5MB3H/01

Edexcel GCSE
Mathematics B (Modular) – 2MB01
Paper 3H (Calculator)
Higher Tier
Practice Paper A
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

- 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 π button, take the value of π to be 3.142 unless the question instructs otherwise.

Information

- 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

- 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.

Show even more working than usual.

*1. Here is part of Mr. Jones' electricity bill.

Electricity Bill

Mr A. Jones
23 The Street
Lavenham
CO 10 1XY

Seelec
Electricity for
the South East

Date of meter reading	Reading in units					Cost per unit
Jan. 31st 2011	2	5	1	9	2	11.45p
April 31st 2011	2	7	0	6	5	

Find the total cost for Mr Jones' electricity bill.

Units used = 27065 − 25192 = 1873 units.

Cost = 1873 units × 11.45p/unit = 21445.85p

≈ 21446p

= £214.46

NOT £214.46p !!

Total for Question 1 is 5 marks

2. Here is a travel graph of Siân's journey from her house to the library and back to her house.
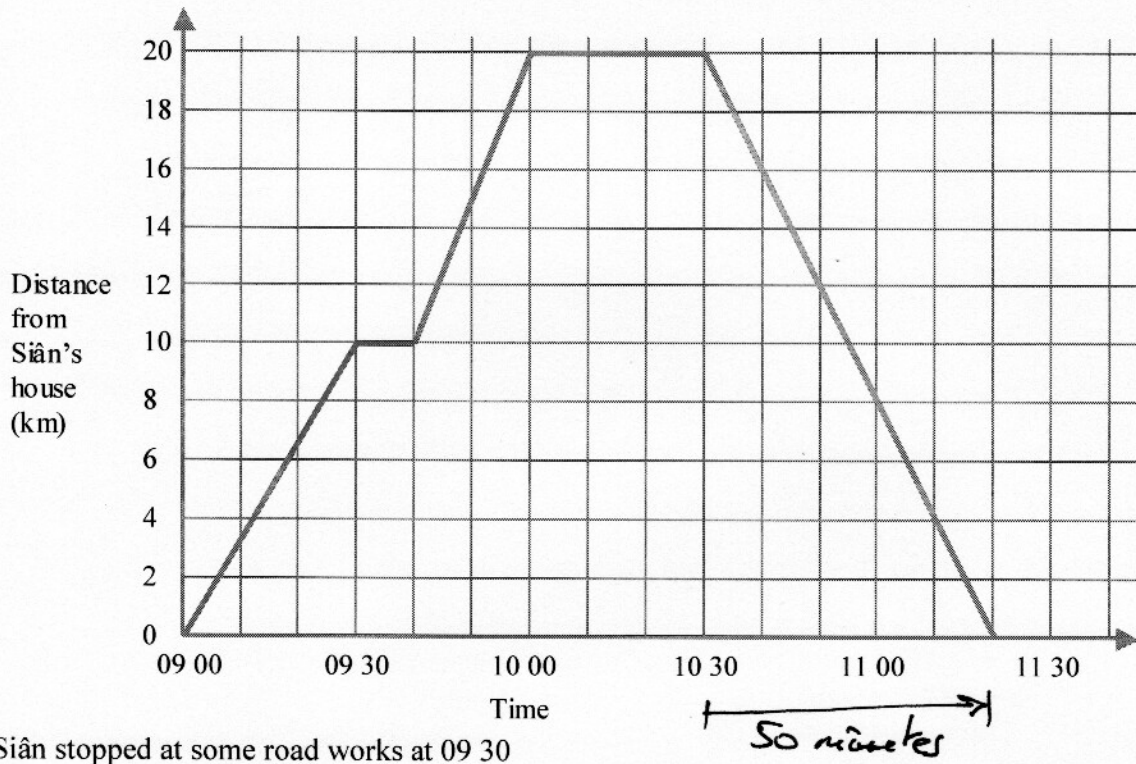
Siân stopped at some road works at 09 30

(a) For far is Siân from her house at 09 30?

...**10**...km
(1)

The library is 20 km from Siân's house.

