Candidate Name	Centre Number	Candidate Number

WELSH JOINT EDUCATION COMMITTEE

General Certificate of Secondary Education

CYD-BWYLLGOR ADDYSG CYMRU

Tystysgrif Gyffredinol Addysg Uwchradd

184/10

MATHEMATICS

HIGHER TIER PAPER 2

A.M. FRIDAY, 9 November 2007

(2 Hours)

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1	**5**	
2	**4**	
3	**3**	
4	**4**	
5	**3**	
6	**3**	
7	**4**	
8	**4**	
9	**5**	
10	**6**	
11	**5**	
12	**8**	
13	**3**	
14	**3**	
15	**5**	
16	**2**	
17	**7**	
18	**6**	
19	**7**	
20	**7**	
21	**6**	
TOTAL MARK		

ADDITIONAL MATERIALS

A calculator will be required for this paper.

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided.

Take π as 3·14 or use the π button on your calculator.

INFORMATION FOR CANDIDATES

You should give details of your method of solution especially when a calculator is used.

Unless stated, diagrams are not drawn to scale.

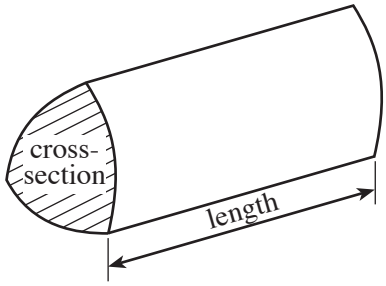
Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

No certificate will be awarded to a candidate detected in any unfair practice during the examination.

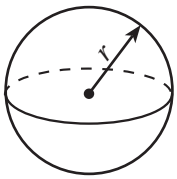
Formula List

Volume of prism = area of cross-section × length



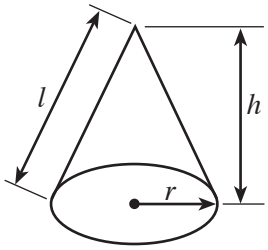
Volume of sphere $= \frac{4}{3}\pi r^3$

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



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

Curved surface area of cone $= \pi rl$

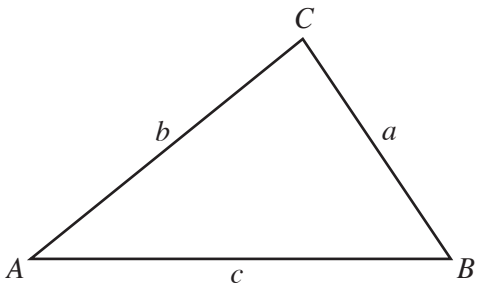


In any triangle ABC

Sine rule $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

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

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



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$

where $a \neq 0$ are given by

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

Standard Deviation

Standard deviation for a set of numbers

$x_1, x_2, \ldots, x_n$, having a mean of $\bar{x}$ is given by

$$s = \sqrt{\frac{\sum (x - \bar{x})^2}{n}} \quad \textbf{or} \quad s = \sqrt{\frac{\sum x^2}{n} - \left\{\frac{\sum x}{n}\right\}^2}$$

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1. The table shows some of the values of $y = x^2 + 2x - 4$ for values of x from –3 to 3.

(a) Complete the table by finding the value of y for $x = -1$.

x	–3	–2	–1	0	1	2	3
$y = x^2 + 2x - 4$	–1	–4		–4	–1	4	11

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[1]

(b) On the graph paper opposite, draw the graph of $y = x^2 + 2x - 4$ for values of x between –3 and 3.

[2]

(c) Draw the line $y = -3$ on your graph paper and write down the x-values of the points where your two graphs intersect.

