

UNIT 40.2 *CSEC Revision Questions***Sample Paper 02**

The time allowed for this paper is 2 hours 40 minutes.

Candidates are expected to have electronic calculators.

SECTION I 90 marks on the CORE syllabus

SECTION II 30 marks available; there are 3 structured or problem-solving questions based mainly on the *Optional Objectives* of the syllabus, with 1 question from

- Algebra and Relations, Graphs and Functions
- Measurement and Geometry and Trigonometry
- Vectors and Matrices.

Candidates are required to answer ANY TWO questions.
Each question will be allocated 15 marks.

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Section II 30 marks available

SECTION I

1. (a) Calculate the EXACT value of

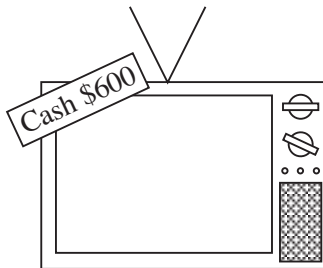
$$\frac{3\frac{1}{4} - 2\frac{1}{3}}{1\frac{5}{6}}$$

(3 marks)

- (b) Write the value of 12.5^2
- (i) exactly
 - (ii) to two significant figures
 - (iii) in standard form.

(3 marks)

2.

**Hire Purchase Plan:**

Pay down \$60

\$55 monthly for 12 months

- (a) Mr Jones purchases the TV advertised in the diagram by using the hire purchase plan instead of paying cash. How much more than \$600 does Mr Jones pay by using the hire purchase plan?
- (b) Mr James works a basic week of 40 hours at a rate of \$16 an hour. His overtime rate is \$4 per hour MORE than his basic rate. Calculate
- (i) his total wage for a basic week,
 - (ii) his wage for a week in which he worked 47 hours,
 - (iii) the number of hours he worked during one week if he was paid a wage of \$860.

(3 marks)

(7 marks)

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3. (a) Draw a Venn diagram with

$$U = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15\}$$

to illustrate the sets

$$A = \{0, 1, 3, 6, 10, 15\}$$

$$B = \{1, 2, 3, 5, 8, 13\}$$

$$C = \{3, 4, 7, 11\}$$

What is

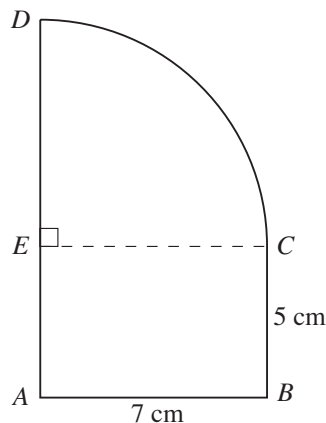
(b) $A \cap B \cap C$

(c) $(A \cup B \cup C)^c$?

(9 marks)

4. The diagram below, **not drawn to scale**, shows a rectangle $ABCE$ joined along the edge EC to a quarter circle ECD , so that AED is a straight line.

$AB = 7$ cm and $BC = 5$ cm.



- (a) Write down the length of AD .

- (b) Use $\pi = \frac{22}{7}$.

Calculate

- (i) the length of the arc CD
 - (ii) the perimeter of the figure $ABCDE$
 - (iii) the area of the figure $ABCDE$.
- (c) If the diagram is drawn to a scale of 1:100, find the actual area of rectangle $ABCE$ in square metres.

(10 marks)

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5. The height, in centimetres, of seedlings were recorded and grouped as shown below.

Height (cm)	3 - 7	8 - 12	13 - 17	18 - 22	23 - 27
Number of Seedlings	5	16	23	12	4

- (a) Calculate
- the TOTAL number of seedlings in the sample.
 - an estimate of the mean height of the seedlings in the sample. (5 marks)
- (b) Using a scale of 2 cm to represent a height of 5 cm on the x -axis, and 2 cm to represent 5 seedlings on the y -axis, draw on graph paper the frequency polygon to represent the data given in the table. (5 marks)
- (c) Calculate the probability that a seedling, selected at random, measures at most 12 cm in height. (2 marks)
6. (a) The cost, J\$C, of advertising in the local newspaper is worked out using the formula
- $$C = 20n + 30$$
- where n is the number of words in the advertisement.
- Annelise puts in an advertisement of 15 words.
Work out the cost. (2 marks)
 - The cost of Debbie's advertisement is J\$250.
 - Use the formula to write down an equation in n . (1 mark)
 - Solve the equation to find the number of words in Debbie's advertisement. (2 marks)
- (b) (i) Simplify
- $3m - 2(m + 1)$
 - $\frac{3}{y} - \frac{2}{y - 2}$
- (ii) Solve the equation
- $$2(x - 1) = \frac{5}{2} \quad \text{span style="float: right;">(8 marks)}$$

