Surname	Centre Number	Candidate Number
Other Names		0

GCSE LINKED PAIR PILOT

4363/02

METHODS IN MATHEMATICS

UNIT 1: METHODS (NON-CALCULATOR)
HIGHER TIER

P.M. MONDAY, 11 June 2012

2 hours

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 ***6(b)***.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1	**5**	
2	**4**	
3	**5**	
4	**6**	
5	**10**	
6	**11**	
7	**6**	
8	**3**	
9	**3**	
10	**3**	
11	**9**	
12	**4**	
13	**9**	
14	**3**	
15	**8**	
16	**11**	
TOTAL MARK		

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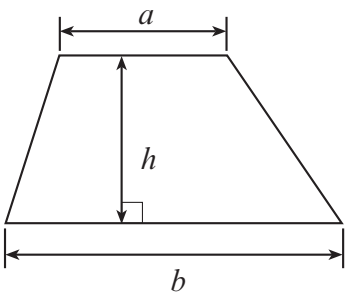
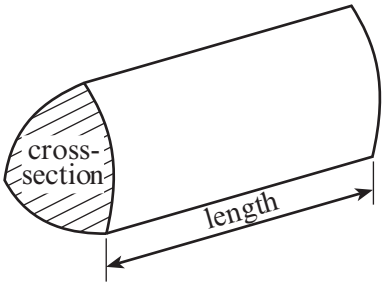
Formula List

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

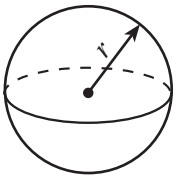


Volume of prism = area of cross-section × length



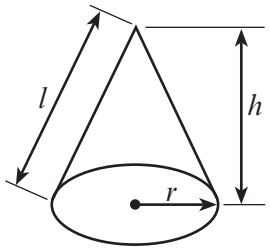
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

Curved surface area of cone = πrl

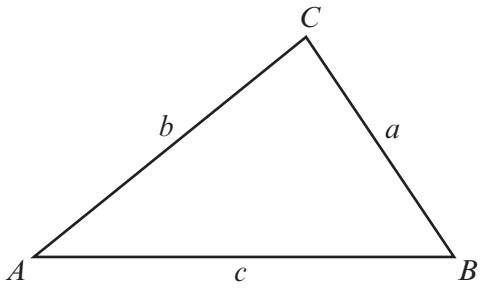


In any triangle ABC

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

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

Examiner only

1. *(a)* Find the highest common factor of 48 and 64.

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[1]

(b) Find the lowest common multiple of 36 and 90.

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[1]

(c) Write down all the prime numbers between 70 and 80.

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[1]

(d) Evaluate $(0{\cdot}78 \times 10 + 3{\cdot}2)^2$.

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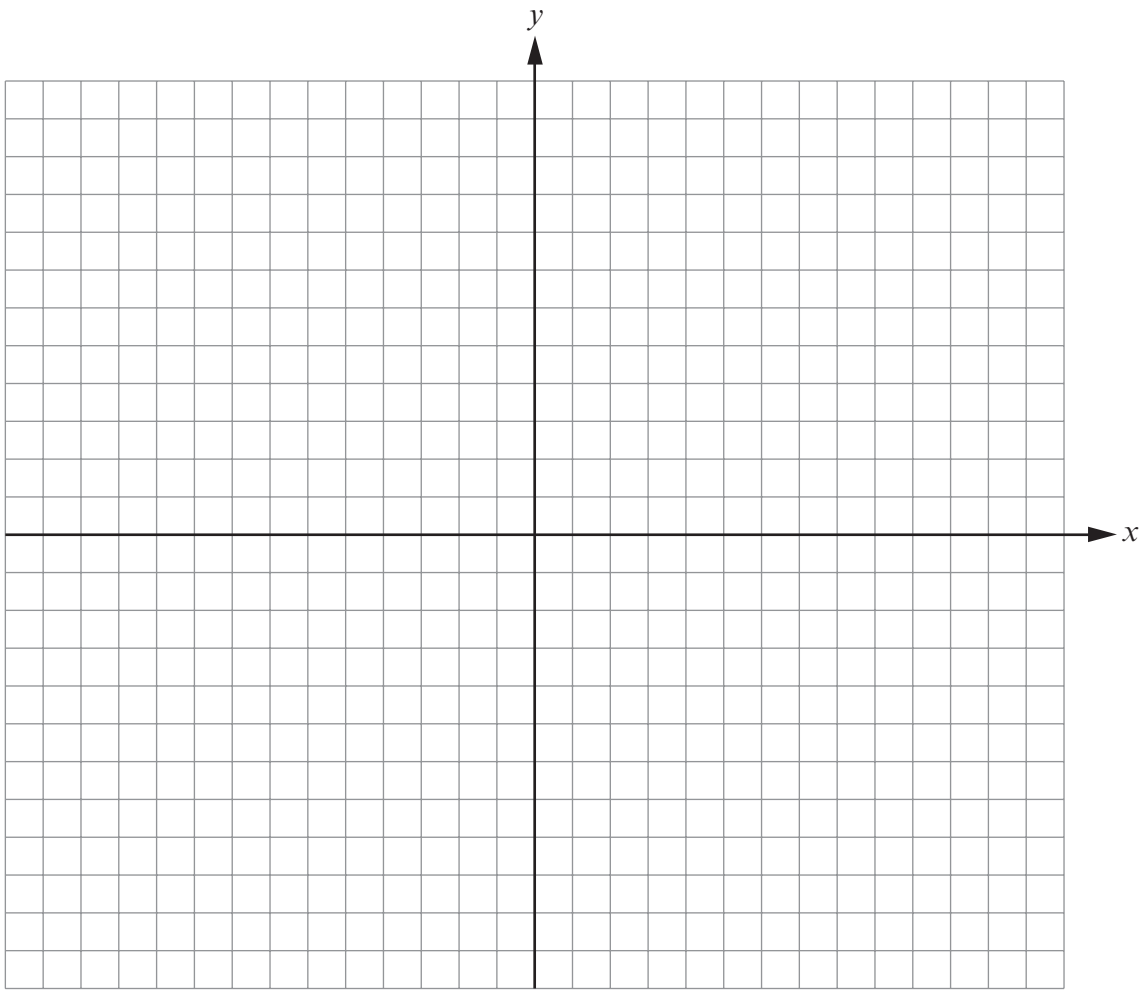
[2]

