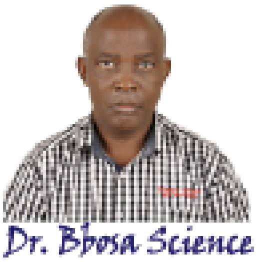
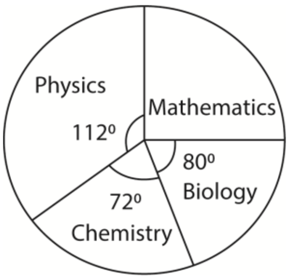


UCE MATHEMATICS PAPER 1 2015 guide

SECTION A (40 marks)

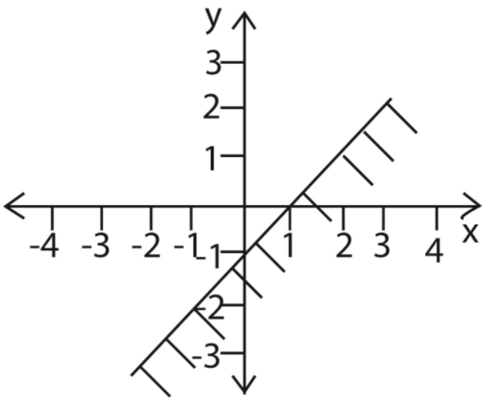
Answer all questions in this section

1. Given that a*b = a$\sqrt{b}$, find the value of (2*4)*16. (04marks)
2. Two towns A and B are such that the bearing of B from A is 085^0. Find the bearing of A from B. (04marks)
3. The pie chart below represents the subjects taught by 45 science teachers.

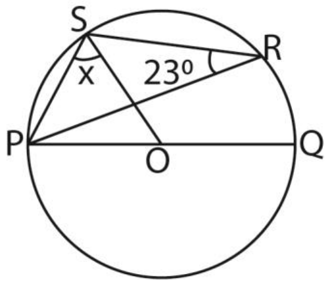


Determine the number of teachers who teach Mathematics. (04marks)

4. Make b the subject of the equation
t = 20 + $\sqrt{a - b^2}$ (04marks)
5. Given that A = $\begin{pmatrix} 2 & -2 \\ -3 & 4 \end{pmatrix}$, determine A^{-1}.
6. Determine an inequality which is represented by the unshaded region of the graph below:



7. (a) Plot the point A(4,2) on a graph. (02marks)
(b)Find the coordinates of the image of the point A after a rotation of $+90^0$ about (1, -1). (02marks)
8. Solve the equation $\frac{3}{4}(2a + 1) = \frac{5}{6}(a + 5)$ (04marks)
9. In the figure below PQ is a diameter and O is the centre of the circle. Angle RS = 250.



Calculate the value of the angle marked x. (04marks)

10. A coin and a rectangular tetrahedron with faces numbered 1 to 4 are tossed.
    (a) Construct a table showing all possible outcomes. (02marks)
    (b) What is the probability of getting a tail an a number greater than 1?

SECTION B (60MARKS)

Answer any five questions from this section. All questions carry equal marks.

11. Copy and complete the following table for curve y $=-2x^2 + x + 1$

x	-3	-2	-1		0	1	2	3
$-2x^2$	-18		-2				-8	
x	-3		-2				2	
1	1		1				1	
y	20		-2				-5	

(a) Using the values in your completed table, draw the graph of y $=-2x^2 + x + 1$. (03marks)
(b) Use the graph to solve the equation $6 - x - 2x^2 = 0$. (05marks)

12. A motor cyclist travelling 8km up a hill at a speed of xkm/h. on the return journey down the hill, his speed was (x+4)km/h. The difference in time between the uphill and downhill journey was 10 minutes.
    (a) Write down an expression for the time taken for the
        (i) Uphill journey
        (ii) Downhill journey (02marks)
    (b) (i) Using the expression in (a), form a quadratic equation for the difference in time for the two journeys.
        (ii) Solve the quadratic equation, (07 marks)
    (c) What was the average speed for the uphill and downhill journeys

13. (a) Matrix A = $\begin{pmatrix} x+7 & x \\ 3 & 0 \end{pmatrix}$ and B = $\begin{pmatrix} x-1 & 0 \\ 2 & 2 \end{pmatrix}$
    If C = A + B, find the value for which the determinant of matrix C = 2. (05marks)
    (b) Solve the following simultaneous equations using the matrix method.
    $3x + 2y = 8$
    $3y + 4x = 11$

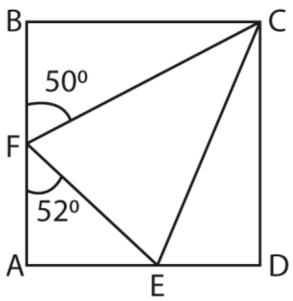
14. The table below shows the ages of 50 people treated for tuberculosis (TB) at a health centre.

