

**5MB3H/01**

# **Edexcel GCSE**

**Mathematics B (Modular) – 2MB01**

Paper 3H (Calculator)

## **Higher Tier**

Practice Paper B

**Time: 1 hour 45 minutes**



**You must have:**

Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser. Tracing paper may be used.

### **Instructions**

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- Use **black** ink or ball-point pen.
- Answer **all** questions.
- Answer the questions in the spaces provided  
– *there may be more space than you need.*
- **Calculators may be used.**
- If your calculator does not have a  $\pi$  button, take the value of  $\pi$  to be 3.142 unless the question instructs otherwise.

### **Information**

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- The total mark for this paper is 80.
- 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  
– *you should take particular care on these questions with your spelling, punctuation and grammar, as well as the clarity of expression.*

### **Advice**

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- 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.

Answer ALL questions.  
Write your answers in the spaces provided.  
You must write down all stages in your working.

1.  $R = 4(3y - 5)$

$$R = 32$$

(a) Work out the value of  $y$ .

$$4(3y - 5) = 32$$

$$3y - 5 = \frac{32}{4} = 8$$

$$3y = 8 + 5 = 13$$

$$y = \frac{13}{3} = 4\frac{1}{3}$$

$$\begin{array}{r} 4\frac{1}{3} \\ \hline \end{array} \quad (2)$$

$$F = ma + b$$

(b) Make  $m$  the subject of the formula.

$$ma + b = F$$

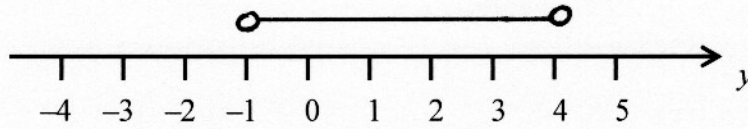
$$ma = F - b$$

$$m = \frac{F - b}{a}$$

$$\begin{array}{r} m = \frac{F - b}{a} \\ \hline \end{array} \quad (2)$$

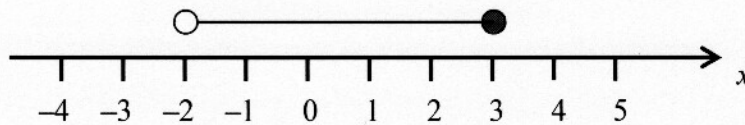
(Total for Question 1 is 4 marks)

2. (a) On the number line below mark the inequality  $-1 < y < 4$



(1)

- (b) Here is an inequality, in  $x$ , shown on a number line.



Write down the inequality.