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7. (a) (i) Given that $f(x) = x^2 + x - 2$, copy and complete the table below.

x	-3	-2	-1	0	1	2
$f(x)$	4		-2		0	

(2 marks)

- (ii) Using 2 cm to represent 1 unit on both axes, draw the graph of

$$f(x) = x^2 + x - 2 \text{ for } -3 \leq x \leq 2.$$

(4 marks)

- (iii) On the graph of $f(x) = x^2 + x - 2$, draw the graph of $g(x) = x - 1$ using the values from the table shown below.

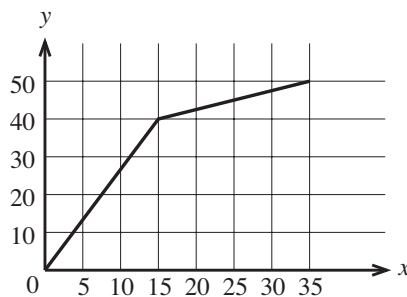
x	-2	3
$g(x)$	-3	2

(2 marks)

- (iv) Using the graphs, write down the coordinates for the points where the two graphs intersect.

(2 marks)

- (b) The speed-time graph below shows the movement of a cyclist.



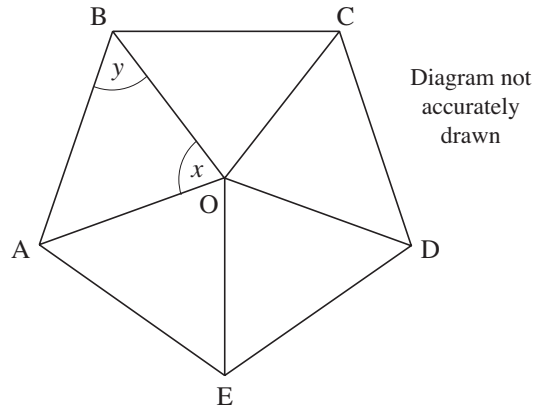
Using the graph, calculate

- (i) the acceleration of the cyclist during the first 15 seconds.
 (ii) the distance travelled by the cyclist between the period $t = 15$ and $t = 35$ seconds.

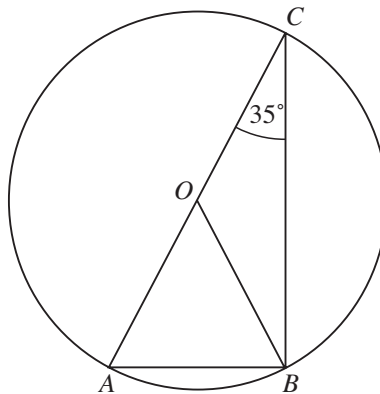
(6 marks)

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8. (a) ABCDE is a regular pentagon.
O is the centre of the pentagon.



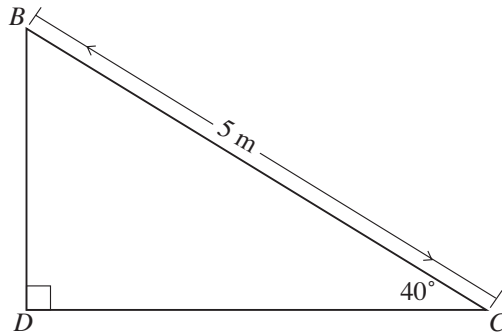
- (i) a) Write down the order of rotational symmetry of the regular pentagon.
b) Write down the number of lines of symmetry of triangle OCD. (2 marks)
- (ii) Work out the value of
a) x b) y . (3 marks)
- (b) The diagram below shows a circle ABC with centre O. AC is a diameter and $\angle ACB = 35^\circ$.
Calculate the size of $\angle ABO$.



(3 marks)

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- (c) In the figure below, **not drawn to scale**, $BC = 5$ metres, angle $BCD = 40^\circ$ and angle BDC is a right angle.



