GCSE

3300U60-1

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S19-3300U60-1

MATHEMATICS
UNIT 2: CALCULATOR-ALLOWED
HIGHER TIER

THURSDAY, 6 JUNE 2019 – MORNING

1 hour 45 minutes

ADDITIONAL MATERIALS

A calculator will be required for this examination.
A ruler, a protractor and a pair of compasses may be required.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

You may use a pencil for graphs and diagrams only.

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.

If you run out of space, use the additional page at the back of the booklet. Question numbers must be given for all work written on the additional page.

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 when appropriate.

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.

In question **2**, the assessment will take into account the quality of your linguistic and mathematical organisation, communication and accuracy in writing.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	8	
2.	6	
3.	Not tested	Summer 21
4.	3	
5.	4	
6.	3	
7.	5	
8.	4	
9.	3	
10.	Not tested	Summer 21
11.	2	
12.	4	
13.	3	
14.	5	
15.	2	
16.	4	
17.	5	
18.	3	
19.	6	
20.	4	
Total	74	

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Formula List - Higher Tier

Area of trapezium = $\frac{1}{2}(a + b)h$
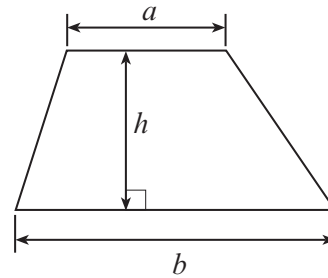
Volume of prism = area of cross-section × length
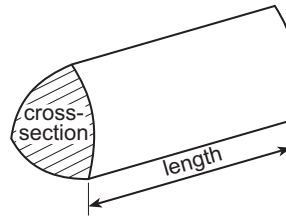
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$
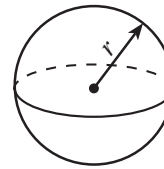
Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = $\pi r l$
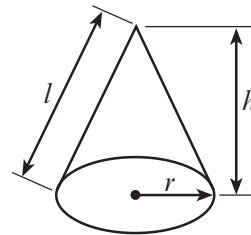
In any triangle ABC

  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 = $\frac{1}{2} ab \sin C$
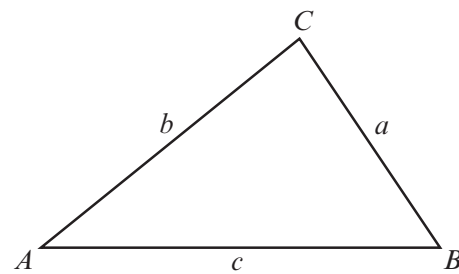
The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$ are given by $\qquad x = \dfrac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$

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1. *(a)* Write down the nth term of the following sequence. [2]

$$8, \quad 11, \quad 14, \quad 17, \quad \ldots\ldots$$

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(b) Make t the subject of the formula $\quad r = 3t - 8.$ [2]

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(c) A rectangle has a length of $(x + 5)\,$cm and a width of $(2x - 3)\,$cm.
Its perimeter is 46 cm.

Calculate the value of x. [4]

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2. *In this question, you will be assessed on the quality of your organisation, communication and accuracy in writing.*

Is it possible to draw a **right-angled** triangle with the measurements shown below?
You must use calculations (not a scale drawing) to support your answer.
You must show all your working. [4 + 2 OCW]

12·8 cm   25·6 cm   22·7 cm

Diagram not drawn to scale

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3. *(a)*

Which of the following sets represents the **shaded** area in the Venn Diagram shown above?
Circle your answer. [1]

    A′   *A∪B*   *B′*   *A∩B*   *A′∩B*   *A∪B′*

(b)

Which of the following sets represents the **shaded** area in the Venn Diagram shown above?
Circle your answer. [1]

    A′   *A∪B*   *B′*   *A∩B*   *A′∩B*   *A∪B′*

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4. Look at the following set of four numbers.