(b) (i) At what time did Siân arrive at the library?

10:00

(ii) How long did Siân spend at the library?

...**30**... minutes
(2)

Siân left the library to travel back to her house.
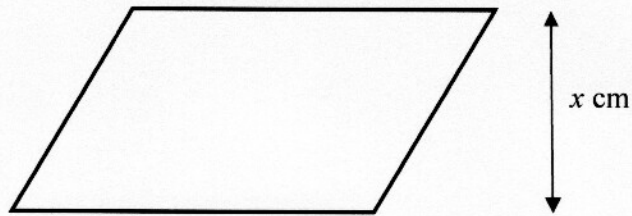
(c) At what time did Siân arrive back at her house?

11:20
(1)

(d) At what speed did Siân travel on her way back from the library?

Speed = $\frac{distance}{time}$ = $\frac{20\ km}{50\ min}$ = 0.4 km/min   ...**24**... km/h
(2)

= 0.4 km/min × $\left(\frac{60\ min}{1\ hr}\right)$ = 24 km/h   **(Total for Question 2 is 6 marks)**
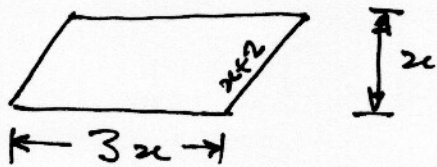
3. Here is a parallelogram.

The height of the parallelogram is x cm.
The perimeter of the parallelogram is 44 cm.

The length of the parallelogram is three times as long as the height.
The slant length of the parallelogram is 2 cm longer than the height.

Find the area of the parallelogram.

$$\text{Perimeter} = 2(3x + x+2) = 2(4x+2) = 44\,cm$$
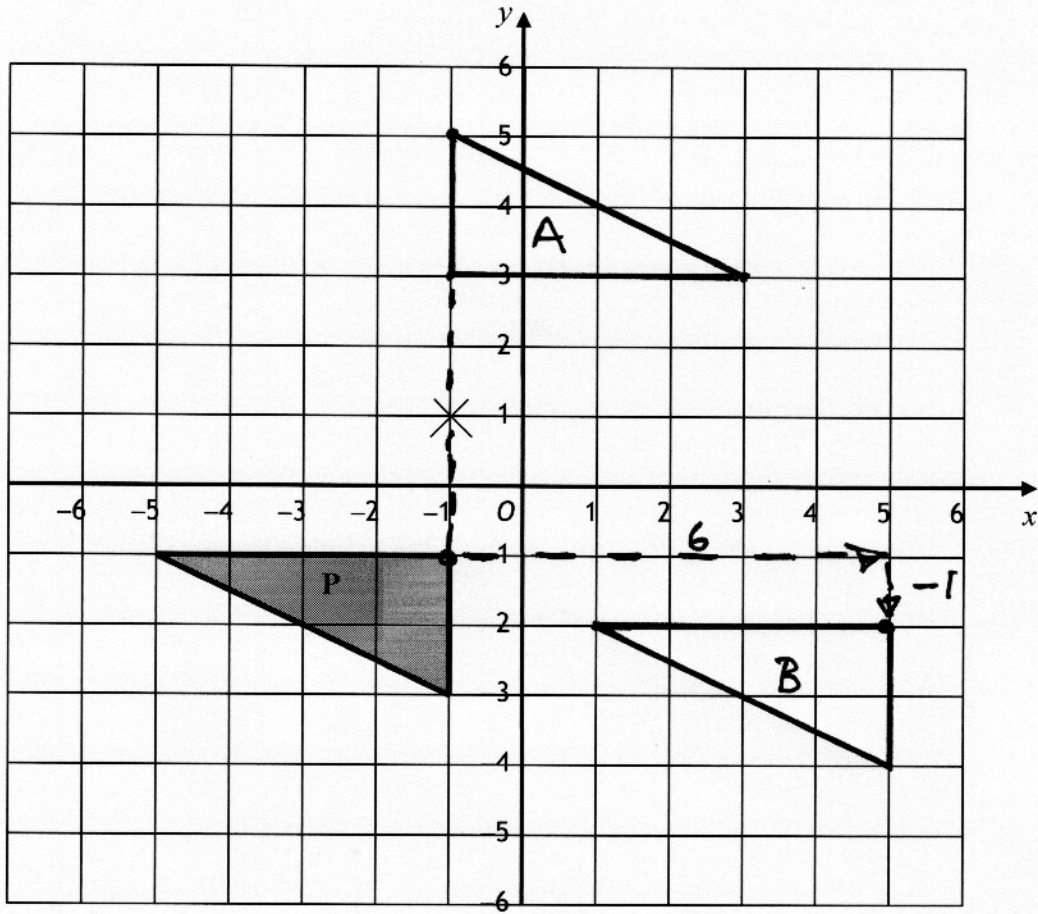
$$\therefore 4x+2 = \frac{44}{2} = 22\,cm$$

