Write your name here

Surname	Other names

Pearson Edexcel International GCSE

Centre Number

Candidate Number

Mathematics B

Paper 2R

Tuesday 20 May 2014 – Afternoon
Time: 2 hours 30 minutes

Paper Reference
4MB0/02R

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 ▶

P43071A

1/1/1/1/

P 4 3 0 7 1 A 0 1 3 2

PEARSON

Answer ALL ELEVEN questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

1 The point *A* has coordinates (–3, 7) and the point *B* has coordinates (5, –8)

Calculate

(a) the length of *AB*,

(2)

(b) the gradient of *AB*.

(2)

(Total for Question 1 is 4 marks)

2 Given that $\mathbf{A} = \begin{pmatrix} 3 & -2 \\ -1 & 4 \end{pmatrix}$, find the 2×2 matrix $\mathbf{B}$ such that $\mathbf{A} + 2\mathbf{B} = \mathbf{A}^2$

(Total for Question 2 is 5 marks)

3 A shopkeeper buys 400 items for £360 to sell in his shop.

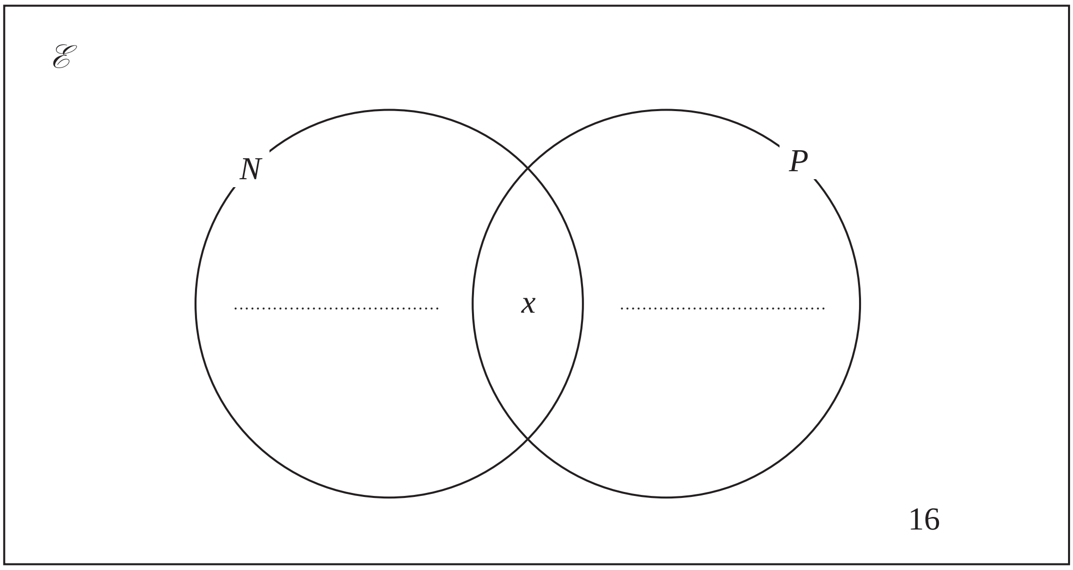
He sells 220 of these items at £2.40 each.
He then reduces the selling price of each item to £1.60 and sells 140 items at this price.
Finally, he sells all the remaining items at £0.55 each.

Calculate the percentage profit made by the shopkeeper after all the items were sold.

Question 3 continued

(Total for Question 3 is 4 marks)

4



A survey was carried out at Buenos Aires airport of passengers travelling to New York (N) or to Paris (P) or to neither of these destinations.

There were 16 passengers who were not travelling to either New York or Paris as shown on the incomplete Venn diagram.

There were 19 passengers travelling to New York, 35 passengers travelling to Paris and x passengers travelling to both New York and Paris.

(a) Complete the Venn diagram to show this information.
Give your answers in terms of x.

(2)

(b) Given that 62 passengers were surveyed,

(i) write down an equation in x.

(ii) solve your equation to find the value of x.

(2)

One of the passengers surveyed was picked at random.
Given that this passenger was travelling to New York,

(c) find the probability that this passenger was also travelling to Paris.

