

MATH PAPER ONE GUIDE

SECTION A (40 marks)

1. Factorise $2x^2 - x - 10$ hence solve $2x^2 - x - 10 = 0$.

$$1. 2x^2 - x - 10$$

$$2x^2 - 5x + 4x - 10$$

$$x(2x - 5) + 2(2x - 5)$$

$$(x+2)(2x - 5)$$

$$F_{20} = \{-5, 4\}$$

M_1 For correct substitution.

A_1 C. a. o

A_1 C. a. o

Either $x+2 = 0$

$$x = -2$$

or $2x - 5 = 0$

$$x = \frac{5}{2}$$

A_1 C. a. o

2. Given that matrix $A = \begin{pmatrix} 1 & 4 \\ -2 & 3 \end{pmatrix}$, $C = \begin{pmatrix} 7 & 6 \\ 6 & 13 \end{pmatrix}$ and that $A + 2B = C$. Find matrix B and hence determinant of matrix B.

$$\begin{pmatrix} 1 & 4 \\ -2 & 3 \end{pmatrix} + 2B = \begin{pmatrix} 7 & 6 \\ 6 & 13 \end{pmatrix}$$

$$2B = \begin{pmatrix} 7 & 6 \\ 6 & 13 \end{pmatrix} - \begin{pmatrix} 1 & 4 \\ -2 & 3 \end{pmatrix}$$

B_1 For simplification.

$$2B = \begin{pmatrix} 6 & 2 \\ 8 & 10 \end{pmatrix}$$

$$B = \begin{pmatrix} 3 & 1 \\ 4 & 5 \end{pmatrix}$$

A_1 C. a. o

3. Joshua bought 3 pens and 4 books both at shs 5,800 while Isma bought only 5 pens from the same shop at 3,000. Find the cost of each pen and book.

$$3p + 4b = 5800$$

$$5p = 3000$$

$$p = 600$$

$$3(600) + 4b = 5800$$

$$4b = 4000$$

$$b = 1000$$

B_1 For the equations

A_1 C. a. o

M_1 For correct substitution.

A_1 C. a. o

4. A translation T maps point A (x,y) into its image A'(x-3, y+2).

i. Find the transformation T.

ii. Find B if B' is (-2,7).

$$T + \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} x-3 \\ y+2 \end{pmatrix}$$

M_1 For correct substitution.

$$T = x - 3 - x$$

$$y + 2 - y$$

$$T = \begin{pmatrix} -3 \\ 2 \end{pmatrix}$$

$$T + B = \begin{pmatrix} -2 \\ 7 \end{pmatrix}$$

$$B = \begin{pmatrix} -2 \\ 7 \end{pmatrix} - \begin{pmatrix} -3 \\ 2 \end{pmatrix}$$

$$B = \begin{pmatrix} 1 \\ 5 \end{pmatrix}$$

A_1 C. a. o

M_1 For correct substitution.

A_1 C. a. o

5. Calculate the area of a triangle ABC in which AB=14cm, AC=9cm and angle BAC=120°.

$$\text{Area} = \frac{1}{2} bc \sin A$$

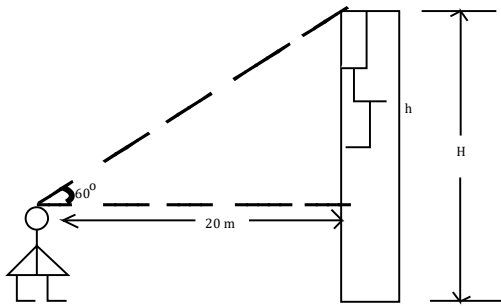
$$= \frac{1}{2} \times 14 \times 9 \sin 120$$

$$= 54.56 \text{sq units}$$

$M_1 M_1 M_1$

A_1 C. a. o

6. A man of height 1.5m stands on a level ground to see the roof of a building at angle of elevation of 54°. If the man stands 20m away from the foundation of the building. Find the height of the building.



$$\tan 54 = \frac{h}{20}$$

$$h = 20 \tan 54$$

$$= 27.53 \text{m}$$

$$\text{Height of the building} = 27.53 + 1.5$$

$$= 29.03 \text{m}$$

M_1 Use of identity

A_1 C. a. o

M_1 Adding two heights

A_1 C. a. o

7. The probability of picking a blue ball at random from the box containing blue and white balls is $\frac{2}{3}$. If 8 balls were white, how many balls are in the box?