$$4x = 20\,cm, \qquad x = 5\,cm.$$

$$\text{Area} = 3x \times x = 15 \times 5 = 75\,cm^2$$

.......75....... cm²

(Total for Question 3 is 5 marks)

4.

(a) Rotate triangle **P** 180° about the point (−1, 1).
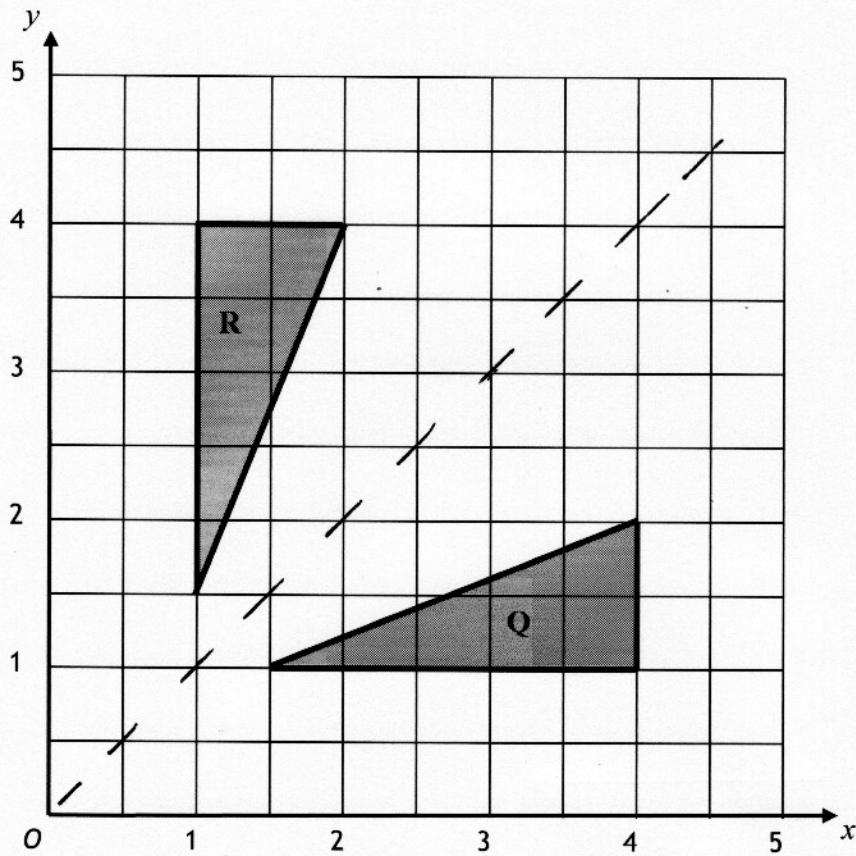
Label the new triangle **A**.

(2)

(b) Translate triangle **P** by the vector $\begin{pmatrix} 6 \\ -1 \end{pmatrix}$.

Label the new triangle **B**.

(2)

(c)   Describe the single transformation that moves shape **Q** to shape **R** .

