

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, 10 November 2006

(2 Hours)

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.

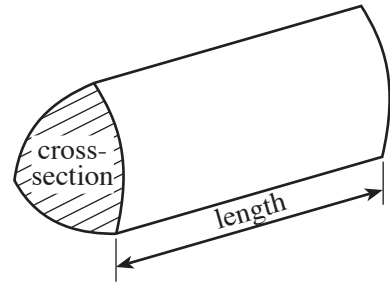
The number of marks is given in brackets at the end of each question or part-question.

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

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1	3	
2	3	
3	4	
4	3	
5	4	
6	4	
7	3	
8	4	
9	4	
10	4	
11	4	
12	6	
13	4	
14	4	
15	3	
16	5	
17	2	
18	7	
19	12	
20	6	
21	5	
22	6	
TOTAL MARK		

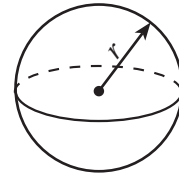
Formula List

Volume of prism = area of cross-section \times length



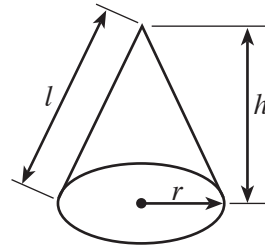
Volume of sphere = $\frac{4}{3} \pi r^3$

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



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

Curved surface area of cone = $\pi r l$

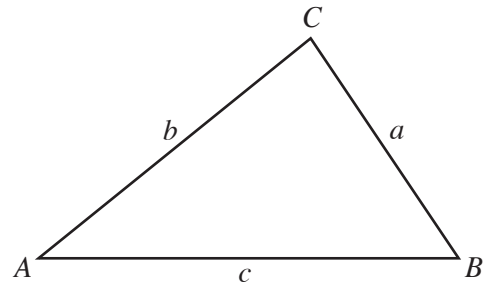


In any triangle ABC

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

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, \dots, x_n , having a mean of \bar{x} is given by

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

1. Hassan, Elin and Richard buy 19, 25 and 16 tickets respectively in a raffle. They agree to share any prize money they win in the ratio of the number of tickets they have bought. How much does each one get when they win £540?

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2. Solve the following equation.

$$2x - 15 = 4(5 - 2x)$$

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3. The heights of 210 leylandii trees were measured. The table shows a grouped frequency distribution of the results.

Height (x cm)	Number of trees
$40 \leq x < 80$	6
$80 \leq x < 120$	30
$120 \leq x < 160$	114
$160 \leq x < 200$	42
$200 \leq x < 240$	18

Find an estimate for the mean height of the trees.

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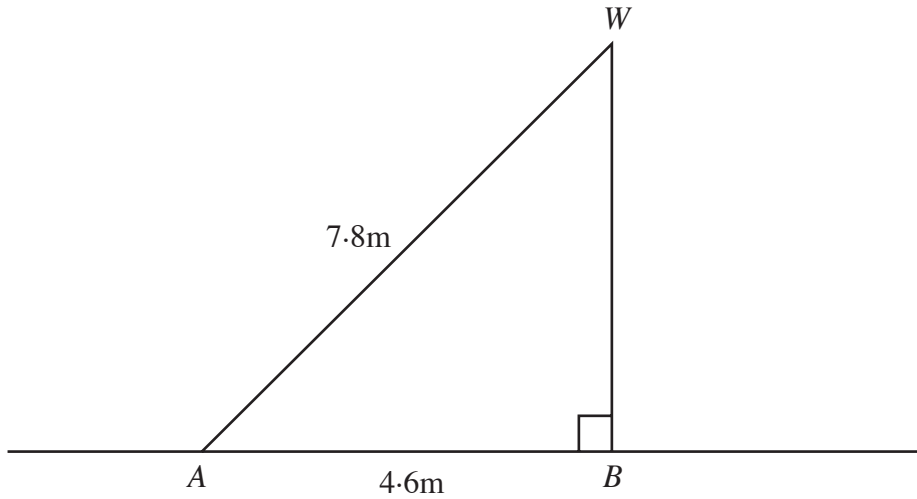
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4. A ladder which is 7.8 m long is resting against a vertical wall at W . The foot of the ladder is at A , which is at a horizontal distance of 4.6 m from the base of the vertical wall at B . Calculate the length of WB .



