| Centre No. | | | | | | Paper Reference | | | | | | | Surname | Initial(s) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Candidate No. | | | | | | 4 | 4 | 0 | 0 | / | 4 | H | Signature | |

Paper Reference(s)

**4400/4H**

Examiner's use only

Team Leader's use only

# London Examinations IGCSE

## Mathematics

Paper 4H

# Higher Tier

Monday 1 June 2009 – Morning

Time: 2 hours

**Materials required for examination**
Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

**Items included with question papers**
Nil

### Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initials and signature.
Check that you have the correct question paper.
Answer ALL the questions. Write your answers in the spaces provided in this question paper.
Without sufficient working, correct answers may be awarded no marks.
**You must NOT write on the formulae page. Anything you write on the formulae page will gain NO credit.**
If you need more space to complete your answer to any question, use additional answer sheets.

### Information for Candidates

The marks for individual questions and the parts of questions are shown in round brackets: e.g. **(2)**.
There are 22 questions in this question paper. The total mark for this paper is 100.
There are 20 pages in this question paper. Any blank pages are indicated.
You may use a calculator.

### Advice to Candidates

Write your answers neatly and in good English.



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*Turn over*

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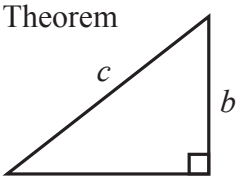
**IGCSE MATHEMATICS 4400**
**FORMULA SHEET – HIGHER TIER**

