Candidate Name	Centre Number	Candidate Number
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GCSE LINKED PAIR PILOT

4363/02

METHODS IN MATHEMATICS

UNIT 1: METHODS (NON-CALCULATOR)

HIGHER TIER

P.M. FRIDAY, 21 January 2011

2 hours

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1	**8**	
2	**4**	
3	**7**	
4	**8**	
5	**8**	
6	**5**	
7	**7**	
8	**6**	
9	**7**	
10	**9**	
11	**8**	
12	**17**	
13	**6**	
TOTAL MARK		

4363 020001

CALCULATORS ARE NOT TO BE USED FOR THIS PAPER

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

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.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

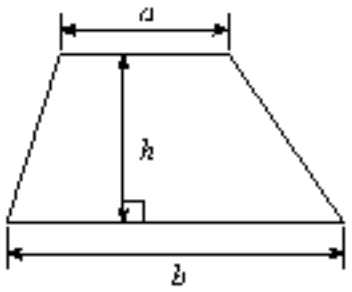
Scale drawing solutions will not be acceptable where you are asked to calculate.

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

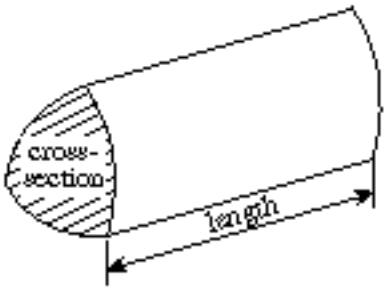
You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **5**.

Formula List

Area of trapezium $= \frac{1}{2}(a + b)h$



Volume of prism = area of cross-section × length

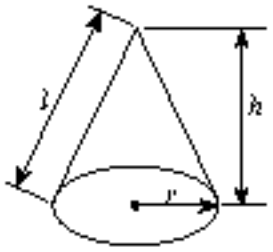


Volume of sphere $= \frac{4}{3}\pi r^3$

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

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

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

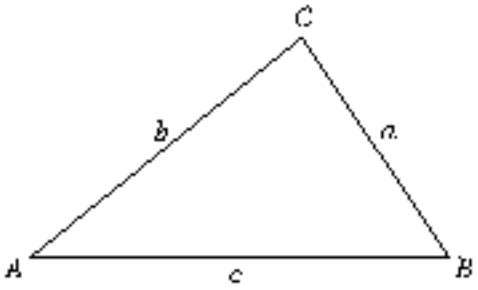


In any triangle ABC

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

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

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

1. *(a)* (i) Use the formula below to find the value of g when $f = 9$ and $h = -3$.

$$g = \frac{f(5 - h)}{3}$$

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[3]

(ii) Find the value of $d^2 - 7$ when $d = -4$.

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[1]

(b) Make q the subject of the formula below.

$$q + 5t = u$$

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[1]

(c) Factorise $7p + 21$.

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[1]

(d) Simplify $4f + 5f - 17f - f + 6f$.

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[1]

(e) Expand $6(x + 2)$.

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[1]