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5. Find, to the nearest penny, the compound interest when £500 is invested for 3 years at 4% per annum.

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6. A cuboid of copper measures 5.3 cm by 6.7 cm by 13.4 cm. The density of copper is 8.96 g/cm³. Calculate the mass, in kg, of the cuboid.

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- 7. An electricity bill came to £103.95 inclusive of V.A.T. at 5%. What was the cost of the electricity before V.A.T. was added?

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- 8. A solution to the equation

$$x^3 - 7x + 1 = 0$$

lies between 2.5 and 2.6.

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

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

(i) 0.0083

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(ii) 7 500 000 000

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

$$(2.66 \times 10^9) \div (7.6 \times 10^{-3}).$$

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10. (a) Rearrange the inequality $3 - 3n < 9 - 5n$ into the form $n < \text{some number}$.

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(b) Given that n also satisfies the inequality $3n > -6$, write down all the integer values of n that satisfy both inequalities.

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11. Solve the following equation.

$$\frac{4x+3}{6} + \frac{x}{3} = 2$$

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12. (a) In the diagram PQ represents a vertical pole. When the sun is at an angle of elevation of 36° the pole casts a shadow, PR , of length 15.8 m on horizontal ground. Calculate the height of the pole PQ .

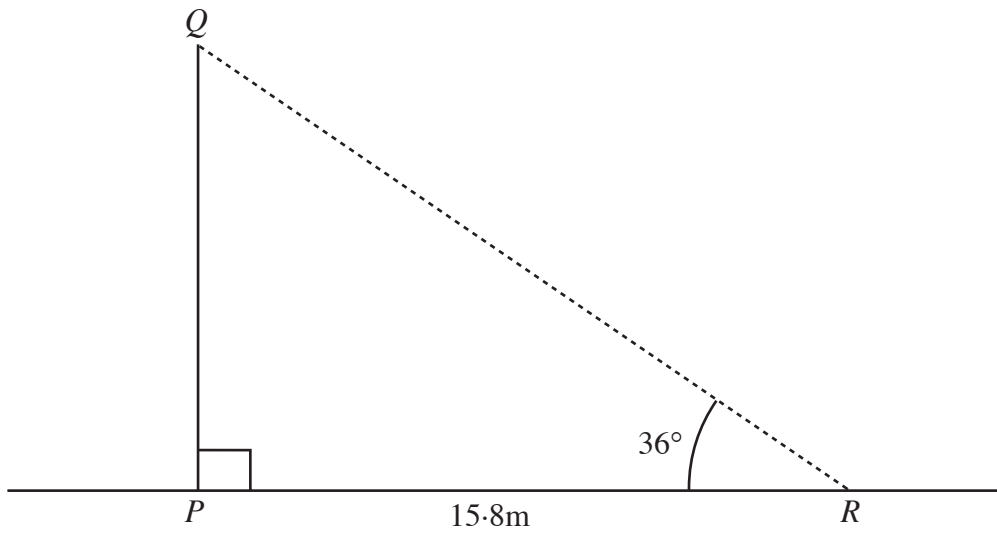


Diagram is not drawn to scale.

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- (b) In the diagram AB represents the arm of a crane which is 35.4 m long. The point C is 24.3 m horizontally from A and vertically below B . Calculate the angle of elevation, x , of the arm of the crane.