(2)

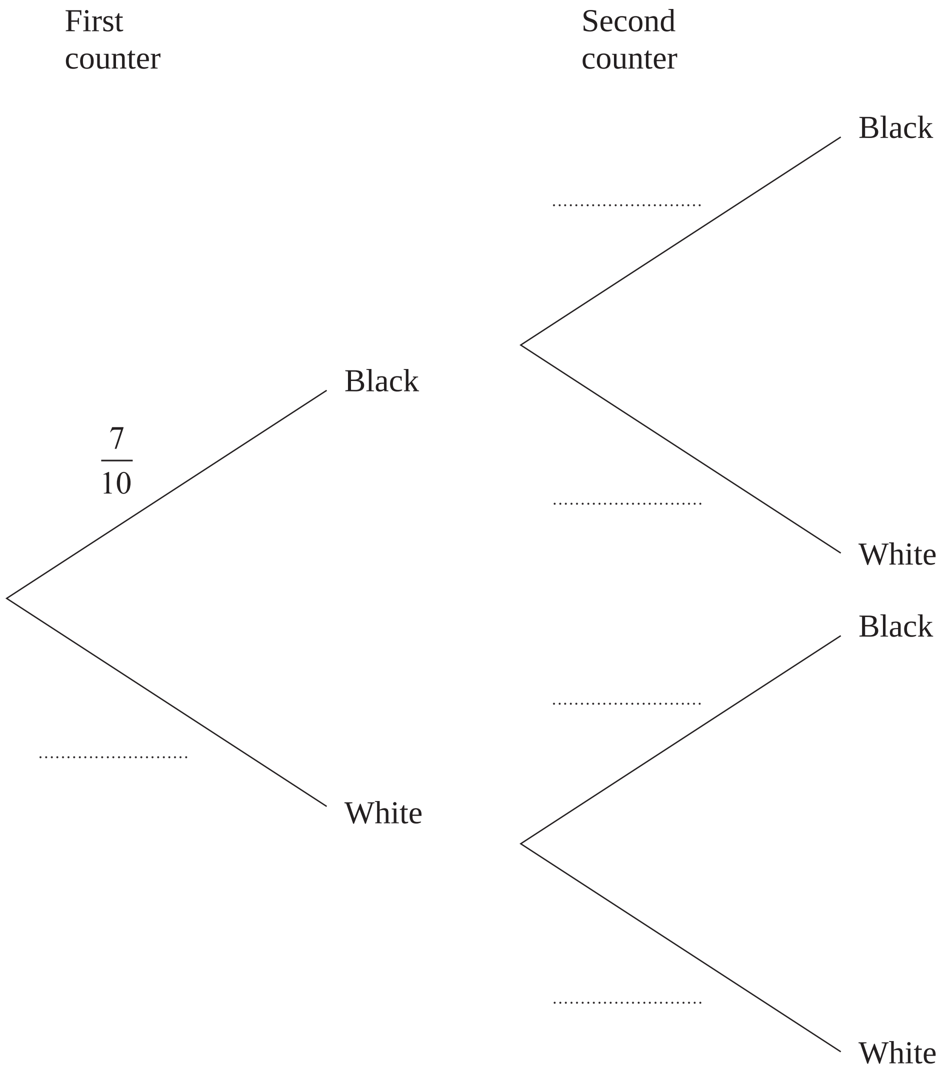
Question 4 continued

(Total for Question 4 is 6 marks)

5 A bag contains 10 counters. Of these counters, 7 are black and 3 are white.
Two of these counters are to be taken at random, without replacement, from the bag.

(a) Complete the probability tree diagram.

(3)



(b) Find the probability that the two counters taken are of different colours.

(3)

....

....

....

....

....

....

Question 5 continued

(Total for Question 5 is 6 marks)

6 The two functions, f and g, are defined as

$$f : x \mapsto 1 - 2x$$

$$g : x \mapsto 2x^2 - 5$$

(a) Find the value of

(i) $f\left(-\frac{2}{3}\right)$

(ii) $g(\sqrt{7})$

(2)

(b) Copy and complete $f^{-1} : x \mapsto \ldots$

(2)

(c) Show that $gf(x) = 8x^2 - 8x - 3$

(2)

(d) Solve the equation $gf(x) = 45$

(4)

Question 6 continued

(Total for Question 6 is 10 marks)

7 A high-speed train runs between the cities of Tokyo and Osaka. The distance between these two cities is 400 km. A train leaves Tokyo for Osaka and travels at an average speed of x km/h.

