The City School

Unified Mid-Year Examinations

2018 – 2019

Class 11

SCHOOL NAME:

INDEX NUMBER: | | | | |

DATE:

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

Paper 1 **2 hours**

Candidates answer on the Question Paper.

Additional materials: Geometrical Instruments

READ THESE INSTRUCTIONS FIRST

Write your School name, Index number and Date in the spaces provided.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.

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.

Invigilated By: _____ Checked By: _____ Marks Tallied By: _____

This document consists of **23** printed pages and **1** blank page.

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1. **(a)** Evaluate $\frac{4}{11} - \frac{2}{7}$

Answer.....[1]

(b) Evaluate 0.9×0.011

Answer.....[1]

2. **(a)** Cecil bought a camera for \$120.
After two years he sold it for \$90.

Calculate the percentage loss.

Answer.....%[1]

(b) Some money is shared between Mariam and Nina in the ratio 2:3.

What percentage of the total money shared does Mariam receive?

Answer.....%[1]

(c) Given that $a : b = 5 : 6$ and $b : c = 3 : 8$ find $a : b : c$.

Answer.... : ..... : ..... [1]

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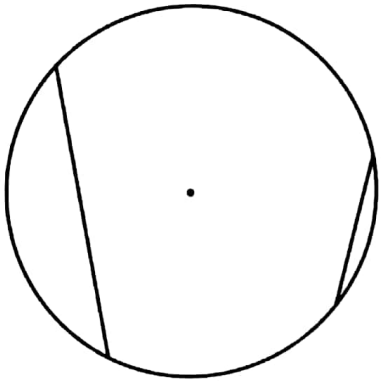
3. Write these numbers in order of size, starting with the smallest.

$\frac{1}{3}$ 0.32 $\frac{15}{40}$ 0.3 $\frac{9}{31}$

Answer..... , ... , ... , ... , ... [2]

smallest

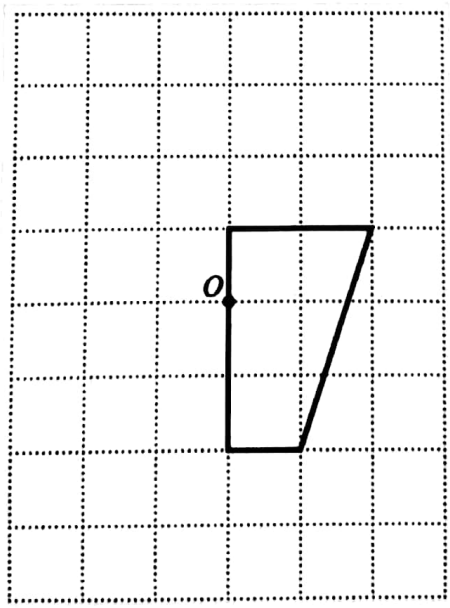
4. **(a)** The diagram shows a circle, its centre, and two chords.
Add **one** chord, to give a diagram that has one line of symmetry.



[1]

(b) The diagram shows part of a shape which has rotational symmetry of order 2 about the point *O*.

Complete the shape.



[1]

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5. **(a)** Carl spent t minutes on his English homework.
He spent three times as long on his Mathematics homework as on his English homework.
He spent a total of 2 hours 20 minutes on his English and Mathematics homework.
Write down an equation to represent this information and hence find the value of t.

Answer.....[2]

(b) A plane leaves London on a flight to Dubai

(i) At one time during the flight the temperature inside the plane is 17 °C.
The temperature outside the plane is – 43 °C.
Work out the difference between the inside and outside temperatures.

Answer.....°C [1]

(ii) The plane leaves London where the temperature outside is 17 °C.
The plane rises to a height where the temperature outside is – 43 °C.
The temperature decreases 2 °C with every increase of 300 m in height.
Calculate the increase in height of the plane.

Answer.....m [1]

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6. **(a)**

p	27	33
q	9	r

Given that p is directly proportional to q, find the value of r.

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

(b)

x	2	10
y	25	1

Complete the sentence below describing the relationship between x and y.

y is inversely proportional to = ... [1]

(c) M is directly proportional to L^3.

