WJEC CBAC

GCSE LINKED PAIR PILOT

4363/02

METHODS IN MATHEMATICS
UNIT 1: Methods (Non-Calculator)
HIGHER TIER

A.M. FRIDAY, 11 January 2013

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**(a).

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

Formula List

Area of trapezium $= \frac{1}{2}(a + b)h$
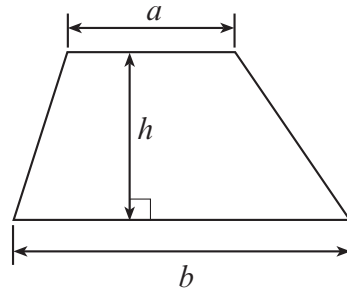
Volume of prism = area of cross-section × length
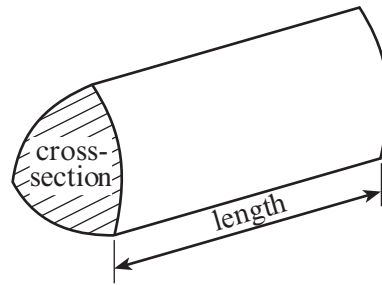
Volume of sphere $= \frac{4}{3}\pi r^3$

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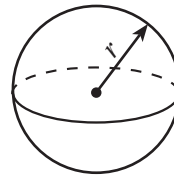
Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi rl$
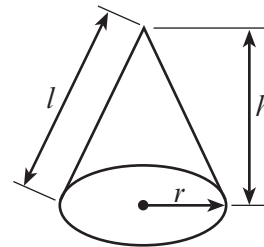
In any triangle ABC

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 $= \dfrac{1}{2}ab \sin C$
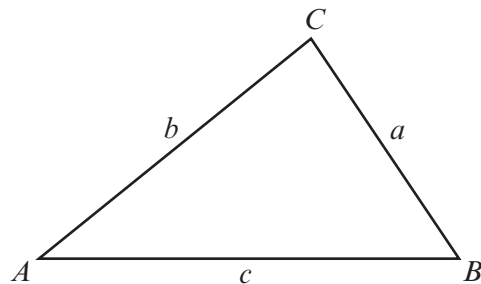
The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$

where $a \neq 0$ are given by

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

1. *(a)* Place the whole numbers 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10 in the correct positions in the Venn diagram.

Odd numbers

Multiples of 3

Factors of 24
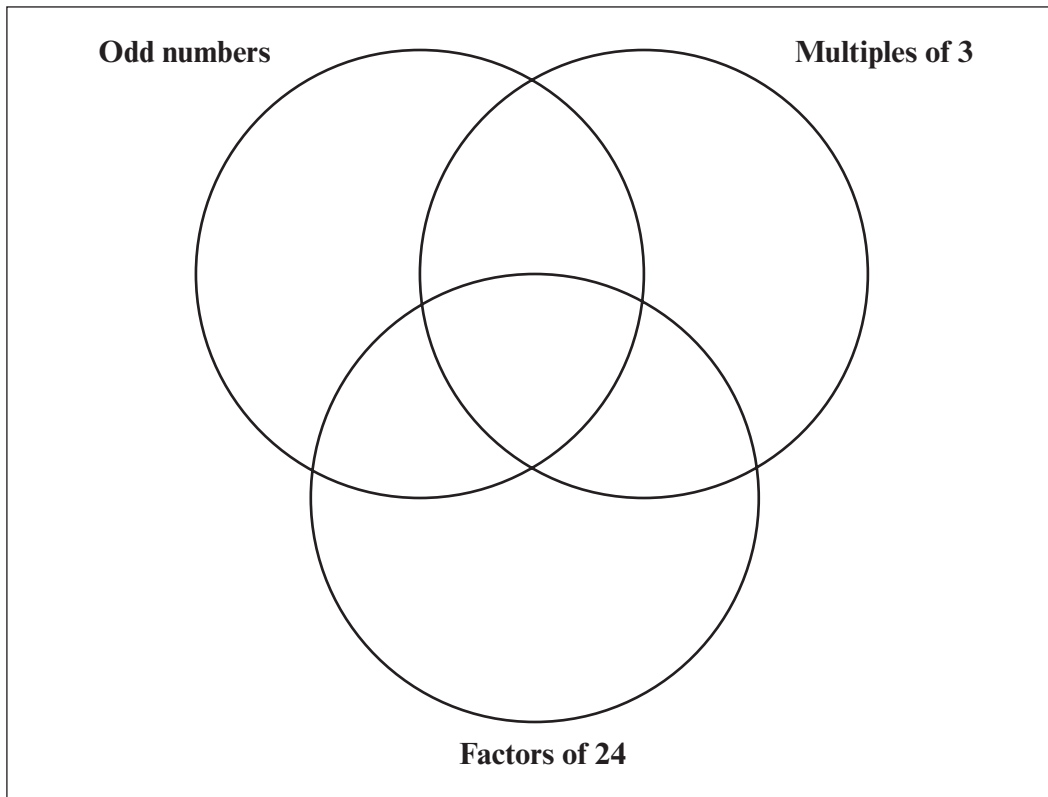
[3]

(b) A whole number is selected at random from the set {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}.