(a) Write down an expression in terms of x for the time taken, in hours, for this journey.

(1)

On the return journey from Osaka to Tokyo, the train travels at an average speed of $(x - 60)$ km/h.

(b) Write down an expression in terms of x for the time taken, in hours, for the return journey.

(1)

The train took 20 minutes longer to return to Tokyo than it took to travel from Tokyo.

(c) Express 20 minutes as a fraction of an hour.

(1)

(d) Hence write down an equation in x for the information about the journey times.

(1)

(e) Solve your equation to find the average speed of the train on its journey from Tokyo to Osaka.

(4)

Mr Stephenson is on holiday in Japan and he bought a 7-day rail pass.
The price of the rail pass is 28 300 Japanese yen.
Mr Stephenson paid for the rail pass in United States dollars.
The exchange rate was 1 United States dollar = 92.35 Japanese yen.

(f) Calculate how much, in United States dollars to the nearest dollar, Mr Stephenson paid for his 7-day rail pass.

(3)

Question 7 continued

Question 7 continued

Question 7 continued

(Total for Question 7 is 11 marks)

8

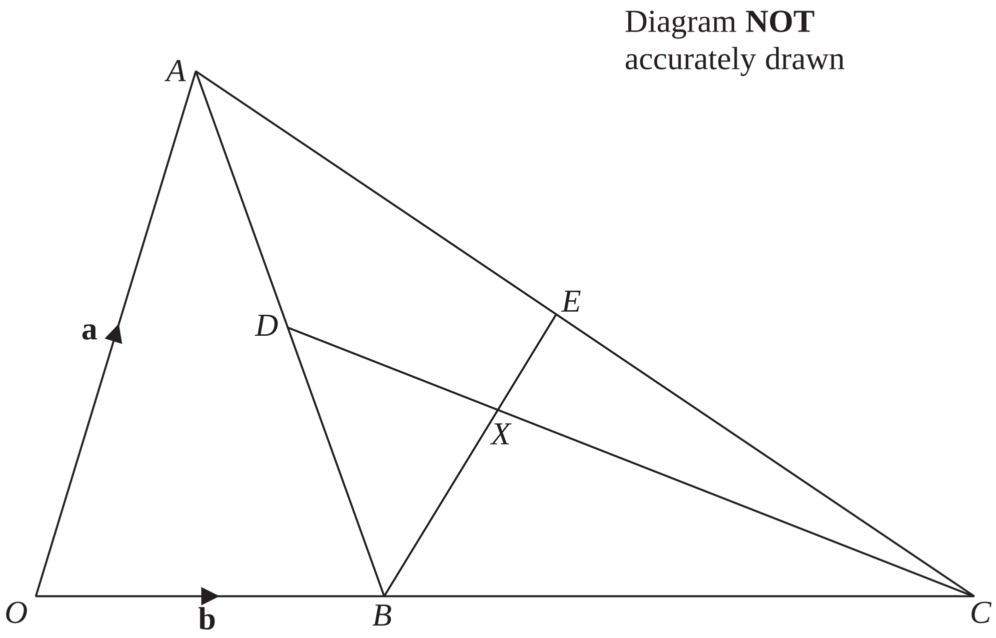


Figure 1

In Figure 1, OAC is a triangle. The point B is on OC such that $OB : OC = 1 : 4$

$\overrightarrow{OA} = \mathbf{a}$, $\overrightarrow{OB} = \mathbf{b}$, D is the midpoint of AB and E is the midpoint of AC.

(a) Find, in terms of **a** or **b** or **a** and **b**, simplifying your answers where possible,

(i) $\overrightarrow{OC}$, (ii) $\overrightarrow{BA}$, (iii) $\overrightarrow{BE}$, (iv) $\overrightarrow{CD}$.

(6)

The point of intersection of BE and CD is X such that $\overrightarrow{BX} = \mu\overrightarrow{BE}$.