How many times larger is M when L is multiplied by 2?

Answer $M=$..... [1]

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7. Factorise completely

(a) $2ax - 3by + 6bx - ay$,

Answer.....[2]

(b) $27x^2 - 3y^2$.

Answer.....[2]

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8. A thermometer measures temperature correct to the nearest degree.
The outside temperature is measured as – 8 °C.

(a) Write down the upper bound of the outside temperature.

Answer.....°C [1]

(b) The inside temperature is measured as 10 °C.
Calculate the lower bound of the difference between the outside temperature and the inside temperature.

Answer.....°C [1]

9. Solve $\frac{2x-1}{4} + \frac{x-2}{3} = 2$

Answer x = ... [3]

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10. Express each of the following as a single fraction in its simplest form.

(a) $1\frac{1}{5} \div 2\frac{2}{5}$

Answer (a) ..... [1]

(b) $\frac{1}{x} + 2 - \frac{3}{x+1}$

Answer (b) ..... [2]

11. By writing each number correct to 2 significant figures, calculate an estimate of

$$\frac{596 \times \sqrt{16.12}}{0.2984}$$

Answer ..... [2]

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12. $f(x) = 3 - 2x$ $g(x) = 4x^3 - 1$

(a) Find $f(5)$.

Answer (a) ..... **[1]**

(b) Find $g(-2)$.

Answer (b) ..... **[1]**

(c) Find $f(4x^3 - 1)$.

Answer(c) ..... **[1]**

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13. Basia records the colour of 100 cars passing the school gate.
Her results are recorded in the table.

Colour of Car	Black	Grey	Red	Blue	Other
Frequency	43	18	12	9	18

(a) Use Basia's results to estimate the probability that the next car seen is **blue** car.

Answer ..... [1]

(b) In the next hour, 500 cars pass the school gate.
Use Basia's results to estimate the number of these cars that are **red**.

Answer ..... [1]

(c) Colin records the colour of the next 100 cars passing the school gate.
His results are shown in the table below.

Colour of Car	Black	Grey	Red	Blue	Other
Frequency	34	10	18	28	10

Use Basia's and Colin's combined results to estimate the number of **red** cars that would be seen when 500 cars pass the school gate.

Answer ..... [1]

(d) Which of the estimates in **part (b)** or in **part (c)** is likely to be the best?
Give a reason for your decision.

The best estimate is ..... because

.....

.....[1]

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14. The lengths of the leaves of a plant were measured.
The results are shown in the table.

Length (x centimetres)	$1 < x \leq 3$	$3 < x \leq 4$	$4 < x \leq 5$	$5 < x \leq 7$	$7 < x \leq 10$
Frequency	8	5	6	12	12
Frequency density					

(a) Complete the table to show the frequency densities.

[2]

(b) One leaf is chosen at random.

Find an estimate of the probability that this leaf is more than 6 cm long.

Answer ..... [1]

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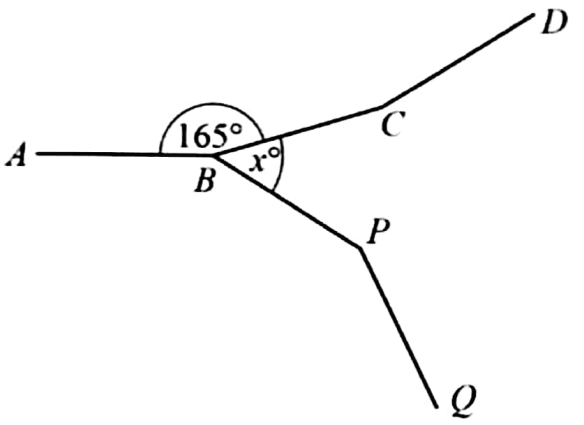
15.



In the diagram, *ABCD* is part of a regular polygon.
Each interior angle is 165^{o}.

(a) How many sides does this polygon have?

Answer ..... [2]

(b) *ABPQ* is part of another regular polygon.
This polygon has 12 sides.