- (i) Calculate the length, in metres, of BD . (2 marks)
- (ii) Calculate the length, in metres, of DC . (2 marks)
- (iii) Prove that the area in m^2 of the triangle BDC is $12.5 \sin 40^\circ \cos 40^\circ$. (2 marks)

UNIT 40.2 CSEC Revision Questions**Sample Paper 02****SECTION II****Answer any TWO questions**Algebra and Relations, Graphs and Functions

1. (a) Factorise completely

(i) $4x^2 - 9$

(i) $mp + mq = np - nq$

(iii) $2x^2 + 3xy + y^2$

(6 marks)

- (b) Solve for x , given

$$3x^2 - 7x + 2 = 0$$

(4 marks)

- (c) Solve the pair of simultaneous equations:

$$x^2 = 4 - y$$

$$x = y + 2$$

(5 marks)

Measurement and Geometry and Trigonometry

2. (a) Port M , is due south of a lighthouse, L . A ship leaves Port M and sails 200 km on a bearing of 60° to Port K . Port K is directly east of the lighthouse.

- (i) Sketch a diagram to represent this information.

At L and K , draw dotted lines to show the direction of north.

- (ii) Label CLEARLY on your diagram

- (i) the points L , M and K

- (ii) the angle of 60° , which shows the bearing of K from M

- (iii) the line segment representing 200 km.

(4 marks)

- (iii) Calculate, to the NEAREST kilometre, the distance LK .

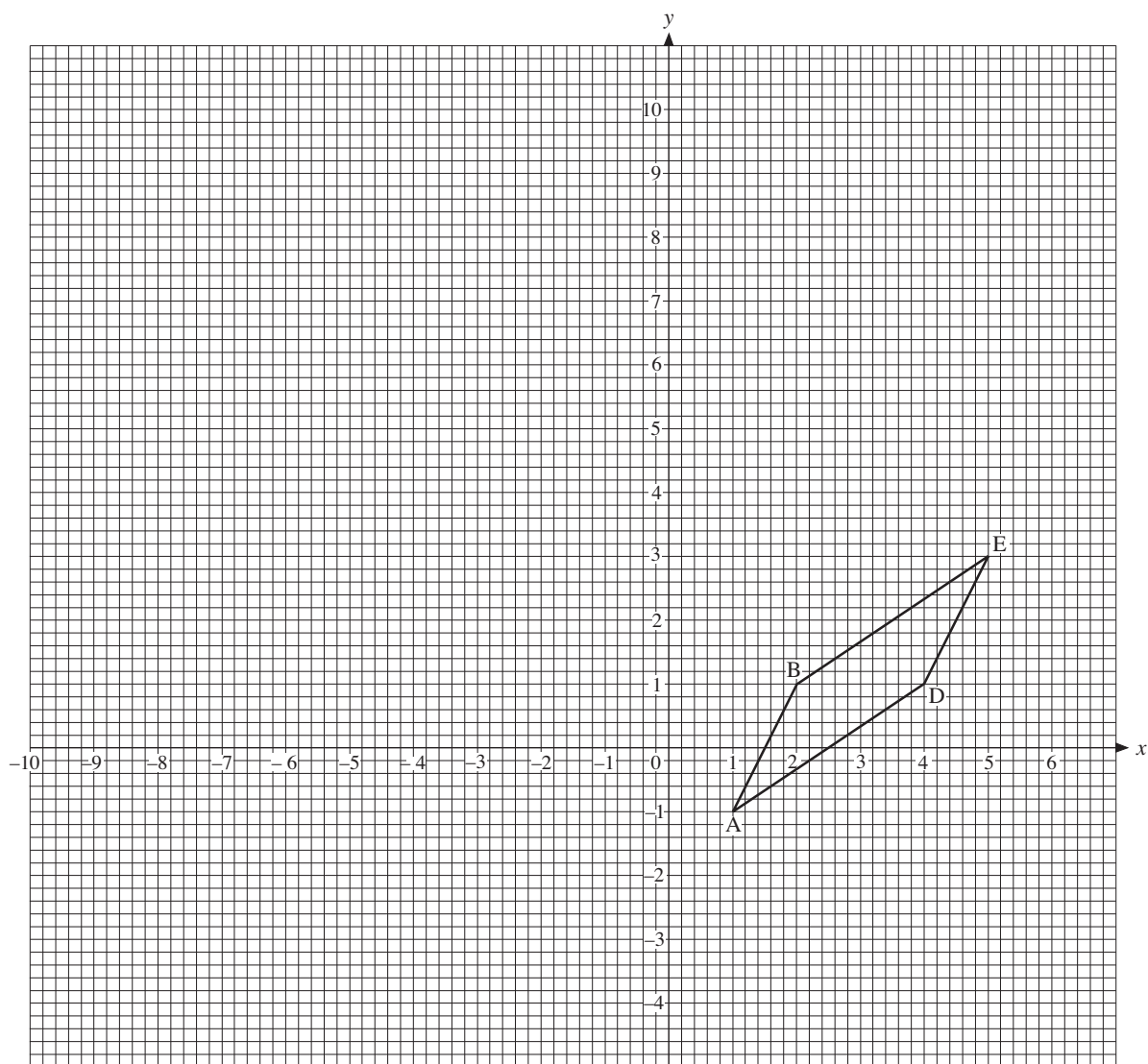
(3 marks)

