ST. FRANÇOIS GIRLS' COLLEGE

FORM 5 MOCK EXAM 2021

CSEC MATHEMATICS

PAPER 02- GENERAL PROFICIENCY

2 hours 30 minutes

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This paper consists of TWO sections: I and II.
2. Section I has SEVEN questions and Section II has THREE questions.
3. Answer ALL questions in Section I and One (1) from Section II
4. Write your answers on your own writing paper.
5. All working MUST be clearly shown.
6. To submit the examination, students are required to:
    a. Take clean and clear pictures of their answers
    b. Upload them onto the website https://jpg2pdf.com
    c. Click the "combine" button to convert all the photos to pdf.
    d. Locate the file on your device
    e. Rename the file: Student Last Name First Name – 5G
    f. Email this file to: stfgcemrith@gmail.com
    g. Upon sending the email, you'll receive a confirmation message acknowledging receipt of your email.
7. Students will have Twenty (20) minutes to submit their answer sheets. No answer sheet will be accepted after the stipulated time frame unless an email is sent from your parent/guardian stating the legitimate reason/s for the delay.

Required Examination Materials:

Electronic calculator

Geometry set

Writing paper

A list of formulae is provided on page 2 of this booklet.

LIST OF FORMULAE

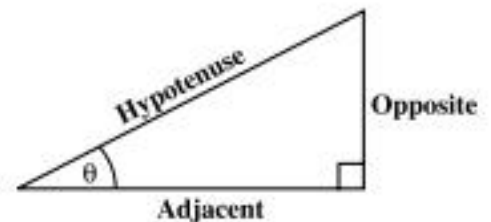|	
Volume of a prism	$V = Ah$ where A is the area of a cross-section and h is the perpendicular length.
Volume of cylinder	$V = \pi r^2 h$ where r is the radius of the base and h is the perpendicular height.
Volume of a right pyramid	$V = \frac{1}{3} Ah$ where A is the area of the base and h is the perpendicular height.
Circumference	$C = 2\pi r$ where r is the radius of the circle.
Arc length	$S = \frac{\theta}{360} \times 2\pi r$ where θ is the angle subtended by the arc, measured in degrees.
Area of a circle	$A = \pi r^2$ where r is the radius of the circle.
Area of a sector	$A = \frac{\theta}{360} \times \pi r^2$ where θ is the angle of the sector, measured in degrees.
Area of trapezium	$A = \frac{1}{2}(a + b)h$ where a and b are the lengths of the parallel sides and h is the perpendicular distance between the parallel sides.
Roots of quadratic equations	If $ax^2 + bx + c = 0$, then $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Trigonometric ratios	$\sin \theta = \dfrac{\text{opposite side}}{\text{hypotenuse}}$ $\cos \theta = \dfrac{\text{adjacent side}}{\text{hypotenuse}}$ $\tan \theta = \dfrac{\text{opposite side}}{\text{adjacent side}}$
Area of triangle	Area of $\Delta = \frac{1}{2}bh$ where b is the length of the base and h is the perpendicular height. Area of $\Delta ABC = \frac{1}{2}ab \sin C$ Area of $\Delta ABC = \sqrt{s(s-a)(s-b)(s-c)}$ where $s = \dfrac{a+b+c}{2}$
Sine rule	$\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$
Cosine rule	$a^2 = b^2 + c^2 - 2bc \cos A$
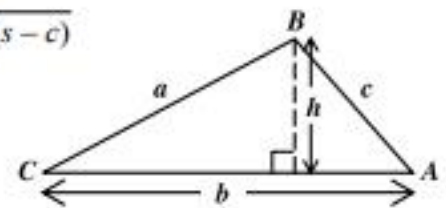
Answer ALL questions in this section.

All working must be clearly shown.

1. (a) Using a calculator, determine the value of

$$\frac{(3.29)^2 - 5.5}{\sqrt{1.5 \times 0.06}}$$

giving your answer to 1 decimal place.   **(3 marks)**

(b) The table below shows rates of exchange.

US$1.00	= TT$6.45
BBD$1.00	= TT$3.00

(i) Using the table, calculate the amount in BBD dollars equivalent to US$1.00.

(2 marks)

(ii) Gail exchanged BBD$1806.00 for US dollars. Calculate the amount she received in US dollars.   **(1 mark)**

(c) The cash price of a laptop is $4799.00. It can be bought on hire purchase by making a deposit of $540.00 and 12 monthly instalments of $374.98 EACH.

