

GENERAL CERTIFICATE OF SECONDARY EDUCATION
METHODS IN MATHEMATICS

Methods in Mathematics 2 (Higher Tier)

B392/02


Candidates answer on the question paper.

OCR supplied materials:

None

Other materials required:

- Scientific or graphical calculator
- Geometrical instruments
- Tracing paper (optional)

Friday 24 June 2011
Morning
Duration: 2 hours


Candidate forename					Candidate surname				
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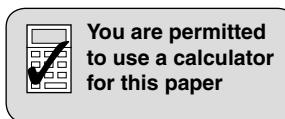
Centre number						Candidate number			
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INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Your answers should be supported with appropriate working. Marks may be given for a correct method even if the answer is incorrect.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Answer **all** the questions.
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

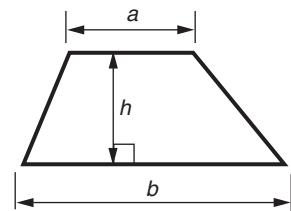
- The number of marks is given in brackets [] at the end of each question or part question.
- Your Quality of Written Communication is assessed in questions marked with an asterisk (*).
- The total number of marks for this paper is **90**.
- This document consists of **20** pages. Any blank pages are indicated.



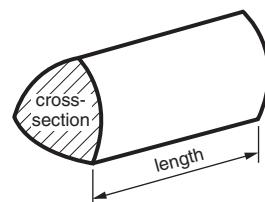
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Formulae Sheet: Higher Tier

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



$$\text{Volume of prism} = (\text{area of cross-section}) \times \text{length}$$

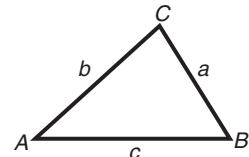


In any triangle ABC

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

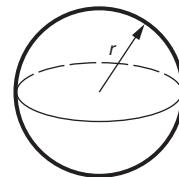
$$\text{Cosine rule} \quad a^2 = b^2 + c^2 - 2bc \cos A$$

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



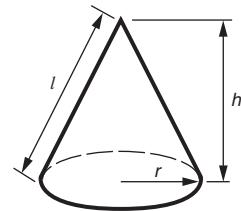
$$\text{Volume of sphere} = \frac{4}{3} \pi r^3$$

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



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

$$\text{Curved surface area of cone} = \pi r l$$



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by

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

PLEASE DO NOT WRITE ON THIS PAGE

1 Use your calculator to work out the following.

(a) $\sqrt{6^2 + 3^2}$

Give your answer correct to 3 significant figures.

(a) _____ [2]

(b) $\frac{7^2 + 6^2 - 5^2}{2 \times 7 \times 6}$

Give your answer correct to 4 decimal places.

(b) _____ [2]

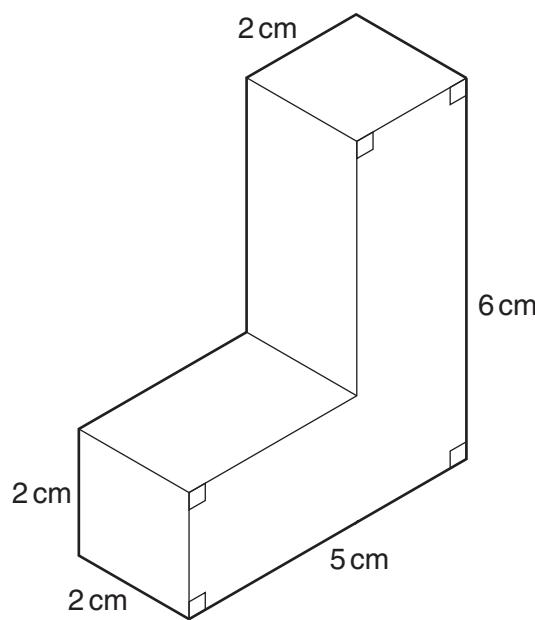
2 Solve.

$$2(x - 4) = 6$$

_____ [2]

4

3 (a)



Calculate the volume of this prism.

State the units of your answer.