Find the probability that the number selected is

an odd number, ...

an odd number that is a factor of 24, ...

not a multiple of 3 and not a factor of 24. ....

[3]

4363
020003

2. Find the size of the angles *q*, *r*, *s* and *t*.
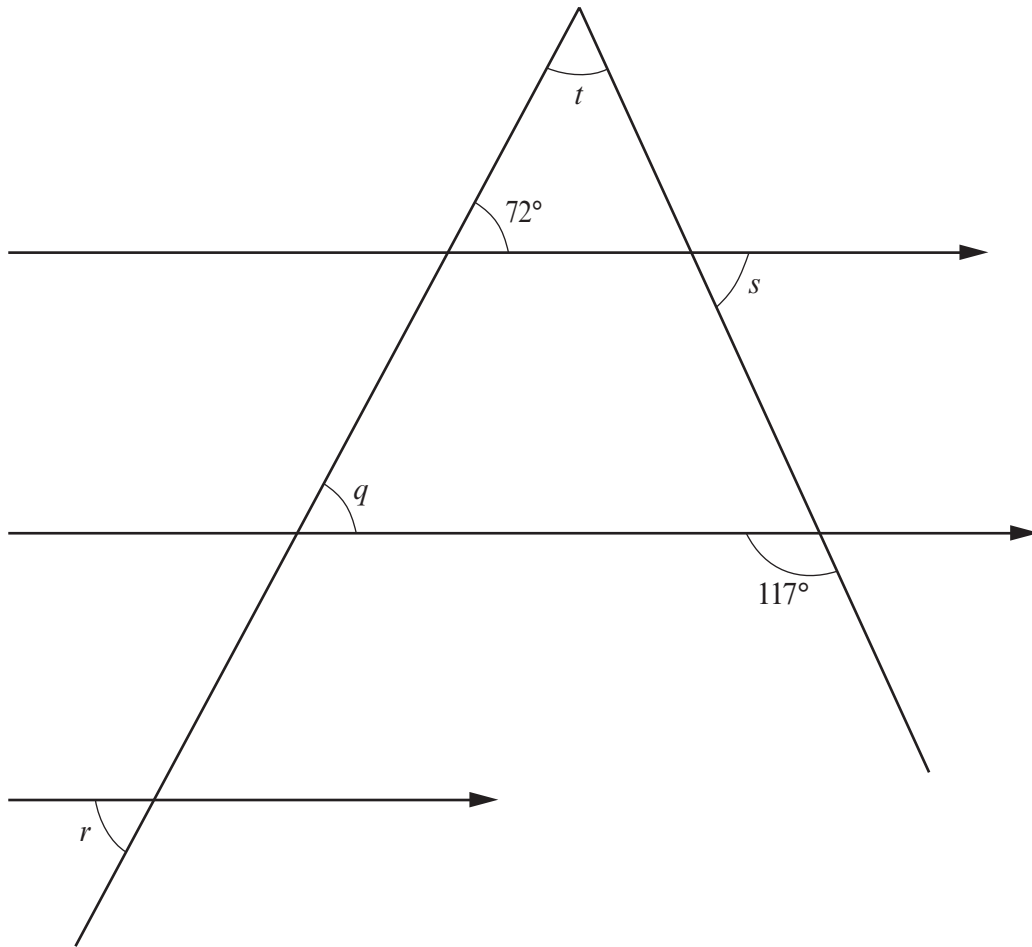
Diagram not drawn to scale

....

....

....

....

q = ... °   *r* = ... °   *s* = ... °   *t* = ... °

[4]

3. *(a)* Write 3600 as a product of prime factors using index notation.

....

....

....

....

....

....

....

....

....

....

[3]

(b) The sum of 4 consecutive prime numbers is 60.
Calculate the sum of these 4 prime numbers together with the next two prime numbers.

....

....

....

....

....

....

....

[4]

4. *(a)* The two smaller angles in a kite are 30° and 70°.
Calculate the size of the other angles of this kite.

....

....

....

....

....

....

[3]

(b) Draw an example of a trapezium with equal diagonals.
You must make it clear why the diagonals are equal.

