Write your name here

Surname	Other names

Pearson Edexcel
International GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Mathematics B

Level 2
Paper 2R

Thursday 7 June 2018 – Morning
Time: 2 hours 30 minutes

Paper Reference
4MB1/02R

You must have:
Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser, calculator. 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 may be used.**

Information

- The total mark for this paper is 100.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Check your answers if you have time at the end.
- Without sufficient working, correct answers may be awarded no marks.

Turn over ▶

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Pearson

Answer ALL TWELVE questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1

Diagram **NOT** accurately drawn

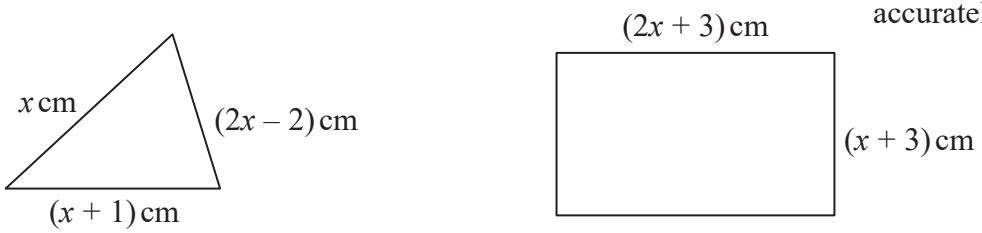


Figure 1

Figure 1 shows a triangle and a rectangle.

The triangle has sides of length x cm, $(2x - 2)$ cm and $(x + 1)$ cm.
The rectangle has length $(2x + 3)$ cm and width $(x + 3)$ cm.

The perimeter of the rectangle is 3 times the perimeter of the triangle.

(a) Write down an equation in x to represent the given information.

(2)

(b) Solve your equation to find the value of x.
Show clear algebraic working.

(3)

Question 1 continued

(Total for Question 1 is 5 marks)

2 Part of the curve with equation $y = x^2 - 3x - 1$ is drawn on the grid on the opposite page.

The equation of another curve is $y = -x^2 - 2x + 4$

(a) Complete the table of values for $y = -x^2 - 2x + 4$

x	–4	–3	–2	–1	0	1	2
y	–4			5		1	

(2)

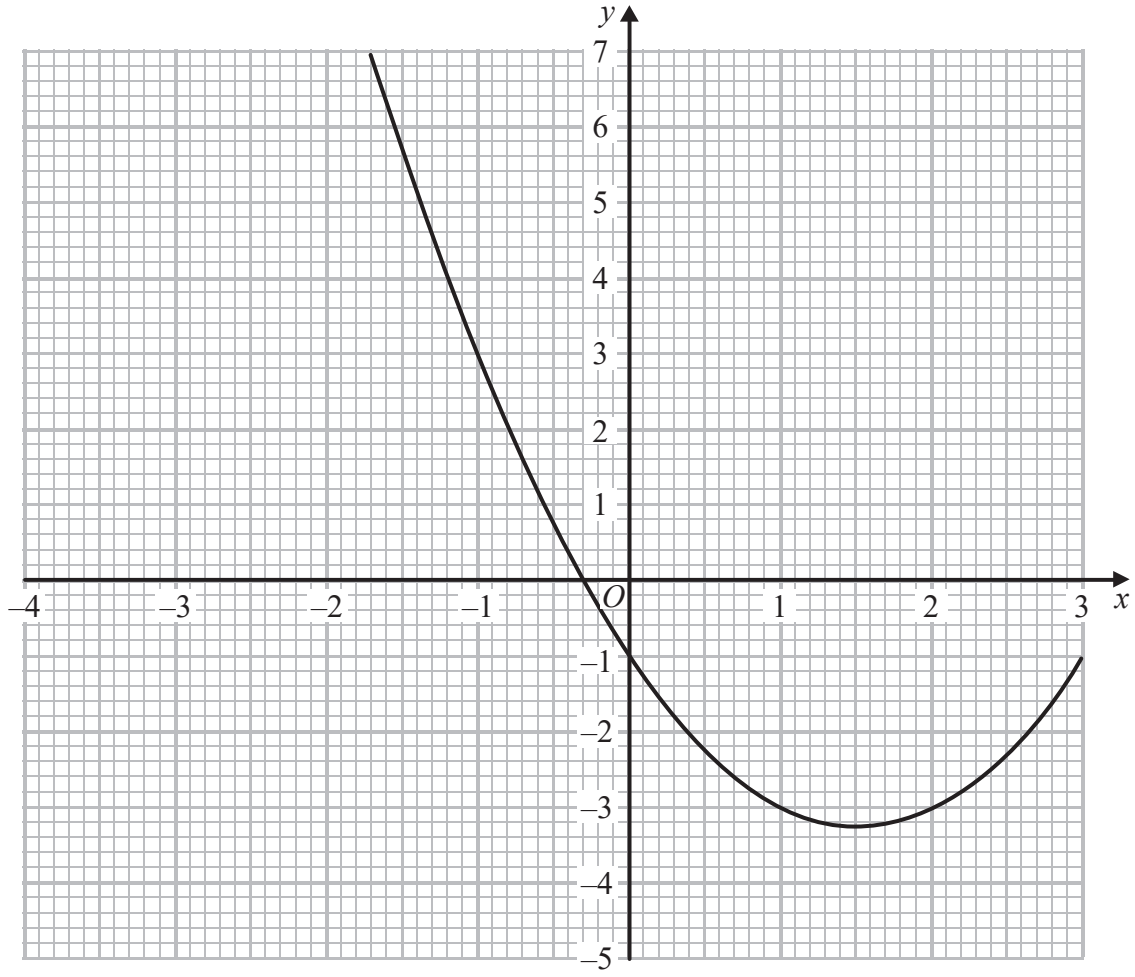
(b) On the grid, plot the points from your completed table and join them to form a smooth curve.