86	85	56	59	67	62	63	50	91	62
56	27	50	54	80	61	52	52	16	28
66	46	55	58	56	77	26	40	42	51
35	45	68	51	49	40	93	84	79	63
52	53	25	93	27	71	66	52	30	12

(a) Construct the frequency table starting with the class 10-19. (03marks)
(b) Use the frequency table to calculate
    (i) Mean age of people treated for TB. (06marks)

(ii) Median age of the people treated for TB

15. A school hired a bus and min-bus to transport a study tour. Each trip of a bus costs shs. 40,000 and that of the min-bus costs shs. 25,000. The bus has a capacity of 42 students and the mini-bus 14 students.
    All the 126 students contributed a total of shs. 200,000 and had to go for the tour. The mini-bus had to make more trips than the bus. Of x and y represent the number of trips made by the bus and mini-bus respectively;
    (a) Write down five inequalities representing the information given. (05marks)
    (b) (i) plot the inequalities on the same axes.
    (ii) by shading the unwanted regions, show the region satisfying all the inequalities. (04marks)
    (c) Use the graph to find the number of trips each vehicle make so as to spend the least amount of money. (03marks)
16. Triangle ABC with vertices A(1,2), B(2,) and C(4,2) is mapped onto triangle A'B'C' by reflection in the line x + y = 0. Triangle A'B'C' is then mapped onto triangle A''B''C'' by a transformation whose matrix is $\begin{pmatrix} 2 & 5 \\ -4 & -5 \end{pmatrix}$.
    (a) Use I(1,0) and J(0,1) to find the matrix of reflection in the line y + x = 0.(03 marks)
    (b) Find the coordinates of
    (i) A', B' and C'
    (ii) A'', B'' and C'' (0marks)
    (iii) Determine a matrix for single transformation which maps A'', B'' and C'' back onto ABC. (03marks)
17. In the diagram ABCD is a rectangle with CF = 10cm, EF = 8cm, angle BFC =50^0 and angle EFA = 52^0.



Calculate
(a) The length
(i) BC (02marks)
(ii) AB (05marks)
(b) The area of triangle CEF. (05marks)

Solutions

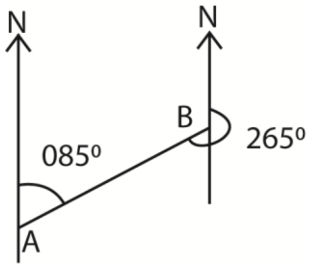
SECTION A (40 marks)

Answer all questions in this section

1. Given that a*b = a$\sqrt{b}$, find the value of (2*4)*16. (04marks)
   a*b = a$\sqrt{b}$
   2*4 = 2$\sqrt{4}$ = 2 x 2 = 4

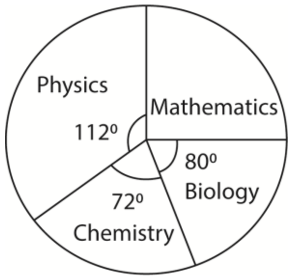
$(2*4)*16 = 4*16 = 4\sqrt{16} = 4 \times 4 = 16$

2. Two towns A and B are such that the bearing of B from A is 085^0. Find the bearing of A from B. (04marks)



Bearing of A from B = 180 + 85 = 265^0

3. The pie chart below represents the subjects taught by 45 science teachers.



Determine the number of teachers who teach Mathematics. (04marks)

Degrees for mathematics = 360 – (80 + 72 + 112)= 360 – 264 = 96^0

Number of mathematics teachers = $\frac{96}{360} x\ 45$ = 12

4. Make b the subject of the equation

$t = 20 + \sqrt{a - b^2}$ (04marks)