....

....

[3]

5. *(a)* Evaluate 4.21×1.3 giving your answer correct to 2 significant figures.

....

....

....

....

....

....

[3]

(b) Convert each of the following fractions into a decimal **and** state whether or not the decimal is a terminating or recurring decimal.
Show **all** your working.

$\dfrac{7}{8}$

....

....

$\dfrac{2}{9}$

....

....

$\dfrac{4}{11}$

....

....

[4]

6. Alma is mixing paint.
She needs to create a colour that is a mix of yellow, blue and white paint in the ratio $2:3:10$.
She wants to make 4·5 litres of this colour paint.
Alma has enough yellow and white paint, but she needs to buy the blue paint.
Blue paint is sold in $\frac{1}{2}$ litre tins, with each tin costing £3.72.

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

Calculate how much Alma will need to spend on buying the blue paint.
You must show **all** your working.

....

....

....

....

....

....

....

....

....

[7]

(b) How much of the blue paint will Alma have left over?

....

....

[1]

7. A ten-sided spinner has sides labelled with numbers from 1 to 10.

The spinner is spun 20 times.
It shows the number 3 on six of these occasions.

The spinner is spun another 20 times.
It shows the number 3 on four of these occasions.

(a) Do you think this is a fair spinner?
You must show your working and give a reason for your answer.

....

....

....

....

....

[2]

(b) Find the best estimate for the probability of the spinner showing the number 3 on a single spin.

....

....

....

[2]

(c) How could your estimate for the probability of the spinner showing the number 3 be improved?

....

....

....

[1]

8. A certain pentagon has 5 angles known as the first, second, third, fourth and fifth angles.

- The second angle is twice the size of the first angle.
- The third angle is three times the size of the second angle.
- The fourth and the fifth angles are both right angles.

Calculate the size of the **largest angle** in the pentagon.

....

....

....

....

....

....

....

....

....

....

....

....

....

[7]

9. Andy sometimes gets a lift to and from college.
When he does not get a lift he walks.
The probability that he gets a lift to college is 0·4.
The probability that he walks home from college is 0·7.
Getting to college and getting home from college are independent events.

(a) Complete the following tree diagram.

Andy gets a lift home
from college

....

0·4   Andy gets a
           lift to college

                              0·7   Andy walks home from
                                         college

                              Andy gets a lift home
                              from college

....

.... Andy walks
                      to college

                              Andy walks home from
                              college

....
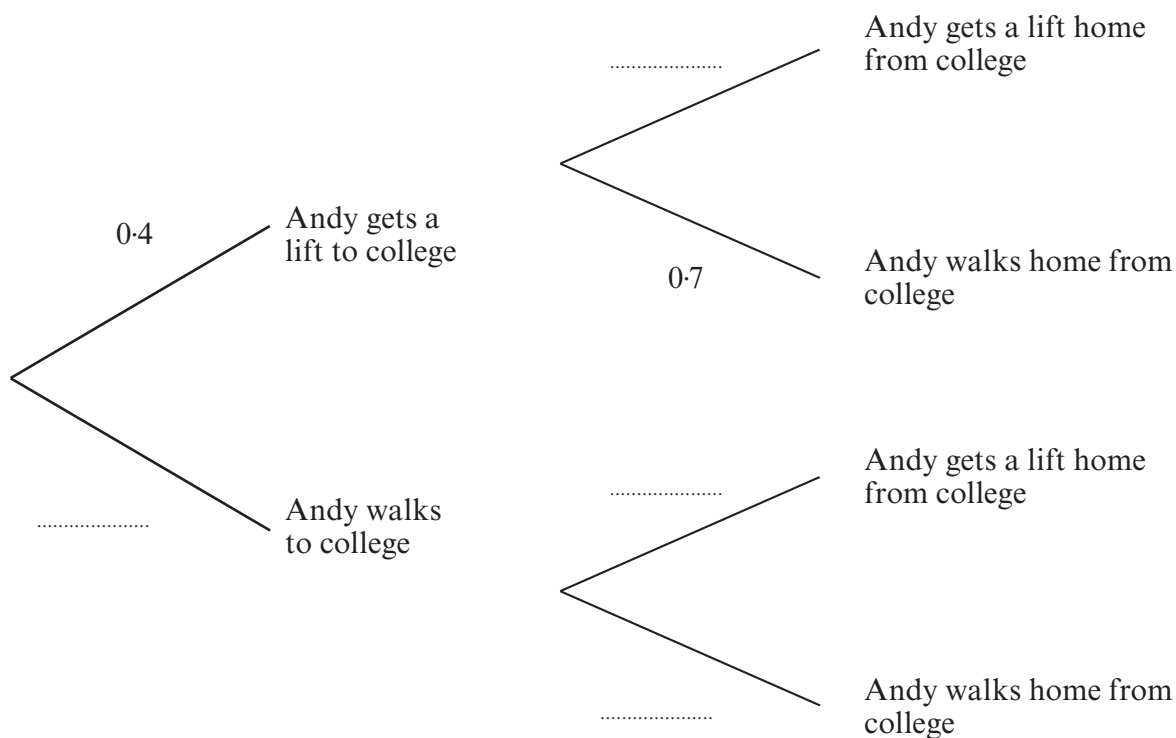
[2]