(2)

(c) Use the two curves on the grid to find estimates, to 1 decimal place, for the solutions of the equation $2x^2 - x - 5 = 0$

(2)

Question 2 continued



(Total for Question 2 is 6 marks)

3

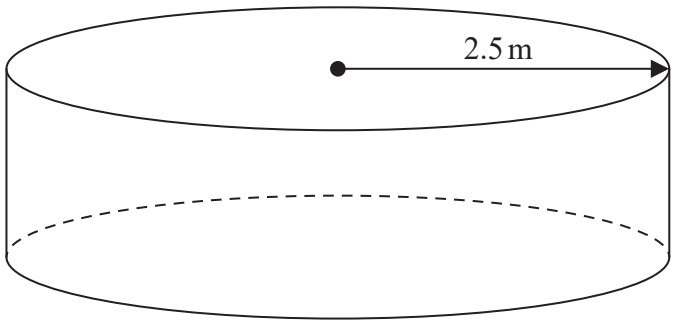


Diagram **NOT** accurately drawn

Figure 2

Figure 2 shows an empty tank in the shape of a right circular cylinder.
The axis of the cylinder is vertical.

Adelih is going to put water into the tank so that the surface of the water is level with the top of the tank.
The water flows into the tank at a constant rate of R litres per minute.

Given that $R = 109$

(a) calculate, in hours and minutes to the nearest minute, the time taken by the water to flow into the tank.

(5)

Adelih wants the time taken by the water to flow into the tank to be 3 hours.

(b) Calculate the value, to the nearest whole number, of R.

(2)

$\left(\begin{array}{c} 1\,\text{m}^3 = 1000 \text{ litres} \\ \text{Volume of cylinder} = \pi r^2 h \end{array} \right)$

Question 3 continued

(Total for Question 3 is 7 marks)

4 The functions f and g are defined as

$$f: x \mapsto 3x + 4$$

$$g: x \mapsto \frac{5}{x - 3}$$

(a) State the value of x that must be excluded from any domain of g.

(1)

(b) Find f(5)

(1)

(c) Find fg(2)

(2)

The function h is defined as

$$h: x \mapsto x^2 - 6x - 8 \text{ where } x \geqslant 3$$

(d) Express the inverse function h^{-1} in the form $h^{-1}: x \mapsto ...$

(3)

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

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

]

Question 4 continued

(Total for Question 4 is 7 marks)

5 (a) Solve the inequality $5(x + 1) < x$
Show clear algebraic working.

(2)

(b) Solve the simultaneous equations

$$3x^2 + y^2 - 7 = 0$$
$$y - 3x - 5 = 0$$

Show clear algebraic working.

(5)

(c) Hence find the value of x for which

$$5(x + 1) < x \quad \textbf{and} \quad 3x^2 + y^2 - 7 = 0 \quad \textbf{and} \quad y - 3x - 5 = 0$$

(1)

Question 5 continued

(Total for Question 5 is 8 marks)

6 The curve C has equation $y = 2x^3 + 3x^2 - 12x + 1$

The point P and the point Q are the turning points on C.

Find an equation of the straight line that passes through P and Q.

