Cambridge O Level

Cambridge Assessment International Education
Cambridge Ordinary Level

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER				

MATHEMATICS (SYLLABUS D) **4024/12**

Paper 1 **May/June 2019**

2 hours

Candidates answer on the Question Paper.

Additional Materials: Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

If working is needed for any question it must be shown in the space below that question.
Omission of essential working will result in loss of marks.

ELECTRONIC CALCULATORS MUST NOT BE USED IN THIS PAPER.

The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 80.

This document consists of **16** printed pages.

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[Turn over

ELECTRONIC CALCULATORS MUST NOT BE USED IN THIS PAPER

1 **(a)** Evaluate $\frac{4}{7} \div \frac{5}{8}$.

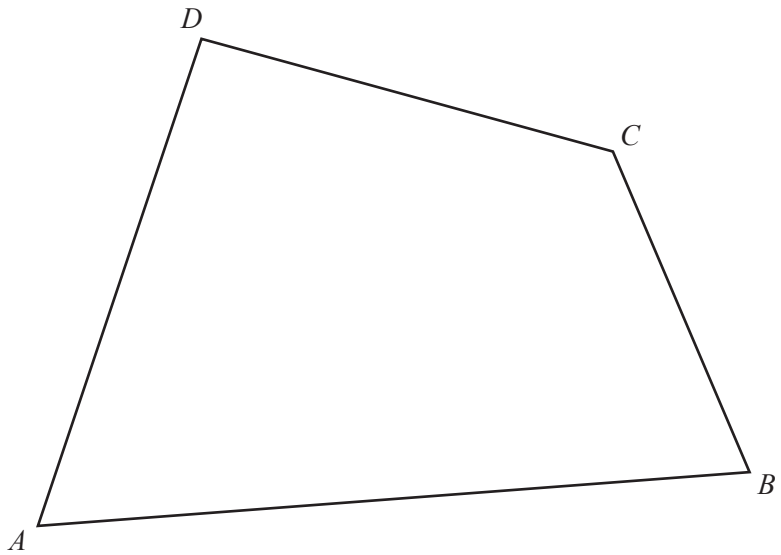
..... [1]

(b) Evaluate $\sqrt{64} - \sqrt[3]{125}$.

..... [1]

2 **Use a straight edge and compasses only in this question.**

Construct the locus of points inside quadrilateral *ABCD* that are equidistant from *AB* and *BC*.



[2]

3 The height of water, in cm, in a river is recorded every week for 10 weeks.
The heights of the water, compared with its normal level, are listed below.

$$-45 \quad -30 \quad -35 \quad 0 \quad 5 \quad -10 \quad -20 \quad 40 \quad 20 \quad 25$$

(a) Work out the range.

..... cm [1]

(b) Calculate the mean.

..... cm [2]

4 By writing each number correct to one significant figure, estimate the value of

$$\frac{71.8 - 32.4}{0.198^2}.$$

..... [2]

5 Lamps are made in a factory.
A random sample of 50 of the lamps is tested and 4 of them are found to be faulty.
A total of 4000 lamps is made in one day.

Calculate the number of these 4000 lamps you would expect to be faulty.

..... [2]

6 **(a)** Daniel earns \$760 each month.
He pays 15% of his earnings in tax.

Calculate the amount of money Daniel has each month after paying tax.

\$ ..... [2]

(b) Daniel invests \$1200 in a savings account.
The account pays simple interest at a rate of 2% per year.

Calculate the amount of money in the account after 6 years.

\$ ..... [2]

7 Find the fraction that lies exactly halfway between $\frac{3}{5}$ and $\frac{3}{4}$.

..... [2]