- (iv) Indicate on your diagram the angle, x , which shows the bearing of M from K .

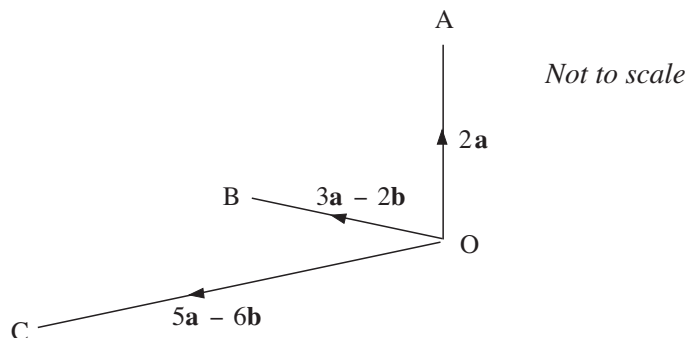
(1 mark)

UNIT 40.2 CSEC Revision Questions**Sample Paper 02**

- (b) The diagram shows the position of a parallelogram ABCD.



- (i) The parallelogram ABCD is rotated through 180° about B to form a new parallelogram $A_1B_1C_1D_1$. On a copy of the diagram, draw and label the parallelogram $A_1B_1C_1D_1$.
(2 marks)
- (ii) The parallelogram $A_1B_1C_1D_1$ is enlarged by a scale factor of 3 to form a new parallelogram $A_2B_2C_2D_2$. The centre of the enlargement is (2, 0). Draw and label the parallelogram $A_2B_2C_2D_2$.
(2 marks)
- (iii) Describe a single transformation which would take $A_2B_2C_2D_2$ back onto $A_1B_1C_1D_1$.
(3 marks)

UNIT 40.2 CSEC Revision Questions**Sample Paper 02**Vectors and Matrices**3.** (a)

In the diagram, $\vec{OA} = 2\mathbf{a}$, $\vec{OB} = 3\mathbf{a} - 2\mathbf{b}$ and $\vec{OC} = 5\mathbf{a} - 6\mathbf{b}$

(i) Express, in terms of $\mathbf{a}$ and $\mathbf{b}$, as simply as possible, (1 mark)

a) $\vec{AB}$ (2 marks)

b) $\vec{BC}$ (2 marks)

(ii) What do your answers to part (a) tell you about the points A, B and C?
Give a reason for your answer. (2 marks)

(b) Given that $A = \begin{pmatrix} 1 & 4 \\ -1 & 2 \end{pmatrix}$ and $B = \begin{pmatrix} -1 & 3 \\ 2 & 5 \end{pmatrix}$,
evaluate $A^2 + B$. (4 marks)

(c) Find the inverse matrix for $A = \begin{pmatrix} 7 & 3 \\ -5 & -2 \end{pmatrix}$.

Hence solve the equations

$$7x + 3y = 6$$

$$-5x - 2y = -5$$

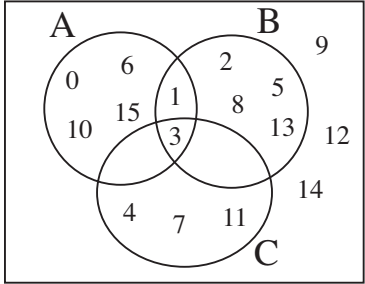
(6 marks)

UNIT 40.2 CSEC Revision Questions**Sample Paper 02
MARK SCHEME**

Marks are

- 'B' marks - independent marks given for the answer
- 'M' marks - method marks
- 'A' marks - accuracy marks ('A' marks cannot be awarded unless the previous 'M' mark has been awarded.)