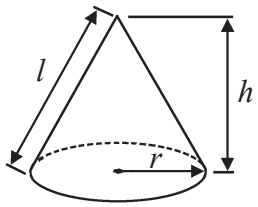
Pythagoras' Theorem




$a^2 + b^2 = c^2$

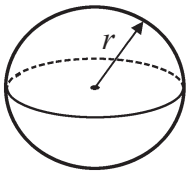
Volume of cone = $\frac{1}{3}\pi r^2 h$

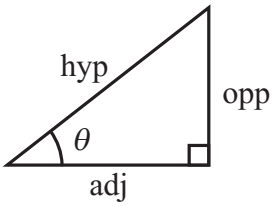
Curved surface area of cone = $\pi r l$




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

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



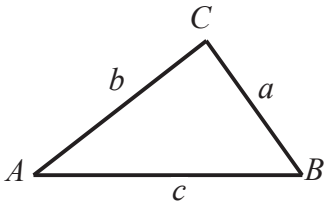

adj = hyp × cos $\theta$
opp = hyp × sin $\theta$
opp = adj × tan $\theta$

*or* $\sin\theta = \frac{\text{opp}}{\text{hyp}}$

$\cos\theta = \frac{\text{adj}}{\text{hyp}}$

$\tan\theta = \frac{\text{opp}}{\text{adj}}$

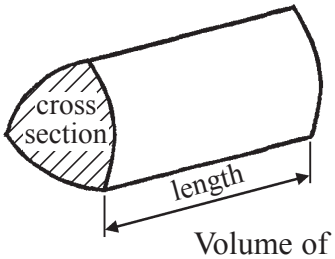
In any triangle $ABC$



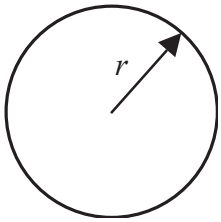

Sine rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

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

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



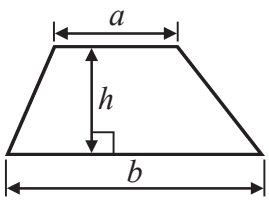

Volume of prism = area of cross section × length

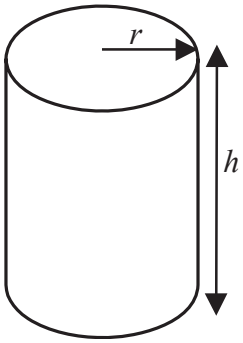



Circumference of circle = $2\pi r$

Area of circle = $\pi r^2$

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




Volume of cylinder = $\pi r^2 h$

Curved surface area of cylinder = $2\pi rh$

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

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

Leave blank

**Answer ALL TWENTY TWO questions.**

**Write your answers in the spaces provided.**

**You must write down all the stages in your working.**

**1.** Show that $\frac{2}{3} \div \frac{5}{9} = 1\frac{1}{5}$

**Q1**

**(Total 3 marks)**

**2.** Angelou has $x$ sweets.
He eats 5 of these sweets.
He puts all the sweets he has left into a bag.

(i) Nina has 3 times as many sweets as the number that Angelou put into the bag.
Nina has 39 sweets.

Use this information to write down an equation in $x$.

.....

(ii) Solve your equation to find the value of $x$.

$x =$ .....

**Q2**

**(Total 5 marks)**

Leave blank

**3.** Work out the value of $\frac{a(b+1)}{16}$ when $a = 6$ and $b = -9$

.....

**Q3**

**(Total 3 marks)**

**4.** The table gives information about the shoe sizes of 67 people.

| Shoe size | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|
| Number of people | 20 | 19 | 0 | 26 | 2 |

Find the median shoe size.

.....

**Q4**

**(Total 2 marks)**

Leave blank

**5.** (a) Calculate the circumference of a circle of radius 40 m.
Give your answer correct to 3 significant figures.

..... m
**(2)**

(b)

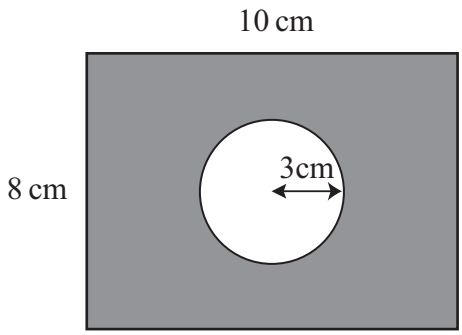



Diagram **NOT** accurately drawn

The diagram shows a circle inside a rectangle.
The rectangle has length 10 cm and width 8 cm.
The radius of the circle is 3 cm.

Calculate the area of the shaded region.
Give your answer correct to 3 significant figures.

..... $cm^2$
**(4)**

**Q5**

**(Total 6 marks)**

Leave blank

**6.** The diagram shows a biased spinner, numbered 1, 2, 3 and 4

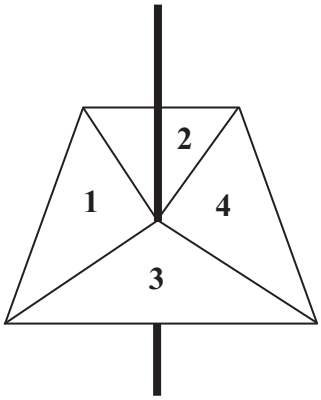



Diagram **NOT** accurately drawn

When the spinner is spun, the number on which it lands is the score.

The table shows the probabilities for three of the scores.

| Score | Probability |
|---|---|
| 1 | 0.3 |
| 2 | 0.1 |
| 3 | 0.4 |
| 4 | |

The spinner is spun once.
Work out the probability that the score is

(a) 4

.....

**(2)**

(b) an odd number.

.....