$$P(B) = \frac{2}{3}$$

$$P(w) = \frac{1}{3}$$

$$\text{Then } \frac{1}{3} \times n = 8$$

$$n = 24 \text{ balls}$$

M_1 for $\frac{1}{3}$ seen

$M_1 M_1$ Ideas used

A_1 C. a. o

8. Solve the inequality $-8 < \frac{3}{4}x - 2 \leq x - 6$ and show the solution on a number line.

$$-8 < \frac{3}{4}x - 2$$

$$-3x < 3x - 8$$

$$\frac{-24}{3} < \frac{3}{3}x$$

$$-8 < x$$

$$\frac{3x}{4} - 2 \leq x - 6$$

$$3x - 8 \leq 4x - 6$$

$$-x \leq 2$$

$$x \leq -2$$

$$-8 < x \leq -2$$

M_1

correct idea

$M_1 M_1 M_1$

correct idea

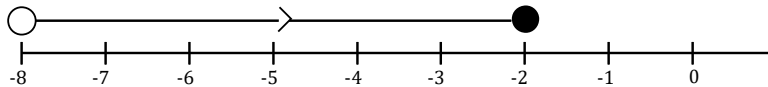
A_1

for $x \leq -2$, $-8 < x$
correct

9. Given that $p * q = p^2 - pq^2$. Find;

i. $3 * -1$

ii. $4 * (3 * -1)$



B_1

Number line seen

$$P * Q = P^2 - PQ^2$$

$$3 * 1 = 3^2 - 3(1)^2$$

$$= 9 - 3$$

$$= 6$$

M_1

For correct substitution.

A_1

C. a. o

$$4 * 6 \Rightarrow 4^2 - 4(6)^2$$

$$\Rightarrow 16 - 144$$

$$= -128$$

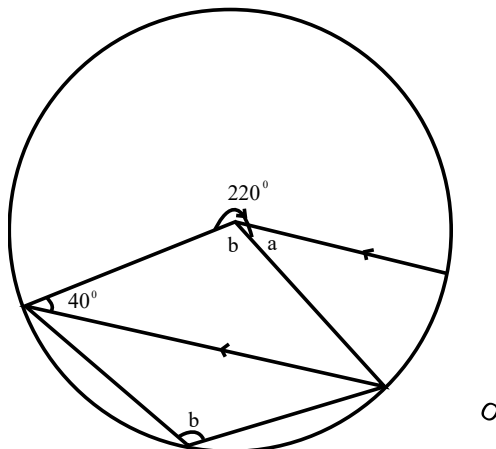
M_1

For correct substitution.

A_1

C. a. o

10. In the figure below O is the center of the circle.



Find the Angles marked **a** and **b**.

B_1

$$40 + 40 + y = 180$$

$$y = 100$$

$$\begin{aligned}y + b &= 180 \\100 + b &= 180 \\b &= 80^0\end{aligned}$$

M_1

A_1

$$\begin{aligned}220 + y + a &= 360 \\220 + 100 + a &= 360 \\a &= 40^0\end{aligned}$$

A_1

SECTION B (60 marks)

Attempt not more than five questions from this section.

11(a) Solve the equation $\frac{6}{x} + \frac{1}{x-5} = 2$.

$$\frac{6}{x} + \frac{1}{x-5} = 2$$

M_1

For L.C.M

$$\frac{6(x-5)+x}{x(x-5)} = 2$$

$$6x - 30 + x = 2x(x-5)$$

M_1

For equating correctly

$$7x - 30 = 2x^2 - 10x$$

B_1

equation formed

$$2x^2 - 17x + 30 = 0$$

$$x = \frac{17 \pm \sqrt{(-17)^2 - 4 \times 2 \times 30}}{2 \times 2}$$

M_1

Any correct method

$$= \frac{17 \pm \sqrt{289 - 240}}{4}$$

$$x = \frac{17 \pm \sqrt{49}}{4}$$

$$x = \frac{17 \pm 7}{4}$$

B_1

For simplifying

$$\text{Either } x = \frac{17+7}{4} = \frac{24}{4} = 6$$

A_1

C. a. o

$$\text{or } x = \frac{17-7}{4} = \frac{10}{4} = 2.5$$

A_1

C. a. o

(b) The power of an engine is given by formular $H = \frac{(W_1 - W_2)CN}{3.3 \times 10^4}$. Make C the subject of the formular and find its value when H=54, N=225, W₁=423, and W₂=27