<div align="center">5   8   10   13</div>

Find another set of four numbers so that:
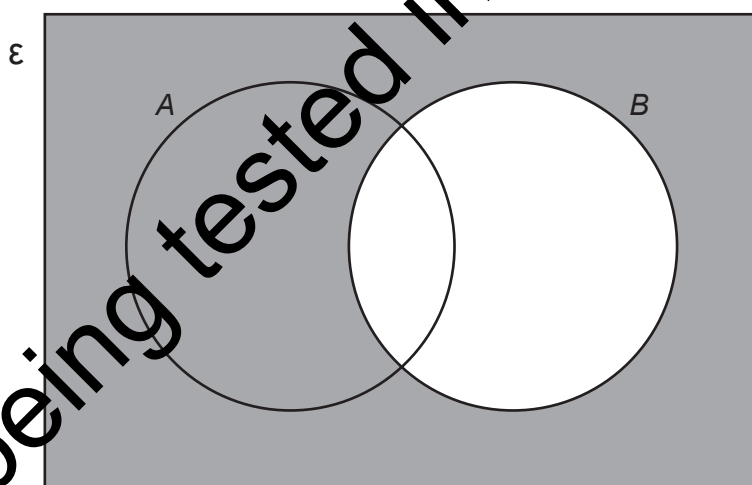
- the range has increased by 2,
- the mean remains the same,
- the median has decreased by 1.

You may use some of the numbers from the original set, but **not** exactly the same four numbers. [3]

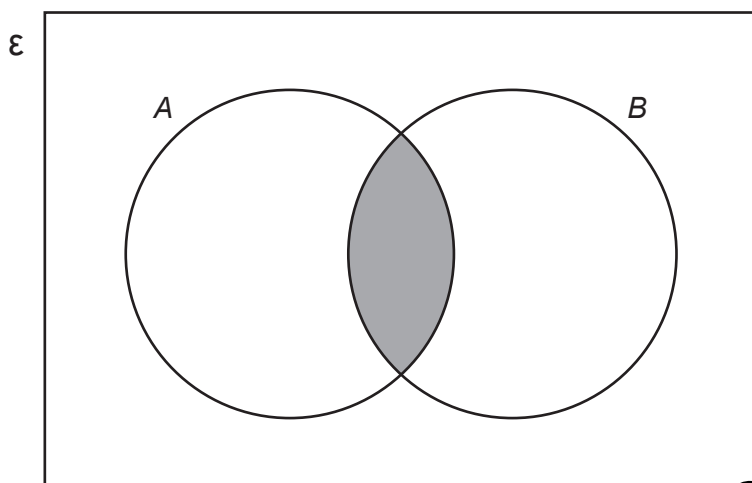...

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My four numbers are

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5. A company has 3 sites based in Wales.
One is in Carno, one is in Holyhead and one is in Porth.

The pie charts below show the distribution of its 128 female staff and 72 male staff.

128 female staff

72 male staff

A person is chosen at random from the company's 200 staff members.
What is the probability that this person works at the Porth site? [4]

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6. *PQR* is a right-angled triangle.
PR = 16·7 cm, *QR* = 9·6 cm.

Diagram not drawn to scale

Calculate the size of $Q\hat{P}R$. [3]

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7. The Morgan family and the Smith family are on holiday in Aberystwyth.
There are 7 adults and 2 children in the Morgan family.
There are 4 adults and 3 children in the Smith family.

Both families visit a Craft Centre.
The entry price to the Craft Centre is £x for adults and £y for children.

The total cost for the Morgan family is £41.50.
The total cost for the Smith family is £29.75.