(b) Calculate the probability that Andy gets a lift to college and walks home from college.

....

....

....
[2]

(c) Calculate the probability that Andy **does not** get a lift to or from college.

....

....

....
[2]

10. *(a)* Evaluate $\dfrac{\sqrt{5} \times \sqrt{3} \times \sqrt{3}}{\sqrt{5}}$.

....

....

....

....

[2]

(b) Evaluate $2^{-3} \times 16^{\frac{1}{2}}$.

....

....

....

....

[3]

(c) Write 0·00085 in standard form.

....

[1]

(d) Evaluate $\dfrac{3\cdot9 \times 10^{7}}{1\cdot3 \times 10^{-2}}$, giving your answer in standard form.

....

....

....

....

....

[2]

11. *(a)* Find the *n*th term of the sequence 8, 11, 16, 23, 32, ...

....

....

....

....

....

[2]

(b) Make x the subject of the following formula.

$$\frac{ax + b}{cx + d} = 2$$

....

....

....

....

....

....

....

....

[5]

12.
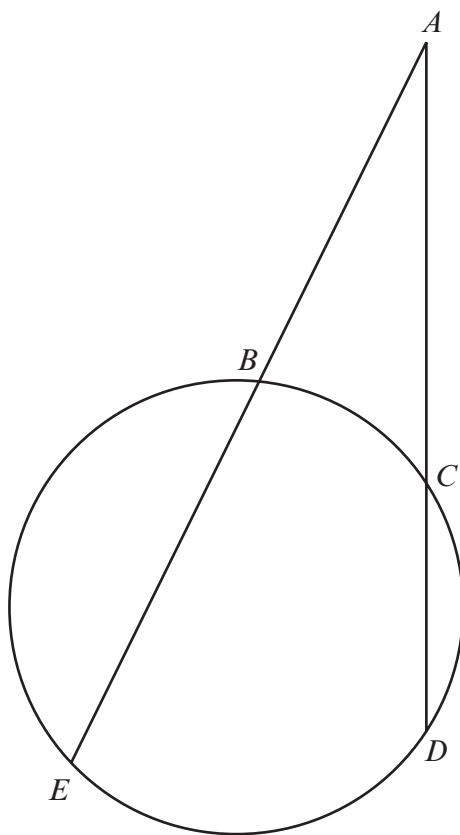
Diagram not drawn to scale

Given that $AC = 6\,$cm, $AB = 5$ cm and $BE = 7\,$cm, calculate the length of AD.

....

....

....

....

....

....

....

[2]

13. *(a)* Factorise the expression $x^2 + 14x - 15$ and hence solve the equation
$x^2 + 14x - 15 = 0$.

....

....

....

....

....

....

....

[3]

(b) Express $x^2 + 6x + 25$ in the form $(x + a)^2 + b$, where a and b are values to be found.

....

....

....

....

....

[2]

14. *(a)* Use the graph paper opposite to draw the graph of $y = -2x^2 - 8x$ for values of x from $x = -5$ to $x = 2$. [5]

....

....

....

....

....

....

....

....

....

(b) Use your graph to solve $-2x^2 - 8x = 0$.

....

....

....

....

[2]

(c) Find the equation of the straight line that is parallel to $y = -2x$ and intersects the graph of $y = -2x^2 - 8x$ at the point $(-4, 0)$.

....

....

....

....

....

....

[3]

15. Prove that $\dfrac{1}{2x+1} + \dfrac{1}{2x-1} - \dfrac{1}{4x} \equiv \dfrac{12x^2+1}{4x(4x^2-1)}$.

[6]

16. Maisy is given a multiple-choice test during a job interview.
There are five possible choices given for each question but only one is the correct answer.
Maisy knows the correct answers to 60% of the questions in the test.
For all the other questions Maisy selects an answer at random.

(a) A question is selected at random from the test.
Calculate the probability that Maisy answers this question correctly.

[4]

(b) The test has 200 questions.
Calculate how many questions you might expect Maisy to answer correctly.

[2]

END OF PAPER