(a) _____ [4]

(b) A sphere has diameter 7 cm.

Work out the volume of the sphere.

(b) _____ [2]

4 The rows in the table show equivalent fractions, decimals and percentages.

Fill in the missing numbers.

Fraction (in its simplest form)	Decimal	Percentage
		15%
	0.375	
$\frac{1}{6}$		

[4]

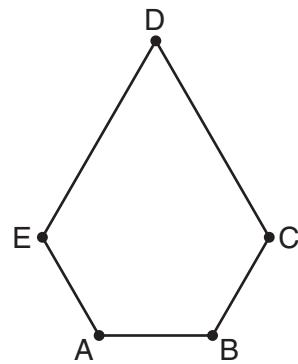
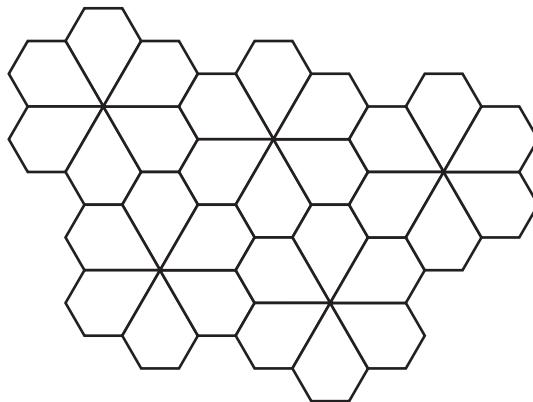
5 (a) (i) Calculate the size of an interior angle of a regular pentagon.

(a)(i) _____ ° [2]

(ii) Explain why regular pentagons will not tessellate.
You may wish to use diagrams to help you.

[2]

(b) ABCDE is a pentagon with one line of symmetry.
ABCDE tessellates.



(i) Explain why angle D must be 60° .

[1]

(ii) Angles A, B, C and E are all equal.

Find the size of angle A.

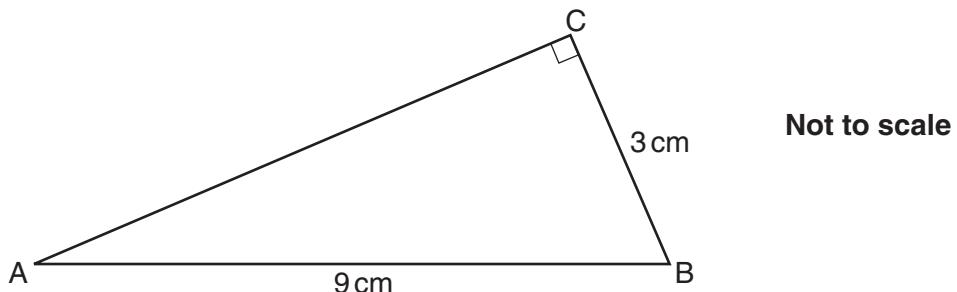
(b)(ii) _____ [1]

(iii)* Identify which sides of ABCDE must be equal to each other and explain why.

[3]

6 ABC is a right-angled triangle.
AB = 9 cm. CB = 3 cm.

Work out the length of AC.



_____ cm [3]

7 Anne and Umar share some money in the ratio 3 : 2.
Umar receives £28.

How much does Anne get?

£ _____ [2]

8 The diagrams show a sequence of patterns using sticks.
The first three patterns are shown.



How many sticks will be needed for the 50th pattern?

[3]