$$H = \frac{(w_1 - w_2)CN}{3.3 \times 10^4}$$

$$\frac{3.3 \times 10^4 H}{(w_1 - w_2)} = CN$$

M_1

for correct idea

$$\therefore C = \frac{3.3 \times 10^4 H}{(w_1 - w_2)N}$$

$$C = \frac{3.3 \times 10^4 \times 54}{(423 - 27) \times 225}$$

$$= \frac{18532.8}{89,100}$$

$M_1 A_1$

*for dividing by N
and C.a.o*

M_1

For correct substitution.

A_1

C. a. o

$$C = 0.208$$

12. The probabilities that Kobusingye , Nalubwama and Tumukunde will attend the party at Sheraton are $\frac{3}{4}, \frac{4}{7}$ and $\frac{7}{8}$ respectively. Find the probability that;

a) All the three will attend the party.

$$P(K) \times P(N) \times P(T)$$

$$\frac{3}{4} \times \frac{4}{7} \times \frac{7}{8}$$

$$= \frac{84}{224}, \frac{3}{8}$$

M_1 For correct substitution.

A_1 C. a. o

b) None of them will attend the party.

$$1 - \frac{84}{224}$$

$$= \frac{140}{224}$$

M_1 For correct substitution.

B_1 For simplifying

A_1 C. a. o

c) Only one attends.

$$P(K \times N^1 \times T^1) \text{ or } P(N \times K^1 \times T^1) \text{ or }$$

$$P(K^1 \times N^1 \times T)$$

$$\frac{3}{4} \times \frac{3}{7} \times \frac{1}{8} + \frac{4}{7} \times \frac{1}{4} \times \frac{1}{8} + \frac{1}{4} \times \frac{3}{7} \times \frac{7}{8}$$

$$= \frac{9}{224} + \frac{4}{224} + \frac{21}{224}$$

$$= \frac{34}{224}$$

$M_1 M_1 M_1$ For each part

B_1 For simplifying

A_1 C. a. o

d) Atmost one of them attends.

$$= \frac{34}{224} + \frac{140}{224} \quad (\text{one or none})$$

$$\Rightarrow \frac{174}{224}$$

M_1 For correct substitution.

A_1 C. a. o

13. The Headteacher of a certain school orders for T-shirts from the tailor as follows in term 1 and term 2.

	Term one	SIZE		
		Small	Medium	Large
Colours	Blue	15	30	5
	Green	0	40	2
	White	30	28	10
	red	25	42	0

	Term Two	SIZE		
		Small	Medium	Large
Colours	Blue	20	35	0

	Green	10	42	8
	White	25	15	10
	Red	24	30	2

If the cost of a small sized T-shirt of any colour is 20,000 while that of medium size is Shs 22,000. The cost of a large-sized T-shirt is shs 5,000 more than the cost of a small-sized shirt.

a) Write down a 4X3 overall matrix for the T-shirts bought in both terms.

$$\begin{pmatrix} 15 & 30 & 5 \\ 0 & 40 & 2 \\ 30 & 28 & 10 \\ 25 & 42 & 0 \end{pmatrix} + \begin{pmatrix} 20 & 35 & 0 \\ 10 & 42 & 8 \\ 25 & 15 & 10 \\ 24 & 30 & 2 \end{pmatrix}$$

$B_1 B_1 M_1$ for each matrix seen
and adding

$$\begin{pmatrix} 35 & 65 & 5 \\ 10 & 82 & 10 \\ 55 & 43 & 20 \\ 49 & 72 & 2 \end{pmatrix} \quad 4 \times 3 \text{ is the overall matrix}$$

A_1 C. a. o

b.i) Find the cost of large sized T-shirts.

ii) Form a 3X1 matrix for the cost of the T-shirts.

$$\text{b) } \begin{pmatrix} 20,000 \\ 22,000 \\ 25,000 \end{pmatrix}$$

B_1 for correct matrix
 B_1 for 25,000 seen

c) Use the matrices formed in (a) and (b) above to find the head teachers expenditure on the T-shirts in the two terms.