Examiner only

2. Find the angles marked *a, b, c* and *d*.

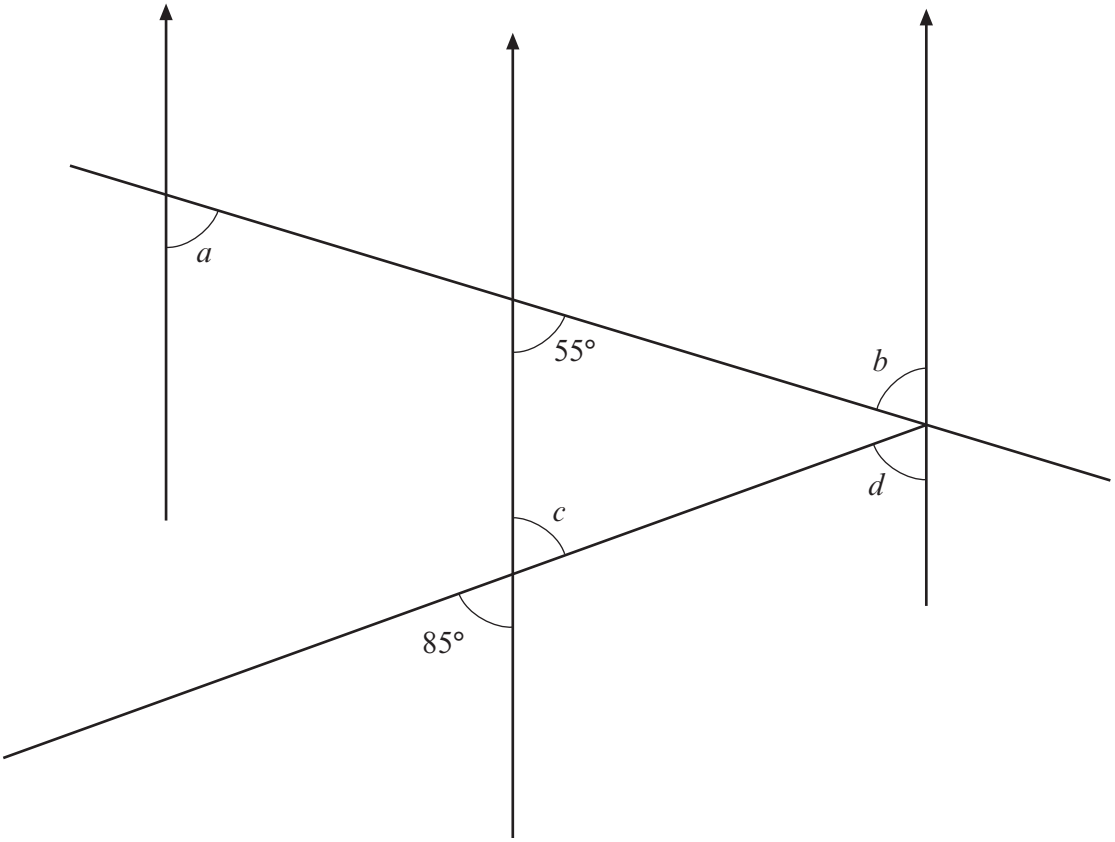

Diagram not drawn to scale

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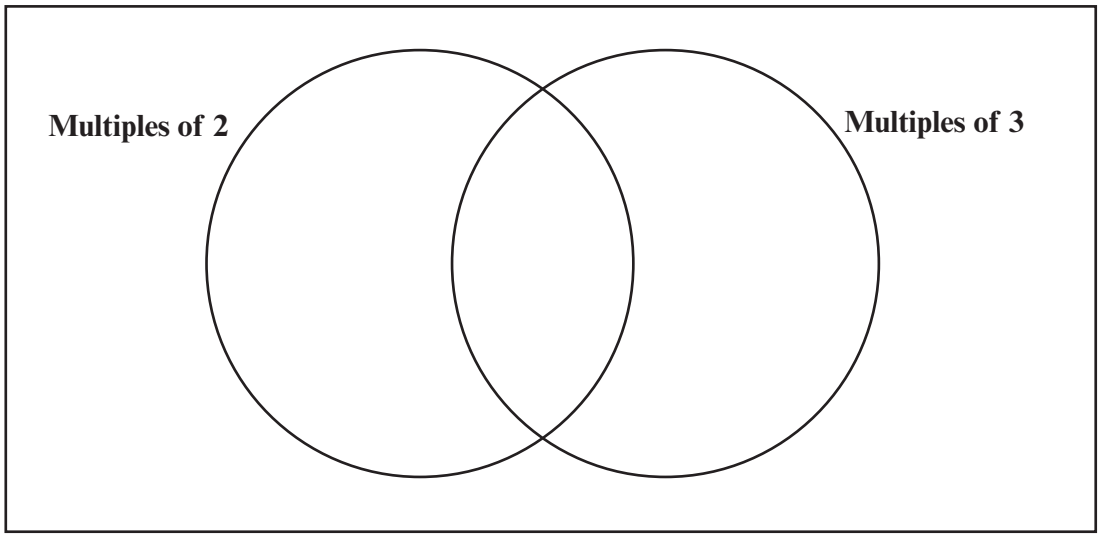
a = ...° *b* = ...° *c* = ...° *d* = ...°

[4]

3. *(a)* (i) Place **each** of the whole numbers 1, 2, 3, 4, 5, 6, 7, 8 in the correct positions in the Venn diagram.



[2]

(ii) A whole number is selected at random from the set {1, 2, 3, 4, 5, 6, 7, 8}.

