OCR **H**

Wednesday 13 November 2013 – Morning

GCSE METHODS IN MATHEMATICS

B392/02 Methods in Mathematics 2 (Higher Tier)

Candidates answer on the Question Paper.

OCR supplied materials:
None

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

Duration: 2 hours

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. HB pencil may be used for graphs and diagrams only.
* Answer **all** the questions.
* 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).
* 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

OCR is an exempt Charity

Turn over

2
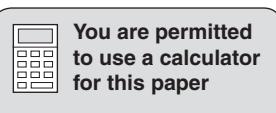
Formulae Sheet: Higher Tier

Area of trapezium $= \frac{1}{2}(a+b)h$
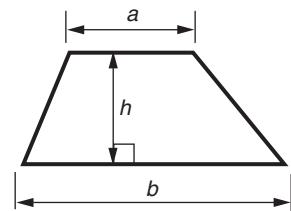
Volume of prism = (area of cross-section) × length
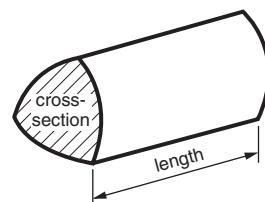
In any triangle ABC

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

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

**Area of triangle** $= \frac{1}{2}ab \sin C$
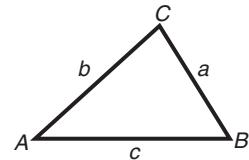
Volume of sphere $= \frac{4}{3}\pi r^3$

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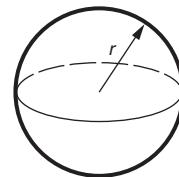
Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi r l$
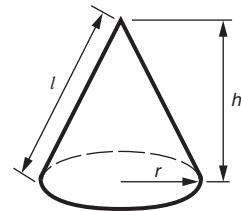
The Quadratic Equation

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

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

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3

Answer **all** the questions.

1 **(a)** Write this ratio in its simplest form.

27 : 36

(a) _____ : _____ **[2]**

(b) Here is a list of ingredients for shortbread.
The list gives the weight of each ingredient.

```
┌────────────────────────────┐
│       Shortbread           │
│  4 oz butter               │
│  2 oz sugar                │
│  6 oz flour                │
└────────────────────────────┘
```

(i) Write down the ratio of butter to sugar to flour in its simplest form.

(b) (i) _____ : _____ : _____ **[2]**

(ii) What fraction of the shortbread is sugar? Give your answer in its simplest form.

(ii) _____ **[2]**

(iii) What percentage of the shortbread is butter?

(iii) _____ % **[2]**

Turn over

2 Adam's class is thinking about a sequence. They are told the first two terms of the sequence. These are shown below.

2,   5,

(a) Adam thinks the expression for the nth term of the sequence is $n^2 + 1$.

Use Adam's expression to work out the 3rd and 4th terms of the sequence.

(a) 2,   5,   _____ ,   _____ **[2]**

(b)* Find a different possible expression for the nth term of the sequence.
Show that your expression gives 2 and 5 as the first and second terms.
Calculate the 3rd and 4th terms for your expression.
These should be different from the 3rd and 4th terms for Adam's expression.

_____

_____

_____

_____

_____

_____

_____

_____ **[4]**

3 Triangle ABC is right-angled at C. AC = 1.5 cm, AB = 3.9 cm.

Not to scale
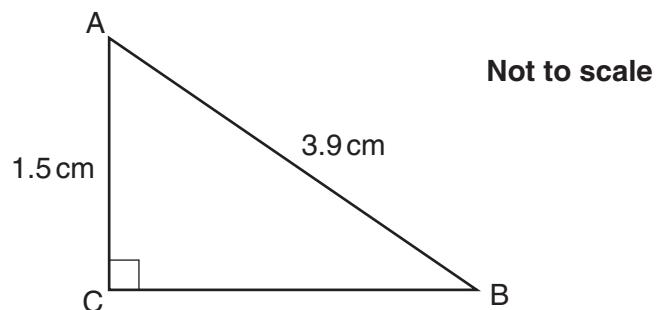
(a) Calculate length BC.