**(2)**

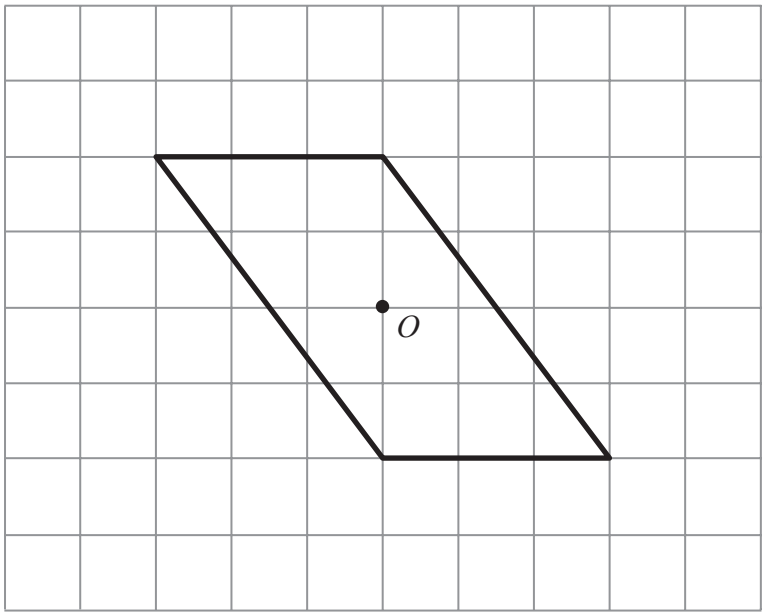
**Q6**

**(Total 4 marks)**

Leave blank

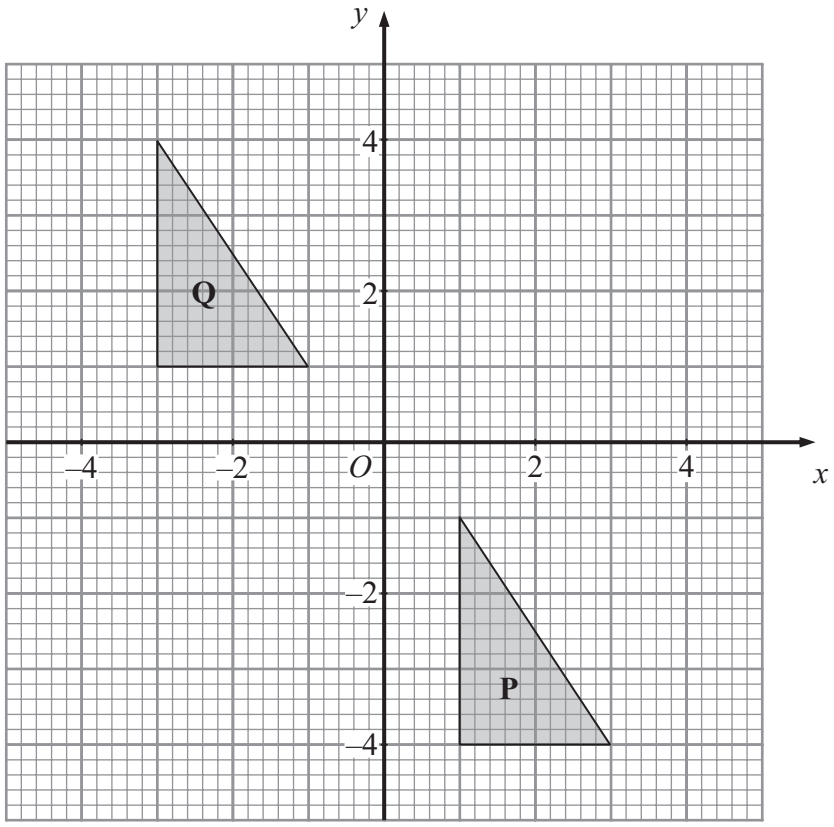
**7.** The diagram shows a parallelogram.

(a) On the grid, rotate the parallelogram through 90° anticlockwise about the point $O$.




**(2)**

(b)




Describe fully the single transformation that maps triangle **P** onto triangle **Q**.

.....

**Q7**

**(2)**

**(Total 4 marks)**

Leave blank

**8.** (a)

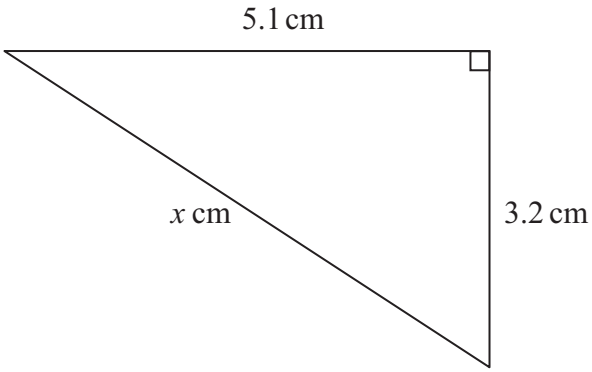



Diagram **NOT** accurately drawn

Calculate the value of $x$.
Give your answer correct to 3 significant figures.