(iii) Calculate the TOTAL hire purchase price of the laptop.   **(2 marks)**

(iv) Calculate the amount saved by purchasing the laptop at the cash price.

(1 mark)

Total 9 marks

2. **(a)** Simplify: $p^3q^2 \times pq^5$ **(1 mark)**

(b) If $a * b = 2a - 5b$, calculate the value of

    (i) $3 * 4$ **(1 mark)**

    (ii) $(3 * 4) * 1$ **(1 mark)**

(c) Factorize completely: $3x + 6y - x^2 - 2xy$ **(2 marks)**

(d) A string of length 14 cm is cut into two pieces. The length of the first piece is x cm. The second piece is 5 cm **longer** than half the length of the first piece.

    (i) State in terms of x, the length of the second piece of string. **(1 mark)**

    (ii) Write an expression, in terms of x, to represent the TOTAL length of the two pieces of string. **(1 mark)**

    (iii) Hence, calculate the length of the first piece of string. **(2 marks)**

Total 9 marks

3. **(a)** Using a ruler, a pencil and a pair of compasses, construct a rhombus, PQRS, in which PR = 6 cm and RPQ = 60°. **(4 marks)**

(b) **Use the graph on page 5 to answer this question.**

The diagram shows triangle JKL and its image J′K′L′ after an enlargement.

    (i) Draw lines on your diagram to locate the point G, the centre of the enlargement. **(1 mark)**

    (ii) State the coordinates of the point G. **(1 mark)**

    (iii) State the scale factor of the enlargement. **(1 mark)**

    (iv) On your diagram, show the point J″, the image of the point J′, after a reflection in the line $x = 4$. **(2 marks)**

Total 9 marks
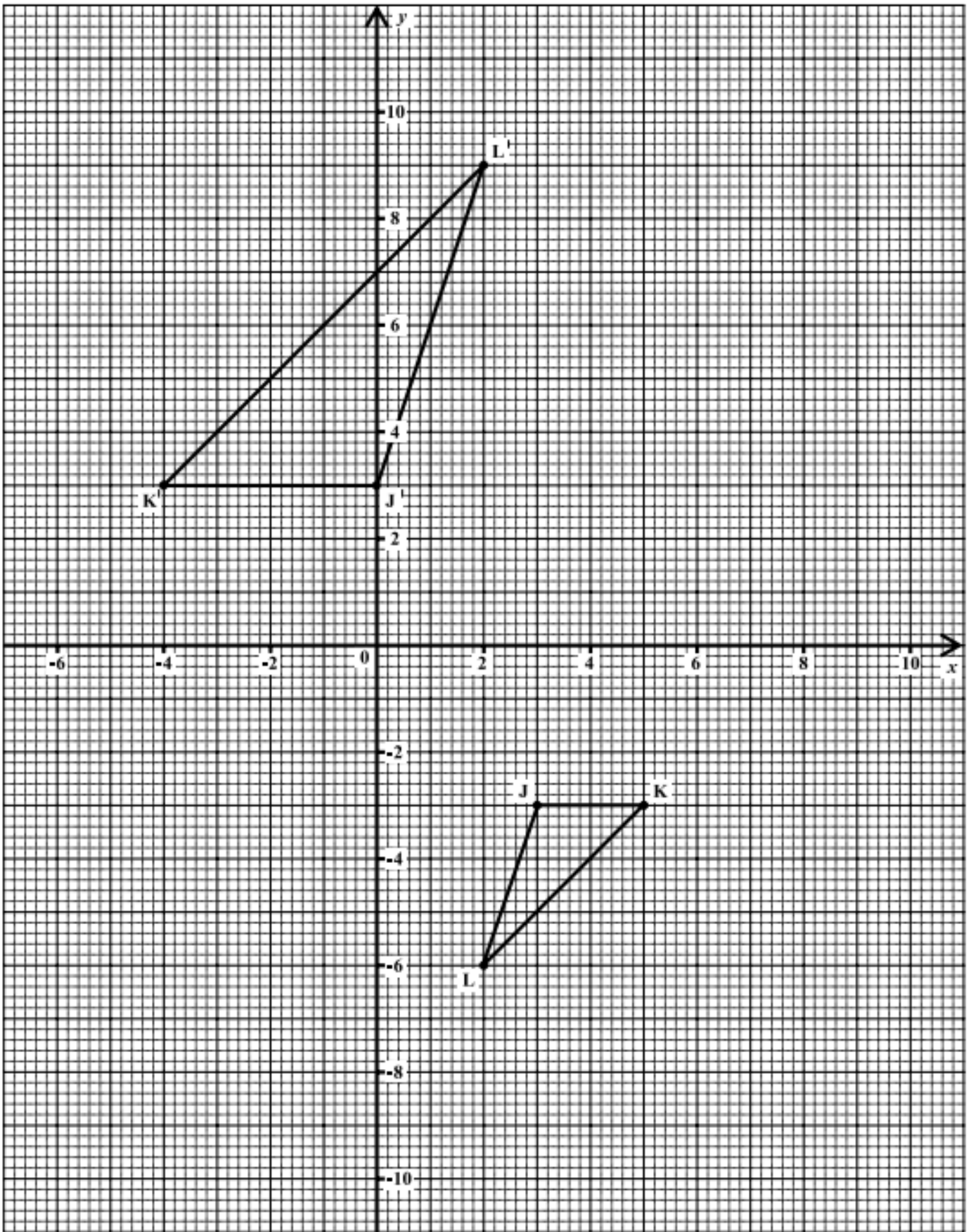
4. (a) The line BC passes through the point A(−5, 3) and has a gradient of $\frac{2}{5}$.