Form two equations in terms of x and y.
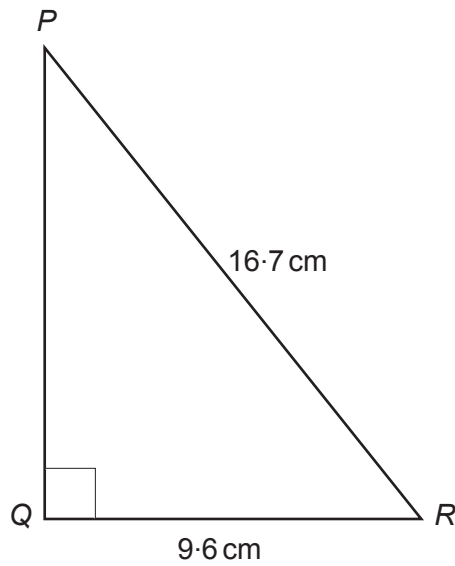
Solve your equations, using an algebraic method, to find the entry price for adults and the entry price for children. [5]

The adult entry price (£x) = £ .... The child entry price (£y) = £ ....

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8. A solution of the equation

$$2x^3 + x - 10 = 0$$

lies between 1 and 2.

Use the method of trial and improvement to find this solution correct to 1 decimal place. You must show all your working. [4]

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9. When a number is reduced by 15%, the answer is 6154.
What is the original number? [3]

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10. *ABCD* is a cyclic quadrilateral in a circle with centre *O*.
$A\hat{B}C$ = 126°.

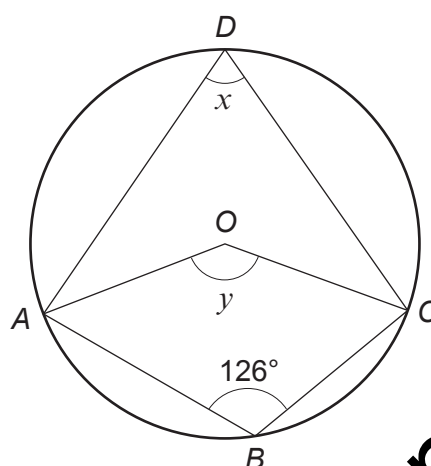*Diagram not drawn to scale*

Write down the size of each of the angles x and y.
You must give a reason for each of your answers. [4]

x = ... °

Reason: ....

....

y = ... °

Reason: ....

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11. Enlarge the given triangle by a scale factor of −3 using point *A* as the centre of enlargement.

[2]

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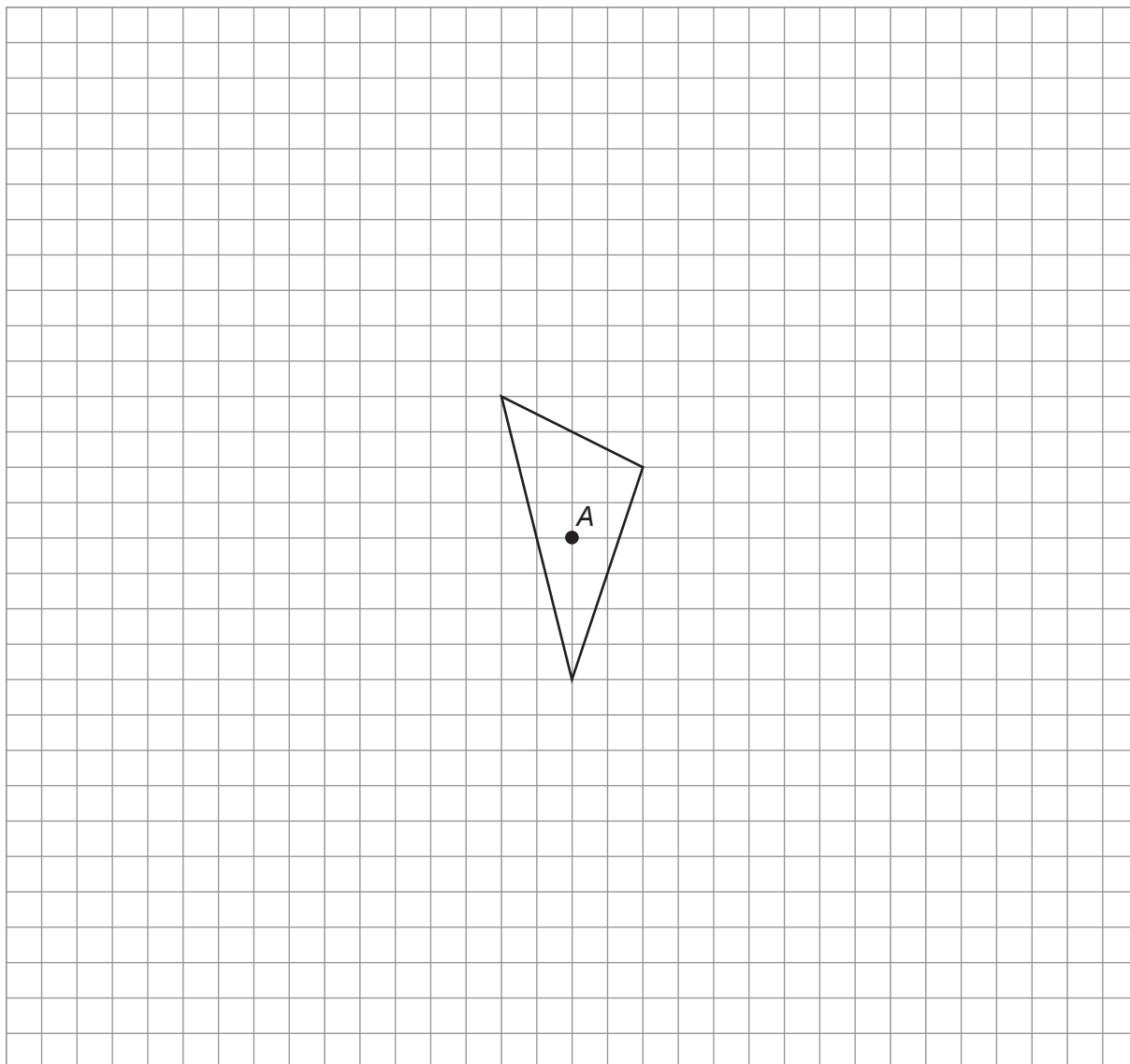
12. *(a)* Factorise $81p^2 - 1$. [2]