Examiner only

2. The coordinates of three vertices of a parallelogram are (5, –2), (–3, –2) and (–2, –6).



(a) Find the coordinates of a fourth vertex of the parallelogram.

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(..... , ...)

[2]

(b) Find the coordinates of the mid point of a diagonal of your parallelogram.

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(..... , ...)

[2]

3. Two sets of rods of length 1, 2, 4, 8, 16 and 32 cm are available to make shapes.

1 cm	2 cm	4 cm	8 cm	16 cm	32 cm
1 cm	2 cm	4 cm	8 cm	16 cm	32 cm

Rods are joined end to end, with all parts of the rods forming part of the shape.

(a) Show how you could use some of these rods to make an equilateral triangle with sides of length 10 cm.

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[1]

(b) What would be the lengths of the sides of the **largest** possible equilateral triangle that could be made using these rods? You must state which rods are used and how the equilateral triangle is to be made.

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[2]

(c) Explain why it is not possible to create a rhombus using some of these rods.

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[2]

Examiner only

4. Simon has two fair dice in his pocket, one blue dice and one red dice.

The two dice are thrown and the two outcomes are multiplied together then the two original outcomes are added on to obtain the total score.

Simon writes the rule as follows:

red × blue + red + blue

The table below shows the possible outcomes and how some of the total scores are recorded.

		Blue dice					
		1	**2**	**3**	**4**	**5**	**6**
Red dice	**1**	3	5				
	2			11			20
	3	7				23	
	4						
	5	11			29		
	6		20				

(a) Complete the table. [3]

(b) Write down the probability that the total score is

(i) less than 10,

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[1]

(ii) a factor of 14,

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[1]

(iii) a 2-digit number.

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[1]

Examiner only

5. *(a)* Divide £2680 in the ratio 5 : 3 : 2.

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[3]

(b) (i) Write 1200 as a product of prime factors using index notation.

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[3]

(ii) Write down the smallest possible number by which 1200 has to be multiplied to create a perfect square.

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[1]

(c) Write $\frac{13}{99}$ as a recurring decimal.

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[2]

(d) Express $\frac{1}{2}\%$ as an equivalent decimal.

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[1]

Examiner only

6. *(a)* Write down the *n*th term of the following sequences.

(i) 6, 13, 20, 27, ...

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[2]

(ii) 26, 20, 14, 8, ...