$$\underline{-2 < x \leq 3} \quad (2)$$

- (c) Solve the inequality

$$3t + 5 > 17$$

$$3t > 17 - 5$$

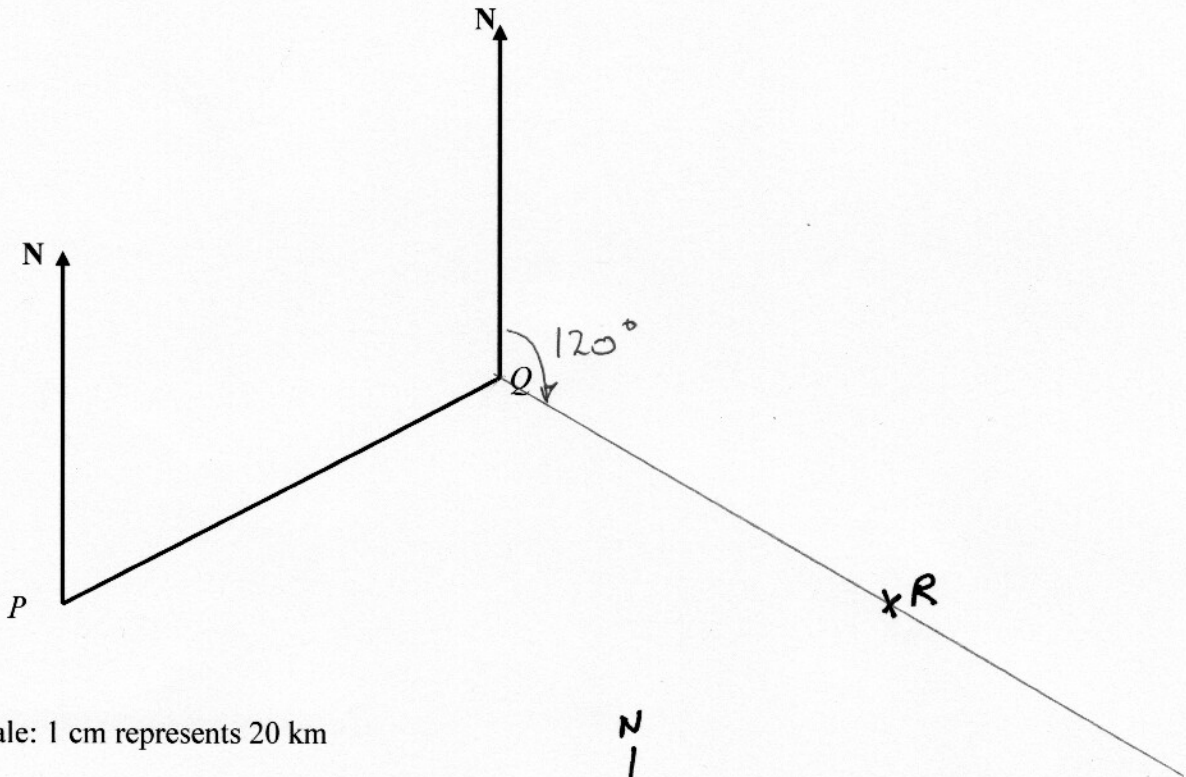
$$3t > 12$$

$$t > 4$$

$$\underline{t > 4} \quad (2)$$

(Total for Question 2 is 5 marks)

3. The diagram shows the position of two ports,  $P$  and  $Q$ .  
A ship sails from port  $P$  to port  $Q$ .



Scale: 1 cm represents 20 km

- (a) Find the bearing of port  $P$  from port  $Q$

$$180 + 63 = 243^\circ$$



..... 243 .....<sup>o</sup>  
(1)

- (b) Work out the real distance between port  $P$  and port  $Q$ .  
Use the scale 1 cm represents 20 km.

$$6.6 \text{ cm} \rightarrow 6.6 \times 20 \text{ km} \\ = 132 \text{ km}$$

..... 132 ..... km  
(2)

Port  $R$  is 120 km on a bearing of  $120^\circ$  from port  $Q$ .

- (c) On the diagram, mark port  $R$  with a cross ( $\times$ ).  
Label it  $R$ .

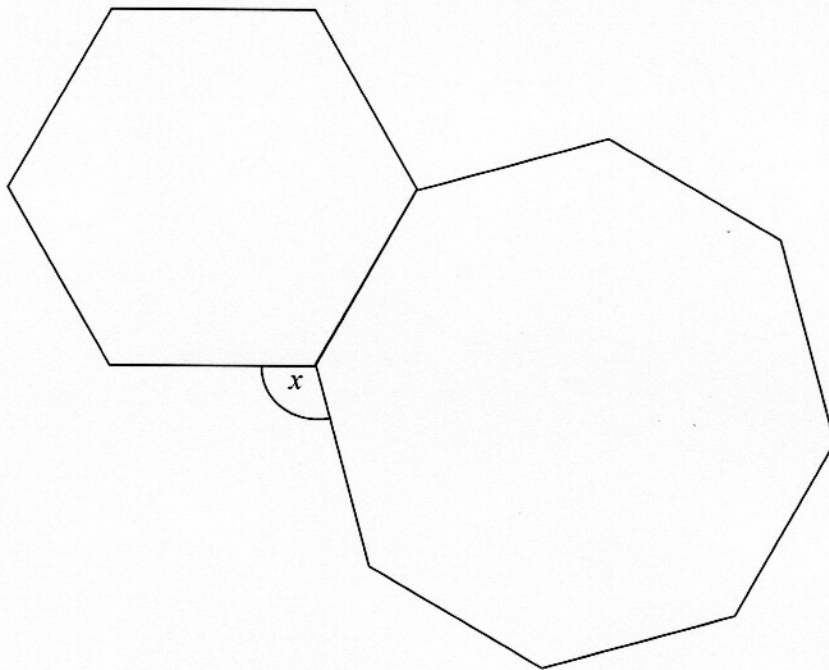
$$120 \text{ km} \rightarrow \frac{120}{20} \text{ cm} = 6 \text{ cm}$$

