M/S FORM 3 PP1 TERM 3 2022.

SECTION I (50 Marks)
Answer ALL the question in the spaces provided.

1. Without using a calculator evaluate. (3mks)

$$\frac{(-16)-36}{18\div(-6)-10}-\frac{4(-17+5)}{8}$$

$\frac{-16-36}{-3-10} = \frac{-52}{-13}$ ✓

$\frac{4(-12)}{8_2} = \frac{-12}{2}$ ✓

$\frac{-52}{-13} - \frac{-12}{2}$

$= 4 + 6$ ✓

$= 10$ ✓

M_1 ✓ attempt to simplify both sides

M_1 ✓ both sides simplified

A_1

2. A farmer has a piece of land measuring 440m by 340m. He divides it into square plots of equal size. Find the maximum area of one plot. (3mks)

	440	340
5	88	68
2	44	34
2	22	17

GCD $= 5 \times 2 \times 2 = 20$ B_1

Max Area

$= 20.5 \times 20.5$ M_1

$= 420.25\ m^2$ A_1.

3. If $2.\dot{5} \times 0.\dot{4}\dot{5} = \frac{a}{b}$ where a and b are in their simplest forms. Find the values of a and b. (3mks)

$r = 2.555\ldots$

$10r = 25.555$

$9r = 23$

$r = \frac{23}{9}$ ✓

$r = 0.4545\ldots$

$100r = 45.4545$

$99r = 45$

$r = 45/99 = 5/11$

$\frac{23}{9} \times \frac{5}{11}$ M_1

$= \frac{115}{99}$

$a = 115$

$b = 99$ } A_1.

M_1 ✓ attempt to write fractions

4. Each interior angle of a regular polygon is 120^0 larger than the exterior angle. How many sides has the polygon? (3mks)

$e + (e + 120) = 180$ M_1

$2e = 60$

$e = 30.$

$n = \frac{360}{30}$ M_1

$n = 12.$ $A_1.$

5. Use squares, square roots and reciprocal tables to evaluate (3mks)

$$3.045^2 + \frac{1}{\sqrt{49.24}}$$

$3.045^2 = 9.272$

$\sqrt{49.24} = 7.017$

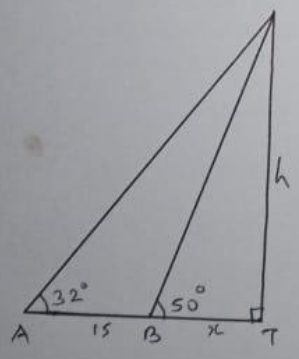
$9.272 + \frac{1}{7.017}$ M_1

$\frac{1}{7.017} = 0.1425$

$= 9.272 + 0.1425$ M_1

$= 9.4175$ $A_1.$

6. A and B are on the same side of the tower. The angles of elevation of the top of the towers from A and B are 32^0 and 50^0 respectively. If AB = 15cm. calculate the height of the tower to 2 decimal places. (4mks)



$\text{Tan } 32 = \frac{h}{x+15}$ ——— i

$\text{Tan } 50 = \frac{h}{x}$ ——— ii M_1

$\text{Tan } 32 = \frac{x \text{ Tan } 50}{x+15}$ M_1

$(0.6249)(x+15) = 1.1918x$

$9.3735 = 0.5669x$

$x = 16.5347$

$h = (16.5347)\text{Tan } 50$ M_1

$= 19.705$ ✗

$= 19.71$ A_1 CAO.

7. Simplify completely $\frac{8x^2-8}{4x^2-10x+6}$ (3mks)

N. $8(x^2-1)$

$8(x+1)(x-1)$ → M_1

D. $4x^2-4x-6x+6$

$4x(x-1)-6(x-1)$

$(4x-6)(x-1) = 2(2x-3)(x-1)$ M_1

$\frac{8(x+1)(x-1)}{2(2x-3)(x-1)}$

$= \frac{4(x+1)}{2x-3}$ A_1.