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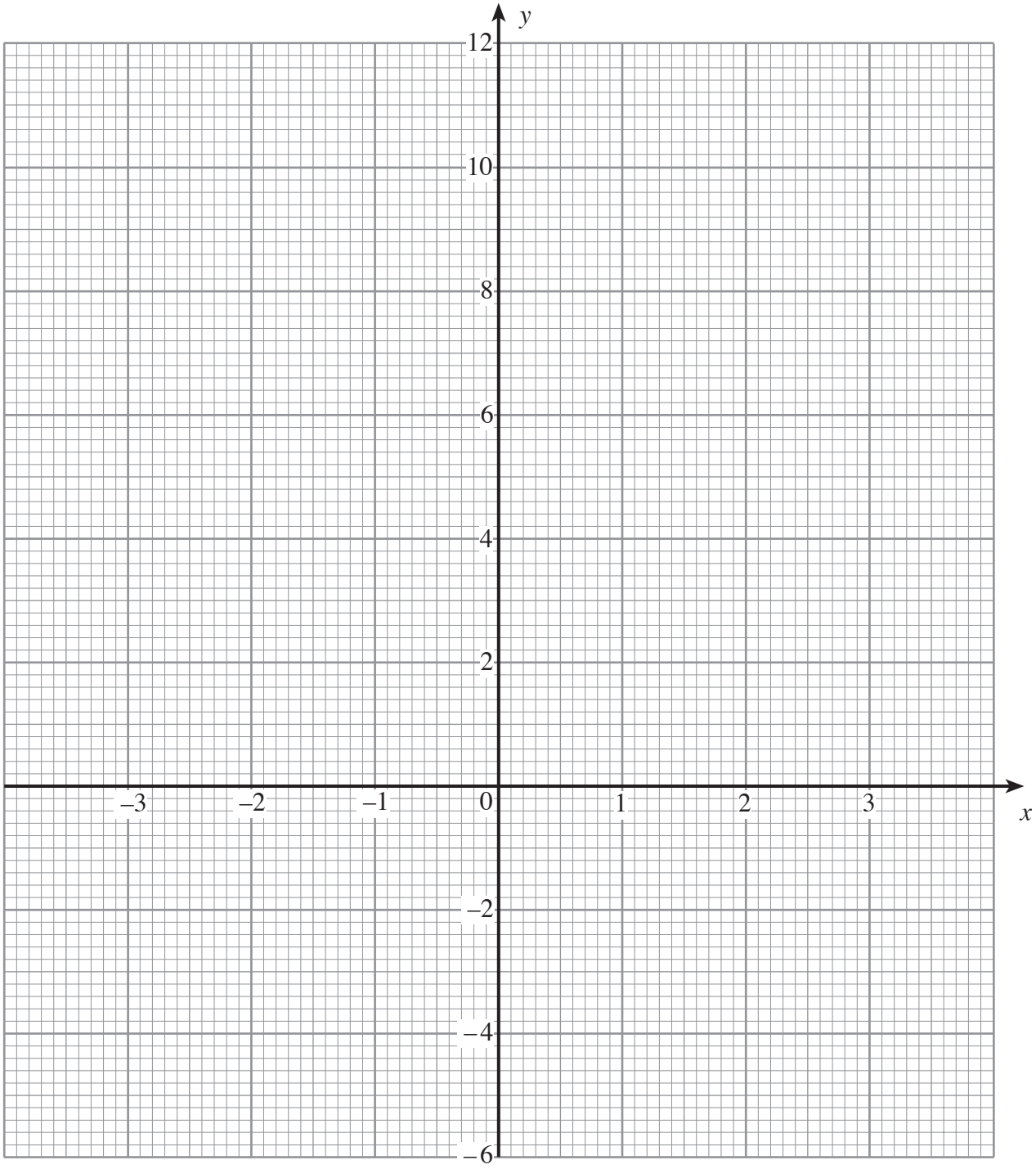
[2]

For use with question 1



2. In the diagram below, *A*, *B* and *C* are three points on a circle with centre *O*. The angle at *B* is a right-angle, *AB* = 5·7 cm and *BC* = 9·4 cm.