Calculate x.

Answer x = ... [2]

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16. A café sells hot drinks

On Monday it sells 80 teas, 60 coffees and 40 hot chocolates.

On Tuesday it sells 70 teas, 90 coffees and 50 hot chocolates.

A cup of tea costs \$0.80, a cup of coffee costs \$1 and a cup of hot chocolate costs \$1.20

This information can be represented by the matrices **M** and **N** below.

$$\mathbf{M} = \begin{pmatrix} 80 & 60 & 40 \\ 70 & 90 & 50 \end{pmatrix} \qquad \mathbf{N} = \begin{pmatrix} 0.8 \\ 1 \\ 1.2 \end{pmatrix}$$

(a) Work out **MN**.

Answer ..... [2]

(b) Explain what the numbers in your answer represent.

Answer.....

.....

.....[1]

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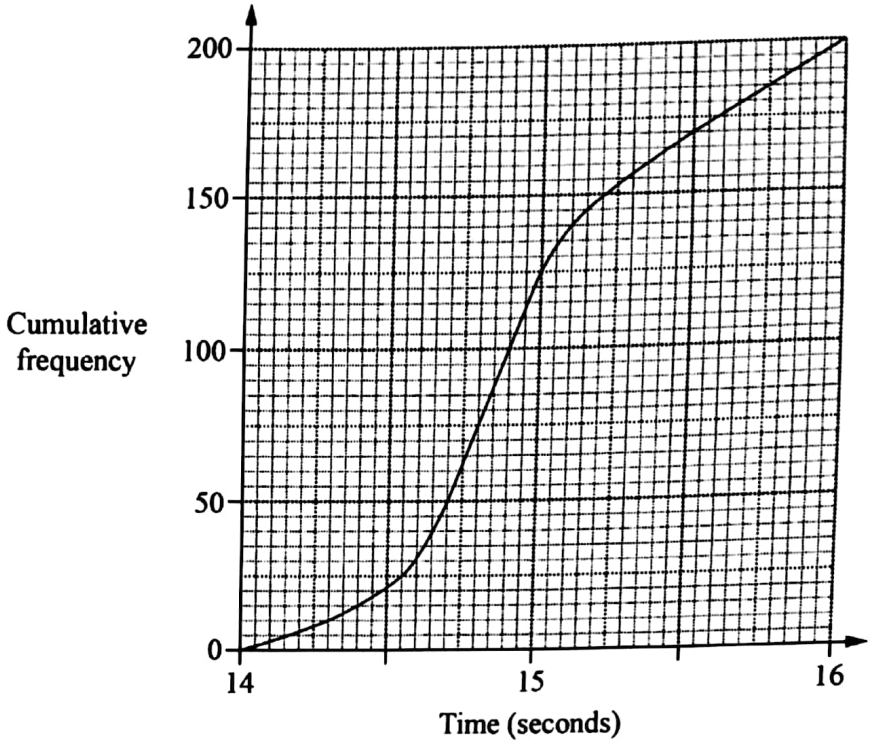
17. The times taken for 200 children to run 100 m were recorded.
The cumulative frequency curve summarises the results.



Use the curve to find

(a) the lower quartile,

Answer ..... seconds [1]

(b) the number of children who took at least 15.5 seconds.

Answer ..... [2]

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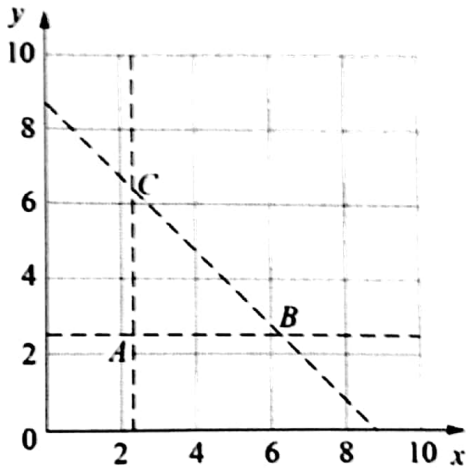
18. The three lines

$3x = 7$

$2y = 5$ and

$4x + 4y = 35$

Intersect to form the triangle *ABC*, as shown in the diagram.