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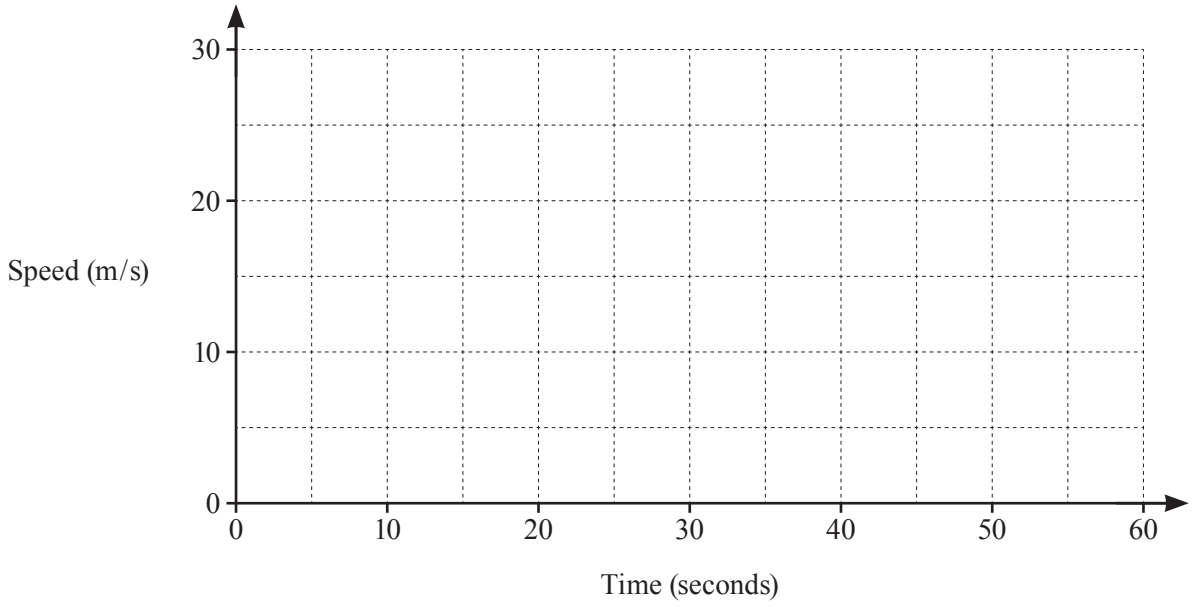
8 A drink is made by mixing fruit juice and water in the ratio 3 : 5.
The drink is made using 2 litres of water.

Calculate the amount of fruit juice used.
Give your answer in millilitres.

..... ml [2]

9 A car starts a journey from rest.
It moves with constant acceleration for 20 seconds until it reaches a speed of 15 m/s.
It then moves at a constant speed of 15 m/s for 40 seconds.

(a) On the grid, draw the speed–time graph for the car's journey.

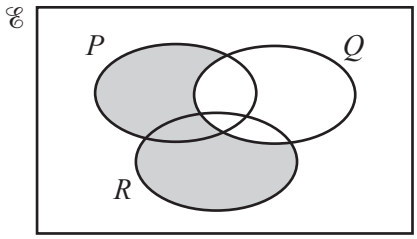


[2]

(b) Calculate the acceleration of the car in the first 20 seconds of the journey.

..... m/s^2 [1]

10 **(a)** Use set notation to describe the shaded region in the Venn diagram.



..... [1]

(b) $\mathscr{E} = \{x : x \text{ is a positive number}\}$
$A = \{x : 9 < x < 10\}$
$B = \{x : x \text{ is an irrational number}\}$

Write down an element of $A \cap B$.

..... [2]

11 Solve the simultaneous equations.
Show your working.

$$9x + 4y = -5$$
$$6x - 2y = 6$$

$x =$ .....

$y =$ ..... [3]

12 **(a)** Write these numbers in order of size, starting with the smallest.

2.1×10^{-3} 4.2×10^{-4} 1.7×10^{-5} 3.5×10^{-4}

..... , ... , ... , ... [1]
smallest

(b) $P = 6 \times 10^{10}$ $Q = 5 \times 10^{9}$

Evaluate the following.
Give each answer in standard form.

(i) $P - Q$

..... [1]

(ii) PQ

..... [1]

13 **(a)** Expand and simplify $(x-3)^2$.

..... [1]

(b) Factorise $18 - 6y + 5xy - 15x$.

..... [2]

14 **(a)** Write $x^2 - 7x + 5$ in the form $(x-a)^2 - b$.

..... [2]

(b) Hence write down the minimum value of $x^2 - 7x + 5$.

..... [1]

15 **(a)** Write 168 as a product of its prime factors.

..... [2]

(b) The highest common factor of 168 and N is 42.

Given that $200 < N < 300$, find the two possible values of N.

$N =$ ..... and $N =$ ..... [2]