Reflection in the line $y = x$

(2)

(Total for Question 4 is 6 marks)

5. The equation

$$x^3 + 2x = 60$$

has a solution between 3 and 4

Use a trial and improvement method to find this solution.
Give your answer correct to 1 decimal place.
You must show **all** your working.

x	$x^3 + 2x$	
3.5	49.875	too small
4	72	too big
3.75	60.234	too big
3.7	58.053	too small

The solution lies between 3.7 and 3.75 so it rounds to 3.7 to 1 decimal place

$x = $ ......3.7......

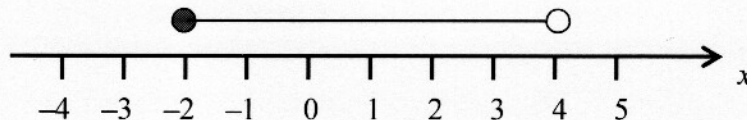**(Total for Question 5 is 4 marks)**

6. (a) $-5 < n \le 2$

n is an integer

Write down all the possible values of n.

$-4, -3, -2, -1, 0, 1, 2$

(2)

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

Write down the inequality.

$-2 \le x < 4$

(2)

(Total for Question 6 is 4 marks)

7. Sally buys 2 tyres for her car.

The tyres cost £85 each plus VAT at 20%.

She has to pay £18 plus VAT at 20% to have the two tyres fitted.

Work out the total cost of the tyres and having them fitted.

$$(2 \times 85 + 18) \times 1.2 = £225.60$$

£ ....225.60....

(Total for Question 7 is 4 marks)

8. Jonty is going to completely fill an empty tank with water.
The tank holds 2 m³.

How many litres of water does he need?

$$1 \text{ litre} = 1000 \text{ cm}^3$$
$$1 \text{ m}^3 = 1000000 \text{ cm}^3$$

∴ 1000 litres = 1 m³

....2000.... litres

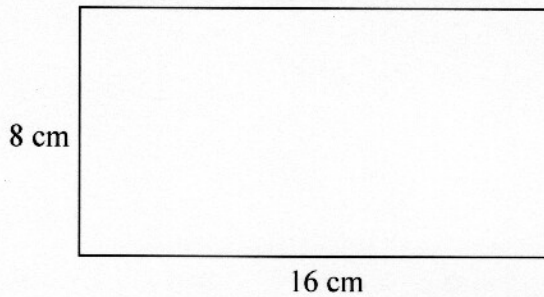**(Total for Question 8 is 3 marks)**

9. Here is a rectangle.

8 cm

16 cm

Diagram **NOT**
accurately drawn

Find the length of a diagonal of the rectangle.
Give your answer correct to 2 decimal places.

$$\sqrt{8^2+16^2} \approx 17.8885 \text{ cm}$$
$$= 17.89 \text{ cm} \text{ to } 2 \text{ d.p.}$$

...17.89... cm

(Total for Question 9 is 3 marks)

10. Light travels at 186 000 miles per second.

A light year is the distance light can travel in a year of $365\frac{1}{4}$ days.

How many miles are there in one light year?
Give your answer in standard form.

186000 miles/sec × 3600 seconds/hr
× 24 hrs/day × 365.25 days/yr
= 5.8697136 × 10¹² miles

(= 5.87 × 10¹² miles
to 3 sig. figures).

.... miles

(Total for Question 10 is 3 marks)

11. (a) Complete the table of values for $y = x^2 - 3x - 1$

x	-2	-1	0	1	2	3	4
y	9	3	-1	-3	-3	-1	3

(2)