(2)

(Total for Question 3 is 5 marks)



4. The diagram shows a regular hexagon and a regular octagon.



Find the size of the angle marked  $x$ .  
You must show all the stages in your working.  
Give the reasons for your answer.

$$\text{Exterior angle of a hexagon} = \frac{360}{6} = 60^\circ$$

$$\begin{array}{r} 120^\circ \\ \underline{60^\circ} \\ \dots \end{array} \quad \therefore \text{interior angle} = \begin{array}{r} 180 - 60 = \\ \underline{\phantom{180} 120} \end{array} = 120^\circ$$

$$\text{Exterior angle of an octagon} = \frac{360}{8} = 45^\circ$$

$$\begin{array}{r} 135^\circ \\ \underline{45^\circ} \\ \dots \end{array} \quad \therefore \text{interior angle} = \begin{array}{r} 180 - 45 \\ \underline{\phantom{180} 135} \end{array} = 135^\circ$$

Angles around a point add to  $360^\circ$

$$\therefore x + 120 + 135 = 360^\circ$$

$$x = 360 - (120 + 135) = 105^\circ$$

(Total for Question 4 is 6 marks)

5. Rodney takes his car to the garage to have a new exhaust pipe fitted.

The exhaust pipe costs £65 plus VAT at 20%.

Find the total price of the exhaust pipe.

$$£65 \times 1.2 = £78$$

£ 78 .....

(Total for Question 5 is 3 marks)

6. Use your calculator to work out

$$\frac{13.7 + 5.86^2}{2.54 \times \sqrt{1.96}}$$

Write down all the figures on your calculator display.  
You must give your answer as a decimal.

13.50944882 .....

(Total for Question 6 is 2 marks)

7. The equation

$$x^3 + 10x = 25$$

has a solution between 1 and 2

Use a trial and improvement method to find this solution.

Give your answer correct to one decimal place.

You must show **all** your working.

$x$	$x^3 + 10x$
1.5	18.375 too small
2	28 too big.
1.75	22.86 too small
1.85	24.83 too small
1.9	25.859 too big

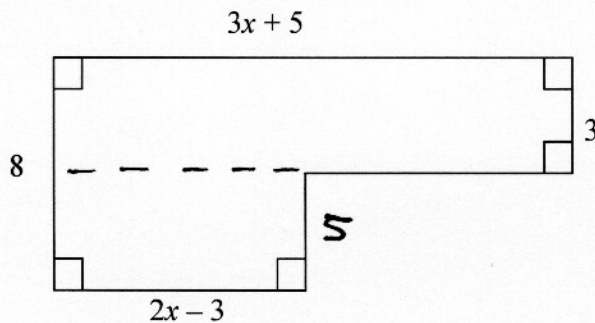
the solution is between 1.85 and 1.9 so it rounds to 1.9 to 1 decimal place

do 1.5 =  
 ANS  $x^3$  + 10 x ANS =  
 2 =  
 (circle with arrow) get equation back  
 = etc

$$x = 1.9 \dots\dots\dots$$

(Total for Question 7 is 4 marks)

- \*8. The area of this shape is  $38 \text{ cm}^2$ .  
All the measurements are in cm.