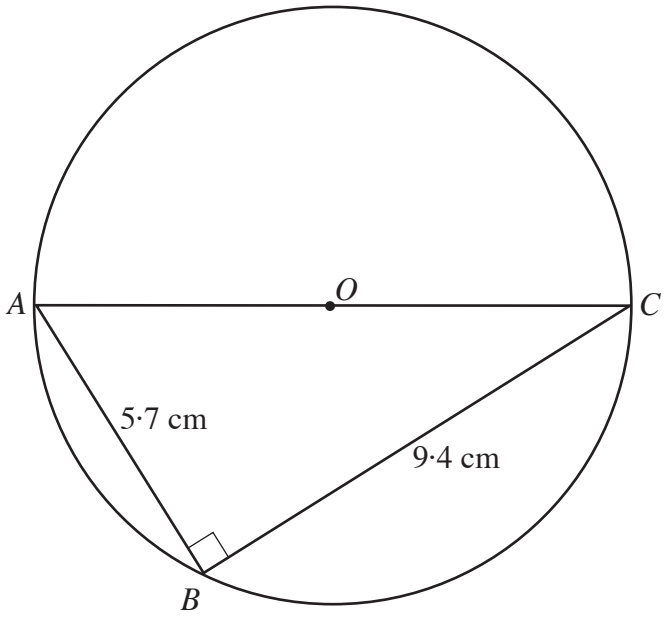


Diagram not drawn to scale.

Calculate the length of the radius of the circle.

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[4]

3. Mair has 90 apple trees.
She records the total weight of apples, measured to the nearest kilogram, on each tree.
The following is a grouped frequency table of her results.

Weight of apples per tree (to the nearest kg)	Number of trees	Class mid-point
31 to 40	7	35·5
41 to 50	14	45·5
51 to 60	20	55·5
61 to 70	27	65·5
71 to 80	18	75·5
81 to 90	4	85·5

Calculate an estimate of the mean weight of apples obtained from a tree.

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[3]

4. Find the compound interest, to the nearest penny, when £5000 is invested for 3 years at 6% per annum.

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[4]

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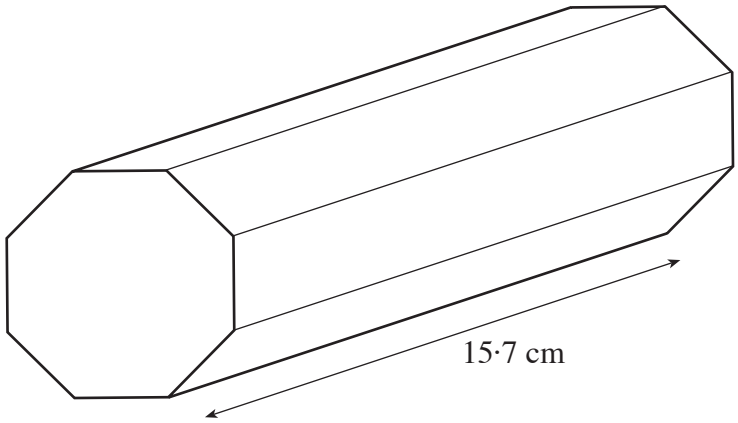

Diagram not drawn to scale.

The diagram represents a prism with a uniform cross-section of area 36·4 cm^2.
The prism is 15·7 cm long and has a mass of 5·12 kg.
Find the density, in g/cm^3, of the material from which the prism has been made.

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[3]

6. In a sale, a discount of 30% was offered on televisions. One television was sold for £574. What was the price of the television before the sale discount?

[3]

7. A solution to the equation

$$x^3 - 6x - 4 = 0$$

lies between 2·7 and 2·8.

Use the method of trial and improvement to find this solution correct to 2 decimal places.

[4]

8. *(a)* Write **each** of the following numbers in standard form.

(i) 49 800 000

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[1]

(ii) 0·000003

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[1]

(b) Find, in standard form, the value of:

$$(4{\cdot}6 \times 10^{7}) \div (5{\cdot}2 \times 10^{-3})$$

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[2]

9. *(a)* Simplify $4a^5b^2 \times 5ab^4$.

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[2]

(b) Make t the subject in the following.

$$3(4 + t) = 7 + 3u$$

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[3]

10. A building stands on the horizontal ground *ABC*. The point *E* is 23 metres below the top of the building along the vertical face, *DEB*. The point *C* is 46 m from the point *B*. The angle of elevation of the point *E* from the point *C* is 37°.