The region **inside** the triangle *ABC* is defined by three inequalities.
One of these is $2y > 5$.

(a) Write down the other two inequalities.

Answer .....

.....[2]

(b) Find the point, with integer coordinates, that lies **inside** the triangle *ABC* and is closest to *B*.

Answer (..... , ...) [1]

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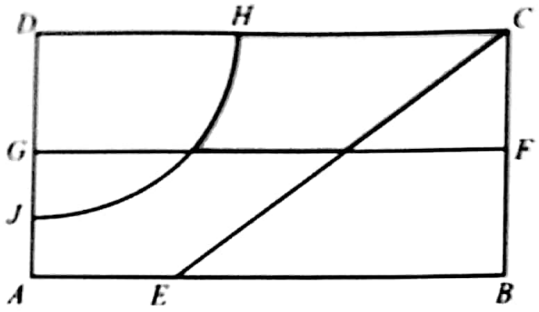
19.



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The diagram shows a rectangular garden divided into different areas.
FG is the perpendicular bisector of *BC*.
The arc *HJ* has centre *D* and radius 20 m.
CE is the bisector of angle *DCB*.

Write down two more statements using loci to describe the shaded region inside the garden.

The shaded region is

- nearer to *C* than to *B*
- .....
- ..... [2]

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20. $N = 2 \times 10^8$

(a) Giving your answers in standard form, find the value of

(i) $N \times 700$

Answer.....[1]

(ii) $\frac{1}{N}$

Answer.....[1]

(b) Find the smallest positive integer M, given that MN is a cube number

Answer.....[1]

21. Find the nth term in each of the following sequences.

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(a) $\frac{1}{3}$, $\frac{2}{4}$, $\frac{3}{5}$, $\frac{4}{6}$, $\frac{5}{7}$, ...

Answer.....[1]

(b) 0, 3, 8, 15, 24, ...

Answer.....[1]

(c) 13, 9, 5, 1, −3, ...

Answer.....[1]

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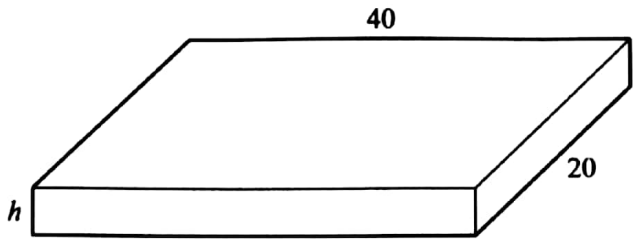
22.



A paving slab is cuboid with length 40 cm, width 20 cm and depth *h*cm.
Its volume is 2400 cm^3.

(a) Find the value of *h*.

Answer h = ... [1]

(b) Calculate the volume of concrete needed to make 1000 of these slabs.
Give your answer in m^3.

Answer .....m^3 [1]

(c) A mathematically similar slab has length 60 cm.
Calculate the volume of concrete, in cm^3, needed to make **one** of these larger slabs.

Answer .....cm^3 [2]

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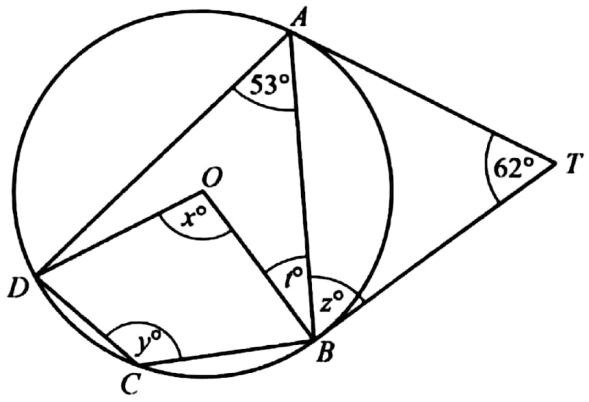
23.