Find the length of the smallest side.

$$\text{Area} = 3(3x + 5) + 5(2x - 3)$$

$$= 9x + 15 + 10x - 15$$

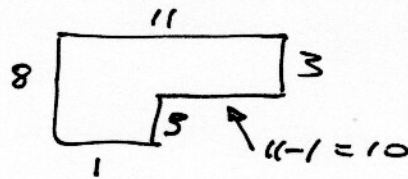
$$= 19x = 38 \text{ cm}^2$$

$$\therefore x = 2$$

$$3x + 5 = 11$$

$$2x - 3 = 1$$

Sides are



The shortest side is 1 cm.

(Total for Question 18 is 4 marks)



\*9. Jim buys 6 trays of Cola for £9.99 a tray.

Each tray holds 24 cans of Cola.

Jim goes to the school fete to sell his Cola.

He sells 75 cans at 80p each.

He gives 10 cans to his friends.

He sells the rest at 50p each.



What is Jim's percentage profit or loss?

Give your answer to 1 decimal place.

$$\text{Jim spends } 6 \times \pounds 9.99 = \pounds 59.94$$

$$\text{He has bought } 6 \times 24 = 144 \text{ cans.}$$

$$\text{He sells } 75 \text{ cans at } \pounds 0.80, \text{ gets } \pounds 60$$

$$\text{He sells } 144 - (75 + 10) = 59 \text{ cans at } \pounds 0.50, \\ \text{gets } \pounds 29.50 \text{ for them.}$$

$$\text{Total income } \pounds 60 + \pounds 29.50 = \pounds 89.50$$

$$\text{Profit} = \text{income} - \text{expenditure}$$

$$= \pounds 89.50 - \pounds 59.94$$

$$= \pounds 29.56$$

$$\underline{\text{Percentage profit}} = \frac{\pounds 29.56}{\pounds 59.94} \times 100\%$$

$$= 49.3\% \quad (\text{to 3 sig. figs}).$$

(Total for Question 9 is 5 marks)

10. (a) Solve  $5x + 4 = 2(4x - 3)$

$$5x + 4 = 8x - 6$$

$$8x = 5x + 10$$

$$3x = 10$$

$$x = \frac{10}{3} = 3\frac{1}{3}$$

$$x = \dots 3\frac{1}{3} \dots \quad (3)$$

(b) Solve  $\frac{2x-3}{6} + \frac{x+4}{2} = 5$

$$\textcircled{\times 6} \quad 2x - 3 + 3(x + 4) = 30$$

$$= 2x - 3 + 3x + 12$$

$$= 5x + 9$$

$$\therefore 5x = 30 - 9 = 21$$

$$x = \frac{21}{5} = 4.2$$

$$x = \dots 4.2 \dots \quad (3)$$

(Total for Question 10 is 6 marks)

11. The distance of the earth from the sun is  $9.3 \times 10^7$  miles.  
Light travels at 186 000 miles per second.

Work out the length of time it takes for light to travel from the sun to the earth.  
Give your answer in minutes and seconds.

$$\text{Speed} \times \text{time} = \text{distance}$$

$$\therefore \text{time} = \frac{\text{distance}}{\text{speed}} =$$

$$\frac{9.3 \times 10^7 \text{ miles}}{186000 \text{ miles/sec}} = 500 \text{ sec}$$

$$= (480 + 20) \text{ sec}$$

$$= 8 \text{ minutes } 20 \text{ seconds}$$

$$\text{or } \frac{500}{60} = 8\frac{1}{3} \text{ min} = 8 \text{ min } 20 \text{ sec.}$$

$$\dots 8 \text{ minutes } 20 \text{ seconds} \dots$$

(Total for Question 11 is 3 marks)

12. (a) Ben bought a car for £12 000.  
Each year the car depreciated by 10%.

Work out its value two years after he bought it.

$$12000 \times 0.9^2 = 9720$$

£ 9720  
(3)

- (b) Susie also bought a car two years ago.  
It too depreciated by 10% each year.