(b) On the grid draw the graph of $y = x^2 - 3x - 1$ for values of x from -2 to 4
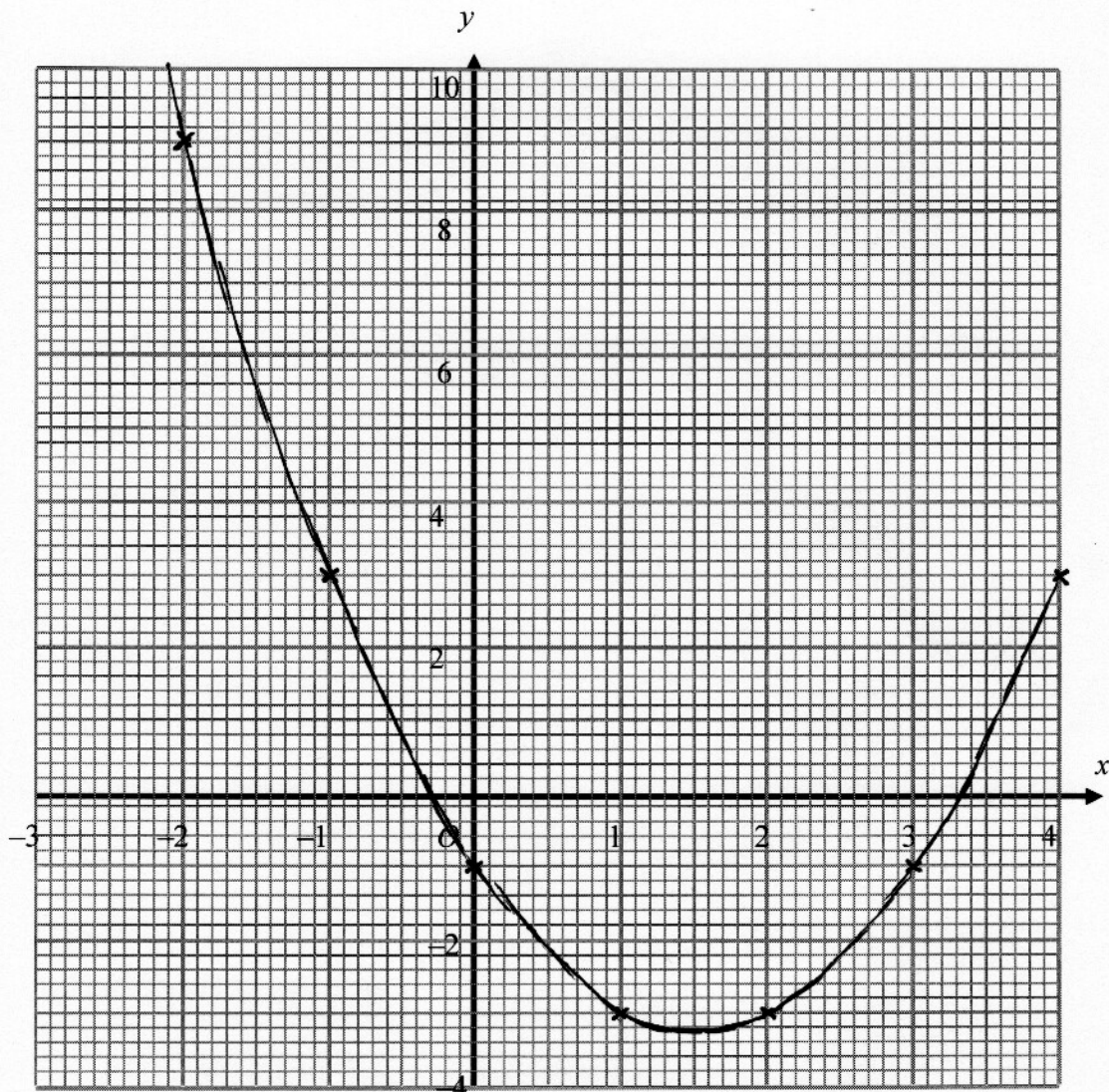
(2)

(c) Solve the equation $x^2 - 3x = 4$

$$x^2 - 3x - 4 = 0$$

$$(x - 4)(x + 1) = 0$$

$x = -1, \quad x = 4$

(2)
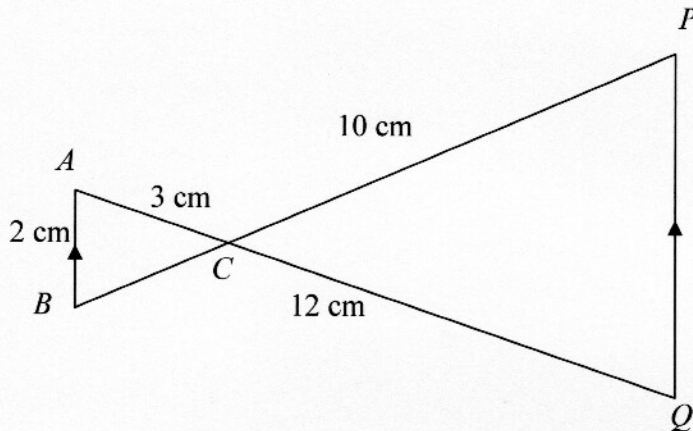
(Total for Question 11 is 6 marks)

12.