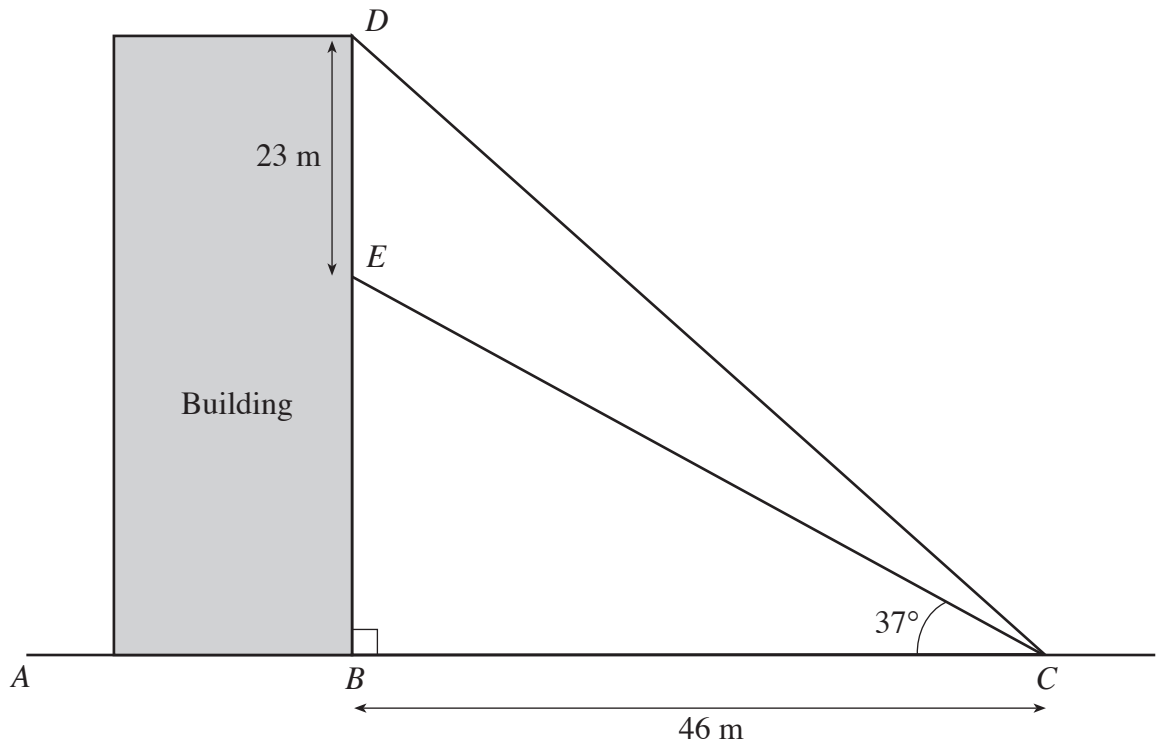

Diagram not drawn to scale.

(a) Calculate the height of the building.

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[3]

(b) Calculate the angle of elevation of the top of the building from the point *C*.

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[3]

