



H

GENERAL CERTIFICATE OF SECONDARY EDUCATION
METHODS IN MATHEMATICS

B392/02

Methods in Mathematics 2 (Higher Tier)

Friday 24 June 2011
Morning

Duration: 2 hours

Candidates answer on the question paper.

OCR supplied materials:
None

- Other materials required:**
- Scientific or graphical calculator
 - Geometrical instruments
 - Tracing paper (optional)



Candidate forename		Candidate surname	
--------------------	--	-------------------	--

Centre number						Candidate number				
---------------	--	--	--	--	--	------------------	--	--	--	--

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.

You are permitted to use a calculator for this paper

This paper has been pre modified for carrier language

Formulae Sheet: Higher Tier

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



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

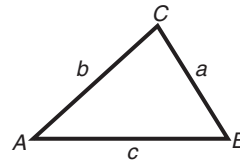


In any triangle ABC

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 = $\frac{1}{2}ab \sin C$



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 = $\pi r l$



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.

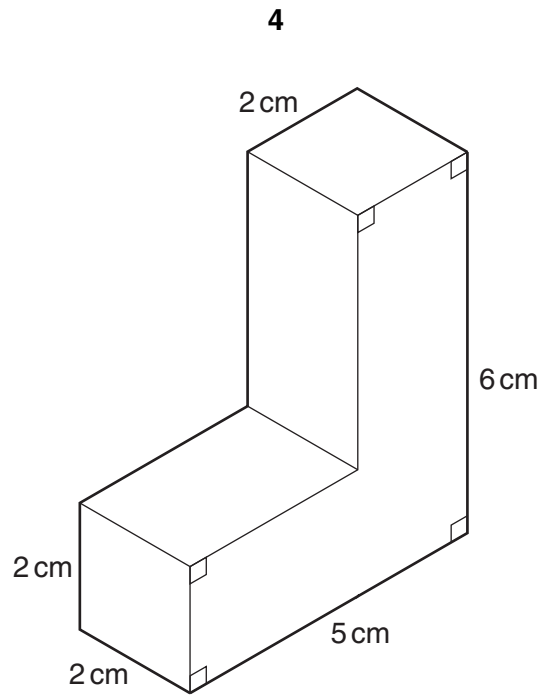
(b) _____ [2]

2 Solve.

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

_____ [2]

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]

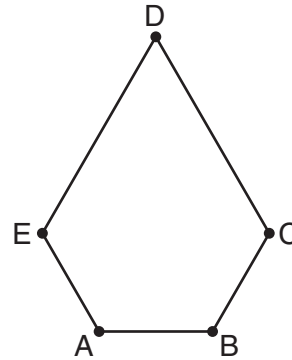
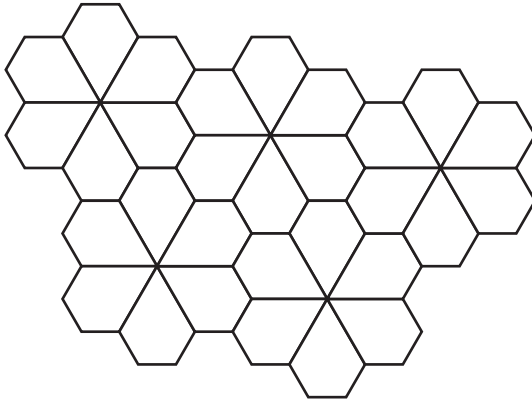
- 5 (a) (i) Calculate the size of an interior angle of a regular pentagon.

(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.

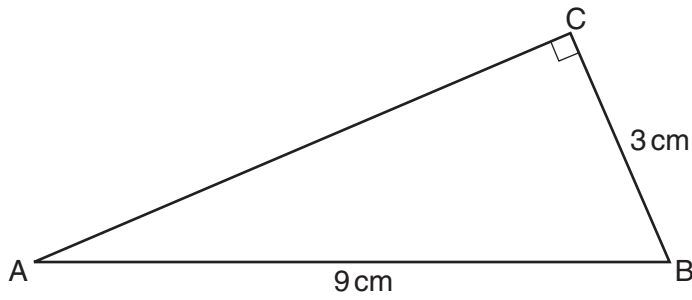
(b)(ii) _____ [1]

- (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.



Not to scale

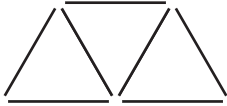
_____ cm [3]

- 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?

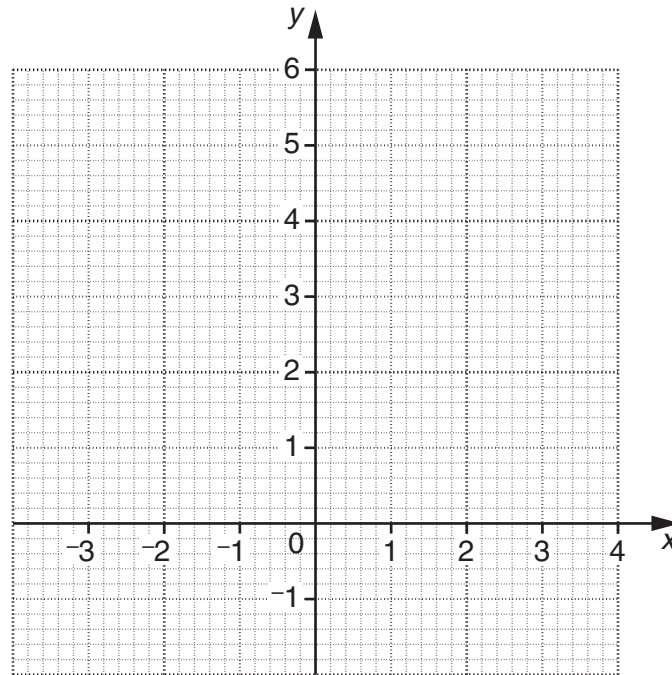
_____ [3]