$$\begin{pmatrix} 35 & 65 & 5 \\ 10 & 82 & 10 \\ 55 & 43 & 20 \\ 49 & 72 & 2 \end{pmatrix} \begin{pmatrix} 20,000 \\ 22,000 \\ 25,000 \end{pmatrix}$$

M_1 Only correct
method

$$\begin{pmatrix} 700,000 + 1,430,000 + 125,000 \\ 200,000 + 1,804,000 + 250,000 \\ 1,100,000 + 946,000 + 500,000 \\ 980,000 + 1,584,000 + 50,000 \end{pmatrix}$$

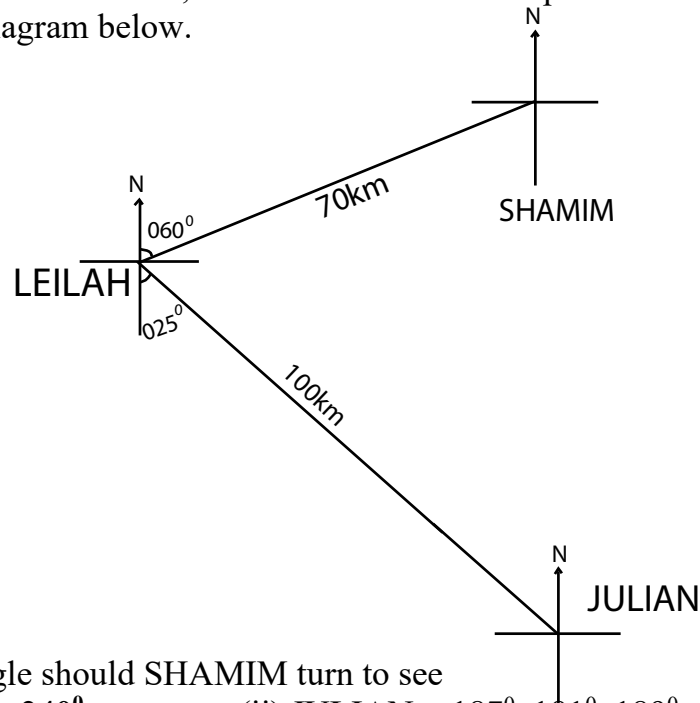
$$\begin{pmatrix} 2,255,000 \\ 2,254,000 \\ 2,546,000 \\ 2,614,000 \end{pmatrix}$$

B_1 for each correct
 B_1
 B_1
 B_1

9,669,000 is the head teacher's expenditure

A_1 C. a. o

14. Three students LEILAH, SHAMIM and JULIAN positioned themselves as shown below in the sketch diagram below.



- a) In which angle should SHAMIM turn to see
 (i) LEILAH = 240° (ii) JULIAN = $187^\circ, 181^\circ, 189^\circ, 190^\circ$
 b) Using a scale of 1cm:10km, make an accurate drawing on a graph paper showing clear position of these students.
 c) How far is Julian from Shamim. Give your answer in Km.

No 14. Missing

15(a) A transformation matrix $M = \begin{pmatrix} 2 & 4 \\ 3 & -1 \end{pmatrix}$ maps the vertices of a triangle ABC to $A'(-12, 11)$ $B'(14, -7)$ $C'(22, -2)$. Find the coordinates of the triangle ABC.

$$\begin{pmatrix} 2 & 4 \\ 3 & -1 \end{pmatrix} \begin{pmatrix} a & c & e \\ b & d & f \end{pmatrix} = \begin{pmatrix} -12 & 14 & 22 \\ -11 & 7 & -2 \end{pmatrix}$$

$M_1 B_1$ for correct substitution and unknowns seen

$$\begin{array}{l} 3 \times 2a + 4b = -12 \\ 2 \times 3a - b = -11 \\ \hline 6a + 12b = -36 \\ -6a - 2b = -22 \\ \hline 14b = -14 \\ b = -1 \\ 3a - (-1) = -11 \\ 3a = -12 \\ a = -4 \end{array}$$

$$\begin{array}{l} 3 \times 2c + 4d = 14 \\ 2 \times 3c - d = 7 \end{array}$$

$$\begin{array}{r}
 6c + 12d = 42 \\
 -6c - 2d = 14 \\
 \hline
 14d = 28 \\
 d = 2 \\
 2c + 4(2) = 14 \\
 2c = 6 \\
 c = 3
 \end{array}$$