(b) Factorise $7t^2 + 19t - 6$. [2]

13. A car travels 300 km, measured correct to the nearest 5 km.
It travels this distance in 6 hours, measured correct to the nearest hour.

Calculate the least possible average speed of the car.
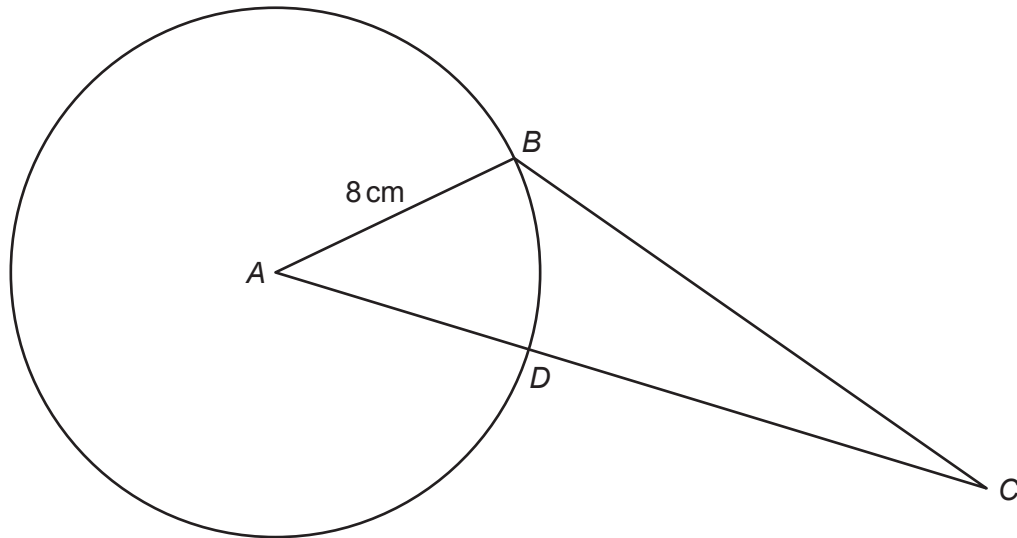Give your answer in km/h, correct to 2 decimal places. [3]

14. The diagram shows a triangle *ABC* and a circle with centre *A*.
The points *B* and *D* lie on the circumference of the circle.