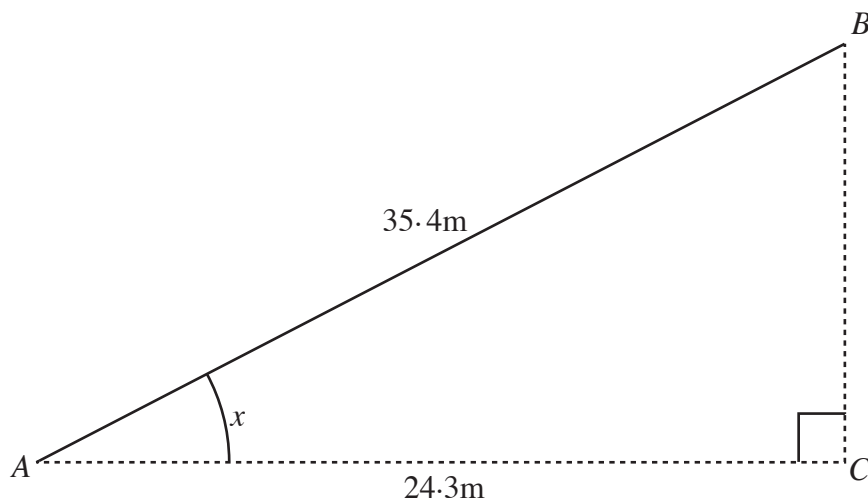


Diagram is not drawn to scale.

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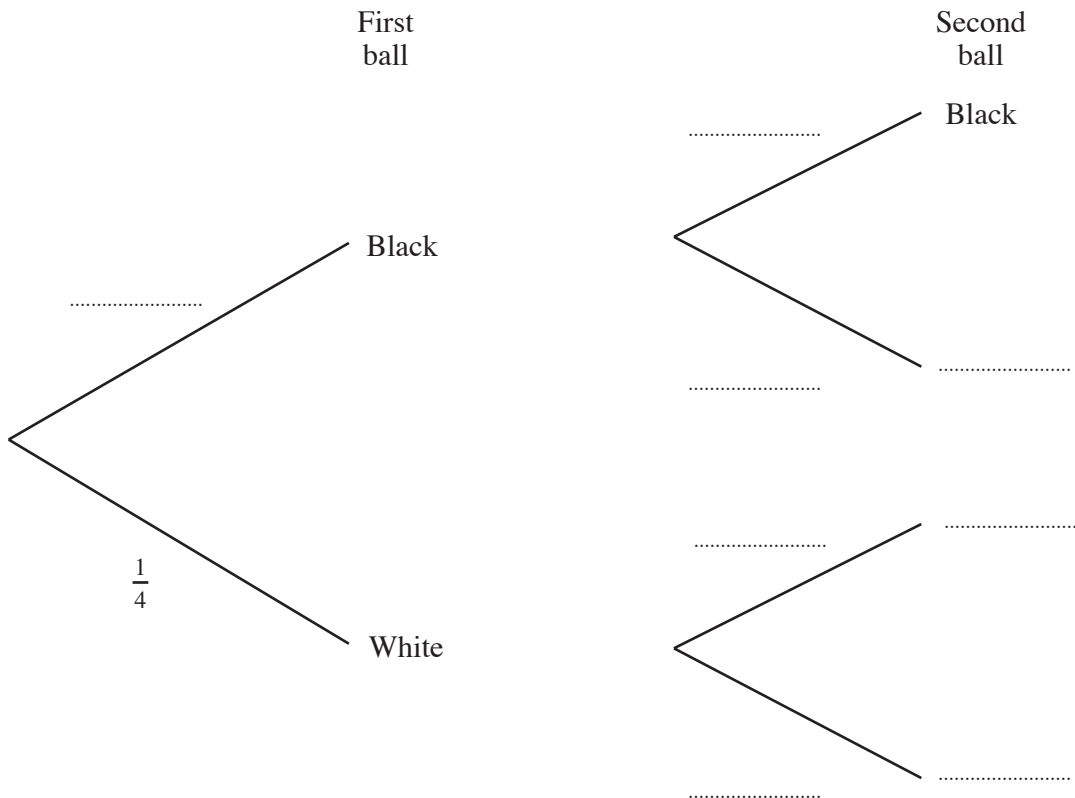
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13. A bag contains only black balls and white balls. The probability that a ball drawn at random from the bag is coloured white is $\frac{1}{4}$.

Two balls are drawn from the bag in the following way. The first ball is drawn at random from the bag and its colour is noted. This ball is then replaced in the bag and a second ball is drawn at random from the bag and its colour is also noted.