The car is now worth £8100

Work out the original cost of Susie's car.

$$\text{let original cost} = C$$

$$C \times 0.9^2 = 8100$$

$$C = \frac{8100}{0.9^2} = 10000$$

£ 10000  
(3)

(Total for Question 12 is 6 marks)

13. Here are the equations of 5 straight lines.

P  $y = 2x + 5$

Q  $y = -2x + 5$

R  $y = x + 5$

S  $y = -\frac{1}{2}x + 6$

T  $y = \frac{1}{2}x + 1$

(a) Write down the letter of the line that is parallel to  $y = x - 5$

R  
.....  
(1)

(b) Write down the letter of the line that is perpendicular to  $y = 2x - 1$

S  
.....  
(1)

(c) Find the coordinates of the point where the line  $y = 2x + 5$  cuts the

(i) y axis,

... (0, 5) ...

(ii) x axis.

... (-2.5, 0) ...  
(2)



$$\begin{aligned} 2x + 5 &= 0 \\ 2x &= -5 \\ x &= -2\frac{1}{2} \end{aligned}$$

(Total for Question 13 is 4 marks)

14. Bob and Sally buy some fruit.

Bob buys 5 oranges and 2 bananas for £2.00

Sally buys 2 oranges and 3 bananas for £1.35

Work out the cost of

- (i) one orange £0.30  
(ii) one banana £0.25

$$\begin{aligned} 5o + 2b &= 2 \\ 2o + 3b &= 1.35 \end{aligned} \quad \left. \begin{array}{l} \times 3 \\ \times 2 \end{array} \right\} \begin{array}{l} \text{subtract} \end{array}$$

$$\begin{aligned} 15o + 6b &= 6 \\ 4o + 6b &= 2.7 \end{aligned}$$


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$$11o = 3.3$$

$$o = \frac{3.3}{11} = 0.3$$

$$2b = 2 - 5o = 2 - 1.5 = 0.5$$

$$\therefore b = 0.25$$

(Total for Question 14 is 5 marks)



\*15

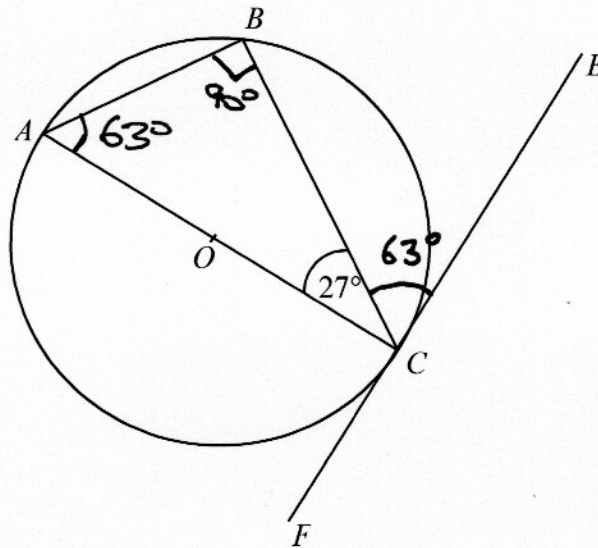


Diagram NOT  
accurately drawn

In the diagram ABC are points on the circle centre  $O$ .

Angle  $ACB = 27^\circ$

FE is a tangent to the circle at point C.

- (i) Calculate the size of angle  $BAC$ .  
Give reasons for your answer.

$\angle ABC = 90^\circ$  (half of the  
 $180^\circ$  angle  $\angle AOC$ ).

Angles in a triangle add to  $180^\circ$

$$\therefore \angle BAC + 90 + 27 = 180$$

$$\angle BAC = 180 - 117 = 63^\circ$$

- (ii) Calculate the size of angle  $BCE$ .  
Give reasons for your answer.