P

10 cm

A

3 cm

2 cm

C

B

12 cm

Q

Diagram **NOT** accurately drawn

ACQ and *BCP* are straight lines.
AB is parallel to *PQ*.
AB = 2 cm.
AC = 3 cm.
CQ = 12 cm.
CP = 10 cm.

(a) Work out the length of *PQ*.

$\triangle$ CPQ is similar to CBA, rotated 180° about C and enlarged. So AC $\rightarrow$ CQ

$$PQ = \left(\frac{12}{3}\right) \times 2\,cm = 4 \times 2\,cm$$

or $\dfrac{AB}{AC} = \dfrac{PQ}{CQ}$, $\dfrac{2}{3} = \dfrac{PQ}{12}$, $PQ = 12 \times \dfrac{2}{3}$
$= 8\,cm$.

............8........ cm

(2)

(b) Work out the length of *BP*.

First find BC:

$$BC = \left(\frac{3}{12}\right) \times 10\,cm = 2.5\,cm$$

$$BP = 2.5 + 10 = 12.5\,cm$$

............12.5........ cm
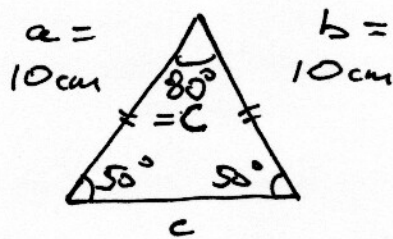
(3)

(Total for Question 12 is 5 marks)

13. Here is an isosceles triangle.

10 cm

50°
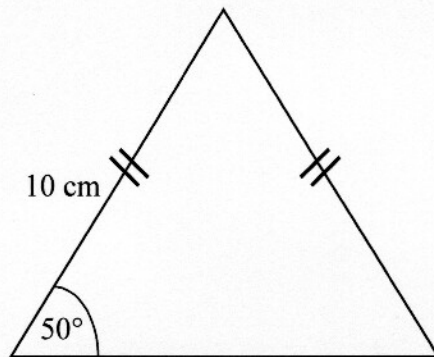
Find the area of the triangle.
Give your answer correct to 3 significant figures.

$a =$ 10cm

$b =$ 10cm

80°

$x = C$

50° 50°

c

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

$= \frac{1}{2} \times 10 \times 10 \times \sin 80°$

$= 49.24038765 \, cm^2$

$= 49.2 \, cm^2$ to

3 significant figures

.........49.2..........cm^2

(Total for Question 13 is 6 marks)

14. Sally buys a car for £4900

She saves 30% on the original price of the car.

What was the original price of the car?

She is paying 70% of the original price "P".

$$0.7P = 4900$$

$$P = \frac{4900}{0.7} = £7000$$

£ .7000

(Total for Question 14 is 3 marks)

15. The volumes of two mathematically similar solids are in the ratio   27 : 125

The surface area of the smaller solid is 36 cm^2.

Work out the surface area of the larger solid.

volume $\propto$ length^3 ,   area $\propto$ length^2

$\therefore$ area $\propto$ volume$^{2/3}$

Surface area = $\left(\frac{125}{27}\right)^{2/3} \times 36$ cm^2

$= \frac{25}{9} \times 36$ cm^2

$= 100$ cm^2

....100..... cm²

(Total for Question 15 is 3 marks)

16. The length of a rectangle is 6.7 cm, correct to 2 significant figures.

(a) For the length of the rectangle write down

(i) the upper bound,

6.75 cm

(ii) the lower bound.

6.65 cm

(2)

The area of the rectangle is 26.9 cm², correct to 3 significant figures.