- (a) Complete the following tree diagram to show all the possible outcomes and their probabilities when two balls are drawn from the bag in this way.



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- (b) Calculate the probability that the 2 balls are the same colour.

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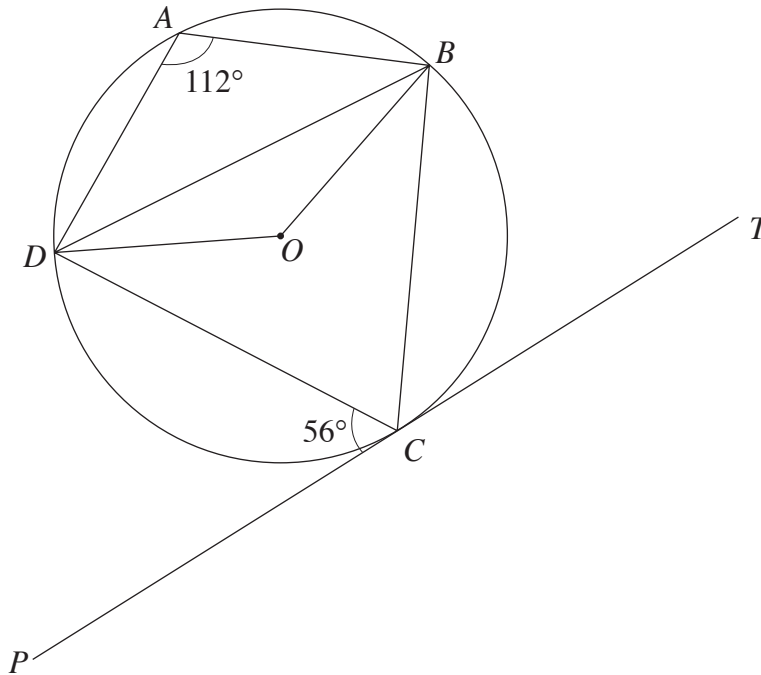


Diagram not drawn to scale.

Four points A, B, C and D lie on the circumference of the circle centre O .

The tangent TP touches the circle at C .

Given that $\widehat{DCP} = 56^\circ$ and $\widehat{DAB} = 112^\circ$, find **each** of the following angles, giving reasons for your answers.

(a) \widehat{DBC}

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(b) \widehat{BOD}

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15. Use the formula method to solve the equation $2x^2 + 19x + 13 = 0$, giving your solutions correct to two decimal places.

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16. Make e the subject of the following formula.

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

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17. Express $0.\dot{5}4\dot{6}$ as a fraction.

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18. (a) (i) Factorise $36x^2 - 49y^2$.

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(ii) Hence simplify $\frac{36x^2 - 49y^2}{12x^2 + 14xy}$