A tangent is perpendicular to the radius at its  
contact point  $\therefore \angle ACE = 90^\circ$   
 $= \angle BCE + 27^\circ$

$$\therefore \angle BCE = 90 - 27 = 63^\circ$$

or Tangent rule: angle between chord and tangent =  
angle from chord to opposite arc, so (Total for Question 15 is 4 marks)

$$\angle BCE = \angle BAC.$$

16.

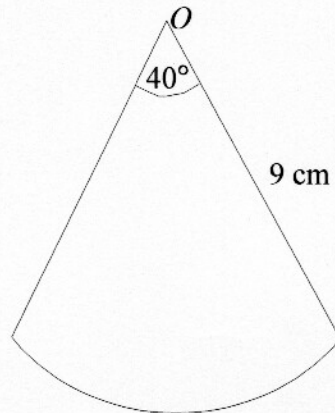


Diagram NOT  
accurately drawn

The diagram shows a sector of a circle centre  $O$ .  
The radius of the circle is 9 cm.  
The angle at the centre of the circle is  $40^\circ$ .

Find the perimeter of the sector.  
Give your answer correct to 2 decimal places.

$$\begin{aligned}\text{Arc Length} &= (\text{fraction of circle}) \times 2\pi r \\ &= \left(\frac{40^\circ}{360^\circ}\right) \times 2\pi \times 9 \text{ cm} = 2\pi \text{ cm}\end{aligned}$$

$$\begin{aligned}\text{Perimeter} &= \text{arc length} + 2 \times \text{radii} \\ &= 2\pi + 18 \\ &= 24.2832 \text{ cm} \\ &= 24.28 \text{ cm to 2 d.p.}\end{aligned}$$

24.28..... cm

(Total for Question 15 is 4 marks)

17. PQR is a scalene triangle.

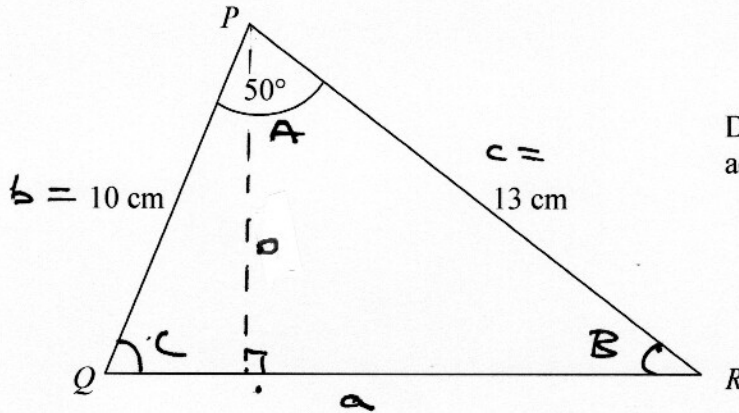


Diagram NOT accurately drawn

Find the length of the perpendicular line from P to QR.  
Give your answer correct to 3 significant figures.

First find length QR using cosine rule

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

$$= 10^2 + 13^2 - 2 \times 10 \times 13 \cos 50 = 101.875,$$

$$a = 10.0933 \text{ cm}$$

$$o = 10 \sin C$$

$$\frac{\sin C}{13} = \frac{\sin A}{a}$$

$$\therefore o = 10 \sin C = 10 \left( \frac{13 \sin 50}{10.0933} \right)$$

$$= 9.8665 \text{ cm}$$

$$= 9.87 \text{ cm to 3 sig. figures}$$

$$\dots\dots\dots 9.87 \dots\dots\dots \text{ cm}$$

(Total for Question 17 is 6 marks)

18. The force,  $F$ , between two magnets is inversely proportional to the square of the distance,  $x$ , between them.

When  $x = 3$ ,  $F = 4$ .

Calculate the value of  $F$  when  $x = 2$ .

$$F \propto \frac{1}{x^2}, \quad F \propto x^{-2}$$

$$F = \left(\frac{2}{3}\right)^{-2} \times 4 = 9$$

.....9.....

(Total for Question 18 is 4 marks)

**TOTAL FOR PAPER = 80 MARKS**