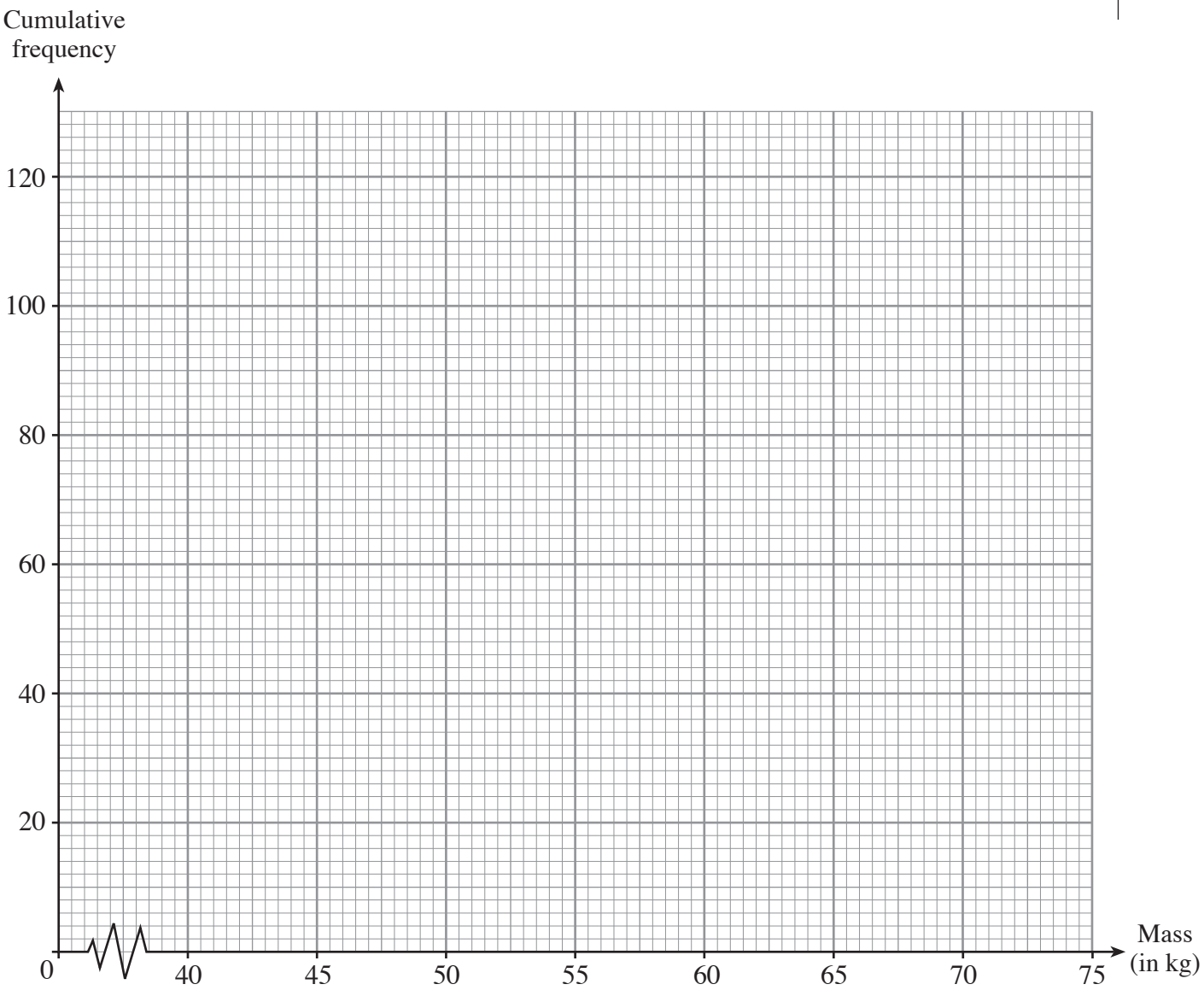
11. The table gives the grouped frequency distribution for the masses, measured to the nearest kilogram, of 100 pupils.

Mass (kg)	36-40	41-45	46-50	51-55	56-60	61-65	66-70
Number of pupils	4	6	16	22	38	10	4

(a) Complete the following cumulative frequency table.

Mass (less than)	40·5	45·5	50·5	55·5	60·5	65·5	70·5
Cumulative frequency							

[1]



(b) On the graph paper provided, draw a cumulative frequency diagram to show this information. [2]

(c) Use your cumulative frequency diagram to find the interquartile range.

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[2]

12. *(a)* A cylinder has a radius of 5 cm and a volume of 2800 cm^3. Find the height of the cylinder. Give your answer to an appropriate degree of accuracy.

[4]

(b) The volume of a sphere is 68·5 cm^3. Calculate the radius of the sphere.

[4]

13. On the graph paper provided, draw the region which satisfies **all** of the following inequalities.

$$\begin{aligned} x + y &\leqslant 5 \\ y - 2x + 1 &\geqslant 0 \\ x &\geqslant -1 \end{aligned}$$

Make sure that you clearly indicate the region that represents your answer.