$x =$ .....

**(3)**

(b)

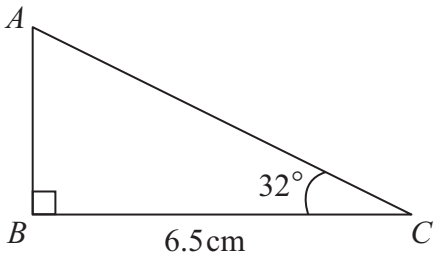



Diagram **NOT** accurately drawn

Calculate the length of $AB$.
Give your answer correct to 3 significant figures.

..... cm

**(3)**

**Q8**

**(Total 6 marks)**

Leave blank

**9.** Solve $\frac{12 - x}{3} = 7$

$x =$ .....

**Q9**

**(Total 3 marks)**

**10.** Express 132 as a product of its prime factors.

.....

**Q10**

**(Total 3 marks)**

Leave blank

**11.** Jagdeesh has to work out $\dfrac{84.2 \times \sqrt{38.2}}{41.6}$ without using a calculator.

Use suitable approximations to work out an estimate for Jagdeesh's calculation.
You **must** show all your working.

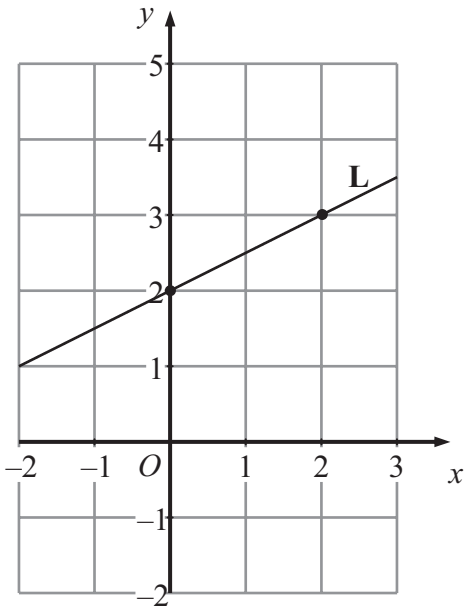
.....

**Q11**

**(Total 3 marks)**

Leave blank

**12.** The straight line, **L**, passes through the points (0, 2) and (2, 3).




(a) Work out the gradient of **L**.

.....

**(2)**

(b) Find the equation of **L**.

.....

**(2)**

(c) Write down the equation of a line parallel to **L**.

.....

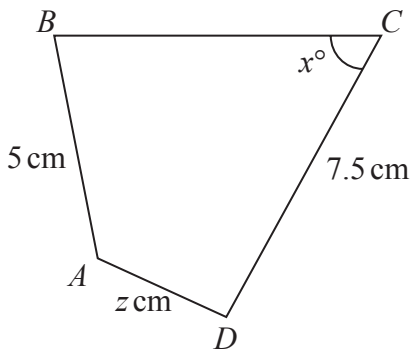
**(1)** **Q12**

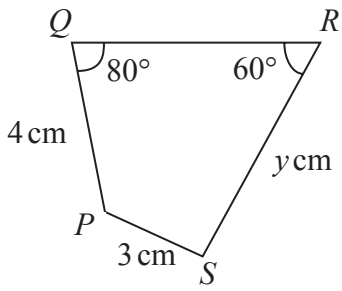
**(Total 5 marks)**

Leave blank

**13.** *ABCD* and *PQRS* are two similar quadrilaterals.

Diagrams **NOT** accurately drawn




*AB* corresponds to *PQ*.
*BC* corresponds to *QR*.
*CD* corresponds to *RS*.