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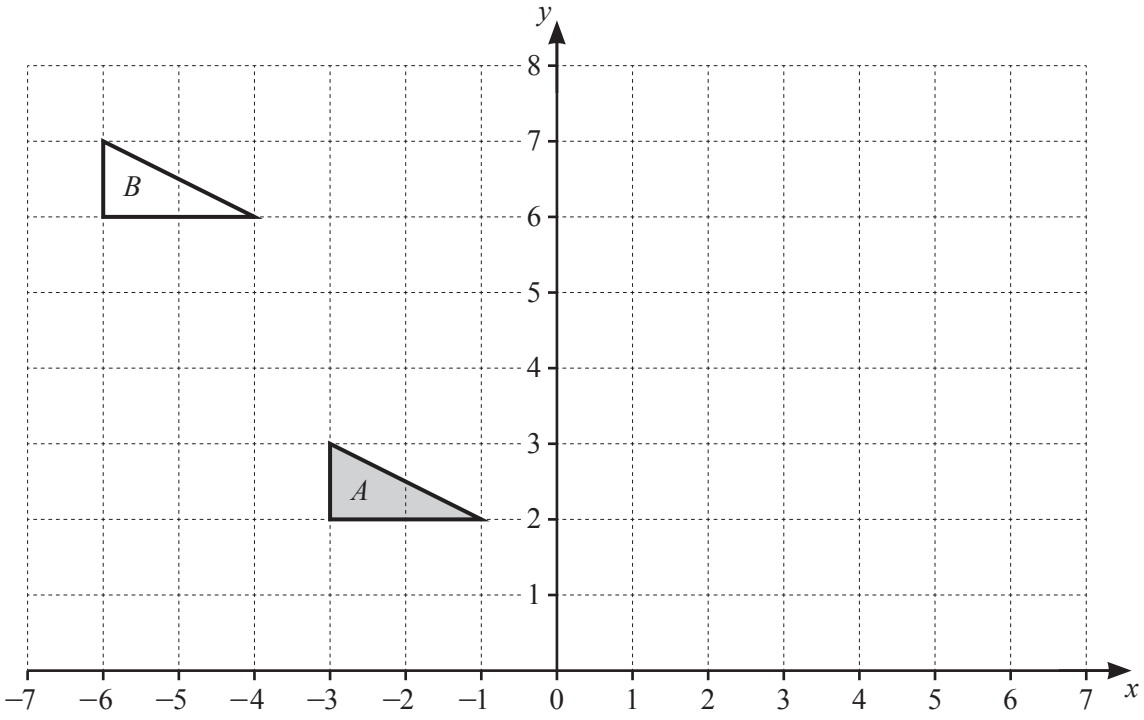


Triangle A and triangle B are drawn on the grid.

(a) Describe fully the **single** transformation that maps triangle A onto triangle B.

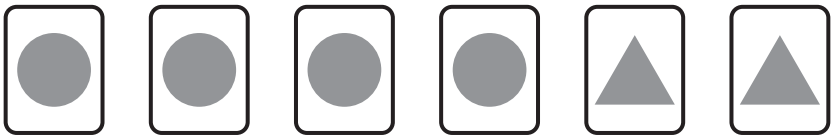
.....

..... [2]

(b) Triangle A is mapped onto triangle C by an enlargement with centre (0, 3) and scale factor −2.

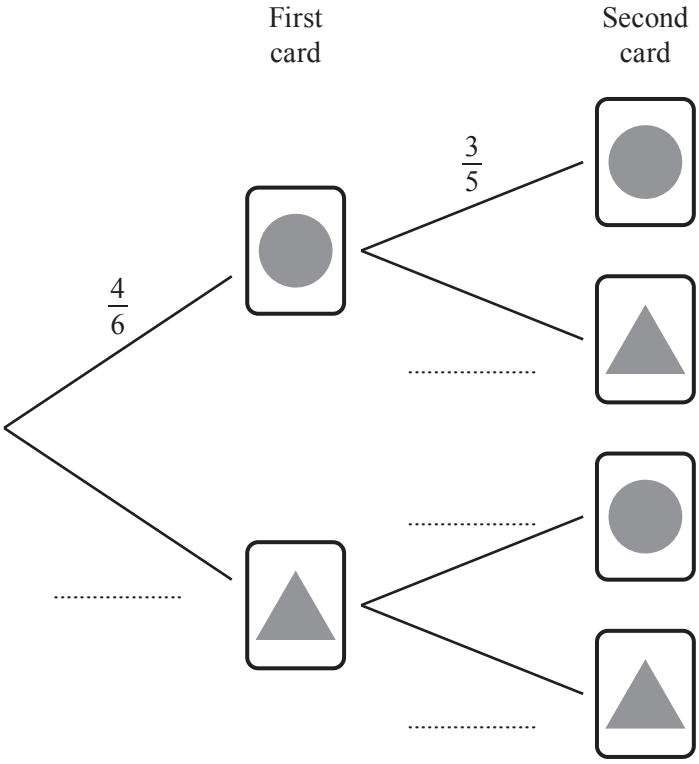
On the grid, draw triangle C. [2]

17



Nima has these six cards. Each card has a shape on it.
She takes two cards at random without replacement.

(a) Complete the tree diagram.



[2]

(b) Find the probability that the shapes on Nima's two cards are the same.
Give your answer as a fraction.

..... [2]

18 $$r = \frac{4p+2}{3-p}$$

(a) Find r when $p = -2$.