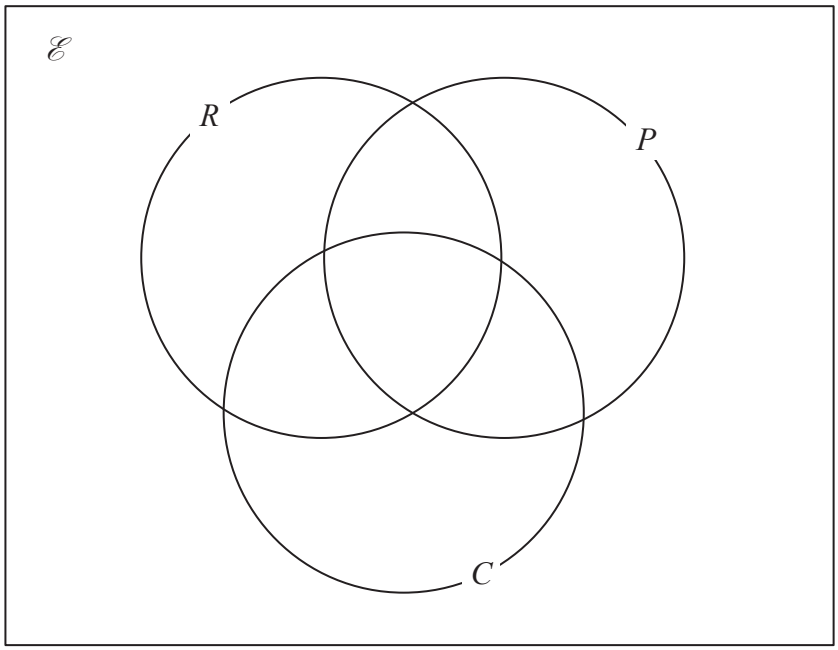
Question 6 continued

(Total for Question 6 is 8 marks)

7 Mr Ng is the head of mathematics at a school.
He asked the students in Year 9 which of a ruler (R), a protractor (P) and a calculator (C) they each had.

Of these students
- 10 students had a ruler, a protractor and a calculator
- 25 students had a ruler and a protractor
- 18 students had a protractor and a calculator
- 17 students had a ruler and a calculator
- 54 students had a ruler
- 49 students had a protractor
- 29 students had a calculator
- 8 students did not have a ruler or a protractor or a calculator.

(a) Show all this information in the Venn diagram.



(3)

(b) Find the number of students in Year 9

(2)

(c) Find n($[R \cup P]'$)

(1)

One of the students in Year 9 is chosen at random.

(d) Given that this student had a calculator, find the probability that this student had a ruler but not a protractor.

(2)

.....

.....

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Question 7 continued

(Total for Question 7 is 8 marks)

8

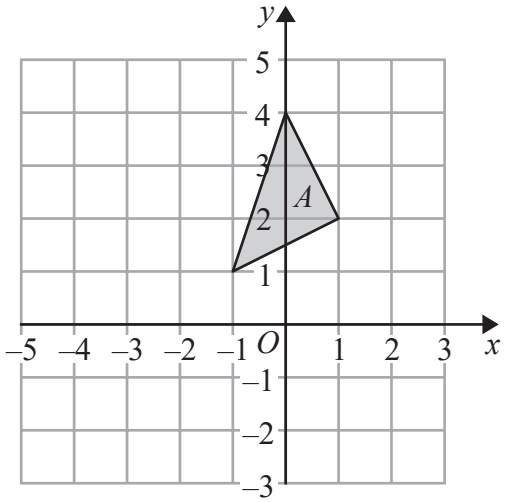

Figure 3

Figure 3 shows a triangle, A, drawn on a grid.

Triangle A is transformed to triangle B under the transformation with matrix **P** where

$$\mathbf{P} = \begin{pmatrix} 2 & -1 \\ \frac{3}{2} & -\frac{1}{2} \end{pmatrix}$$

(a) On the grid in Figure 3, draw and label triangle B.

(4)

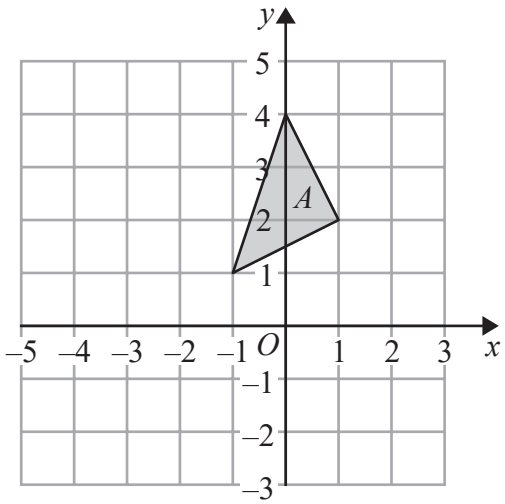

Figure 4

Figure 4 shows triangle A drawn on a grid.