$t - 20 = \sqrt{a - b^2}$

$(t - 20)^2 = \left(\sqrt{a - b^2}\right)^2$

$(t - 20)^2 = a - b^2$

$b^2 = a - (t - 20)^2$

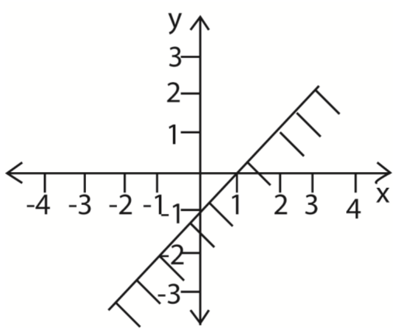
$b = \sqrt{[a - (t - 20)^2]}$

5. Given that A = $\begin{pmatrix} 2 & -2 \\ -3 & 4 \end{pmatrix}$, determine A^{-1}.

Det(A) = 2 x 4 – (-2 x -3) = 8 – 6 = 2

$A^{-1} = \frac{Adjunct\ of\ A}{\det(A)} = \frac{1}{2}\begin{pmatrix} 4 & 2 \\ 3 & 2 \end{pmatrix} = \begin{pmatrix} \frac{4}{2} & \frac{2}{2} \\ \frac{3}{2} & \frac{2}{2} \end{pmatrix} = \begin{pmatrix} 2 & 1 \\ 1.5 & 1 \end{pmatrix}$

6. Determine an inequality which is represented by the unshaded region of the graph below:

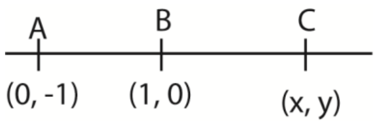


Considering points lying on the boundary line (1, 0) and (0, 1)
Finding the equation of boundary line
Method I: using difference method

X	1	0
-y	0	-1
	1	1

⇨ x –y = 1

Method II: Using gradient method



Grad of AB = grad of AC

$\frac{1}{1} = \frac{y+1}{x}$

x = y + 1

x – y = 1

Testing for the wanted region using point (0, 0)

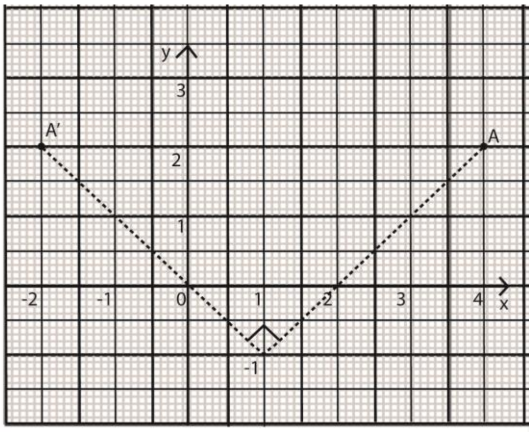
LHS = 0 – 0 = 0

RHS = 1

Here LHS< RHS

Hence the inequality is x – y < 1

7. (a) Plot the point A(4,2) on a graph. (02marks)
(b)Find the coordinates of the image of the point A after a rotation of +90^0 about (1, -1). (02marks)



The coordinates of the image of A are a' (-2, 2)

8. Solve the equation $\frac{3}{4}(2a+1) = \frac{5}{6}(a+5)$ (04marks)

$\frac{3}{4}(2a+1) = \frac{5}{6}(a+5)$

Multiplying through by 12

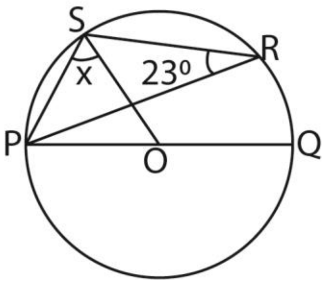
9(2a + 1) = 10(a + 5)

18a + 9 = 10a + 50

8a = 41

a = $\frac{41}{8} = 5.125$

9. In the figure below PQ is a diameter and O is the centre of the circle. Angle RS = 250.



Calculate the value of the angle marked x. (04marks)

Note: the angle subtended by an arc PS at the center O is twice the angle the same arc subtends at the circumference of the circle, i.e., at R

⇨ <SOP = 2<SRP = 23 x 2 = 46^0

<PSO + <SPO + <SRP = 18^0

x + x + 460 = 180^0

2x = 180^0 -46^0 = 134^0

x = $\frac{134}{2}$ = 67^0

10. A coin and a rectangular tetrahedron with faces numbered 1 to 4 are tossed.

(a) Construct a table showing all possible outcomes. (02marks)

Let H and T be the faces of the coin

	1	2	3	4
H	H 1	H 2	H 3	H 4
T	T 1	T 2	T 3	T 4

Or

	H	T
1	H 1	T 1
2	H 2	T 2
3	H 3	T 3
4	H 4	T 4

(b) What is the probability of getting a tail and a number greater than 1?