- 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]

- 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.

e	f
g	h

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 .

e	

[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]

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

$$y = 2x + 4$$

$$y = -x^2$$

$$y = 4 - x^2$$

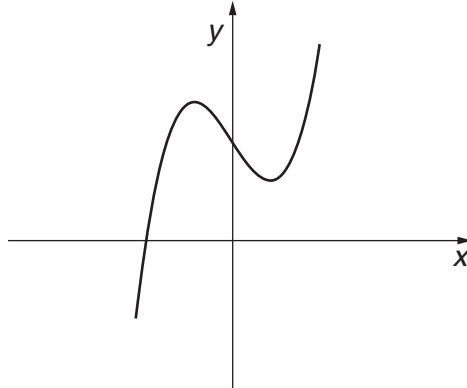
$$y = x^3$$

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

$$y = \cos x$$

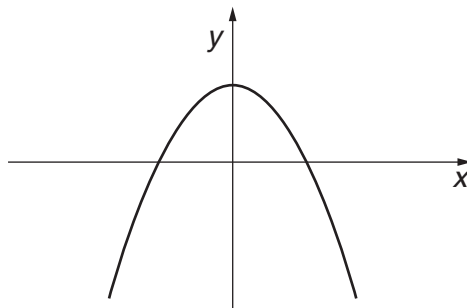
$$y = \sin x$$

(a)



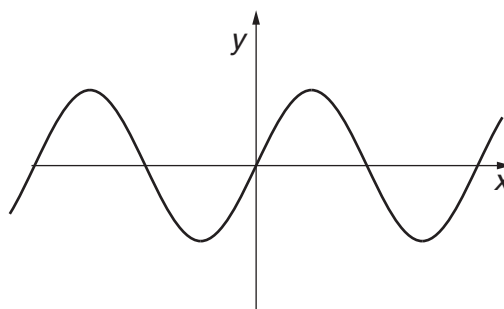
(a) _____ [1]

(b)



(b) _____ [1]

(c)



(c) _____ [1]

- 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]

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

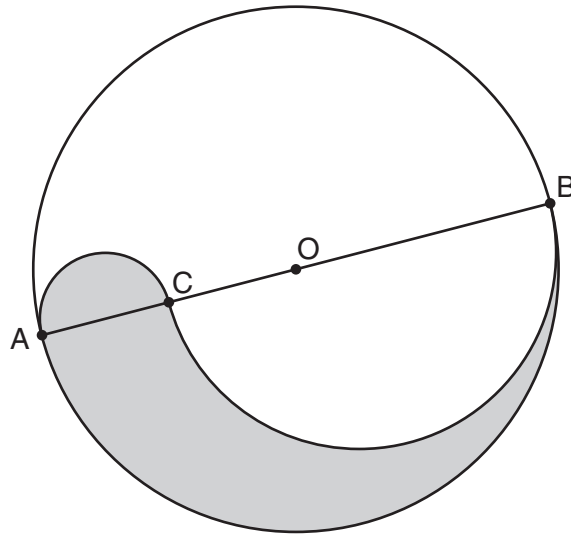
(a) Find y when $x = 8$.

(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]

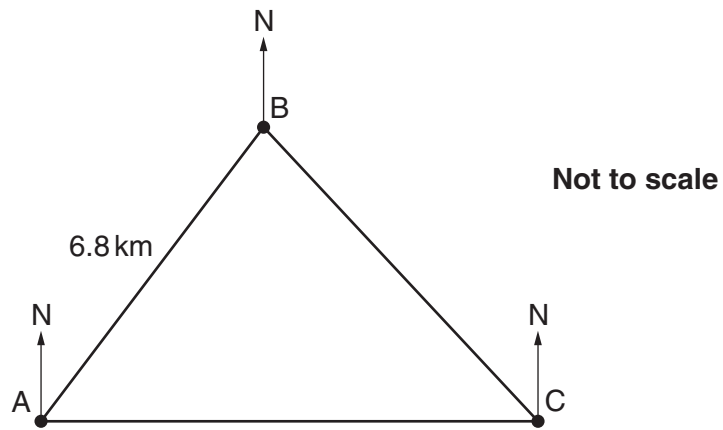
(b)* Show that the shaded area is exactly $\frac{1}{4}$ of the area of the circle with diameter AB.

[5]

(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]

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.

18 Convert $0.\dot{1}\dot{3}$ 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]



Copyright Information

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website (www.ocr.org.uk) after the live examination series. If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1GE.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.