Triangle B is transformed to triangle C under the transformation with matrix **Q** where

$$\mathbf{Q} = \begin{pmatrix} 3 & -4 \\ 1 & -2 \end{pmatrix}$$

(b) On the grid in Figure 4, draw and label triangle C.

(3)

Triangle C is the image of triangle A under a **single** transformation.

(c) Describe fully this transformation.

(2)

Turn over for a spare copy of Figure 3 and Figure 4 if you need to redraw your triangles.

Question 8 continued

Question 8 continued

Only use these grids if you need to redraw your triangles.

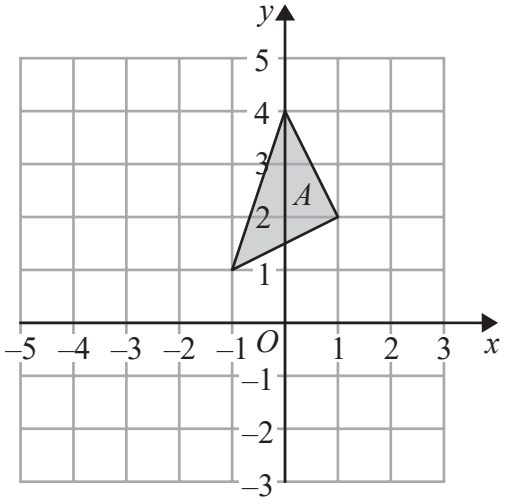

Figure 3

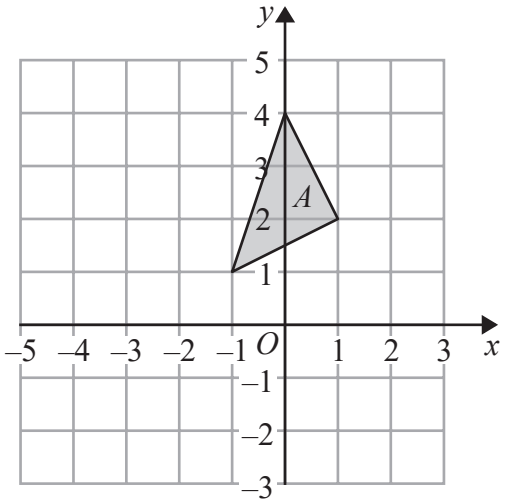

Figure 4

(Total for Question 8 is 9 marks)

9 One Saturday, each of the 100 people who visited a library was asked how long they were in the library.
The table below shows information about the results.

Time (t mins)	Frequency
$0 < t \leqslant 10$	16
$10 < t \leqslant 30$	22
$30 < t \leqslant 35$	10
$35 < t \leqslant 60$	40
$60 < t \leqslant 100$	12

(a) Calculate an estimate for the mean length of time, in minutes to 3 significant figures, these people were in the library.

(4)

Two of the 100 people who visited the library that Saturday are picked at random.

(b) Find, to 3 decimal places, the probability that

(i) both people were in the library for more than 30 minutes,

(ii) one of the two people was in the library for more than 30 minutes and one was in the library for 30 minutes or less.

(5)

Question 9 continued

(Total for Question 9 is 9 marks)

10 Zahur made 250 cakes to sell at a cake sale.
Of the cakes made by Zahur, 28% were chocolate cakes.

(a) Calculate the number of chocolate cakes made by Zahur.

(2)

All the other cakes made by Zahur were either lemon cakes or vanilla cakes.
The ratio of the number of lemon cakes to the number of vanilla cakes was 4 : 5

(b) Calculate the number of lemon cakes made by Zahur.

(2)

Zahur put icing on each of the vanilla cakes he made.
The icing for each vanilla cake needed 75 g of icing sugar.

(c) Calculate the total amount, in kg, of icing sugar needed for all the vanilla cakes made by Zahur.

(2)

At the start of the cake sale, the selling price of each of the cakes made by Zahur was $4 and he sold 204 cakes at this price.

Zahur then reduced the selling price of each cake by 30% and he sold all the remaining cakes.

(d) Calculate the total amount of money, in $, that Zahur received by selling all 250 cakes.