Let E be the event a tail and a number greater than 1 is obtained.

E = { 2T, 3T, 4T}

Probability = $\frac{n(E)}{n(S)} = \frac{3}{8} = 0.375$

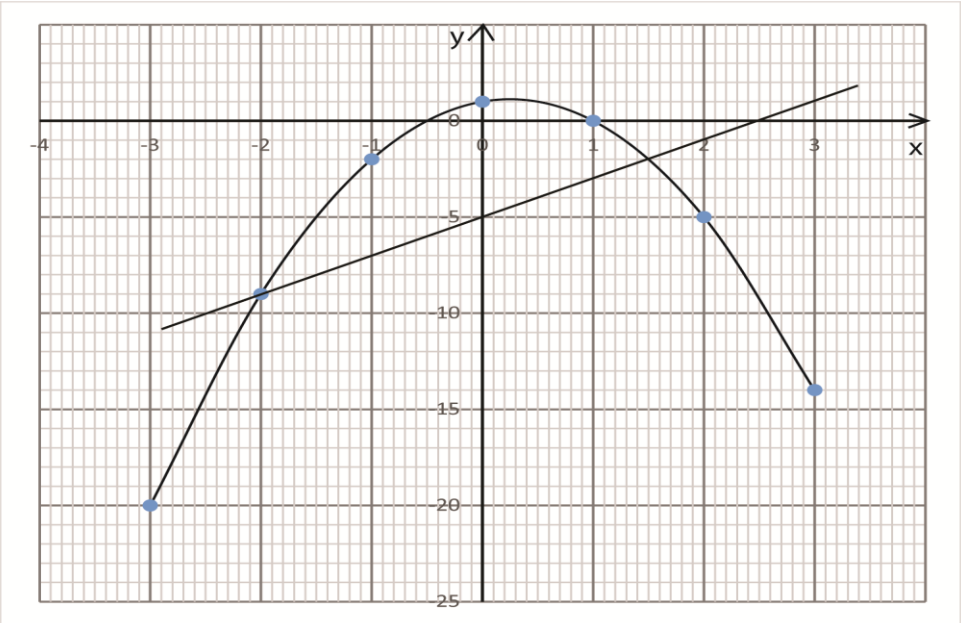
SECTION B (60MARKS)

Answer any five questions from this section. All questions carry equal marks.

11. Copy and complete the following table for curve y =-2x^2 + x + 1

x	-3	-2	-1	0	1	2	3
-2x^2	-18	-18	-2	0	-2	-8	-18
x	-3	-3	-2	0	1	2	3
1	1	1	1	1	1	1	1
y	20	-20	-2	1	0	-5	-14

(a) Using the values in your completed table, draw the graph of y =-2x^2 + x + 1. (03marks)



(b) Use the graph to solve the equation 6 –x -2x^2 = 0. (05marks)

$$\begin{array}{rl} & -2x^2 + x + 1 = y \\ - & -2x^2 - x + 6 = 0 \\ \hline & 2x - 5 = y \end{array}$$

y = 2x – 5

X	0	2
y	-5	-1

From the graph

x = -2 and x = 1.5

12. A motor cyclist travelling 8km up a hill at a speed of xkm/h. on the return journey down the hill, his speed was (x+4)km/h. The difference in time between the uphill and downhill journey was 10 minutes.

(a) Write down an expression for the time taken for the

(i) Uphill journey

Time $t_1 = \frac{8}{x}\ hrs$

(ii) Downhill journey (02marks)

Time $t_2\ \frac{8}{x+4}\ hrs$

(b) (i) Using the expression in (a), form a quadratic equation for the difference in time for the two journeys.