(b) Write down an expression for $\overrightarrow{BX}$ in terms of μ, **a** and **b**.

(1)

Given also that $\overrightarrow{CX} = \lambda\overrightarrow{CD}$,

(c) write down and simplify an expression for $\overrightarrow{BX}$ in terms of λ, **a** and **b**.

(2)

(d) Using your two expressions for $\overrightarrow{BX}$, find the value of λ and find the value of μ.

(3)

Question 8 continued

Question 8 continued

Question 8 continued

(Total for Question 8 is 12 marks)

9 The points (–5, –4), (–5, –6) and (–2, –4) are the vertices of triangle *P*.

(a) On the grid opposite, draw and label triangle *P*.

(1)

Triangle *Q* is the image of triangle *P* under a reflection in the line with equation $y = -1$

(b) On the grid, draw and label the line of reflection.

(1)

(c) On the grid, draw and label triangle *Q*.

(1)

Triangle *Q* is transformed to triangle *R* under the transformation with matrix **M** where

$$\mathbf{M} = \begin{pmatrix} -1 & -1 \\ 1 & 3 \end{pmatrix}$$

(d) On the grid, draw and label triangle *R*.

(3)

(e) On the grid, translate triangle *R* by the vector $\begin{pmatrix} 4 \\ -12 \end{pmatrix}$. Label this triangle *S*.

(2)

Triangle *S* is transformed to triangle *T* under the transformation with matrix **N** where

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

(f) On the grid, draw and label triangle *T*.

(3)

(g) Describe fully the single transformation which maps triangle *T* onto triangle *P*.

(2)

....

....

....

....

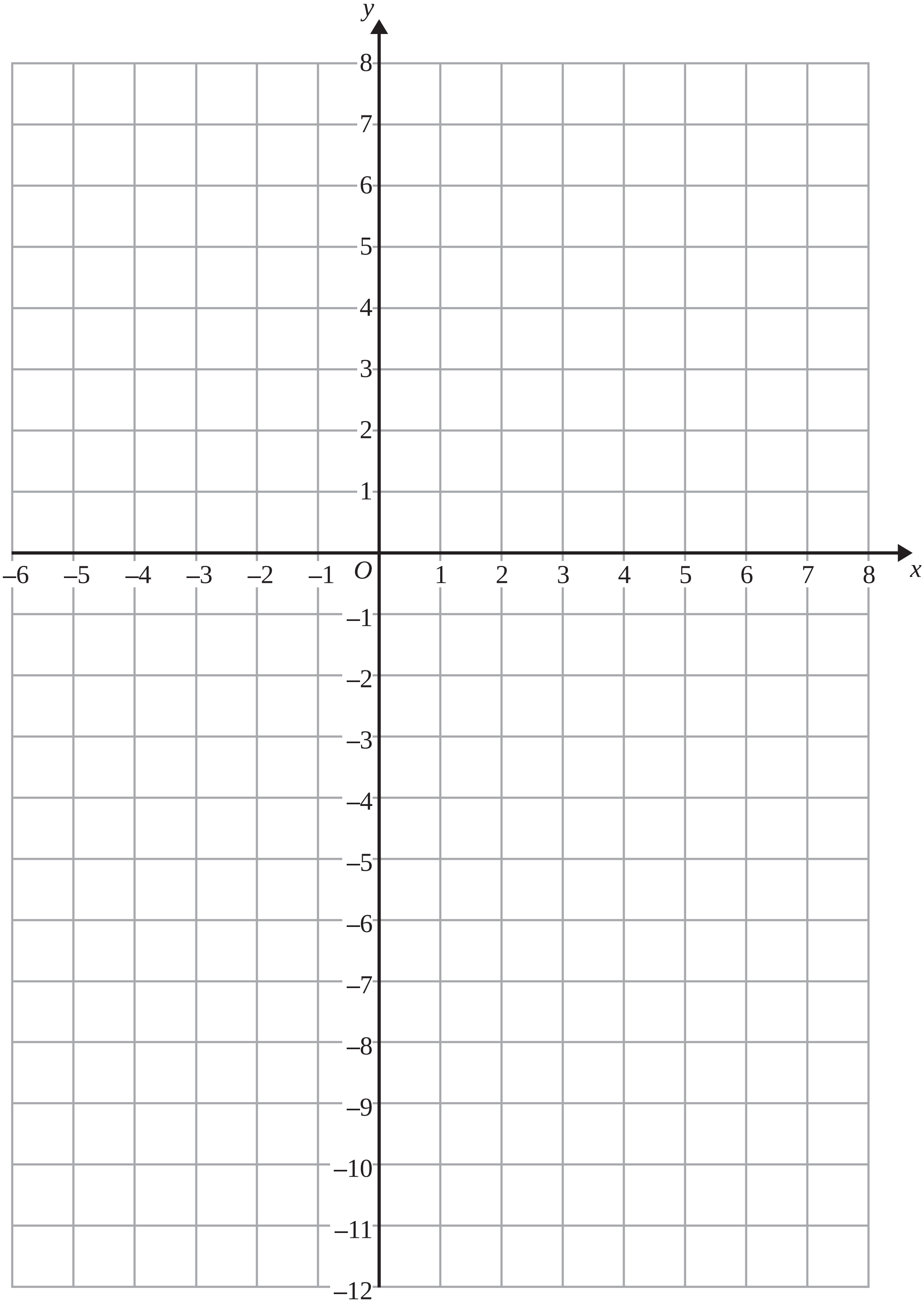
....