(3)

When Zahur had subtracted the cost of all the ingredients he needed to make his cakes from the total amount of money he received by selling all the cakes, he found that he had made a profit of 60%

(e) Calculate, in $, the cost of all the ingredients Zahur needed.

(3)

Question 10 continued

Question 10 continued

Question 10 continued

(Total for Question 10 is 12 marks)

11

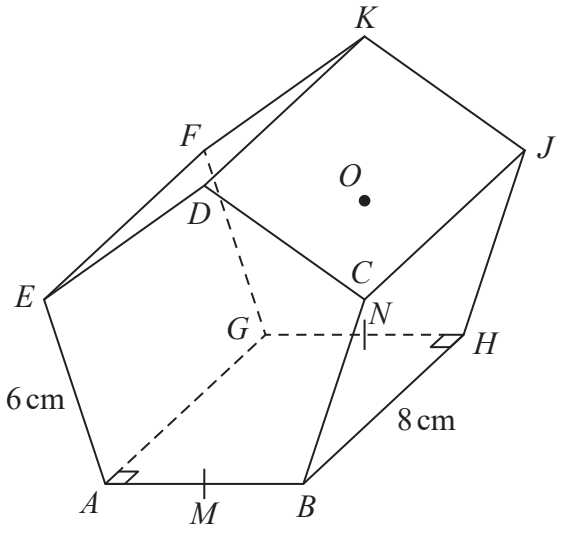

Diagram **NOT** accurately drawn

Figure 5

Figure 5 shows a right prism *ABCDEFGHJK*.
A cross section of the prism is a regular pentagon with sides of length 6 cm.

BH = 8 cm.
M is the midpoint of *AB*.
N is the midpoint of *GH*.
O is the centre of pentagon *FGHJK*.

(a) Find, in cm to 3 significant figures, the length of *AO*.

(5)

(b) Calculate the size, in degrees to 1 decimal place, of the angle between *MK* and *MN*.

(5)

Question 11 continued

Question 11 continued

Question 11 continued

(Total for Question 11 is 10 marks)

12

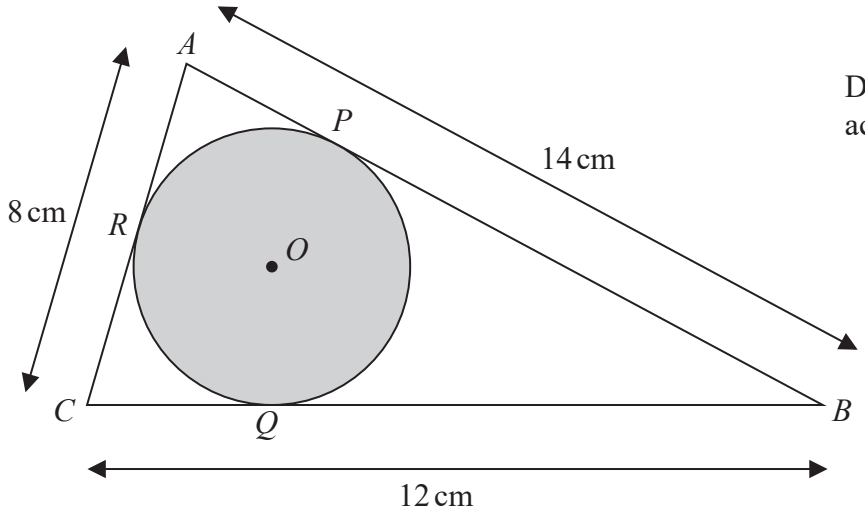

Diagram **NOT** accurately drawn

Figure 6

Figure 6 shows a triangle ABC and a circle PQR, centre O. The triangle is such that side AB is the tangent to the circle at P, side BC is the tangent to the circle at Q and side AC is the tangent to the circle at R. The region inside the circle is shaded, as shown in Figure 6.

$AB = 14\,\text{cm}$, $BC = 12\,\text{cm}$ and $AC = 8\,\text{cm}$.

Let $BP = x\,\text{cm}$ and by considering the lengths of the tangents to the circle,

(a) obtain an equation in x only and solve it to find the length, in cm, of BP.

(4)

(b) Find, to 3 significant figures, the area of the circle as a percentage of the total area of triangle ABC.

(7)

$$\left(\text{Cosine rule: } a^2 = b^2 + c^2 - 2bc\cos A \right)$$

$$\left(\text{Area of triangle} = \frac{1}{2}ab\sin C \right)$$

Question 12 continued

Question 12 continued

(Total for Question 12 is 11 marks)

TOTAL FOR PAPER IS 100 MARKS