Find the probability that the number selected is

a multiple of 3, ...

a multiple of both 2 and 3. .....

[2]

(b) A biased coin is thrown 50 times; the coin shows Heads on 15 of these occasions. The coin is thrown another 50 times; the coin shows Heads on 20 of these occasions.

Find the best estimate for the probability of the biased coin showing Head when thrown. How could the estimate be improved?

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[3]

Examiner only

4. *(a)* Three sisters, Ruth, Joanne and Sharon share a prize in the ratio 2 : 5 : 8 respectively.
Sharon receives £1 760 which is the largest share.
Find how much Ruth and Joanne each receive.

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Ruth £ .....

Joanne £ .....

[4]

(b) The following fractions can be converted into decimals.

$$\frac{1}{4} \qquad \frac{5}{6} \qquad \frac{1}{9} \qquad \frac{3}{10}$$

Sort them into two groups: terminating decimals **or** recurring decimals.
Show **all** your working.

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Complete the table **using decimal notation.**

Terminating decimals	Recurring decimals

[4]

Examiner only

5. *You will be assessed on the quality of your written communication in this question.*

Square numbers: 1 4 9 16 .....

Investigate whether square numbers have an odd number of factors.
Show all your working.
You must give a conclusion with an explanation for your answer.

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[8]

Examiner only

6. A robot moves 6 steps forward, and then turns left through 12°.
This movement is then repeated many times, with the robot moving another 6 steps forward and then turning left through 12° each time.
Will the robot's path form a polygon?
Give an explanation for your answer and show all your working.

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[5]

Examiner only

7. *(a)* Express 1764 as a product of prime factors using index notation.

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[3]

(b) Write down the *n*th term of the sequence 13, 19, 25, 31, ...

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[2]

(c) Write down the *n*th term of the sequence 2, 5, 10, 17, 26, 37, ...

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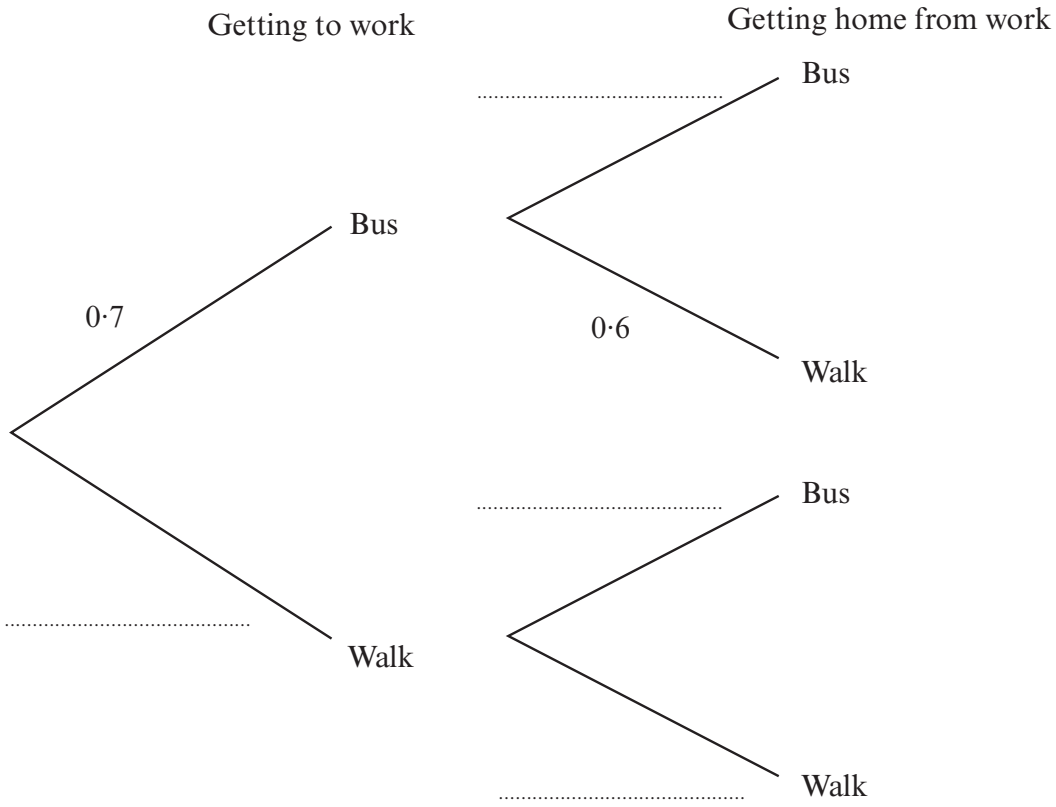
[2]

Examiner only

8. Roger sometimes uses the bus to get to and from work.
When Roger does not take the bus he walks.
The probability that he takes the bus to work is 0·7.
The probability that he walks home from work is 0·6.
Getting to work and getting home from work are two independent events.