8. The volumes of two similar solids are $800cm^3$ and $2700cm^3$. If the surface area of the larger solid is $2160cm^2$, find the surface area of the smaller one. (3mks)

$VSf = \frac{2700}{800} = \frac{27}{8}$

$L.S.f = \sqrt[3]{27/8} = 3/2$

$A.S.f = 9/4.$ B_1

$a = 4/9 \times 2160$ m_1

$= 960\ cm^2$ A_1.

9. A Kenyan bank buys and sells currencies at the exchange rates below

Currency	Buying (ksh)	Selling (ksh)
1 euro	147.87	148.00
1 us dollar	74.22	74.50

An American tourist arrived in Kenya with 24,000 Euros. He converted all the euros to Kenya shillings at the bank. He spent a total sh. 200,000 while in Kenya and converted the rest into US dollars at the bank. Find the amount in dollars that he received. (3mks)

24000×147.87 M_1

$= 3,548,880$

$3,548,880 - 200,000$

$= 3,348,880$

$\frac{3,348,880}{74.5}$ M_1

$= \$44,951.4094$ A_1.

$= \$44.951$

10. Given that $\mathbf{a} = \begin{pmatrix}3\\1\end{pmatrix}$ $\mathbf{b} = \begin{pmatrix}-2\\7\end{pmatrix}$, evaluate (3mks)

$|\frac{1}{2}\mathbf{a} + 2\mathbf{b}|$

$\frac{1}{2}\begin{pmatrix}3\\1\end{pmatrix} + 2\begin{pmatrix}-2\\7\end{pmatrix}$

$= \begin{pmatrix}3/2\\1/2\end{pmatrix} + \begin{pmatrix}-4\\14\end{pmatrix}$

$= \begin{pmatrix}-5/2\\29/2\end{pmatrix}$ B_1

$\left|\begin{pmatrix}-5/2\\29/2\end{pmatrix}\right| = \sqrt{\left(\frac{55}{2}\right)^2 + \left(\frac{29}{2}\right)^2}$ M_1

$= \sqrt{\frac{25}{4} + \frac{841}{4}}$

$= \sqrt{433/2}$.

$= 14.7139$ A_1.

$= 14.71$

11. Solve for x in $125^x + 5^{3x} - 3 = 47$. (3mks)

$5^{3x} + 5^{3x} = 50$. M_1

$2(5^{3x}) = 50$

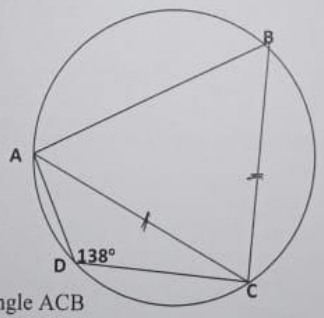
$5^{3x} = 25$

$5^{3x} = 5^2$ M_1

$3x = 2$

$x = 2/3$. A_1.

12. In the circle drawn to scale below A,B,C and D are points on its circumference, Chord BC=AC and angle ADC=138°



Giving reasons calculate the angle ACB (3mks)

$\angle ABC$; Opposite angles of a cyclic quadrilateral are supplementary. B_1

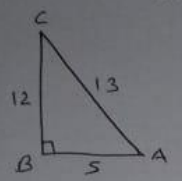
$180 - 138 = 42°$. B_1

$\angle ACB$: Base angles of isosceles triangles are equal.

$180 - 2(42) = 96°$ B_1.

13 Given that Cos A $= \frac{5}{13}$ and angle A is acute, find the value of (3mks)

2 Tan A + 3 Sin A



B_1

$2\left(\frac{12}{5}\right) + 3\left(\frac{12}{13}\right)$ M_1

$\frac{24}{5} + \frac{36}{13} = \frac{492}{65}$.

$= 7\frac{37}{65}$ A_1.