Difference in time of arrival = $\frac{10}{60}\ hrs$

$\Rightarrow\ \frac{8}{x} - \frac{8}{x+4} = \frac{10}{60}$

$\frac{8}{x} - \frac{8}{x+4} = \frac{1}{6}$

$\frac{8(x+4)-8x}{x(x+4)} = \frac{1}{6}$

$\frac{32}{x^2+4x} = \frac{1}{6}$

$x^2 + 4x = 32 \times 6 = 192$

$x^2 + 4x - 192 = 0$

(ii) Solve the quadratic equation, (07 marks)

Using factorization method

Product of factors = -192

Sum of factors = 4

Factors are 16 and -12

$x^2 + 4x - 192 = 0$

$(x - 12)(x + 16) = 0$

Either $x - 12 = 0$; $x = 12$

Or $x + 16 = 0$; $x = -16$

We disregard $x = -16$; hence $x = 12$

(c) What was the average speed for the uphill and downhill journeys

Time $t_1 = \frac{8}{12} = \frac{2}{3} hrs$

Time $t_2 = \frac{8}{16} = \frac{1}{2} hrs$

Total time = $\frac{2}{3} + \frac{1}{2} = \frac{4+3}{6} = \frac{7}{6}$

Total distance = 8 x 2= 16

Average speed = $16 \div \frac{7}{6} = 16\ x\ \frac{6}{7} = \frac{96}{7} = 13\frac{5}{7} kmh^{-1}$

13. (a) Matrix A = $\begin{pmatrix} x+7 & x \\ 3 & 0 \end{pmatrix}$ and B = $\begin{pmatrix} x-1 & 0 \\ 2 & 2 \end{pmatrix}$

If C = A + B, find the value for which the determinant of matrix C = 2. (05marks)

C = $\begin{pmatrix} x+7 & x \\ 3 & 0 \end{pmatrix} + \begin{pmatrix} x-1 & 0 \\ 2 & 2 \end{pmatrix} = \begin{pmatrix} 2x+6 & x \\ 5 & 2 \end{pmatrix}$

Det(C) = 2(2x+6)-5x

=2x + 12 -5x

= -x + 12

⇨ -x + 12 = 2

x = 10

(c) Solve the following simultaneous equations using the matrix method.

3x + 2y = 8

3y + 4x = 11

Rearranging the equations

3x + 2y = 8

4x + 3y = 11

Expressing the equation in matrix

Equation

$\begin{pmatrix} 3 & 2 \\ 4 & 3 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 8 \\ 11 \end{pmatrix}$

Let C = $\begin{pmatrix} 3 & 2 \\ 4 & 3 \end{pmatrix}$

Det(C) = 3 x 3 -4 x 2 = 1

$C^{-1} = \frac{Adjunct\ of\ A}{\det(C)}$

$Adjunct\ of\ A = \begin{pmatrix} 3 & -2 \\ -4 & 3 \end{pmatrix}$

$C^{-1} = \frac{1}{1}\begin{pmatrix} 3 & -2 \\ -4 & 3 \end{pmatrix} = \begin{pmatrix} 3 & -2 \\ -4 & 3 \end{pmatrix}$

Pre- multiplying both sides of the matrix equation by C-1

$\begin{pmatrix} 3 & -2 \\ -4 & 3 \end{pmatrix}\begin{pmatrix} 3 & 2 \\ 4 & 3 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 3 & -2 \\ -4 & 3 \end{pmatrix}\begin{pmatrix} 8 \\ 11 \end{pmatrix}$

$\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} (3x8) + (-2x11) \\ (-4\ x\ 8) + (3x11) \end{pmatrix} = \begin{pmatrix} 24 - 22 \\ -32 + 33 \end{pmatrix} = \begin{pmatrix} 2 \\ 1 \end{pmatrix}$

$\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 2 \\ 1 \end{pmatrix}$

$\therefore x = 2\ and\ y = 1$

14. The table below shows the ages of 50 people treated for tuberculosis (TB) at a health centre.

86	85	56	59	67	62	63	50	91	62
56	27	50	54	80	61	52	52	16	28
66	46	55	58	56	77	26	40	42	51
35	45	68	51	49	40	93	84	79	63
52	53	25	93	27	71	66	52	30	12

(a) Construct the frequency table starting with the class 10-19. (03marks)

Frequency distribution table

Classes	Tally	Frequency
10 – 19	//	2
20 – 29	~~////~~	5
30 – 39	//	2
40 – 49	~~////~~ /	6
50 – 59	~~////~~ ~~////~~ ~~////~~ /	16
60 – 69	~~////~~ ////	9
70 – 79	///	3
80 – 89	////	4
90 – 99	///	3