    (i)   Write the equation of the line BC in the form $y = mx + c$.   (2 marks)

    (ii) Determine the equation of the line which passes through the origin and is perpendicular to the line BC.   (2 marks)

    (b) The functions f and g are defined as:

    $$f(x) = \frac{2x-1}{x+3} \qquad\qquad g(x) = 4x - 5$$

    (i)   Determine f g(3).   (2 marks)

    (ii) Derive an expression for $f^{-1}(x)$.   (3 marks)

   **Total 9 marks**

5. **A graph sheet is provided for this question.** The table below shows the time spent, to the nearest minute, by 25 students at the school canteen.

| Time spent at the bookstore (minutes)	Frequency	Cumulative Frequency
6–10	2	2
11–15	4	6
16–30	5	11
(i) 21–25	____	20
(ii) 26–30	4	____
31–35	1	25

    (a) Complete the rows numbered (i) and (ii).   (2 marks)

    (b) On your graph on page 7, draw a cumulative frequency curve of the time spent at the canteen, using a scale of **2 cm to represent 5 minutes** on the horizontal axis and **2 cm to represent 5 students** on the vertical axis.   (4 marks)

    (c) **Use the graph drawn at (b)** to estimate

    (i)   the median time spent at the canteen   (1 mark)

    (ii) the probability that a student selected at random spent LESS than 24 minutes at the canteen.   (2 marks)