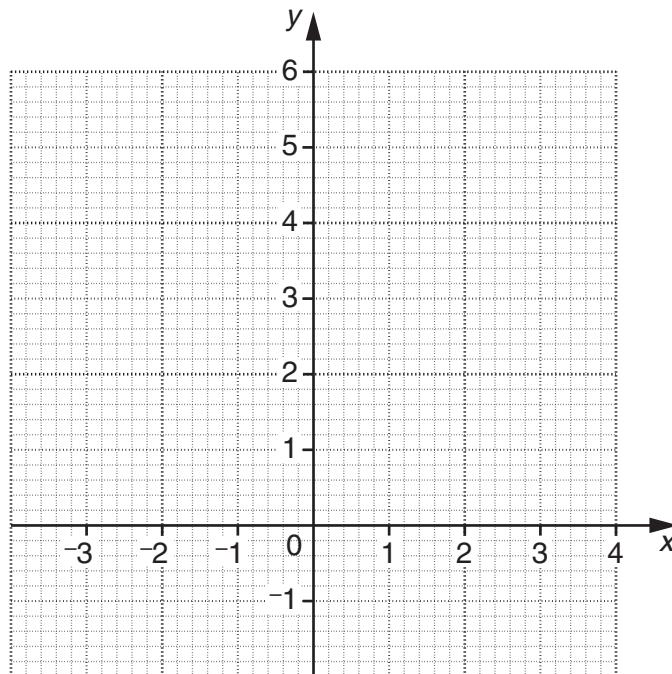
10

9 (a) Complete the table for $y = x^2 + x$.

x	-3	-2	-1	0	1	2
y	6			0		

[2]

(b) Draw the graph of $y = x^2 + x$.



[2]

(c) Use your graph to solve $x^2 + x = 5$.
Write your answers correct to 1 decimal place.

(c) _____ [2]

11

10 Sam is doing some calculations without a calculator.
These two are wrong.

For each one, without working it out, explain how Sam could have known the answer is wrong.

(a) $0.41 \times 0.21 = 0.861$

[1]

(b) $\frac{2}{3} + \frac{1}{2} = \frac{3}{5}$

[1]

11 The table shows a calendar for one month.

Mon	Tues	Weds	Thurs	Fri	Sat	Sun
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

(a) Choose a “window” of four numbers from the calendar.

<i>e</i>	<i>f</i>
<i>g</i>	<i>h</i>

For example,

1	2
8	9

Work out the value of $fg - eh$ for your “window”.

(a) _____ [2]

(b) In the “window” below, write the other three numbers in terms of *e*.

<i>e</i>	

[2]

(c) Using your answer to part (b), prove that the value of $fg - eh$ will be the same no matter which “window” you choose.

[4]

13

12 For each sketch graph, choose the most appropriate equation from the list below.

$$y = 2x + 4$$

$$y = -x^2$$

$$y = 4 - x^2$$

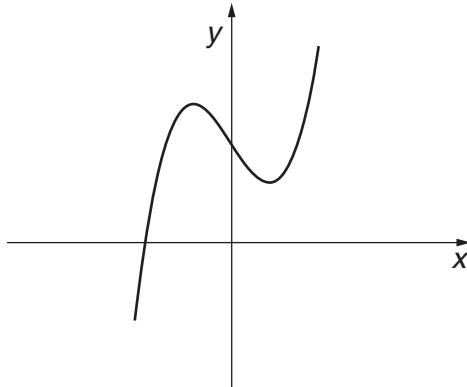
$$y = x^3$$

$$y = x^3 - 3x + 5$$

$$y = \cos x$$

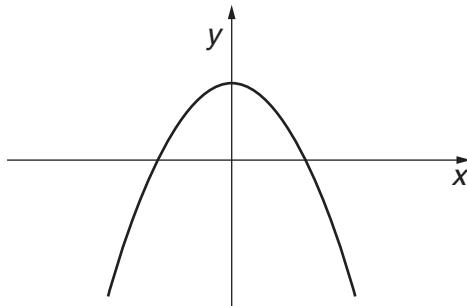
$$y = \sin x$$

(a)



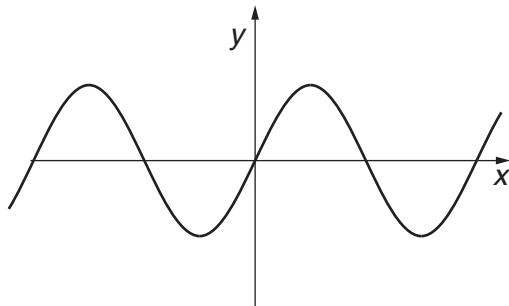
(a) _____ [1]

(b)



(b) _____ [1]

(c)



(c) _____ [1]

14

13 (a) On a special offer day, a shop reduces all prices by 20%.
The special offer price of a coat is £100.