Find the value of

(a) $x$,

$x =$ .....
**(1)**

(b) $y$,

$y =$ .....
**(2)**

(c) $z$.

$z =$ .....
**(2)** **Q13**

**(Total 5 marks)**

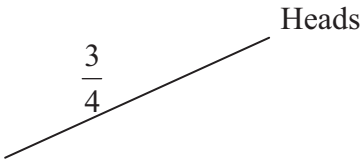
Leave blank

**14.** A coin is biased so that when it is thrown, the probability that it will show Heads is $\frac{3}{4}$

The coin is thrown twice.

(a) Complete the probability tree diagram.

First throw Second throw




**(3)**

(b) Work out the probability that the coin shows Tails on both throws.

.....

**(2)** **Q14**

**(Total 5 marks)**

Leave blank

**15.** (a) Simplify $3c^5d \times c^2d^4$

.....

**(2)**

(b) Simplify $(2x^3y)^4$

.....

**(2)**

(c) Simplify fully $\dfrac{2x-6}{x^2-3x}$

.....

**(2)**

**Q15**

**(Total 6 marks)**

**16.** (a) Factorise $2x^2 - x - 3$

.....

**(2)**

(b) Hence write down the solutions of $2x^2 - x - 3 = 0$

.....

**(1)**

**Q16**

**(Total 3 marks)**

Leave blank

**17.** A curve has equation $y = x^2 + 3x$

(a) Find $\frac{dy}{dx}$

.....

**(2)**

(b) Find the gradient of the curve at the point where $x = -4$

.....

**(1)**

(c) The curve has a minimum point.
Find the coordinates of this minimum point.

.....

**(3)**

**Q17**

**(Total 6 marks)**

Leave blank

**18.** The diagram shows a parallelogram, $ABCD$.
$M$ is the midpoint of $BC$.
$N$ is the midpoint of $AD$.

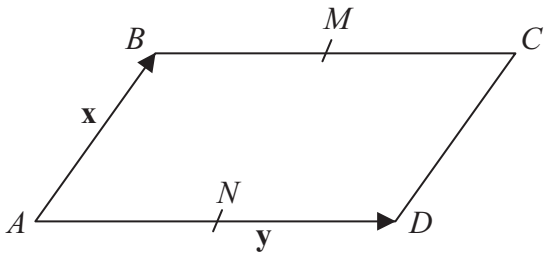



Diagram **NOT** accurately drawn

$\overrightarrow{AB} = \mathbf{x}$

$\overrightarrow{AD} = \mathbf{y}$

Find, in terms of **x** and/or **y**, the vectors

(a) $\overrightarrow{MN}$

.....

**(1)**

(b) $\overrightarrow{AC}$

.....

**(1)**

$P$ is the point such that $\overrightarrow{CP} = \mathbf{y} - \frac{1}{2}\mathbf{x}$

(c) Find, in terms of **x** and/or **y**, the vector $\overrightarrow{PA}$
Simplify your answer as much as possible.

