\
 \text{L} & \quad (6, 5) \quad y = -\frac{1}{3}x + k \\
 5 &= -\frac{1}{3} \times 6 + k \\
 5 + 2 &= k \\
 k &= 7 \\
 y &= -\frac{1}{3}x + 7 \\
 (3)
 \end{aligned}$$

(Total for Question 16 is 4 marks)



17 (a) Write down the value of 10^{-1}

$$10^{-1} = \frac{1}{10} = 0.1$$

$$\frac{1}{10}$$

(1)

(b) Find the value of $27^{\frac{2}{3}}$

$$27^{\frac{2}{3}} = \sqrt[3]{27^2} = \sqrt[3]{3^2 \times 3^2} = 3^2 = 9$$

$$9$$

(2)

(c) Write $\sqrt{75}$ in the form $k\sqrt{3}$, where k is an integer.

$$\sqrt{75} = \sqrt{25 \times 3} = \sqrt{25} \times \sqrt{3} = 5\sqrt{3} = 5\sqrt{3}$$

$$5\sqrt{3}$$

(2)

(Total for Question 17 is 5 marks)

18 Simplify fully $\frac{2x^2 + 6x}{x^2 - 2x - 15} =$

$$2x^2 + 6x = 2x\bar{x} + 2\bar{x}3 \times \bar{x}$$

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

$$\frac{2x^2 + 6x}{x^2 - 2x - 15} = \frac{2x(x+3)}{(x-5)(x+3)}$$

$$\begin{array}{r} x \quad -5 \\ x \quad +3 \end{array}$$

$$3x - 5x = -2x \checkmark$$

$$\frac{2x^2 + 6x}{x^2 - 2x - 15} = \frac{2x\cancel{(x+3)}}{(x-5)\cancel{(x+3)}}$$

$$= \frac{2x}{x-5}$$

$$\frac{2x}{x-5}$$

(Total for Question 18 is 3 marks)

TOTAL FOR PAPER IS 60 MARKS



BLANK PAGE