(b) Use the frequency table to calculate

(i) Mean age of people treated for TB. (06marks)

Classes	Class marks (x)	f	fx	cf
10 – 19	14.5	2	29.0	2
20 – 29	24.5	5	122.5	7
30 – 39	34.5	2	69.0	9
40 – 49	44.5	6	267.0	15
50 – 59	54.5	16	872.0	31
60 – 69	64.5	9	580.5	40
70 – 79	74.5	3	223.5	43
80 – 89	84.5	4	338.0	47
90 – 99	94.5	3	283.5	50
		$\sum f = 50$	$\sum fx = 2785.0$	

Mean = $\frac{\sum fx}{\sum f} = \frac{2785}{50} = 55.7$

(ii) Median age of the people treated for TB

Median = $L_1 + \left(\frac{\frac{N}{2} - cf_b}{fm}\right) = 49.5 + \left(\frac{\frac{50}{2} - 15}{16}\right) = 49.5 + \frac{100}{16} = 49.5 + 6.25 = 55.75$

∴ the median age f people treated for TB is 55.7 years

15. A school hired a bus and min-bus to transport a study tour. Each trip of a bus costs shs. 40,000 and that of the min-bus costs shs. 25,000. The bus has a capacity of 42 students and the mini-bus 14 students.
All the 126 students contributed a total of shs. 200,000 and had to go for the tour. The mini-bus had to make more trips than the bus. Of x and y represent the number of trips made by the bus and mini-bus respectively;

(a) Write down five inequalities representing the information given. (05marks)

1 trip of mini-bus carries 14 students

x trips of bus = 42x

y trips of mini-bus = 14y

⇨ 42x + 14y ≥ 126 ….. (i)

Note: Here the inequality symbol ≥ because all students must be transported

1 trip of bus costs 40,000/=

x trip of bus = 40,000x

1 rip of mini-bus = 25,000/=

y trip of mini-bus = 25,000y

money raised = 200,000/=

⇨ 40,000x + 25,000y≤ 200,000 …… (ii)

Number of trips, y made by minibus is greater than number of trips x made by the bus

⇨ y > x …………. (iii)

But the bus and min-bus must be at least make some trips

⇨ x ≥ 0 …………… (iv)

y ≥ 0 …………… (v)

Hence the five inequalities are

42x + 14y ≥ 126

$40{,}000x + 25{,}000y \leq 200{,}000$

$x \geq 0$

$y \geq 0$

(b) (i) plot the inequalities on the same axes.

For $42x + 14y \geq 126$

The boundary line $42x + 14y = 126$

Dividing through by 14

$3x + y = 9$

x	0	3
y	9	0

Testing for wanted region using point (0, 0)

LHS = 0 + 0 = 0

RHS = 126

LHS < RHS

Hence the point (0, 0)is the unwanted region

For $40{,}000x + 25{,}000y \leq 200{,}000$

The boundary line $40{,}000x + 25{,}000y = 200{,}000$

Dividing through by 5000

$8x + 5y = 40$

x	0	5
y	8	0

Testing for wanted region using point (0, 0)

LHS = 0 + 0 = 0

RHS = 200,000

LHS < RHS

Hence the point (0, 0) is the wanted region

For $y > x$

The boundary line is $y = x$

x	0	4
y	0	4

Testing for wanted region using point (1, 3)

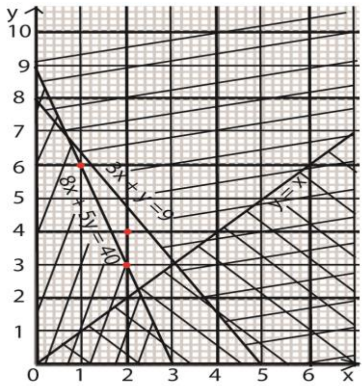
LHS = 3

RHS = 1

LHS < RHS

Hence the point (1, 3) is the wanted region

(ii) by shading the unwanted regions, show the region satisfying all the inequalities. (04marks)



(c) Use the graph to find the number of trips each vehicle make so as to spend the least amount of money. (03marks)

The possible (lattice) point is feasible (wanted) region are (2, 3), (2, 4), and (1, 6)