$$\begin{array}{r}
 3 \times 2e + 4f = 22 \\
 2 \times 3e - f = -2 \\
 \hline
 6e + 12f = 66 \\
 -6e - 2f = -4 \\
 \hline
 14f = 28 \\
 f = 5 \\
 2e + 4(5) = 22 \\
 2e = 2 \\
 e = 1
 \end{array}$$

$$\therefore A(-4, -1) \quad B(3, 2) \quad C(1, 5)$$

*for correct
substitution and
unknowns seen*
 $B_1 B_1 B_1$

- b) If the image triangle further reflected in the line $y + x = 0$ to form $A'' B'' C''$.
i) Write down the reflection matrix for $y + x = 0$.

$y + x = 0$ matrix

$$\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$$

B_1 *Correct matrix seen*

- ii) Use the reflection matrix in b(i) above to find the image triangle $A'' B'' C''$

$$\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix} \begin{pmatrix} -12 & 14 & 22 \\ -11 & 7 & -2 \end{pmatrix} = A'' B'' C'' \\
 A''(11, 12) \quad B''(-7, -14) \quad C''(2, -22)$$

*Correct matrix
multiplication
for each seen correct*
 M_1
 $B_1 B_1 B_1$

- c) Find a single Matrix of transformation which maps ABC direct to $A'' B'' C''$.

$$\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix} \begin{pmatrix} 2 & 4 \\ 3 & -1 \end{pmatrix} \\
 \begin{pmatrix} 0 + -3 & 0 + 1 \\ -2 + 0 & -4 + 0 \end{pmatrix} \\
 \begin{pmatrix} -3 & 1 \\ -2 & -4 \end{pmatrix} \text{ maps } ABC \text{ to } A'' B'' C''$$

M_1 *Correct idea*

A_1 *C.a.o*

16. There are more than 108 tourists that are to visit Mt. Rwenzori. They are to use a taxi and a coaster. The capacity of the taxi is 18 people while that of a coaster is 27 people. Each trip the taxi and coaster make cost shs 24 000 and shs 30,000 respectively. These tourists had contributed shs 240,000 for this trip.

The trips made by the taxi should not exceed those made by the coaster by more than 2. If x and y are the number of trips made by the taxi and the coaster respectively.

- a) Write down 5 inequalities representing the above information.

16. $18x + 27y \geq 108$, $2x + 3y \geq 12$
 $24,000x + 30,000y \leq 240,000$ $4x + 5y \leq 40$
 $x \leq y + 2$,
 $x \geq 0$, $y \geq 0$