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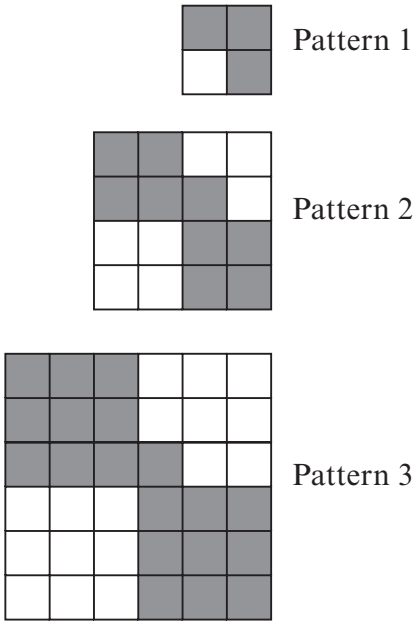
[2]

Examiner only

(b) *You will be assessed on the quality of your written communication in this part of the question.*

The diagrams show tile patterns.
Each pattern has some shaded tiles and some white tiles.



Find the expression for the total number of tiles in Pattern n, the expression for the number of shaded tiles in Pattern n and the expression for the number of white tiles in Pattern n.

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[7]

Turn over.

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Examiner only

7. Two of the exterior angles of a pentagon are 110° and 130°.
The other exterior angles of this pentagon are all equal.
Calculate the size of the largest of the interior angles of this pentagon.

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[6]

8. *(a)* Express 0·000053 in standard form.

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[1]

(b) Evaluate $(4{\cdot}5 \times 10^7) \times (4 \times 10^5)$ giving your answer in standard form.

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[2]

Examiner only

9. Rearrange the following to make r the subject of the formula

$$A = \frac{4\pi r^2}{3}.$$

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[3]

10.

Line	Equation
A	$y = 3x + 4$
B	$y = -3x + 3$
C	$y = -2x - 4$
D	$y = 3x - 5$
E	$y = 4x + 4$

(a) Which two of the above lines are parallel?
You must give a clear reason for your answer.

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[2]

(b) Which two of the above lines intersect each other on the y-axis?

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[1]

Examiner only

11. The table shows some of the values of $y = 2x^2 + 3x - 9$ for values of x from –4 to 3.

(a) Complete the table below.

x	–4	–3	–2	–1	0	1	2	3
$y = 2x^2 + 3x - 9$	11	0		–10	–9	–4		18

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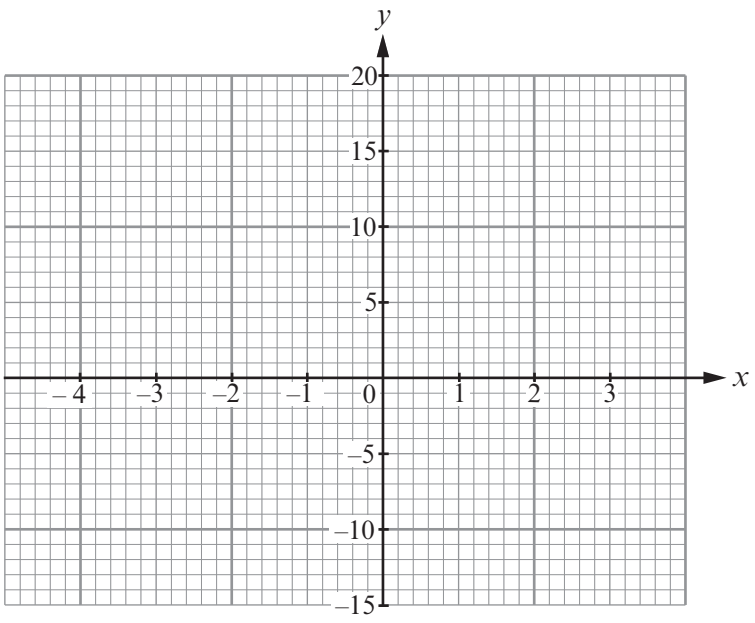
[2]

(b) On the graph paper below, draw the graph of $y = 2x^2 + 3x - 9$ for values of x from –4 to 3.



[3]

(c) Use your graph to solve $2x^2 + 3x - 9 = 0$.

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[2]

(d) Use your graph to solve $2x^2 + 3x - 9 = 6$.

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[2]