The cost function for minimization is

40,000x + 25,000y

Trips (x, y)	Total cost
(2, 3)	2 x 40,000 + 3 x 25,000 = 155,000/=
(2, 4)	2 x 40,000 + 4 x 25,000 =180,000/=
(1, 6)	1 x 40,000 + 6 x 25,000 = 190,000/=

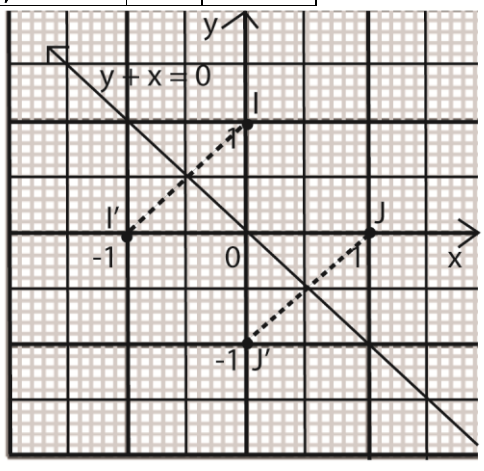
Hence for the cost to be minimum, 2 trips of bus and 3 trips of the mini-bus should be made.

16. Triangle ABC with vertices A(1,2), B(2,) and C(4,2) is mapped onto triangle A'B'C' by reflection in the line x + y = 0. Triangle A'B'C' is then mapped onto triangle A''B''C'' by a transformation whose matrix is $\begin{pmatrix} 2 & 5 \\ -4 & -5 \end{pmatrix}$.

(a) Use I(1,0) and J(0,1) to find the matrix of reflection in the line y + x = 0.(03 marks)

We plot I(1, 0) and J(0, 1) and reflect in the line y + x = 0 or y = -x.

x	0	2
y	0	-2



The images of I(1,0) and J(0, 1) are I'(0, -1) and J'(-1, 0) respectively

Let the M = matrix of reflection in the line y + x = 0

$$\Rightarrow \quad M\begin{array}{c} \begin{matrix} I & J \end{matrix} \\ \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \end{array} = \begin{array}{c} \begin{matrix} I' & J' \end{matrix} \\ \begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix} \end{array}$$

Since $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ *is an identity matrix, I*

⇨ M = $\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$

(b) Find the coordinates of

(i) A', B' and C'

$$\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}\begin{array}{c} \begin{array}{ccc} A & B & C \end{array} \\ \begin{pmatrix} 1 & 2 & 4 \\ 2 & 6 & 2 \end{pmatrix} \end{array} = \begin{array}{c} \begin{array}{ccc} A' & B' & C' \end{array} \\ \begin{pmatrix} 0-2 & 0-6 & 0-2 \\ -1+0 & -2+0 & -4+0 \end{pmatrix} \end{array} = \begin{array}{c} \begin{array}{ccc} A' & B' & C' \end{array} \\ \begin{pmatrix} -2 & -6 & -2 \\ -1 & -2 & -4 \end{pmatrix} \end{array}$$

Hence A'(-2, -1), B'(-6, -2) and C'(-2, -4)

(ii) A'', B'' and C'' (0marks)

$$\begin{pmatrix} 2 & 5 \\ -4 & -5 \end{pmatrix}\begin{array}{c} \begin{array}{ccc} A' & B' & C' \end{array} \\ \begin{pmatrix} -2 & -6 & -2 \\ -1 & -2 & -4 \end{pmatrix} \end{array} = \begin{pmatrix} -4+-5 & -12 + -10 & -4+-20 \\ 8+5 & 24+10 & 8+20 \end{pmatrix}$$

$$= \begin{array}{c} \begin{array}{ccc} A'' & B'' & C'' \end{array} \\ \begin{pmatrix} -9 & -22 & -24 \\ 13 & 34 & 28 \end{pmatrix} \end{array}$$

Hence A''(-9, 13), B''(-22, 34) and C''(-24, 28)

(iii) Determine a matrix for single transformation which maps A'', B'' and C'' back onto ABC. (03marks)

The matrix that map, ABC onto A''B''C'' = NM

Hence the matrix that maps A''B''C'' onto ABC = $(NM)^{-1}$

Now NM = $\begin{pmatrix} 2 & 5 \\ -4 & -5 \end{pmatrix}\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix} = \begin{pmatrix} 0+-5 & -2+0 \\ 0+5 & 4+0 \end{pmatrix} = \begin{pmatrix} -5 & -2 \\ 5 & 4 \end{pmatrix}$