The radius of the circle is 8 cm.
The length of the line *AC* is 19 cm.
The area of triangle *ABC* is 70 cm^2.

Diagram not drawn to scale

Calculate the area of the sector *ABD*. [5]

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15. Four quadratic graphs are sketched below.
Draw a line connecting each graph to its equation.
One has been completed for you.

[2]

Graph

Equation
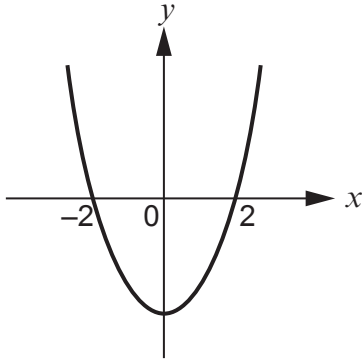
$y = (x + 1)(x - 4)$
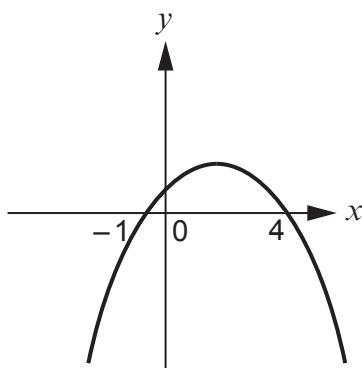
$y = (x - 4)^2$

$y = x(x + 4)$

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

$y = (x - 2)(x + 2)$

$y = x(x - 4)$

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

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

$y = (x + 4)^2$

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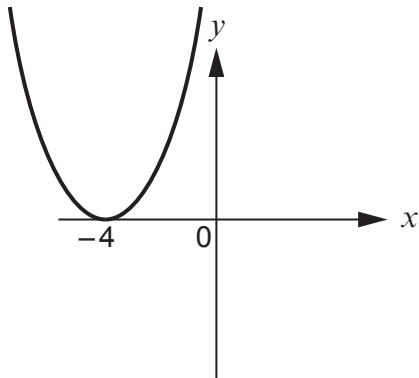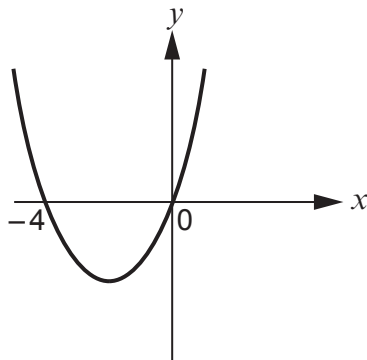
16. *(a)* Sketch the curve $y = \sin x$ on the axes below.
You must indicate any important values on the y-axis. [2]
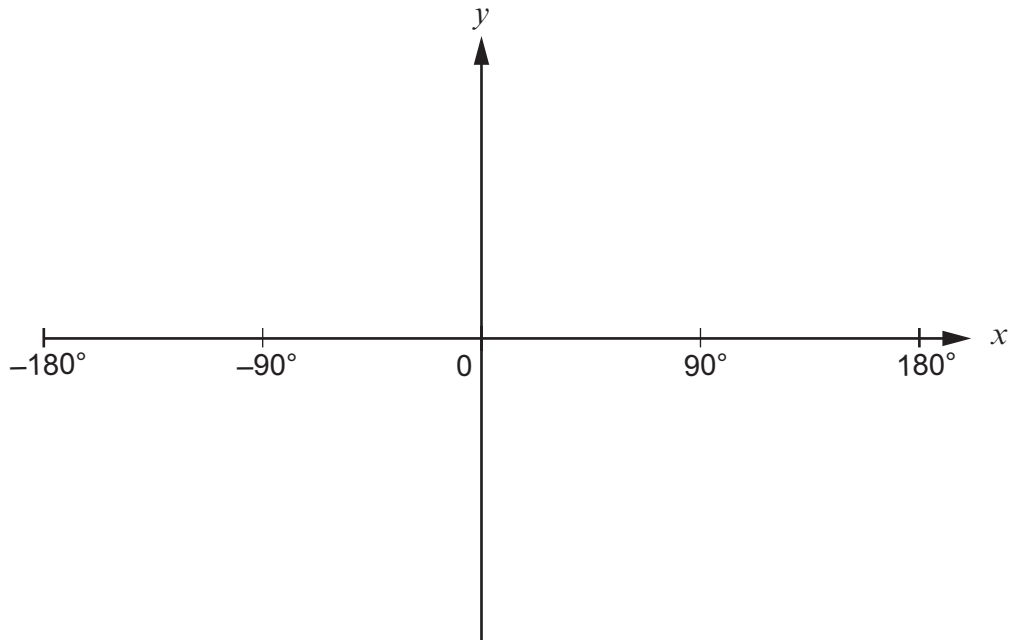
(b) Solve the equation $\sin x = -0\cdot 5$.
Give all answers in the range $x = -180°$ to $x = 180°$. [2]