(a) Complete the following tree diagram.



[2]

(b) Calculate the probability that Roger takes the bus to work and walks home.

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[2]

(c) Which is the most unlikely way of Roger getting to and from work?
Show your working and give a reason for your answer.

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[2]

Examiner only

9. *(a)* Evaluate $\sqrt{5} \times \sqrt{5}$.

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[1]

(b) Write 0·000093 in standard form.

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[1]

(c) Evaluate $\frac{8{\cdot}8 \times 10^4}{2{\cdot}2 \times 10^{-3}}$ giving your answer in standard form.

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[2]

(d) Evaluate $4^{-2} \times 8^{\frac{1}{3}} \times 2^4$.

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[3]

Examiner only

10. *(a)* Use the graph paper below to draw the graph of the straight line $y = 5x + 2$.

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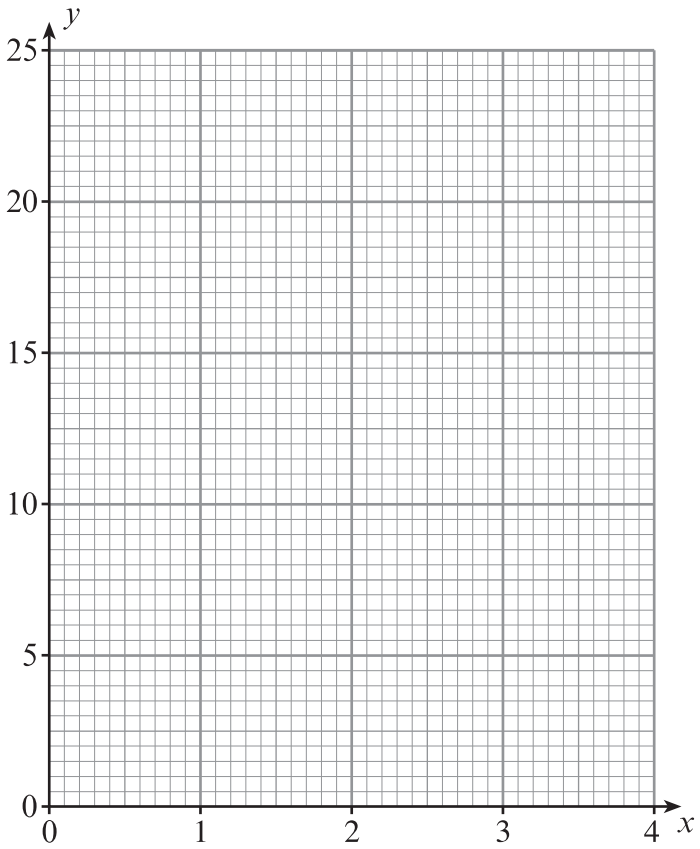
[3]



(b) Write down the equation of a straight line that is parallel to $6x + 3y - 8 = 0$.