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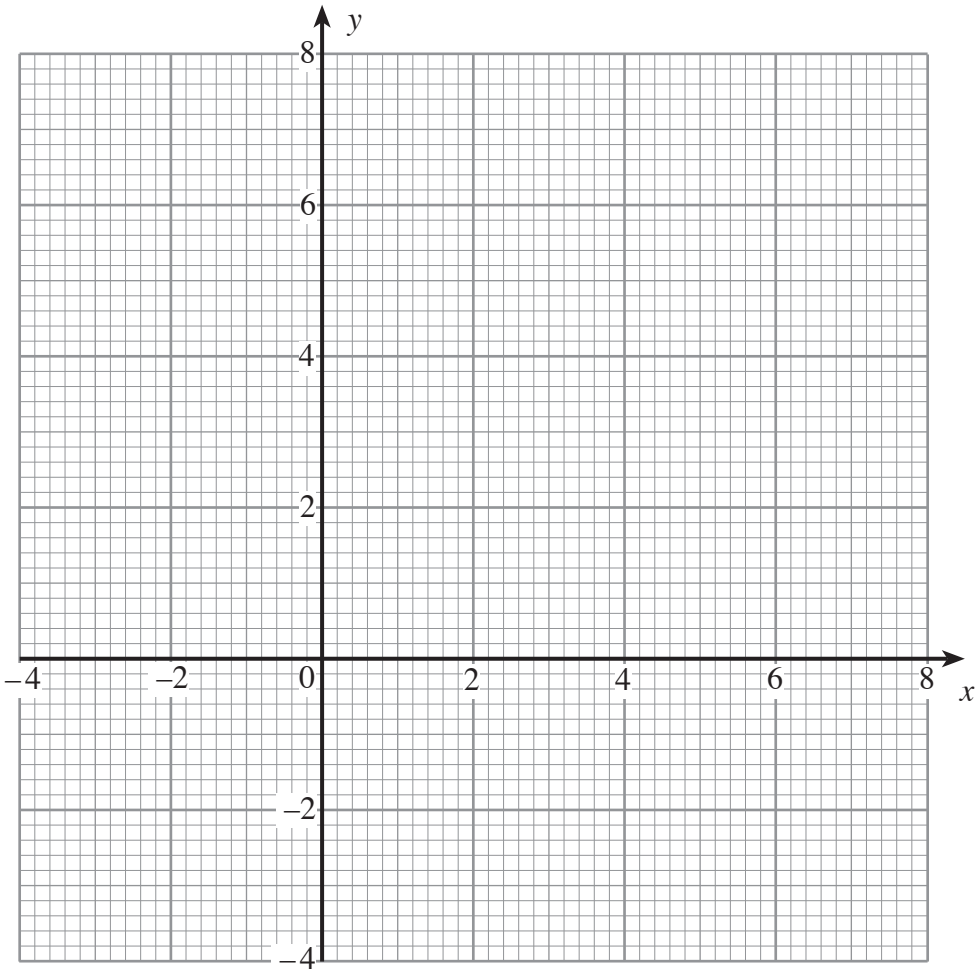
[3]



14. Use the formula method to solve the equation $5x^2 + 11x + 3 = 0$, giving your solutions correct to two decimal places.

[3]

15. Make e the subject of the following formula.

$$f = \frac{e(7+g)}{3-2e}$$

[5]

16. Express $0{\cdot}6\dot{4}\dot{2}$ as a fraction.

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[2]

17. *(a)* (i) Factorise $49x^2 - 100y^2$.

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(ii) Hence simplify $\dfrac{49x^2 - 100y^2}{21x^2 - 30xy}$.

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(b) Factorise the expression $6x^2 + 19x + 10$ and hence solve the equation $6x^2 + 19x + 10 = 0$.

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[3]

18. *(a)* The numbers of absences for 10 pupils in one school year were as follows.

13 3 18 8 0 15 7 8 2 25

Calculate the mean and standard deviation of these numbers.

[3]

(b) The ages of the pupils have a mean of 13·9 years and a standard deviation of 0·8 years. State the mean and the standard deviation of the ages of these pupils in 2 years time. Give a reason for your answer.