....

....

....

Question 9 continued



Question 9 continued

Question 9 continued

(Total for Question 9 is 13 marks)

10

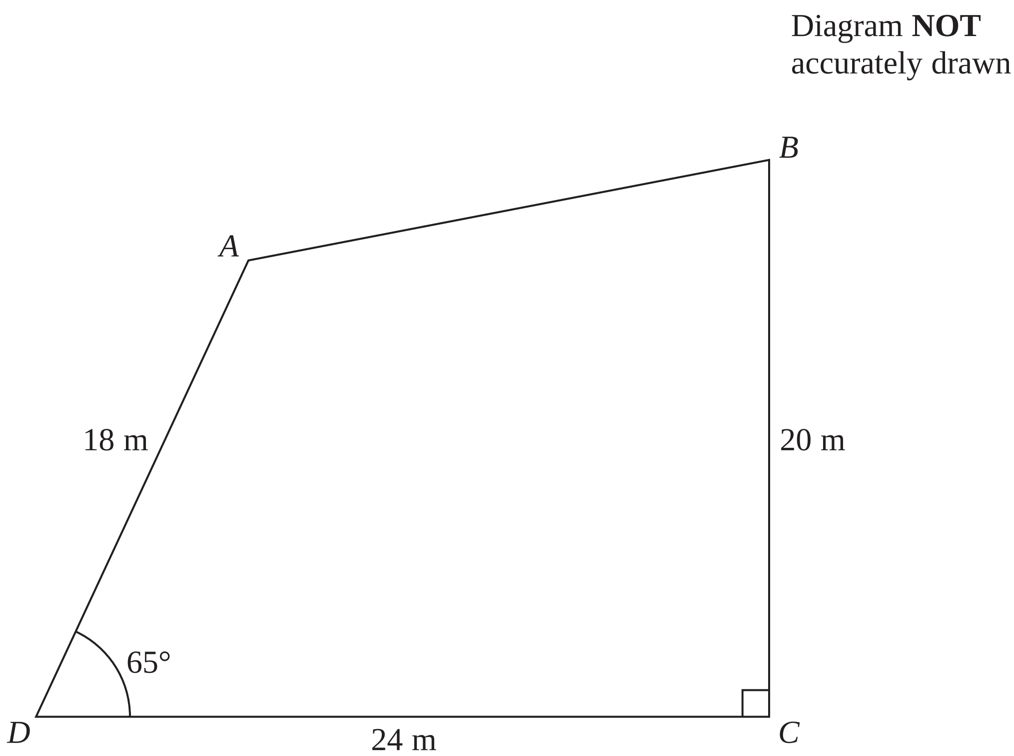


Figure 2

Figure 2 shows a quadrilateral *ABCD* with $AD = 18$ m, $DC = 24$ m and $BC = 20$ m.
$\angle ADC = 65°$ and $\angle DCB = 90°$.