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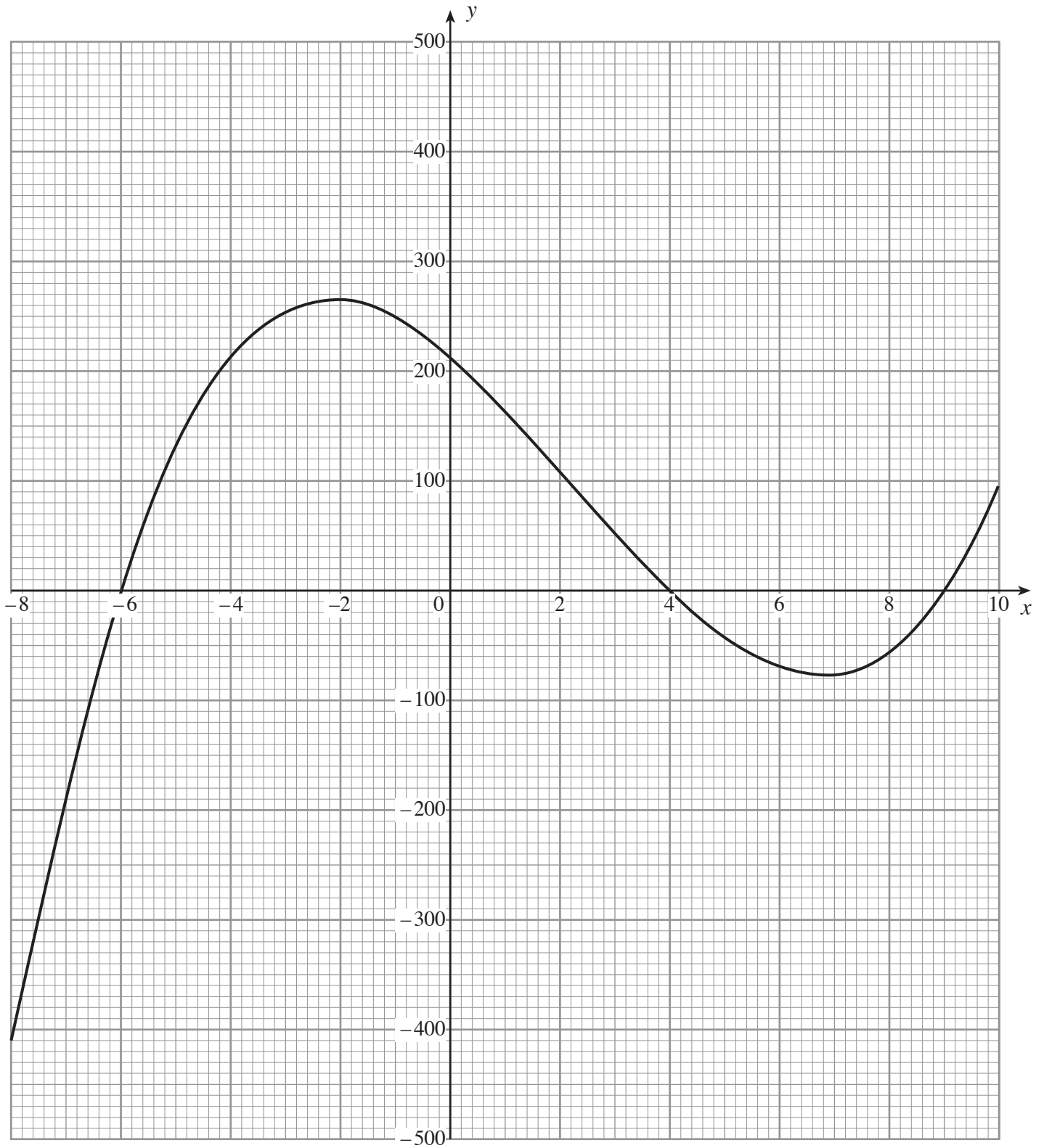
(b) Factorise the expression $10x^2 + 19x + 6$ and hence solve the equation $10x^2 + 19x + 6 = 0$.

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19. The graph of $y = x^3 - 7x^2 - 42x + 216$, for values of x between $x = -8$ and $x = 10$, has been drawn below.



20. (a) The marks scored by 10 pupils in a test were as follows.

63 35 57 92 25 77 64 58 63 42

Calculate the mean and standard deviation of the 10 test marks.

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(b) The ages of the pupils have a mean of 15.8 years and a standard deviation of 0.36 years. State the mean and the standard deviation of the ages of these pupils in 4 years time. Give a reason for your answer.