B_1

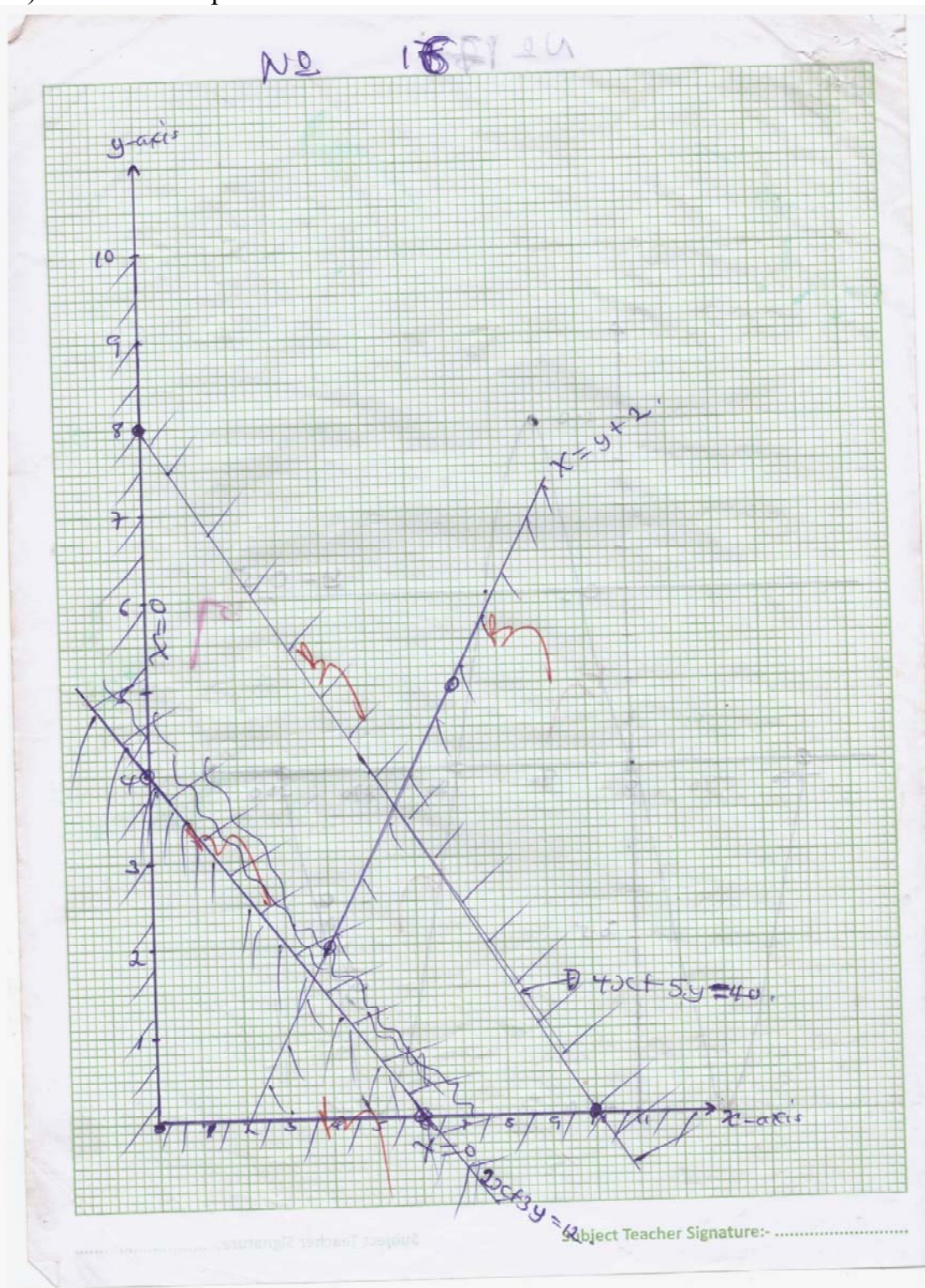
for each inequality formed
correctly

B_1

B_1

B_1

b) Plot these inequalities on the same axes.



Inequality	Equation	Points	Nature
$2x + 3y \geq 12$	$2x + 3y = 12$	$(0,4)(6,0)$	solid

$$4x + 5y \leq 40 \quad 4x + 5y = 40 \quad (0,8)(10,0) \text{ solid}$$

$$X \leq y + 2 \quad x = y + 2 \quad (4,2)(7,5) \text{ solid}$$

c) Show the possible number of trips each vehicle will make given that all the money for transport is to be used.

c) (5,4)

B_1B_1 *Correct reading from graph*

d) Find the total number of tourists that went for the trip.

$$18 \times 5 + 27 \times 4 = \text{No. of tourist}$$

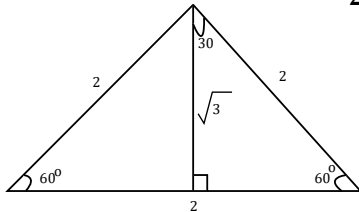
M_1 *Correct substn*

198 tourists went to the tour.

A_1 *C.a.o*

17a) Using an equilateral triangle of sides 2 units and without using a calculator, show that