Giving all your answers to 3 significant figures, calculate

(a) the length, in m, of *AC*

(3)

(b) the size, in degrees, of $\angle ACD$

(3)

(c) the area, in m^2, of triangle *ABC*

(3)

(d) the area, in m^2, of triangle *ADB*

(4)

[Cosine rule: $a^2 = b^2 + c^2 - 2bc\cos A$ Sine rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$]

[Area of triangle $= \frac{1}{2}bc\sin A$]

....

....

....

....

Question 10 continued

Question 10 continued

Question 10 continued

(Total for Question 10 is 13 marks)

11

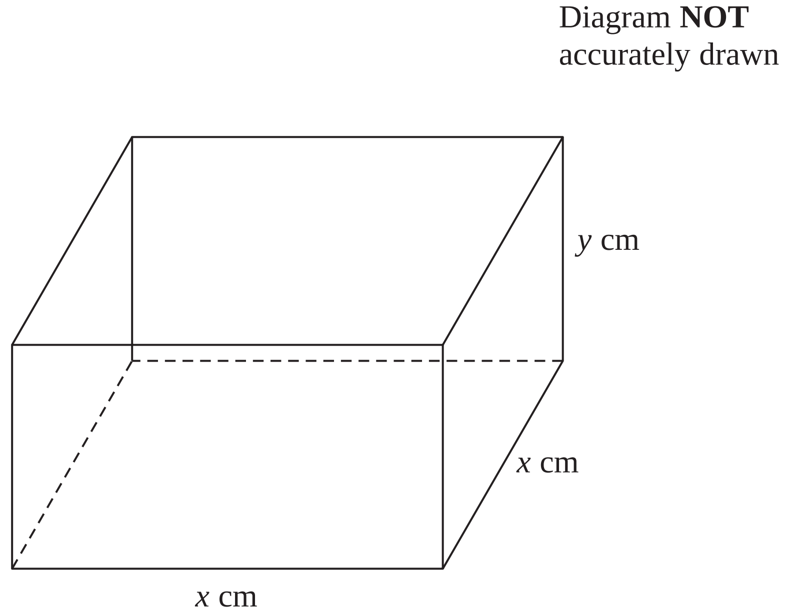


Figure 3

Figure 3 shows a metal box with no top. The four sides and the base of the box are to be cut from a single rectangular sheet of metal of width x cm as shown in Figure 4.

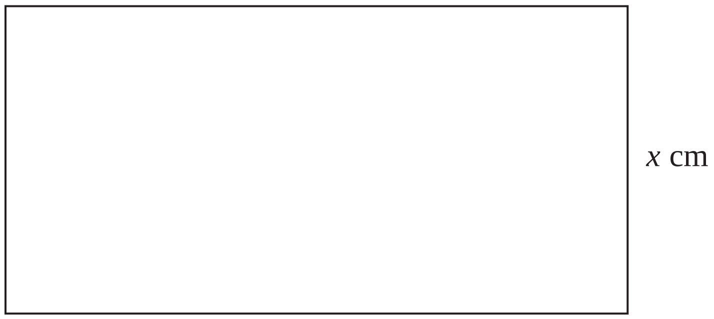


Figure 4

Assuming that no metal is wasted when the box is made, find an expression, in terms of x and y for

(a) the length, in cm, of the sheet of metal,

(1)

(b) the area, in cm^2, of the sheet of metal.

(1)

The area of the sheet of metal is S cm^2 and the volume of the metal box is 40 cm^3.

(c) Show that $S = x^2 + \dfrac{160}{x}$

(2)

(d) Find, by differentiating, the value of x for which the area of the metal sheet is a minimum. Give your answer to 1 decimal place.

(4)

P 4 3 0 7 1 A 0 2 8 3 2

Question 11 continued

Question 11 continues on the next page.

Question 11 continued

(e) For $S = x^2 + \frac{160}{x}$ complete the following table giving your values of S to one decimal place where necessary.

x	1	2	3	4	5	6	7
x^2	1			16		36	49
$\frac{160}{x}$	160			40		26.7	22.9
S	161			56		62.7	71.9

(3)

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

(3)

(g) Using your curve, find a value of x when $S = 75$

(2)

....