(a) _____ cm **[3]**

(b) The same triangle ABC is the cross-section of a prism of length 8 cm.
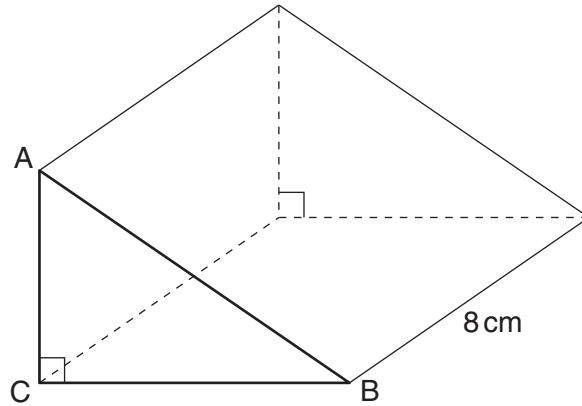
Calculate the volume of the prism.

(b) _____ cm³ **[3]**

Turn over

4* The diagram below is made from five straight lines. AC is parallel to GE.
Angle CBF = 42°, angle CDE = 90°, angle BCD = *p*, angle DEF = *q*.

Not to scale
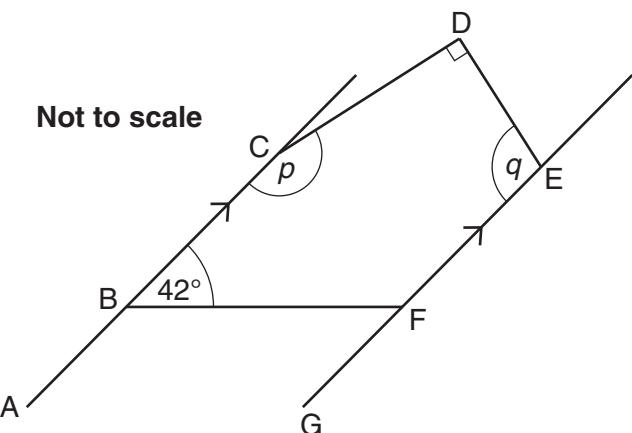
Calculate the value of *p* + *q*. Give geometrical reasons for each step of your working.

_____

_____

_____

_____

_____

_____

_____

_____ **[4]**

5 **(a)** Use your calculator to work out the following.

(i) 1.2^5

(a)(i) _____ **[1]**

(ii) $(2.4 \times 10^5) \div (3.2 \times 10^{-8})$. Give your answer in standard form.

(ii) _____ **[2]**

(b) Barry divides one whole number by another whole number on his calculator.
He gets the answer 3.125.

Find three possible calculations which Barry could have done to get this answer.

(b) [＿＿＿＿] ÷ [＿＿＿＿]

[＿＿＿＿] ÷ [＿＿＿＿]

[＿＿＿＿] ÷ [＿＿＿＿]

[3]

6 **(a)** A stamp goes up in price from 46p to 60p.

Calculate the percentage increase in price. Give your answer correct to one decimal place.

(a) _____ % **[3]**

(b) Draw a line to match each calculation on the left with the way of working it out on the right.
An example has been done for you.
Some of the statements on the right will not be used.