$$\cos 30^\circ = \sin 60^\circ = \frac{\sqrt{3}}{2}.$$



$$2^2 - 1^2 = h^2$$

$$\sqrt{3} = \sqrt{h^2}$$

$$h = \sqrt{3}$$

$$h = 3$$

$$\cos \theta = \frac{\text{Adj}}{\text{Hyp}}$$

$$\cos 30 = \frac{\sqrt{3}}{2}$$

M_1 *Correct substn*

A_1 *C.a.o*

$$\sin \theta = \frac{\text{opp}}{\text{Hyp}}$$

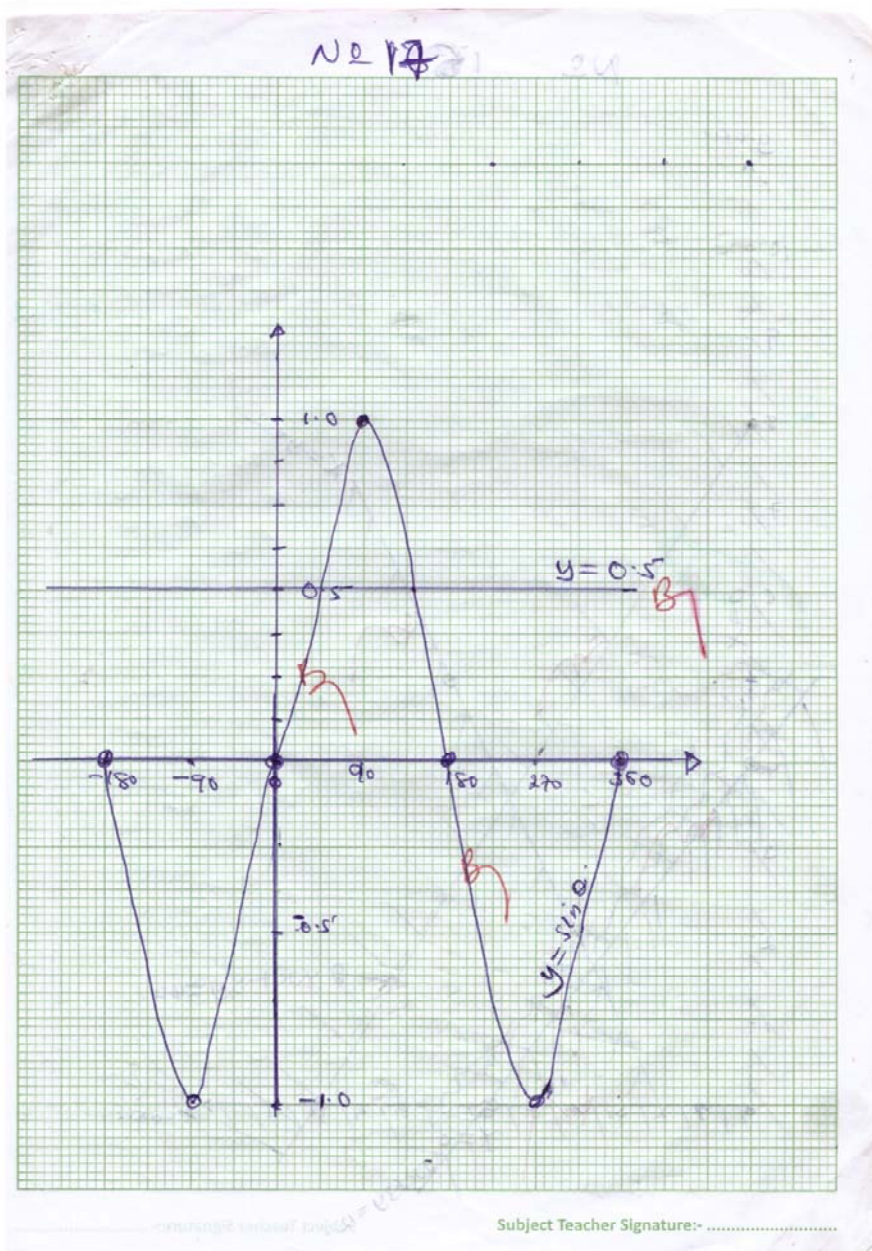
$$\sin 60 = \frac{\sqrt{3}}{2}$$

B_1 *see correct*

B_1 *see correct*

$$\therefore \cos 30 = \sin 60 = \frac{\sqrt{3}}{2}$$

b(i) Draw a graph of $y = \sin \theta$ for $-180^\circ \leq \theta < 360^\circ$ using an interval of 90°



θ	-180	-90	0	90	180	270	360
$\sin \theta$	0	-1	0	1	0	-1	0

B_1 for interval

B_1 all correct

ii) Use this graph to solve $2 \sin \theta = 1$

$$2 \sin \theta = 1$$

$$\sin \theta = \frac{1}{2}$$

$$y = \sin \theta$$

$$\frac{1}{2} = \sin \theta$$

$$y - \frac{1}{2} = 0$$

$$y = \frac{1}{2} \quad B_1$$

$$Q_1 = 45 \pm 18, \quad B$$

$$Q_2 = 135 \pm 18 \quad B_1$$

END