*(b) Calculate the upper and lower bound for the width of the rectangle.

Upper bound of area = 26.95 cm²

Lower bound " " = 26.85 cm²

Upper bound for width = $\frac{biggest\ area}{smallest\ length}$ = $\frac{26.95\ cm^2}{6.65\ cm}$

= $4\frac{1}{19}$ cm ≈ 4.05263 cm

Lower bound for width = $\frac{smallest\ area}{biggest\ length}$ = $\frac{26.85}{6.75}$

= $3\frac{44}{45}$ ≈ 3.977 cm

(3)

*(c) Write down the width of the rectangle to an appropriate degree of accuracy.
You must give reasons for your answer.

Strictly speaking, since the width can be >4.05 cm, one cannot write it as 4.0 cm to 2 sig. figs — it has to be 4 cm.
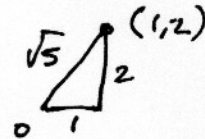
[The probability of it being >4.05 though is probably small, ≈ 0.035, so one could argue that 4.0 cm gives a more useful indication of the accuracy].

(2)

(Total for Question 7 is marks)

*17. Explain why any straight line that passes through the point (1, 2) must intersect the curve with equation $x^2 + y^2 = 16$ at two points.
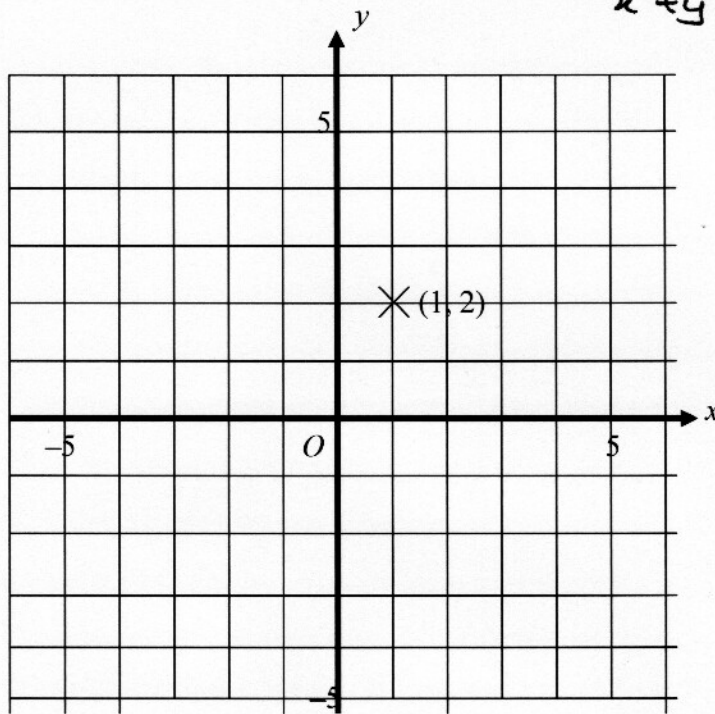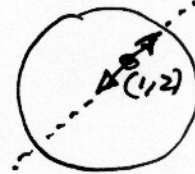
$x^2 + y^2 = 4^2$ is the equation of a circle, radius 4, centred on the origin.

The point (1, 2) is inside the circle since $\sqrt{5} = 2.236 < 4$.

The line extends in 2 directions so cuts it twice.

(Total for Question 17 is 3 marks)

18. Solve the equation

$$\frac{3}{x+3} - \frac{4}{x-3} = \frac{5x}{x^2-9}$$

Left side:

$$\frac{3}{x+3} - \frac{4}{x-3} = \frac{3(x-3) - 4(x+3)}{(x+3)(x-3)} = \frac{3x-9-4x-12}{x^2-9}$$

$$\therefore \frac{-x-21}{x^2-9} = \frac{5x}{x^2-9} \quad \} \text{ same denominators } \therefore \text{ same numerators}$$

$$\therefore 6x = -21$$

$$x = -3.5$$

$x = \underline{-3.5}$

(Total for Question 18 is 4 marks)

TOTAL FOR PAPER = 80 MARKS