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17. A raffle is held at a school fair and a total of 100 tickets are sold.
Angharad buys three of the tickets and Meirion buys one ticket.
Tickets are selected at random and not replaced.
The first prize to be awarded is a calculator.
The second prize to be awarded is a voucher.
No other prizes are awarded.

(a) Calculate the probability that Angharad wins the calculator and Meirion wins the voucher. [2]

(b) Calculate the probability that no one wins a prize apart from Angharad or Meirion. [3]

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18. Triangle *ABC* has sides *AB* = 17 cm, *AC* = 13 cm and *BC* = 23 cm, as shown below.

A

13 cm

17 cm

C

23 cm

B

Diagram not drawn to scale

Calculate the size of $C\hat{A}B$. [3]

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19. Use the quadratic formula to solve $(3x - 2)^2 = (x + 1)(x + 2)$.
Give your answers correct to 2 decimal places.
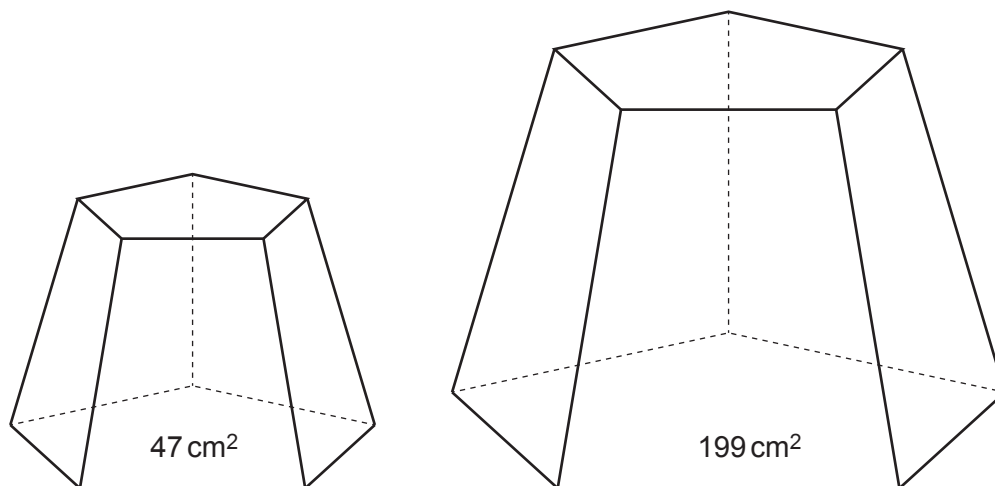You must show all your working. [6]

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20. Two **similar** solids have base areas of 47 cm^2 and 199 cm^2, as shown below. The volume of the smaller solid is 350 cm^3.

47 cm^2

199 cm^2

Diagram not drawn to scale

Calculate the volume of the larger solid. [4]

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