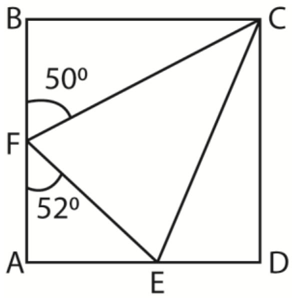
$(NM)^{-1} = \frac{Adjunct\ of\ NM}{\det(NM)}$

Det(NM) = -5 x 4 – (-2 x 5) = -20 + 10 = -10

Adjunct of NM = $\begin{pmatrix} 4 & 2 \\ -5 & -5 \end{pmatrix}$

(NM)-1 = $\frac{1}{-10}\begin{pmatrix} 4 & 2 \\ -5 & -5 \end{pmatrix} = \begin{pmatrix} \frac{4}{-10} & \frac{2}{-10} \\ \frac{-5}{-10} & \frac{-5}{-10} \end{pmatrix} = \begin{pmatrix} \frac{-2}{5} & \frac{-1}{5} \\ \frac{1}{2} & \frac{1}{2} \end{pmatrix}$

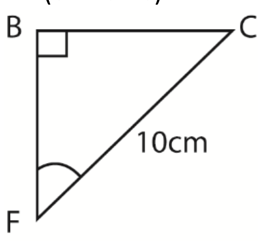
17. In the diagram ABCD is a rectangle with CF = 10cm, EF = 8cm, angle BFC =50^0 and angle EFA = 52^0.



Calculate

(a) The length

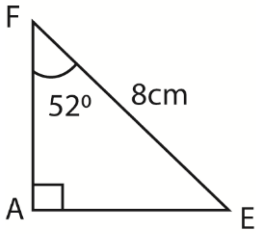
(i) BC (02marks)



$\overline{BC}$ = 10sin50^0 = 7.66cm

(ii) AB (05marks)

$\overline{AB}$ = $\overline{AF}$ + $\overline{FB}$



AF = 8cos52^0 =4.93cm

$\overline{FB}$ = 10cos50^0 = 6.43cm

$\overline{AB}$ = 4.93 + 6.43 = 11.36cm

(b) The area of triangle CEF. (05marks)

Method I: considering surrounding

Area of CFE = Area of ABCD – area of (AFE + FBC + EDC)

Area of ABCD = L x W = 11.36 x 7.766 = 87.02cm^2

Area of AFE = $\frac{1}{2}\ x\ \overline{AE}\ x\ \overline{AF}$

$\overline{AE}$ = 8sin52^0 = 6.3cm

$Area\ of\ AFE\ =\ \frac{1}{2}x\ 6.3\ x\ 4.93\ =\ 15.53cm^2$

Area of FBC = $\frac{1}{2}\ x\ \overline{BC}\ x\ \overline{FB}\ =\frac{1}{2}\ x\ 7.66\ x\ 6.43\ =\ 24.63cm^2$

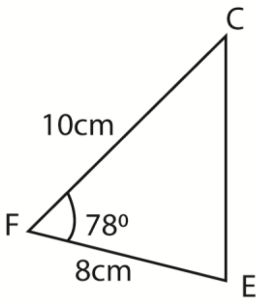
Area of EDC = $\frac{1}{2}\ x\ \overline{ED}\ x\ \overline{DC}$

$\overline{ED}$= $\overline{BC}$ – $\overline{AC}$ = 7.66 – 6.3 = 1.36cm

Area of EDC = $\frac{1}{2}\ x\ 1.36\ x\ 11.36\ =\ 7.72cm^2$

Area of EFC = 87.02 – (15.53 + 24.63+ 7.72) = 87.02 – 47.88 = 39.14cm^2

Method II: using sine rule



Area of AFE = $\frac{1}{2}\ x\ \overline{EF}\ x\ \overline{FC}\ \mathrm{x}\ \sin\theta$

Where θ = 180^0 – (50^0 + 52^0) = 78^0

⇨ Area of AFE = $\frac{1}{2}\ x\ 8\ x\ 10\ \mathrm{x}\ \sin 78^0$ =39.124cm^2

Thank you

Dr. Bbosa Science