                                                                Total 9 marks
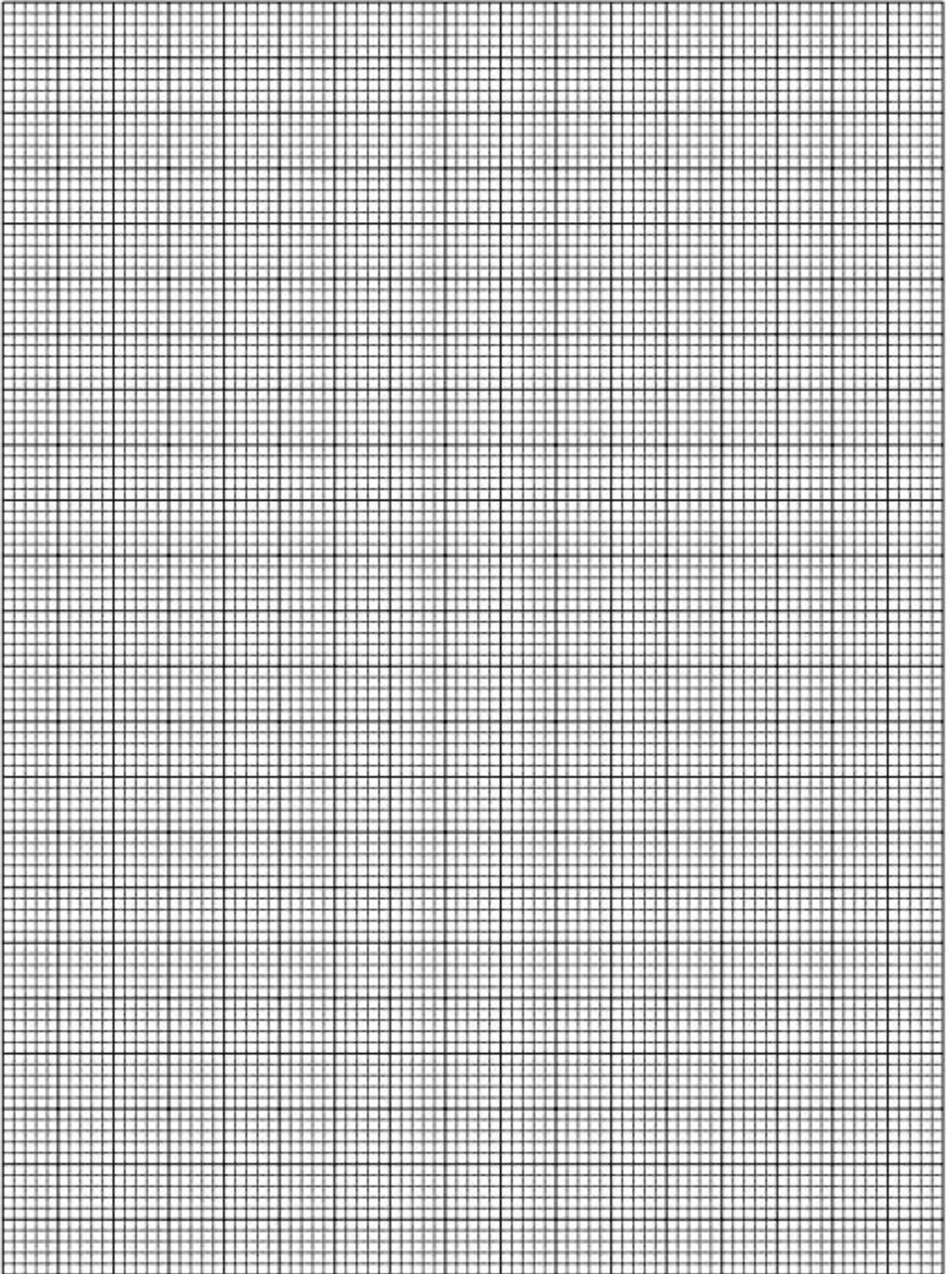
6. **(a)** In this question, use $\pi = \frac{22}{7}$.

(i) A piece of wire is bent to form a square of area 121 cm². Calculate the perimeter of the square. **(2 marks)**

(ii) The same piece of wire is bent to form a circle. Calculate the radius of the circle. **(2 marks)**

(b) The diagram below shows a map of an island drawn on a grid of 1 cm squares. The map is drawn to a scale of 1:50 000.
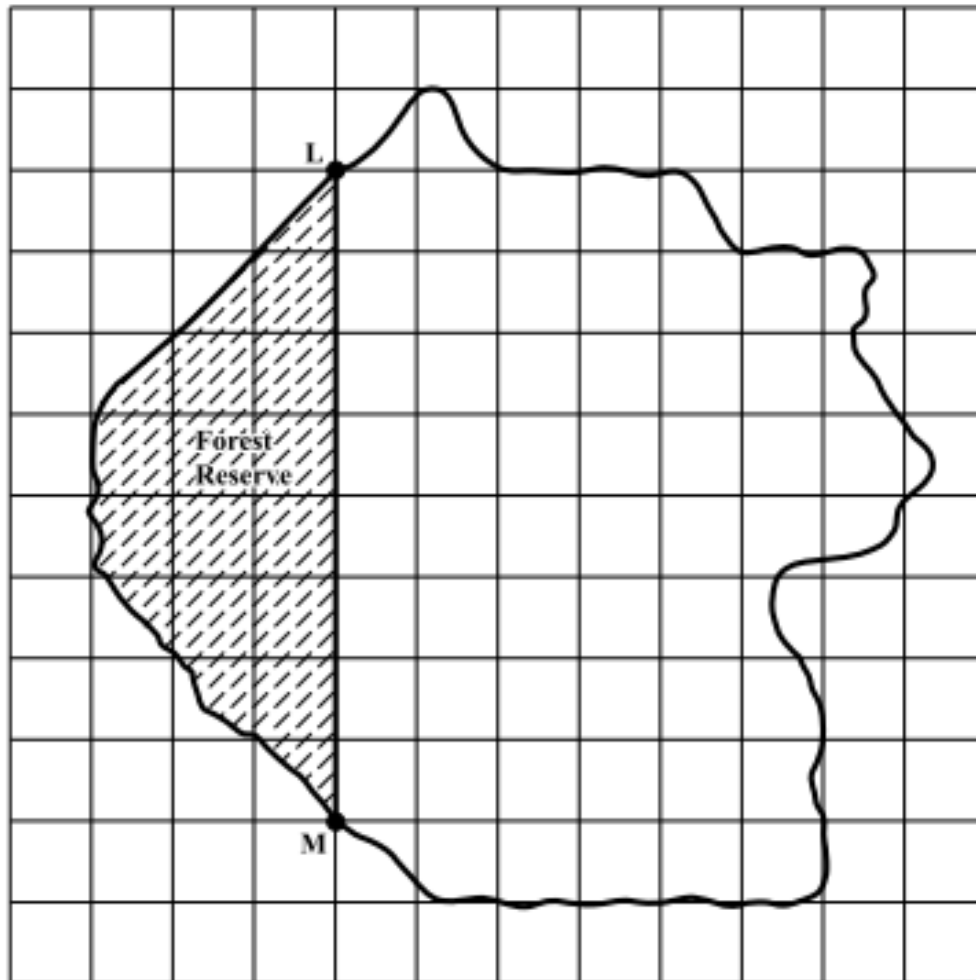
(i) L and M are two tracking stations. State, in centimetres, the distance LM on the map. **(1 mark)**