The diagram shows a circle, centre *O*, that passes through *A, B, C* and *D*.
The tangents at *A and B meet at T*.

$A\hat{T}B = 62^o$ and $D\hat{A}B = 53^o$.

(a) Find *x*

Answer x = ...[1].

(b) Find *y*.

Answer y = ...[1]

(c) Find *z*.

Answer z = ...[1]

(d) Find *t*.

Answer t = ...[1]

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24. $\mathbf{a} = \begin{pmatrix} 3 \\ -4 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} -1 \\ 7 \end{pmatrix}$

(a) Express **a** + 2**b** as a column vector.

Answer $\boldsymbol{a} + 2\boldsymbol{b} = \begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(b) **(i)** Find |**a**|=

Answer |**a**| = ... [1]

(ii) Given that $\frac{|\boldsymbol{b}|}{|\boldsymbol{a}|} = \sqrt{n}$, where *n* is an integer, find the value of *n*.

Answer n = ...[1]

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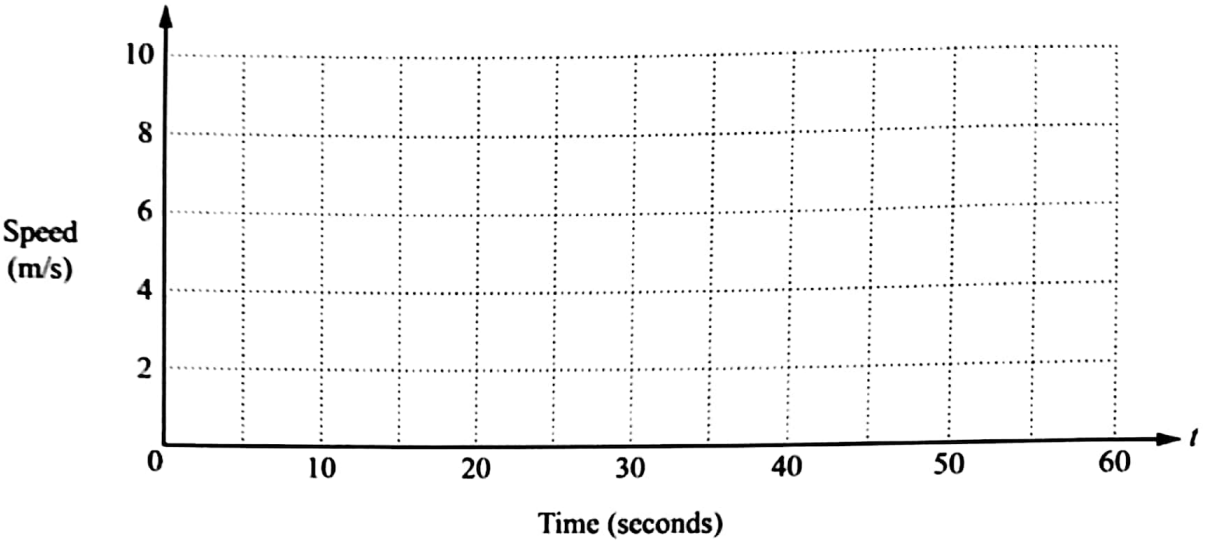
25. A car passes through a checkpoint at time $t = 0$ seconds, travelling at 8 m/s.

It travels at this speed for 10 seconds.

The car then decelerates at a constant rate until it stops when $t = 55$ seconds.

(a) On the grid, draw the speed-time graph.



[1]

(b) Calculate the total distance travelled by the car after passing through the checkpoint.

Answer ..... m [2]

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26. *A* is the point $(10,0)$ and *B* is the point $(0,8)$.

(i) Find the gradient of the line *AB*.

Answer .....[1]

(ii) Find the equation of the line *AB*.

Answer .....[1]

(iii) Find the equation of the line which is parallel to the line *AB* and passes through origin

Answer .....[1]

(iv) Find the equation of the line which is perpendicular to line *AB* and passes through

$(10,0)$

Answer .....[1]

(v) Find the equation of the line which is perpendicular bisector of line *AB*.

Answer .....[1]

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