[3]

19. The diagram shows triangle *ABC*.

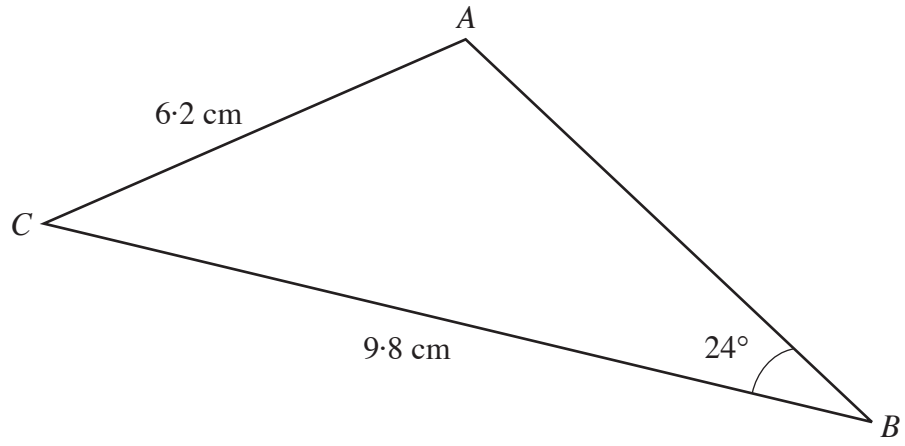

Diagram not drawn to scale.

Given that $AC = 6{\cdot}2$ cm, $CB = 9{\cdot}8$ cm, $A\hat{B}C = 24°$ and $C\hat{A}B$ is an obtuse angle,

(a) show that $A\hat{C}B = 16°$.

[4]

(b) calculate the area of the triangle *ABC* stating the units of your answer.

[3]

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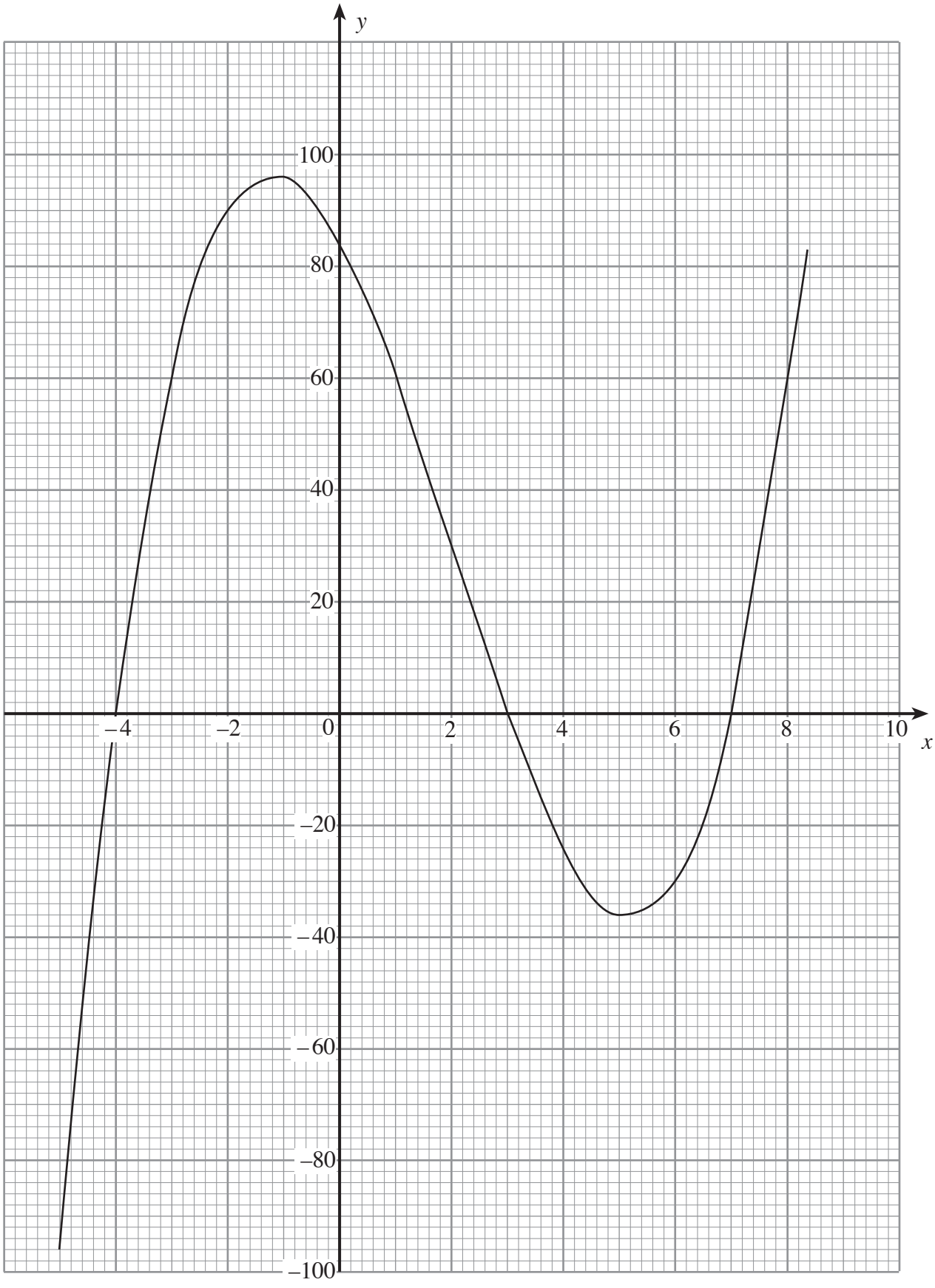
20. The graph of $y = x^3 - 6x^2 - 19x + 84$, for values of x between $x = -5$ and $x = 8$, has been drawn below.