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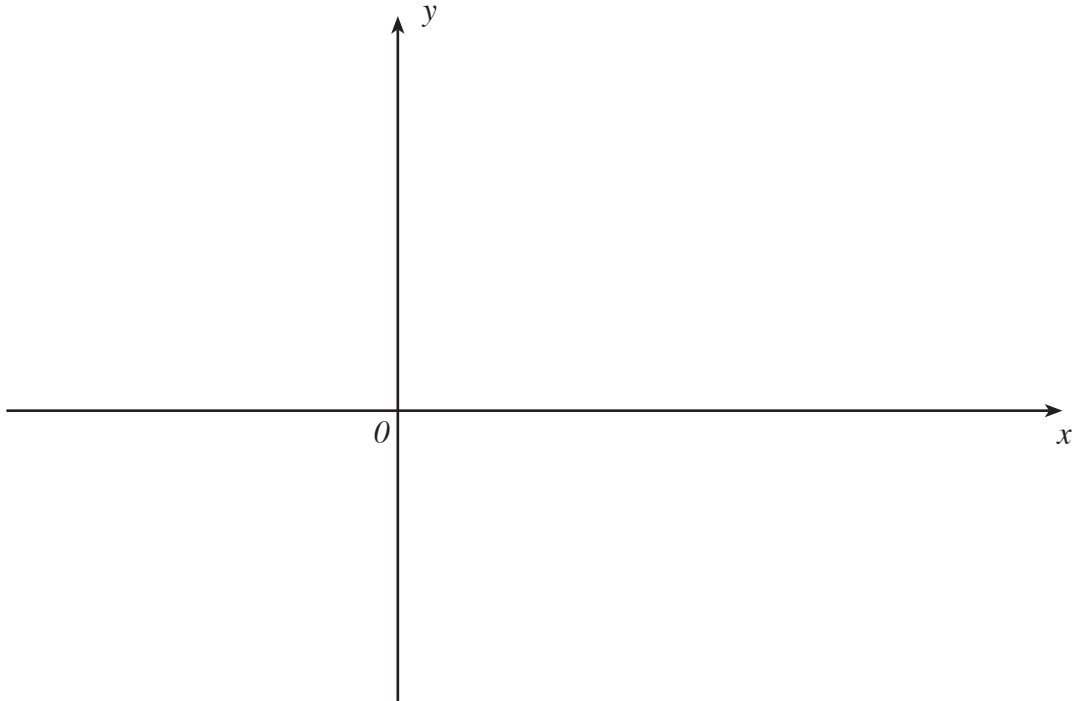
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21. (a) Using the axes below, **sketch** the graph of $y = \sin x$ for values of x from -180° to 360° .

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- (b) Find all solutions of the following equation in the range -180° to 360° .

$$\sin x = -0.8$$

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22. The diagram shows two triangles ABC and ACD with the common side AC .

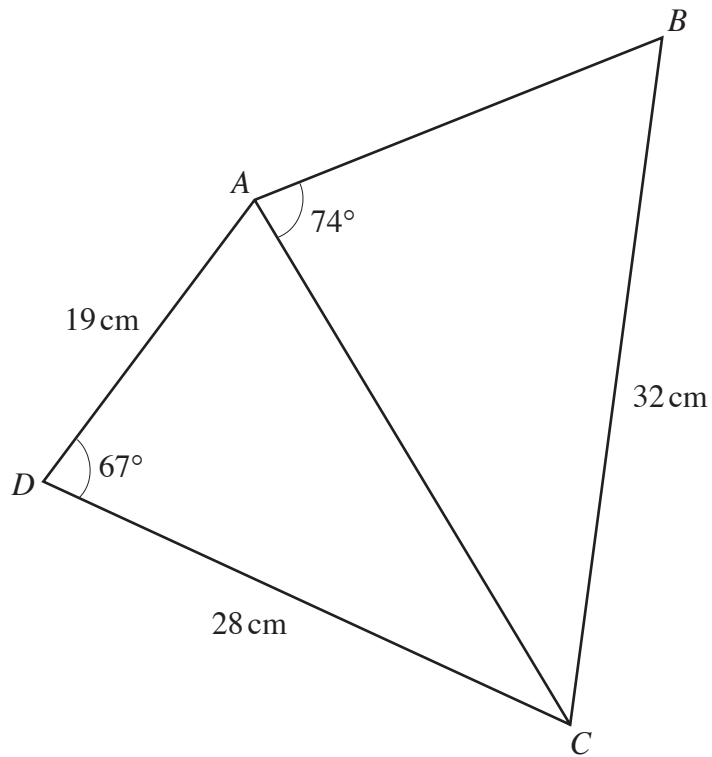


Diagram not drawn to scale.

The triangles ABC and ACD are such that $BC = 32$ cm, $AD = 19$ cm, $CD = 28$ cm, $\hat{BAC} = 74^\circ$ and $\hat{ADC} = 67^\circ$.

Find the size of \hat{ABC} .

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