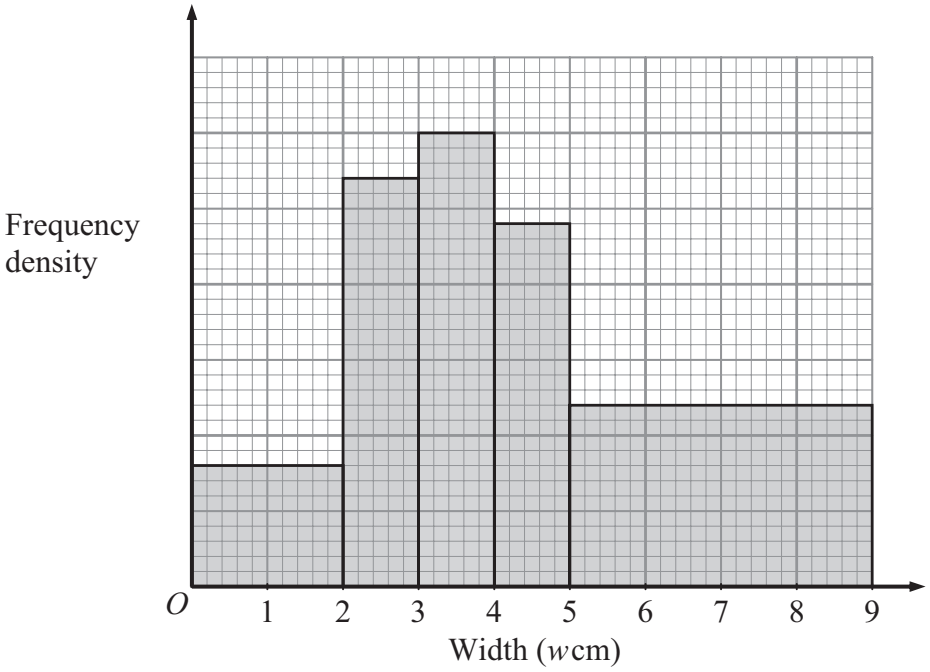
.....

**(3)** **Q18**

**(Total 5 marks)**

Leave blank

**19.** The histogram shows information about the widths, $w$ centimetres, of some leaves.




The number of leaves with widths in the class $3 < w \leqslant 4$ is 15

(a) Find the number of leaves with widths in the class $0 < w \leqslant 2$

.....

**(2)**

(b) Find an estimate of the number of leaves with widths in the range

$4.5 < w \leqslant 5.5$

.....

**(3)** **Q19**

**(Total 5 marks)**

Leave blank

**20.** The diagram shows an equilateral triangle of side 2 m.

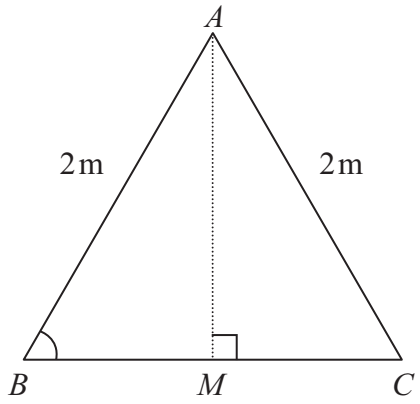



Diagram **NOT** accurately drawn

(a) (i) Use the diagram to show that $\cos 60^\circ = \frac{1}{2}$

(ii) Use the diagram to find the exact value of $\sin 60^\circ$
Give your answer as a surd.

$\sin 60^\circ =$ .....

**(4)**

(b) Use the exact values of $\cos 60^\circ$ and $\sin 60^\circ$ to show that $(\cos 60^\circ)^2 + (\sin 60^\circ)^2 = 1$

**(2)**

**Q20**

**(Total 6 marks)**

Leave blank

**21.** (a) Solve $2x^2 + 3x - 1 = 0$
Give your solution(s) correct to 3 significant figures.

.....

**(3)**

(b) Solve $\frac{2}{x} - \frac{1}{x+1} = 1$

.....

**(4)** **Q21**

**(Total 7 marks)**

**TURN OVER FOR QUESTION 22**

Leave blank

**22.** (a) Each of the numbers $x$, $y$ and $z$ is greater than 1 and less than 10

$x \times 10^5 + y \times 10^4 = z \times 10^5$

Find an expression for $z$ in terms of $x$ and $y$.
Give your answer as simply as possible.

$z =$ .....

**(2)**

(b) Each of the numbers $3 \times 10^n$, $4 \times 10^m$ and $a \times 10^p$ is in standard form.

$$\frac{3 \times 10^n}{4 \times 10^m} = a \times 10^p$$

(i) Find the value of $a$.

$a =$ .....

(ii) Find an expression for $p$ in terms of $n$ and $m$.

$p =$ .....

**(3)** **Q22**

**(Total 5 marks)**

**TOTAL FOR PAPER: 100 MARKS**

**END**