(a) Use the graph to solve $x^3 - 6x^2 - 19x + 84 = 0$.

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[2]

(b) Use the graph to estimate the x-values of the points on the curve $y = x^3 - 6x^2 - 19x + 84$ where the gradient is zero.

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[2]

(c) By drawing an appropriate line on the graph, solve the equation $x^3 - 6x^2 + x + 84 = 0$.

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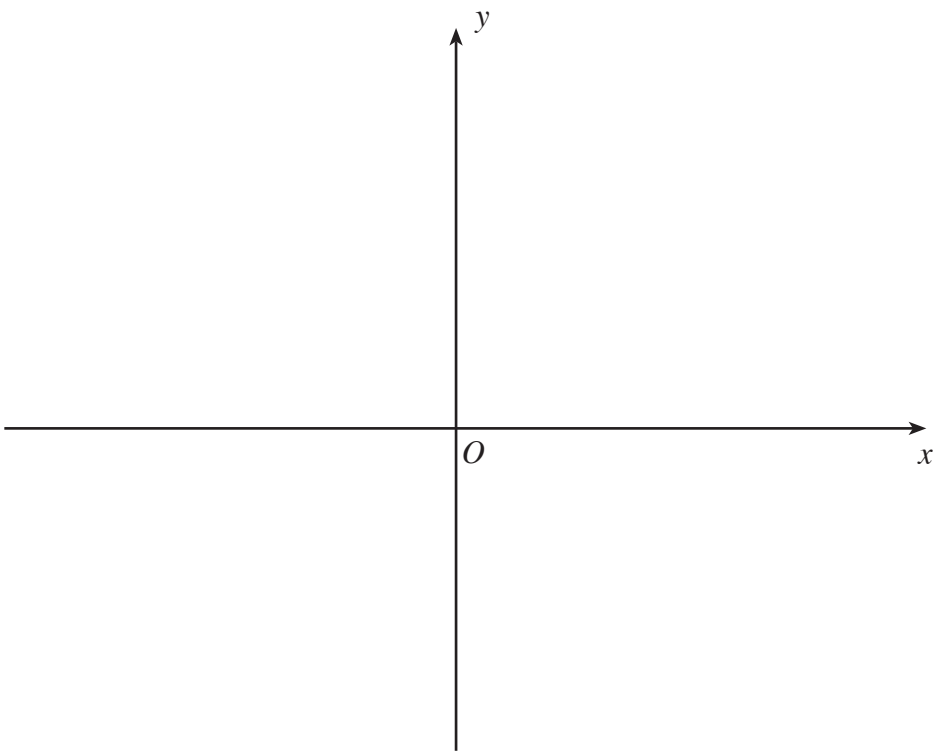
[3]

21. *(a)* Using the axes below, **sketch** the graph of $y = \sin x$ for values of x from –180° to 180°.

[2]



(b) Find all solutions of the following equation in the range –180° to 180°.

$$\sin x = -0{\cdot}8192$$

[2]

(c) Find all solutions of the following equation in the range 0° to 180°.

$$(\sin x)^3 = 0{\cdot}125$$

[2]