Find 50% of 68	0.68 × 23
	0.5 × 68
Reduce 68 by 23%	68 ÷ 0.23
	68 × 1.23
Increase 68 by 5%	68 × 1.5
	68 × 0.77
Increase 68 by 23%	68 × 1.05
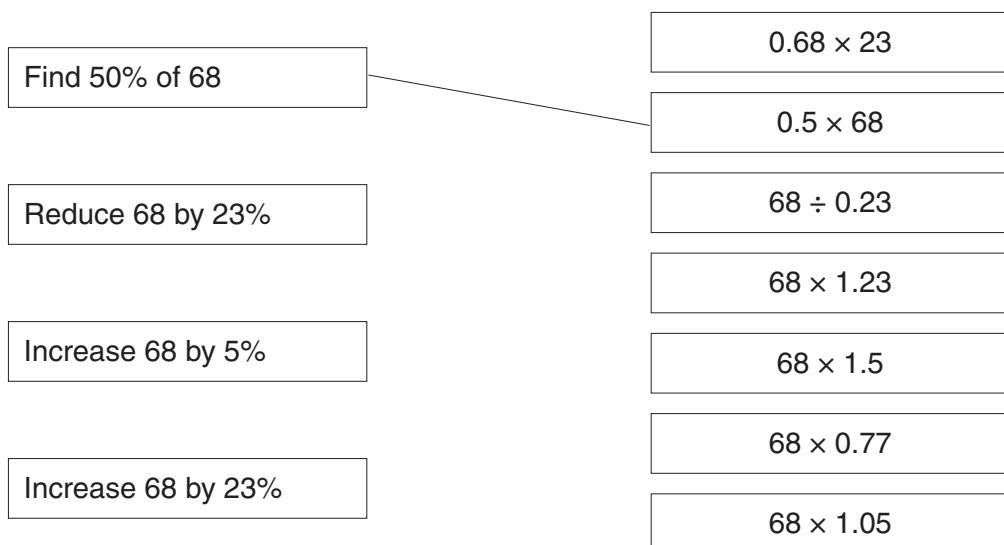
[3]

(c) Find the fraction, in its simplest form, that is half way between $\dfrac{1}{8}$ and $\dfrac{1}{4}$.

(c) _____ **[3]**

7 Solve.

(a) $3(2x-1) = 15$

(a) _____ **[3]**

(b) $5x + 3 > 9$

(b) _____ **[2]**

(c) $3x^2 - 4x + 1 = 0$

(c) _____ **[4]**

Turn over

8 **(a)** Complete the table for $y = x^3 - 3x$.

x	⁻2	⁻1.5	⁻1	⁻0.5	0	0.5	1	1.5	2
y	⁻2		2	1.375	0	⁻1.375			

[2]

(b) Draw the graph of $y = x^3 - 3x$.
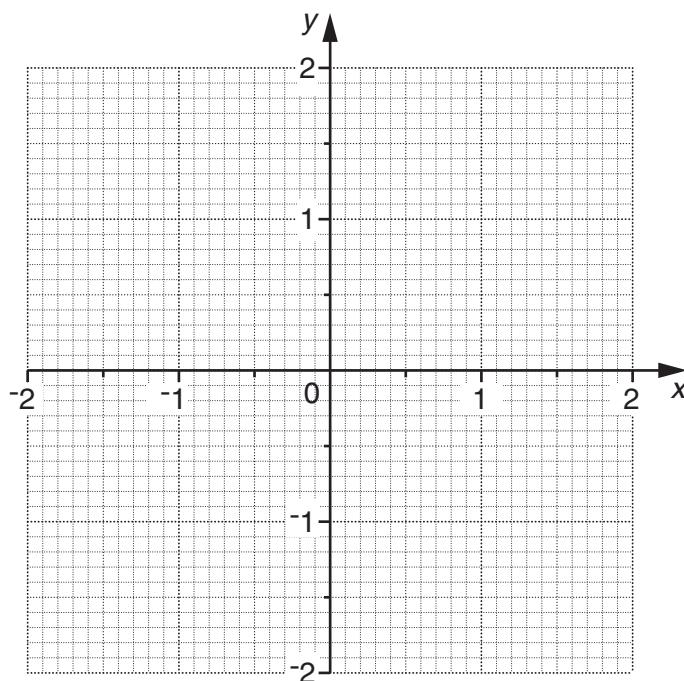
[2]

9   ABCD is a kite.
AD = AB = 3.4 cm. DC = BC = 6.2 cm.
Angle ADC = Angle ABC = 90°.
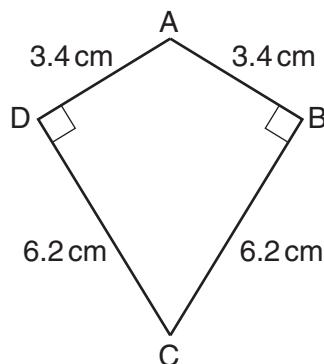
Not to scale

Calculate the size of angle DAB.