What was the normal price?

(a) £ _____ [2]

(b) On another special offer day, all prices are reduced by 40%.
At the end of the day, special offer prices go back to normal.

By what percentage do special offer prices increase at the end of the day?

(b) _____ % [3]

15

14 y is directly proportional to x^3 .
When $x = 2$, $y = 20$.

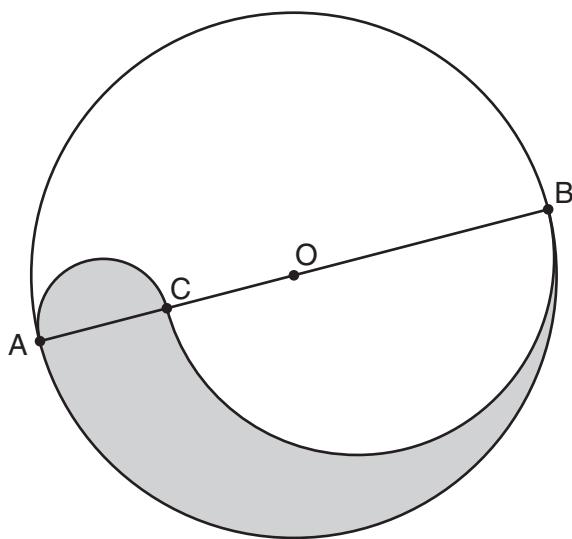
(a) Find y when $x = 8$.

(a) _____ [4]

(b) Find x when $y = 1000$.

(b) _____ [2]

15 O is the centre of the circle with diameter AB.
AB is 8 cm long.
C is the midpoint of AO.
Semicircles are drawn with diameters AC and BC.



(a) Find the area of the semicircle with diameter AC.
Give your answer in terms of π .

(a) _____ cm^2 [3]

(b)* Show that the shaded area is exactly $\frac{1}{4}$ of the area of the circle with diameter AB.

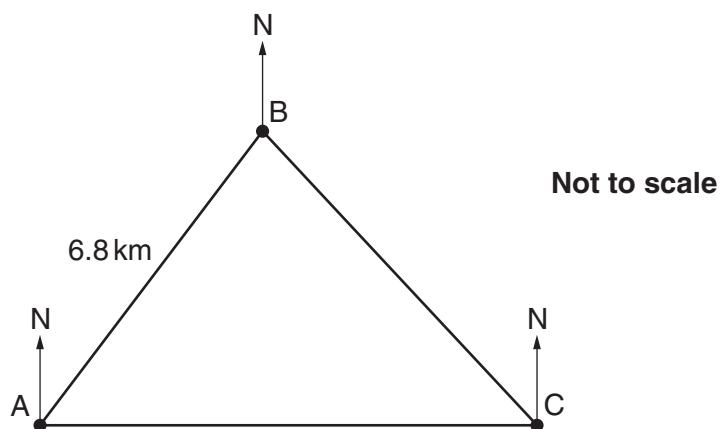
[5]

[5]

(c) Write down the ratio of the shaded area to the unshaded area in the diagram.

(c) [1]

16 A ship is at point A.
A small island is observed due East at C.
The ship travels 6.8 km on a bearing of 043° to reach B.
C is on a bearing of 118° from B.



Calculate the distance BC.

_____ km [5]

19

17 (a) Rearrange this formula to make b the subject.

$$T = \frac{h}{2} (a + b)$$

(a) _____ [3]

(b) (i) Factorise.

$$x^2 + x - 2$$

(b)(i) _____ [2]

(ii) Hence simplify.

$$\frac{x^2 + x - 2}{x^2 - 4}$$

(ii) _____ [2]

TURN OVER FOR QUESTIONS 18 AND 19.

20

18 Convert $0.\overline{13}$ to a fraction.

[2]

19 Find the x -coordinate of the point where the straight line $y = x$ meets the curve $y = 4x^2 - 3x + 1$.

[4]

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