SECTION I

1. (a) $\frac{\left(\frac{13}{4} - \frac{7}{3}\right)}{\frac{11}{6}} = \frac{11}{12} \times \frac{6}{11} = \frac{1}{2}$ M1 A1 A1
- (b) (i) 156.25 (ii) 160 (iii) 1.5625×10^2 B1 B1 B1 (6 marks)
2. (a) Total payment = \$60 + 12 × \$55 M1
= \$720 A1
Extra payment = \$720 – \$600 = \$120 B1
- (b) (i) 40 × \$16 = \$640 B1
(ii) \$640 + 7 × \$20 = \$780 M1 A1
(iii) 640 + $x \times 20 = 860$ M1 A1
 $20x = 220 \Rightarrow x = 11$ hours overtime A1
No. of hours worked = 40 + 11 = 51 B1 (10 marks)
3. (a)  U
(–1 for each mistake) B5
- (b) $A \cap B \cap C = \{3\}$ B2
- (c) $(A \cup B \cup C)' = \{9, 12, 14\}$ B2 (9 marks)

UNIT 40.2 CSEC Revision Questions**Sample Paper 02****MARK SCHEME**

4. (a) $AD = 7 + 5 = 12 \text{ cm}$

B1

(b) (i) $CD = \frac{1}{4} \cdot (2\pi \times 7) = 11 \text{ cm}$

M1 A1

(ii) Perimeter = 35 cm $(11 + 5 + 7 + 5 + 7)$

M1 A1

(iii) Area = $(7 \times 5) + \frac{1}{4} \times (\pi \times 7^2)$

M1 A1

$$= 35 + \frac{77}{2} = 73\frac{1}{2} \text{ cm}^2$$

A1

(c) Actual area = $\frac{147}{2} \times 100 \times 100 \text{ cm}^2$

M1

$$= \frac{147}{2} \text{ m}^2$$

A1

(10 marks)

5. (a) (i) $5 + 16 + 23 + 12 + 4 = 60$

M1 A1

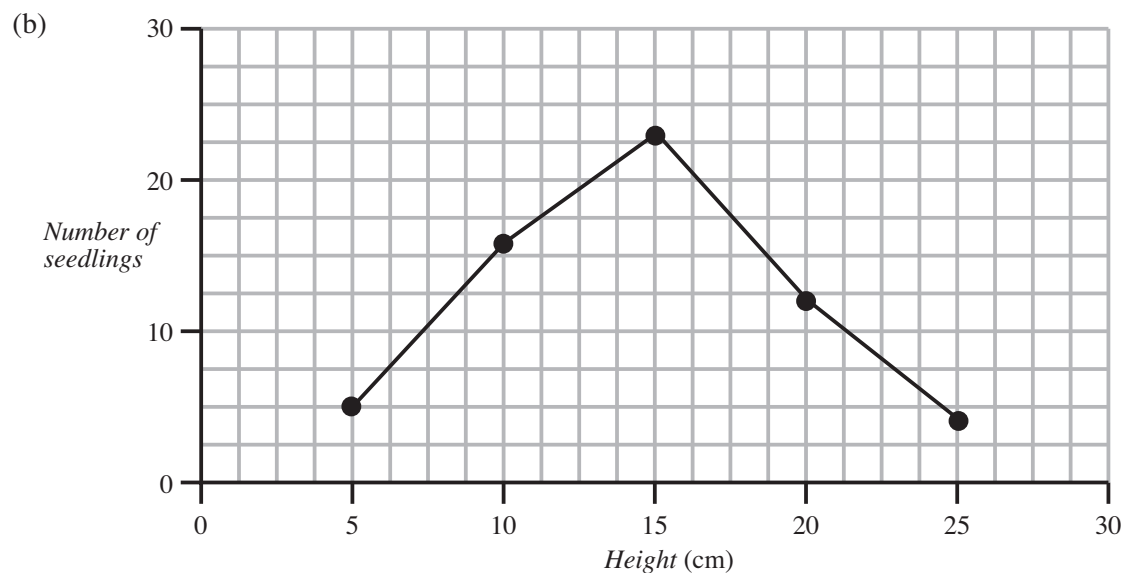
(ii) Mean = $(5 \times 5 + 10 \times 16 + 15 \times 23 + 20 \times 12 + 25 \times 4) \div 60$

$$= \frac{870}{60}$$

M1 A1

$$= 14.5$$

A1



(-1 for each mistake)