....

....

....

....

....

....

....

....

....

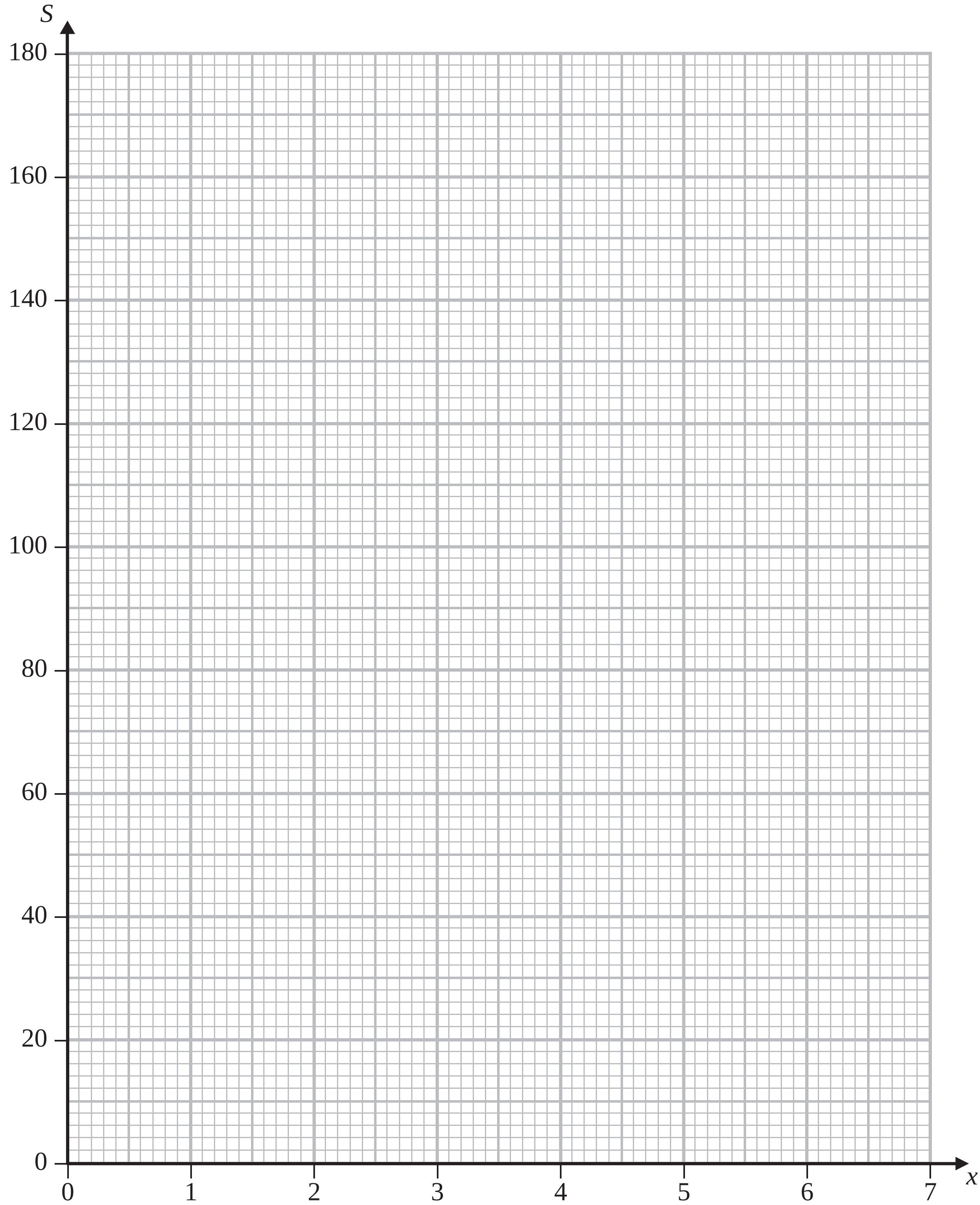
....

....

....

....

Question 11 continued



(Total for Question 11 is 16 marks)

TOTAL FOR PAPER IS 100 MARKS

BLANK PAGE

Do NOT write on this page.