14. Awuor uses a third of her farm for coffee, a quarter for tea and two fifth of the reminder for mixed farming. She still has 6 hectares of unused land. Find the size of the farm. (3mks)

Coffee + Tea $= 1/3 + 1/4 = 7/12$. M_1

Mixed farming $= 2/5 \times 5/12 = 1/6$.

Used land $= 7/12 + 1/6 = 9/12$.

6ha $\simeq 3/12$.

? $= 1$

$\frac{1 \times 6 \times 12}{3}$ —— M_1

$= 24$ ha. —— A_1.

15. A triangle has sides measuring 7cm, 8cm and 9cm.calculate the area of the triangle (3mks)

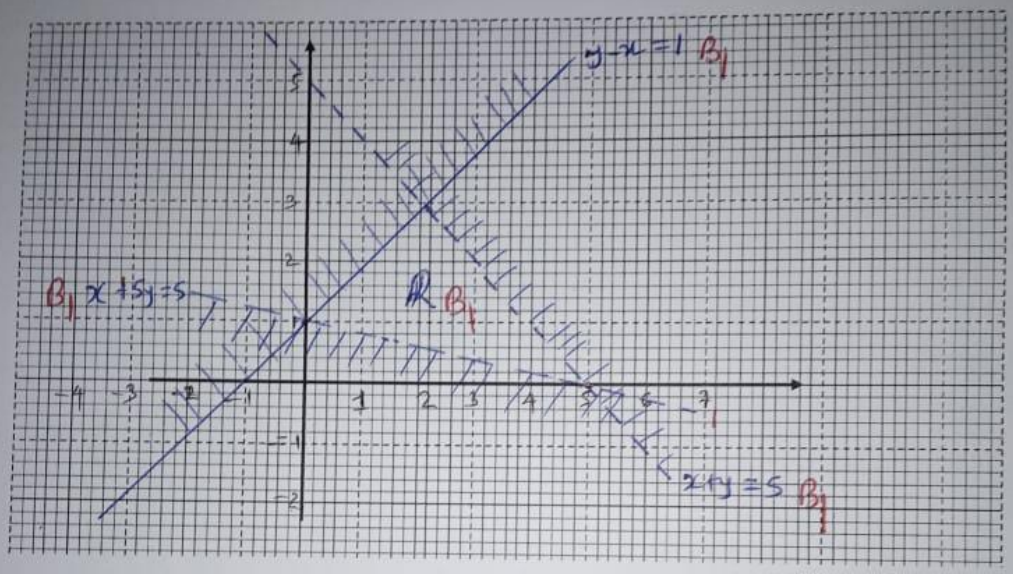
$s = \frac{7+8+9}{2} = 12$ B_1

$A = \sqrt{12(12-7)(12-8)(12-9)}$ M_1

$= \sqrt{720}$

$= 26.833$. A_1.

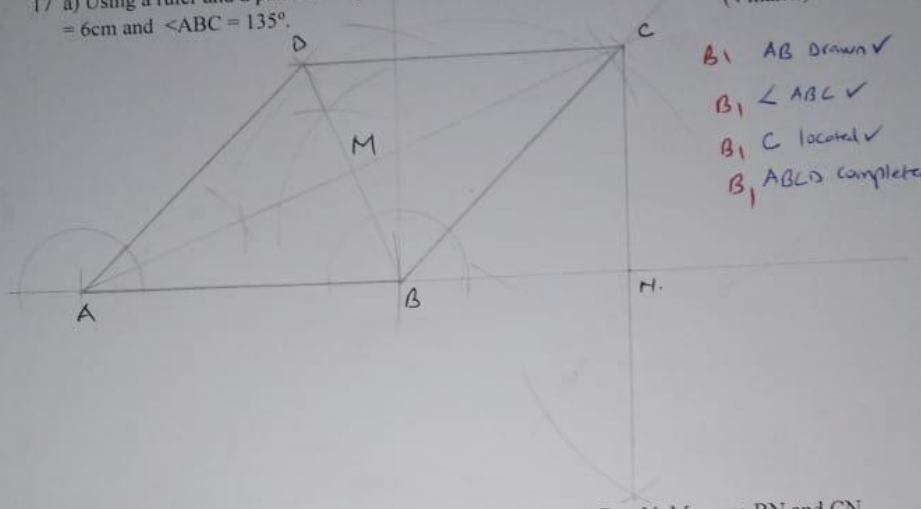
16. Using the grid provided below, draw and shade the unwanted regions to show the region satisfied by R given the following inequalities; $y+x<5, y-x\leq 1$ and $x+5y>5$ (4 marks)