B5

(c) probability = $\frac{5 + 16}{60} = \frac{21}{60} = 0.35$

M1 A1

(12 marks)

UNIT 40.2 CSEC Revision Questions

Sample Paper 02 MARK SCHEME

6. (a) (i) J\$330 (ii) a) $250 = 20n + 30$ b) 11 M1 A1 B1 M1 A1

(b) (i) a) $3m - 2m - 2 = m - 2$ M1 A1

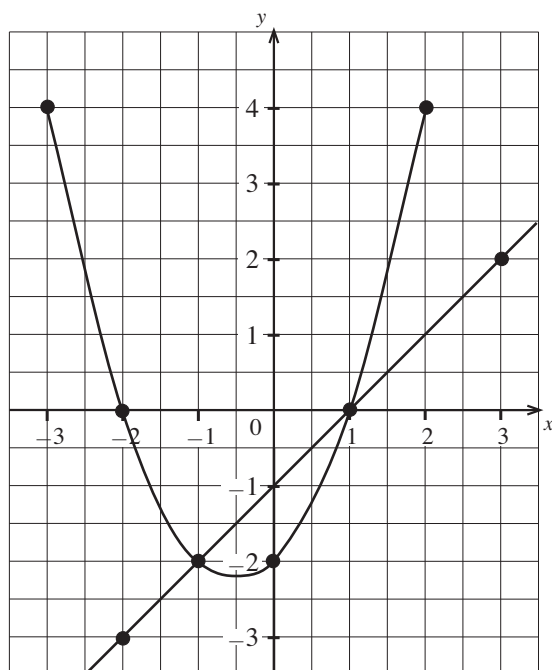
b) $\frac{3(y-2) - 2y}{y(y-2)} = \frac{y-6}{y(y-2)}$ M1 A1 A1

(ii) $x - 1 = \frac{5}{4}$ M1 A1

$x = \frac{5}{4} + 1 = \frac{9}{4}$ A1 (13 marks)

7. (a) (i) $f(-2) = 0$
 $f(0) = -2$
 $f(2) = 4$ (–1 for each mistake) B2

(ii)



axes B1

(–1 for each mistake) points B2

shape B1

(iii) graph graph B2

(iv) (1, 0) and (–1, –2) B1 B1

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MARK SCHEME

(b) (i) Acceleration = gradient = $\frac{40}{15} = \frac{8}{3} \text{ m/s}^2$ M1 A1 A1

(ii) Distance travelled = $\left(40 \times 20 + \frac{1}{2} \times 20 \times 10\right) \text{ m}$

= $(800 + 100) \text{ m}$

= 900 m

M1 A1 A1

(16 marks)

8. (a) (i) a) 5 b) 1 (ii) a) 72° b) 54° B1 B1 M1 A1 B1

(b) $\hat{AOB} = 70^\circ \Rightarrow 2 \times \hat{ABO} = 180^\circ - 70^\circ \Rightarrow \hat{ABO} = 55^\circ$ B1 M1 A1

(c) (i) $BD = 5 \sin 40^\circ (\approx 3.21 \text{ m})$ M1 A1

(ii) $DC = 5 \cos 40^\circ (\approx 3.83 \text{ m})$ M1 A1

(iii) Area = $\frac{1}{2} \times BD \times DC$ M1

= $\frac{25}{2} \sin 40^\circ \cos 40^\circ$ A1 (14 marks)

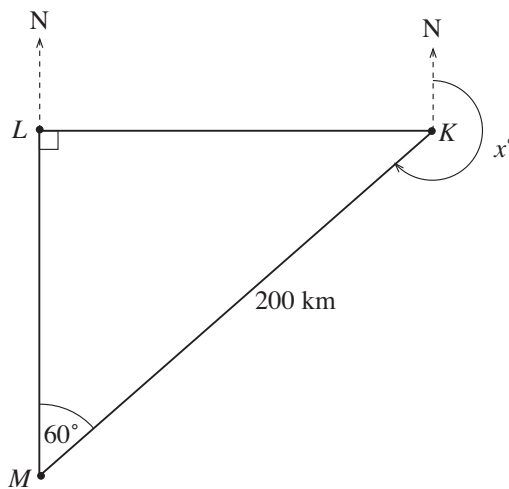
(TOTAL MARKS 90)