(ii) Calculate the ACTUAL distance, in kilometres, from L to M on the island. **(2 marks)**

(iii) Calcuate the ACTUAL area, in km², of the forest reserve, given that 1×10^{10} cm² = 1 km². **(2 marks)**

Total 9 marks

7. The table below represents the calculation of the sum of the cubes of the first **n** natural numbers. Information is missing from some rows of the table.

(a) Study the pattern in the table and complete the rows marked (i), (ii) and (iii).

	n	Series	Sum	Formula
	1	1^3	1	$\dfrac{1^2}{4}(1+1)^2$
	2	1^3+2^3	9	$\dfrac{2^2}{4}(1+2)^2$
	3	$1^3+2^3+3^3$	36	$\dfrac{3^2}{4}(1+3)^2$
	4	$1^3+2^3+3^3+4^3$	100	$\dfrac{4^2}{4}(1+4)^2$
(i)	5	....	....	....
	6	$1^3+2^3+3^3+4^3+5^3+6^3$	441	$\dfrac{6^2}{4}(1+6)^2$
(ii)	....		....	$\dfrac{8^2}{4}(1+8)^2$
(iii)	n			....

(6 marks)

(b) It was further noted that:

$1+2=3=\sqrt{9}$

$1+2+3=6=\sqrt{36}$

$1+2+3+4=10=\sqrt{100}$

Using information from the table above and the pattern in the three statements above, determine

    (i)   the value of x for which $1+2+3+4+5+6=\sqrt{x}$ **(2 marks)**

    (ii)   a formula in terms of **n** for the series: $1+2+3+4+...+n$ **(2 marks)**

Total 10 marks

Answer ALL questions in this section.

All working must be clearly shown.

8. (a) Solve the pair of simultaneous equations:

$$x^2 = 4 - y$$

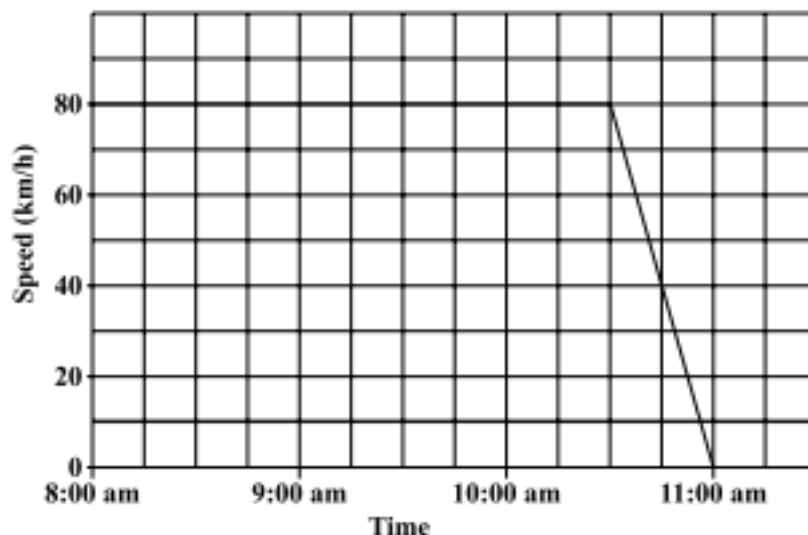$$x = y + 2$$ **(4 marks)**

(b) (i) Express $3x^2 + 2x + 1$ in the form $a(x + p)^2 + q$ where a, p and q are real numbers.