$r =$ ..... [1]

(b) Rearrange the formula to make p the subject.

$p =$ ..... [3]

19 y is inversely proportional to the square of x.
When $x = 4$, $y = 10$.

(a) Find the value of y when $x = 10$.

$y =$ ..... [2]

(b) Describe the effect on y when x is halved.

..... [1]

20 Simplify.

$$\left(\frac{9x^7y}{x^5y^9}\right)^{-\frac{1}{2}}$$

..... [2]

21 A cuboid has a square base.
The length of the base of the cuboid is y cm.
The height of the cuboid is twice the length of its base.
The total surface area of the cuboid is 360 cm^2.

Find the height of the cuboid.

..... cm [3]

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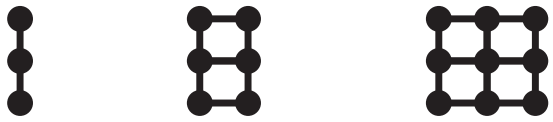
22 Here are the first three patterns in a sequence made using dots and lines.



Pattern 1 Pattern 2 Pattern 3

(a) Complete the table for the first five patterns in this sequence.

Pattern number	1	2	3	4	5
Number of dots	3	6			
Number of lines	2	7			

[2]

(b) Find an expression, in terms of n, for the number of lines in Pattern n.

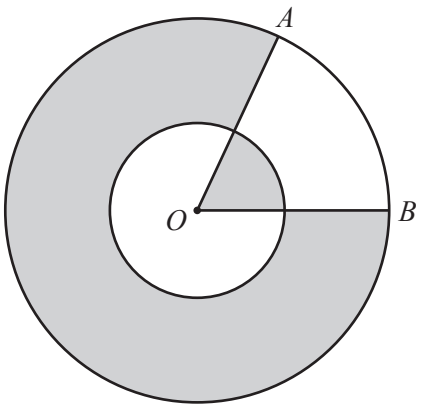
..... [2]

(c) Anwar makes one of these patterns using 92 lines.

Find the number of dots in Anwar's pattern.

..... [2]

23



NOT TO SCALE

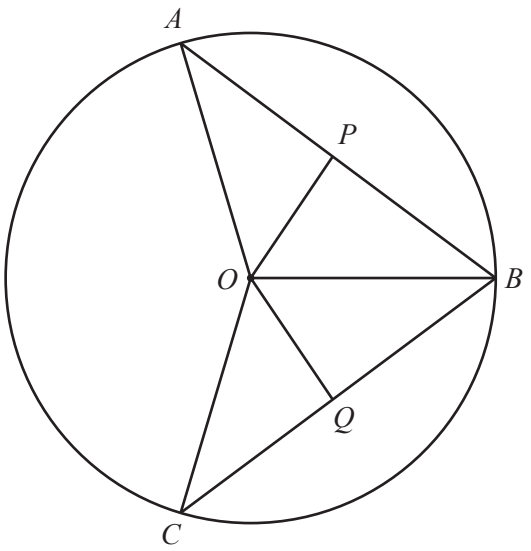
The diagram shows two circles, both with centre O.
The radius of the small circle is 3 cm and the radius of the large circle is 6 cm.
The minor sector AOB has an angle of 60°.

The total area of the shaded regions is $k\pi$ cm^2.

Find the value of k.

$k =$ ..... [4]

24



NOT TO SCALE

A, B and C are points on the circle centre O and $AB = BC$.
P is the midpoint of chord AB and Q is the midpoint of chord BC.

(a) Prove that triangle OAP is congruent to triangle OCQ.
Give a reason for each statement you make.

.....

.....

.....

..... [3]

(b) Given that obtuse angle $COA = 140°$, find angle QCO.

Angle QCO = ... [2]

QUESTION 25 IS PRINTED ON THE NEXT PAGE

25 **(a)** $\mathbf{P} = \begin{pmatrix} 4 & 0 \\ -2 & 3 \end{pmatrix}$ $\mathbf{Q} = \begin{pmatrix} 1 & 2 \\ 0 & -1 \end{pmatrix}$

Evaluate **PQ**.

$\begin{pmatrix} \quad & \quad \\ \quad & \quad \end{pmatrix}$ [2]

(b) $\mathbf{M} = \begin{pmatrix} 3 & -1 \\ 2 & k \end{pmatrix}$

The determinant of matrix **M** is -4.

(i) Find the value of k.

$k =$ ..... [1]

(ii) Find $\mathbf{M}^{-1}$.

$\begin{pmatrix} \quad & \quad \\ \quad & \quad \end{pmatrix}$ [1]

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