SECTION II

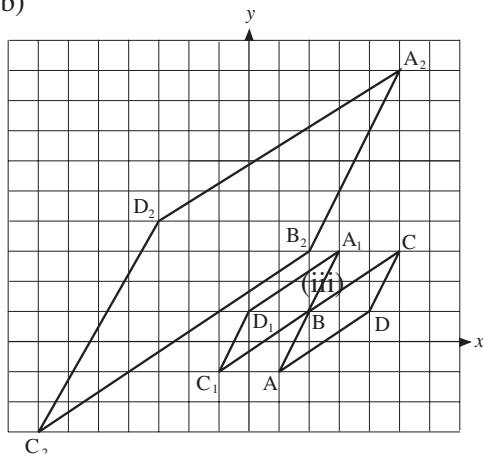
Algebra and Relations, Graphs and Functions

1. (a) (i) $(2x - 3)(2x + 3)$ M1 A1
- (ii) $(m - n)(p + q)$ M1 A1
- (iii) $(2x + y)(x + y)$ M1 A1
- (b) $(3x - 1)(x - 2) = 0$ M1 A1
- $\Rightarrow 3x - 1 = 0$ or $x - 2 = 0$ A1
- $\Rightarrow x = \frac{1}{3}$ or $x = 2$ A1
- (c) $x^2 = 4 - y = 4 - (x - 2)$ M1 A1
- $x^2 + x - 6 = 0$
- $(x + 3)(x - 2) = 0$ M1
- $x = -3, y = -5, \text{ or } x = 2, y = 0$ A1 A1 (15 marks)

Measurement and Geometry and Trigonometry

2. (a) (i)  sketch B1
- (ii) Label a) points L, M, K B1
- b) angle 60° B1
- c) line representing 200 km B1
- (iii) $LK = 200 \times \sin 60^\circ$ M1
- $= 173.205$ A1
- $\approx 173 \text{ km}$ to the nearest km A1
- (iv) Bearing, x° , shown on sketch B1

(b)



(i) Shape $A_1D_1C_1B$ B2

(ii) Shape $A_2B_2C_2D_2$ B2

Enlargement, B1

scale factor $\frac{1}{3}$, B1

about $(2, 0)$ B1

(15 marks)

Vectors and Matrices

3. (a) (i) a) $\mathbf{a} - 2\mathbf{b}$ B1

b) $2\mathbf{a} - 4\mathbf{b} \quad (= 2(\mathbf{a} - 2\mathbf{b}))$ B2

(ii) Since $\vec{BC} = 2\vec{AB}$, points A, B, C are collinear B1 B1

$$(b) \quad A^2 + B = \begin{pmatrix} 1 & 4 \\ -1 & 2 \end{pmatrix} \begin{pmatrix} 1 & 4 \\ -1 & 2 \end{pmatrix} + \begin{pmatrix} -1 & 3 \\ 2 & 5 \end{pmatrix} \quad \text{M1}$$

$$= \begin{pmatrix} -3 & 12 \\ -3 & 0 \end{pmatrix} + \begin{pmatrix} -1 & 3 \\ 2 & 5 \end{pmatrix} \quad \text{A2}$$

$$= \begin{pmatrix} -4 & 15 \\ -1 & 5 \end{pmatrix} \quad \text{A1}$$

(c) $\det A = 1$ M1 A1

$$A^{-1} = \begin{pmatrix} -2 & -3 \\ 5 & 7 \end{pmatrix} \quad \text{A1}$$

$$A \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 6 \\ -5 \end{pmatrix} \Rightarrow \begin{pmatrix} x \\ y \end{pmatrix} = A^{-1} \begin{pmatrix} 6 \\ -5 \end{pmatrix} = \begin{pmatrix} -2 & -3 \\ 5 & 7 \end{pmatrix} \begin{pmatrix} 6 \\ -5 \end{pmatrix} = \begin{pmatrix} 3 \\ -5 \end{pmatrix}$$

M1 A1 A1

(15 marks)