_____ ° **[4]**

Turn over

10 The diagram shows a quadrant of a circle.
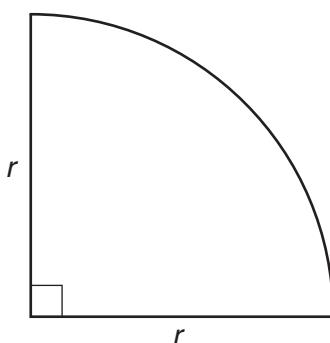
The total perimeter of the quadrant is 20 cm.

Calculate the radius, r cm.

_____cm **[4]**

11 (a) Expand and simplify.

$$(x-3)(x-1)$$

(a) _____ **[3]**

(b) Make _a_ the subject of the formula.

$$M = \sqrt{ab + c}$$

(b) _____ **[3]**

(c) Simplify.

$$\frac{2x-2}{x^2-1}$$

(c) _____ **[3]**

12 The circle on the grid below has equation $x^2 + y^2 = 4$.
AB is a diameter of the circle.
The angle between AB and the positive x-axis is 70°.
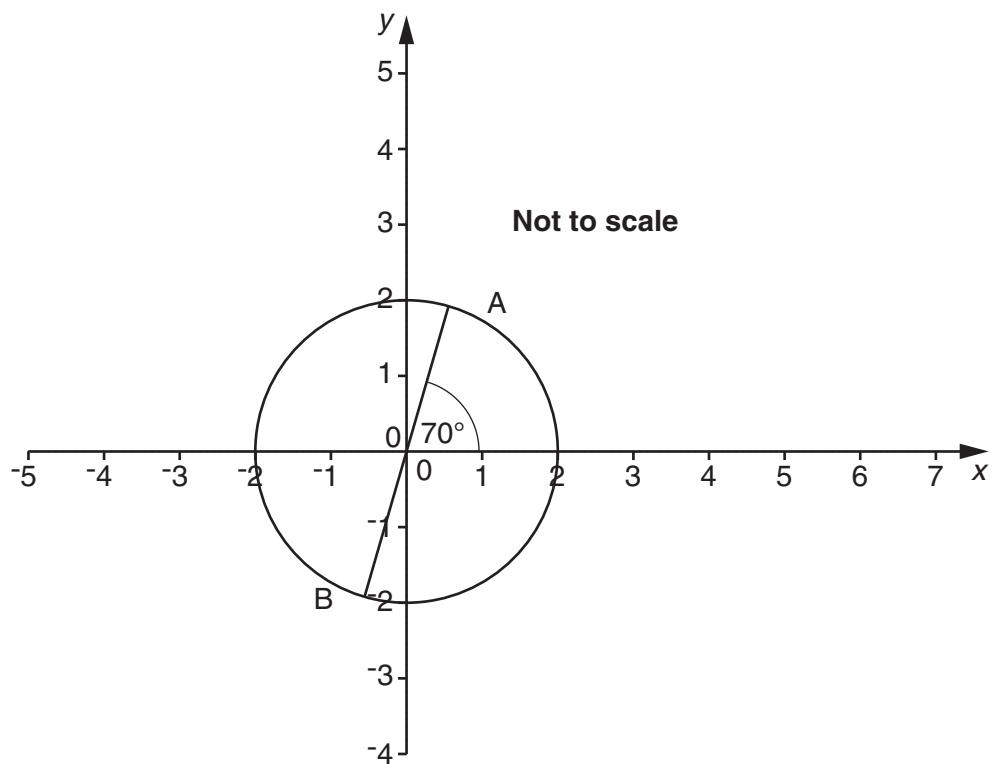
(a) The exact coordinates of point A are $(2\cos 70°,\ 2\sin 70°)$.

Write down the exact coordinates of point B.

(a) (_____ , _____) **[2]**

(b) Draw the curve with equation $x^2 + y^2 = 9$ on the diagram above. **[2]**

(c) Here are two simultaneous equations.

$$x^2 + y^2 = 4$$
$$x + y = 1$$

(i) Show that $2x^2 - 2x - 3 = 0$.