(2 marks)

(ii) Hence, determine for $f(x) = 3x^2 + 2x + 1$

•   the minimum value for $f(x)$

•   the equation of the axis of symmetry.   **(2 marks)**

(c) The speed–time graph below shows the journey of a car from 8:00 a.m. to 11:00 a.m.
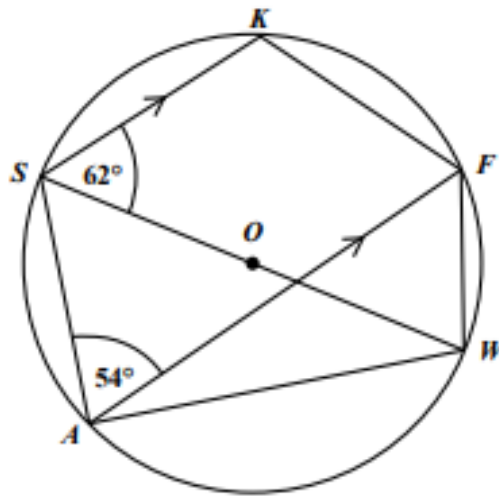

Using the graph, determine

(i)   the time at which the speed of the car was 40 km/h   **(1 mark)**

(ii)   the TOTAL distance the car travelled for the entire journey   **(2 marks)**

(iii) the average speed of the car for the entire journey.   **(1 mark)**
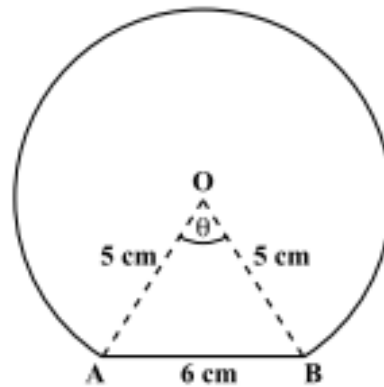
Total 12 marks

9. (a) In the diagram below, **not drawn to scale**, O is the centre of the circle. The lines SK and AF are parallel.

$$\angle KSW = 62° \qquad \angle SAF = 54°$$

Calculate, **giving reasons for your answer**, the measure of:

(i) $\angle FAW$ (2 marks)

(ii) $\angle SKF$ (2 marks)

(iii) $\angle ASW$ (2 marks)

(b) A machine produces circular discs of diameter 10 cm. The machine malfunctions and cuts a disc to produce the shape in the figure below, **not drawn to scale**, with centre, O.

Use $\pi = 3.14$

Determine

(i)   the measure of angle θ   (2 marks)

(ii) the area of triangle AOB   (2 marks)

(iii) the area of the disc that was cut off.   (2 marks)

Total 12 marks

10. (a) The vertices of a quadrilateral, OPQR are (0,0), (4,2), (6,10) and (2,8) respectively.

      (i) **Using a vector method**, express in the form $\begin{pmatrix} x \\ y \end{pmatrix}$ the vectors

          • $\overrightarrow{OP}$

          • $\overrightarrow{RQ}$ **(2 marks)**

      (ii) Calculate $| \overrightarrow{OP} |$, the magnitude of $\overrightarrow{OP}$.   **(2 marks)**

      (iii) State ONE geometrical relationship between the line segments OP and RQ.
                                            (2 marks)

  (b) The matrix, K, maps the point S (1,4) onto S' (−4,−1) and the point T (3,5) onto T' (−5,−3).

      Given that K $= \begin{bmatrix} a & b \\ c & d \end{bmatrix}$,

      (i) express as a matrix equation, the relationship between K, S, S', T and T'.
                                            (2 marks)

      (ii) hence, determine the values of a, b, c and d.   **(3 marks)**

      (iii) describe COMPLETELY the geometric transformation which is represented by the matrix K.   **(2 marks)**

                                        Total 12 marks

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.