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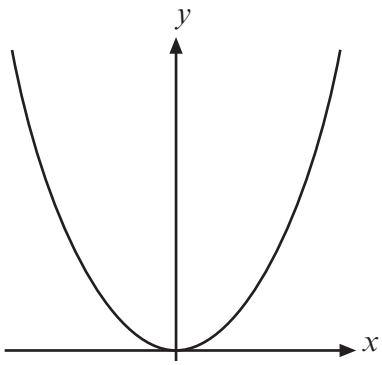
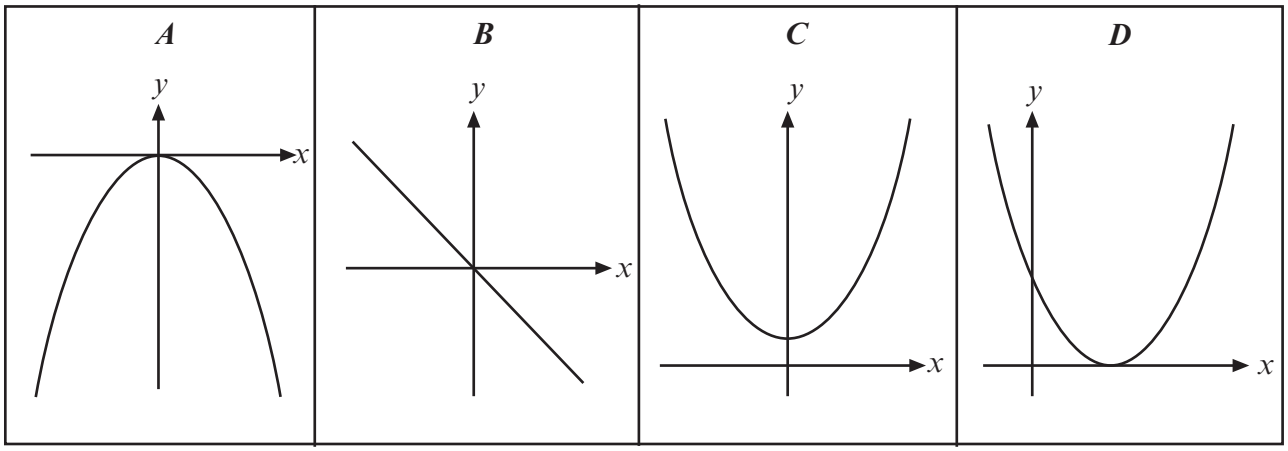
[3]

Examiner only

(c) This is a sketch of $y = x^2$.



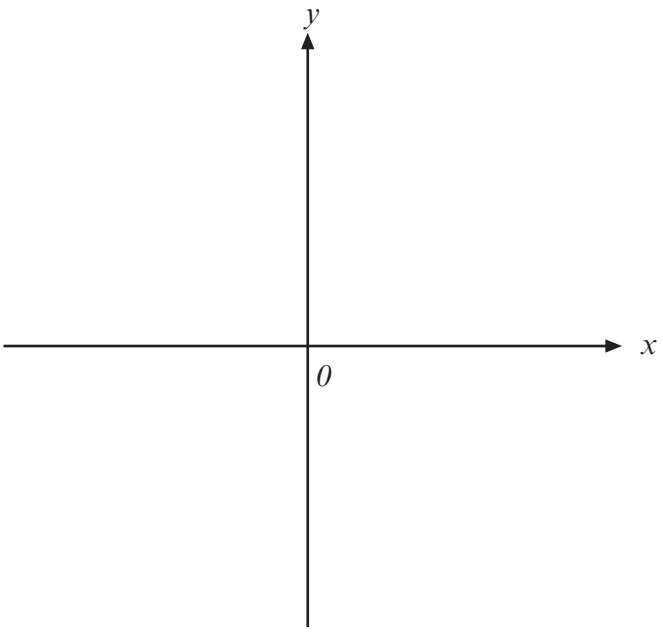
Write down which of the following sketches ***A***, ***B***, ***C*** or ***D*** could be a sketch of $y = x^2 + 3$.



Sketch .....

[1]

(d) Use the axes below to sketch the graph of $y = \frac{1}{x}$.

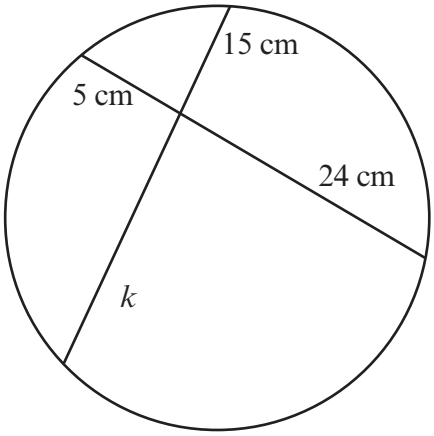


[2]

Examiner only

11. The diagrams in this question are **not** drawn to scale.

(a) Find the length of the line marked k. Give a reason for your answer.