_____

_____

_____

_____

_____

_____ **[2]**

(ii) Solve $2x^2 - 2x - 3 = 0$, giving your answers correct to two decimal places.

(ii) _____ **[3]**

　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　Turn over

13 ABC is a triangle.

D is the midpoint of AB, E is the midpoint of AC, F is the midpoint of BC.

Not to scale
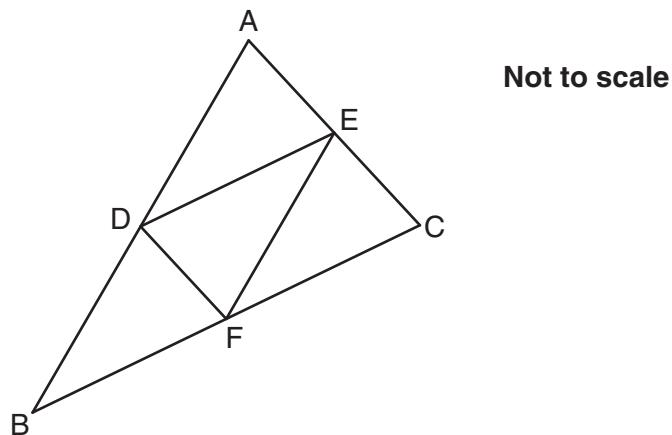
Prove that triangle ADE is congruent to triangle FED.

_____

_____

_____

_____

_____

_____

_____

_____ **[3]**

14 PQRS is a quadrilateral.
PQ = 3.2 cm, PR = 6.7 cm, PS = 7.5 cm.
Angle QPR = 48°, angle PRS = 82°.
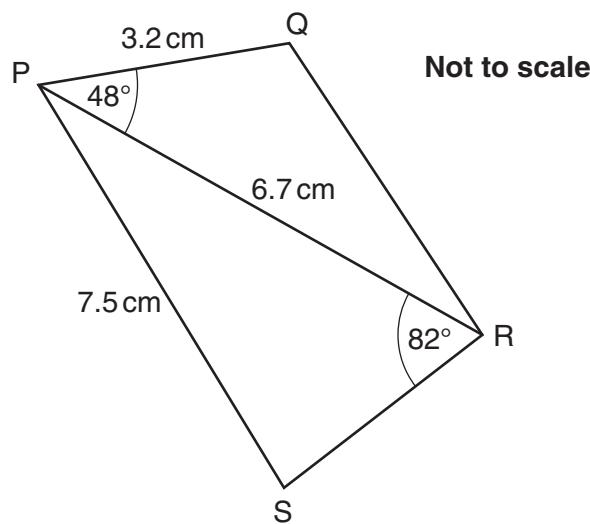
(a) Calculate QR.

(a) _____ cm **[3]**

(b) Calculate angle PSR.

(b) _____ ° **[3]**

Turn over

15 This glass is a cone on a stem and base.
The cone has radius 3 cm and height 12 cm.
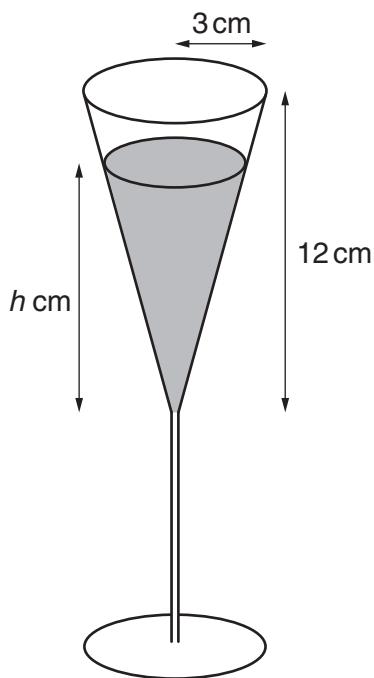
The glass is filled to half its capacity.

Work out the height, h cm, of the liquid in the cone.

_____ cm **[3]**

END OF QUESTION PAPER

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