Examiner only

12. The diagram shows a circle with $BC = 30\,\text{cm}$, $AB = 50\,\text{cm}$ and $CD = 25\,\text{cm}$.

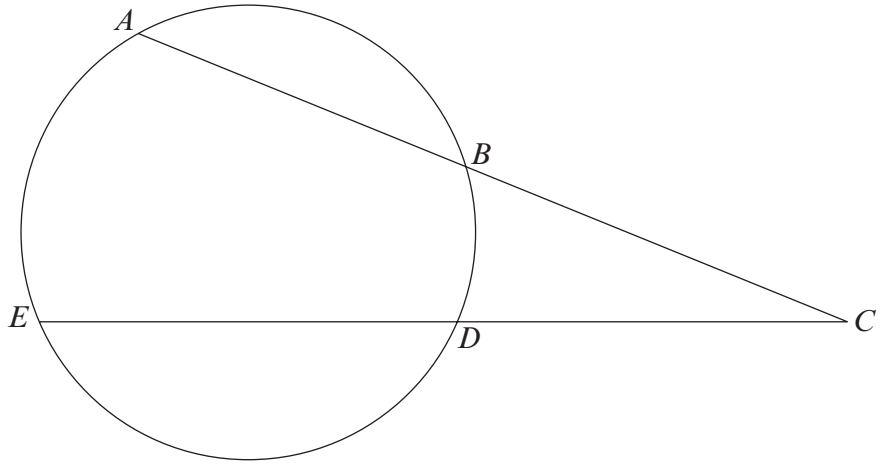

Diagram is not drawn to scale

Calculate the length of ED.

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[4]

Examiner only

13. *(a)* Express $8^{-\frac{2}{3}}$ as a decimal.

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[2]

(b) Factorise $4x^2 - 1600$.

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[3]

(c) Evaluate $(\sqrt{3})^6$.

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[1]

(d) Simplify $(2 + 3\sqrt{2})(5 - \sqrt{2})$.

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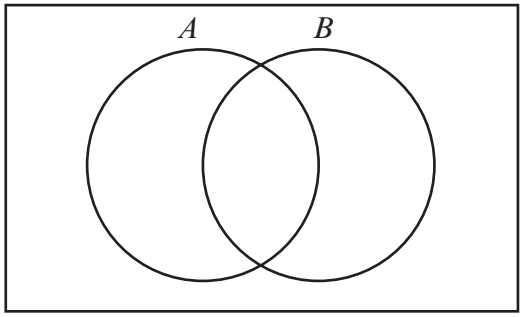
[3]

Examiner only

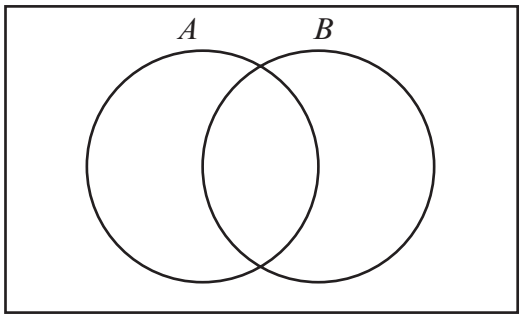
14. On each Venn diagram, shade the appropriate region to represent the information given in each part of the question.

(a) $A \cap B$



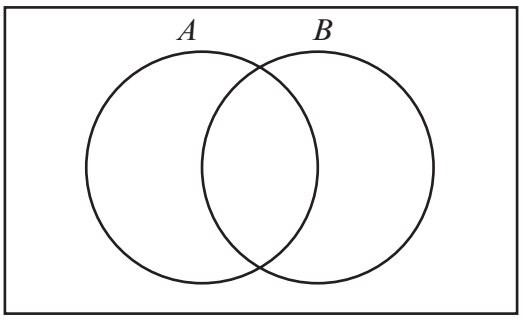
[1]

(b) $(A \cup B)'$



[1]

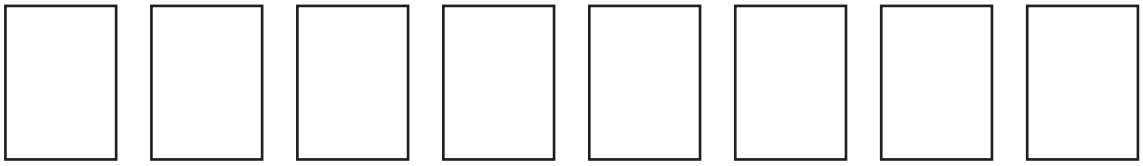
(c) $A \cup B'$



[1]

Examiner only

15. Each of eight cards has one factor of 70 on it.
The eight numbers are all different.



Two cards are selected at random without replacement.

(a) Calculate the probability that the **difference** of the two numbers on the selected cards is odd.

[5]

(b) Calculate the probability that at least one of the selected cards is even.

[3]

Examiner only

16. *(a)* Express $x^2 - 16x + 66$ in the form $(x + a)^2 + b$ where a and b are values to be found.

[2]

(b) Prove that $\frac{2x + 3}{4} - \frac{3x - 2}{3} + \frac{1}{6} \equiv \frac{19 - 6x}{12}$.

[5]

(c) Simplify $\frac{2x^2 + 5x - 7}{10x + 35}$.

[4]

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