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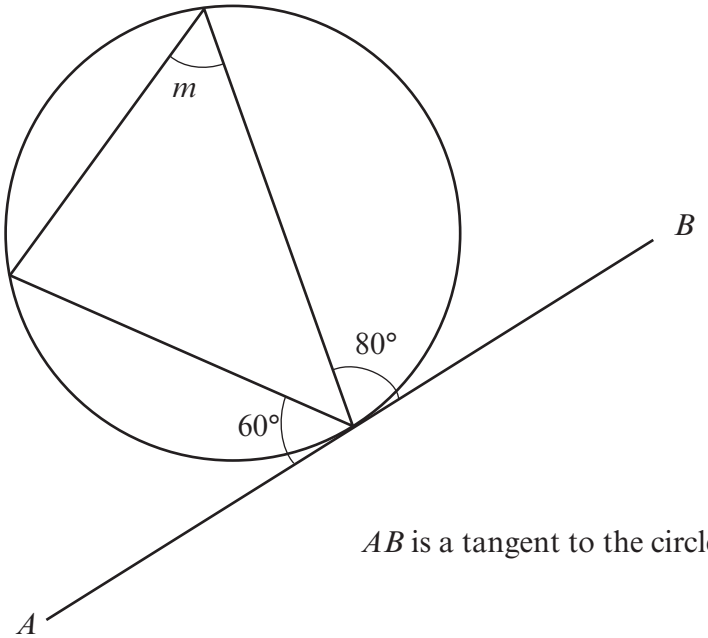
k = ... cm [3]

(b) Find the size of the angle marked m. Give a reason for your answer.



AB is a tangent to the circle.

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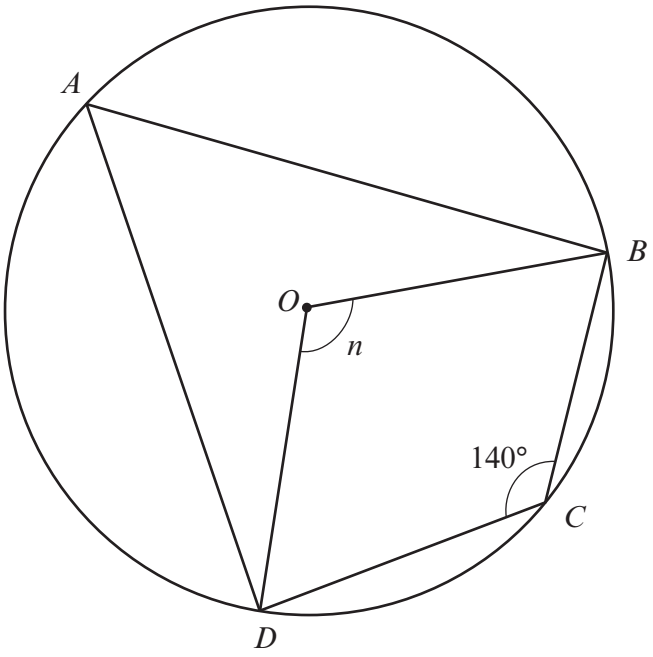
m = ... ° [2]

Examiner only

(c) Find the size of the angle marked n. Give reasons for your answer.



The point O is the centre of the circle.

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$n =$ ..... °

[3]

Examiner only

12. *(a)* Expand and simplify $(3x - 2)(5x + 7)$.

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[2]

(b) Factorise the expression $121d^2 - 25$.

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[2]

(c) Factorise the expression $20y^2 + 7y - 6$ and hence solve the equation $20y^2 + 7y - 6 = 0$.

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[3]

(d) Express $x^2 + 14x + 47$ in the form $(x + a)^2 + b$ where a and b are values to be found.

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[2]

Examiner only

(e) Express the following as a single fraction in its simplest form.

$$\frac{8}{f-4} - \frac{5}{3f-2}.$$

[4]

Examiner only

(f) Prove that $\frac{3x}{11} + \frac{x-3}{3} + \frac{4x+5}{2} \equiv \frac{172x+99}{66}$.

[4]

Examiner only

13. Robbie sits a multiple choice examination.
For each question in the examination, four possible answers are given, only one of these answers is correct.
Robbie knows 80% of the facts tested in the examination and for each question based on these facts he selects the correct answer.
On all other questions he selects at random one of the four possible answers.

(a) A question is selected at random from the paper.
Calculate the probability that Robbie correctly answers the question.

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[4]

(b) The examination has 40 questions.
Calculate how many questions you might expect Robbie to answer correctly.

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[2]