SECTION. II: (50 marks)

Answer ONLY FIVE questions from this section

17 a) Using a ruler and a pair of compasses only construct a rhombus A B C D such that AB = 6cm and <ABC = 135°. (4 marks)



B1 AB Drawn ✓
B1 ∠ ABC ✓
B1 C located ✓
B1 ABCD completed

(b) Drop a perpendicular from C to AB extended to meet AB at N. Measure BN and CN. (2 marks)

CN = 4.4 Accept 4.3 – 4.5 N located ✓ B1
BN = 4.4 Accept 4.3-4.5 CN or BN ✓ B1

(c) Bisect <ABC and <DAB, let the two bisectors meet at M. Measure MA. (2 marks)

MA = 5.8 Accept 5.7 - 5.9 Any One Bisector ✓ B1
MA ✓ B1

(d) Determine the area of triangle ABM. (2 marks)

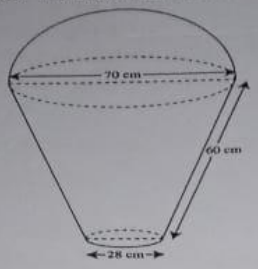
MB = 2.3 Accept 2.2 - 2.4.

A = $\frac{1}{2}$ × 5.8 × 2.3. M1

= 6.67 cm^2 A1.

NB: Award Alternative methods.

18 The figure below represents a model of a solid structure in the shape of a frustum of a cone with a hemispherical top. The diameter of the hemispherical part and the top of the frustum is 70cm. The frustum has a base diameter of 28cm and slant height of 60cm.



Calculate:

(a) The area of the hemispherical surface. (2mks)

$A = \frac{1}{2} \times 4 \times \frac{22}{7} \times 35 \times 35$ M_1

$= 7,700\ cm^2$. A_1.

(b) The slant height of the cone from which the frustrum was cut. (2mks)

$\frac{60+h}{h} = \frac{70}{28} = \frac{5}{2}$. M_1

$5h = 120 + 2h$; $h = 40$

$L = 40 + 60$

$= 100cm$. A_1.

(c) The curved surface area of the frustrum. (2mks)

$SA = \pi R(R+L)$

$= \frac{22}{7} \times 60(35+14)$ M_1

$= 9240\ cm^2$ A_1.

OR $\pi RL - \pi rl = \pi(RL - rl)$

$= \frac{22}{7}(35 \times 100 - 14 \times 40)$ M_1

$= 9240\ cm^2$ A_1

(d) The area of the base. (2mks)

$A = \frac{22}{7} \times 14 \times 14$. M_1

$= 616\ cm^2$ A_1.

(e) The total surface area of the model. (2mks)

$A = 7,700 + 9240 + 616$ M_1

$= 17,556\ cm^2$ A_1.

19. Three business partners, Bella, Joan and Trinity contributed Kshs. 112, 000, Kshs. 128, 000 and Kshs. 210, 000 respectively to start a business. They agreed to share their profits as follows:

30% to be shared equally
30% to be shared in the ratio of their contributions
40% to be retained for the running of the business.

If at the end of the year, the business realized a profit of Kshs. 1. 35million
Calculate:

(a) The amount of money retained for running the business at the end of the year (2marks)

$\frac{40}{100} \times 1,350,000$ M1

$= 540,000$ A1.

(b) The difference between the amounts received by Trinity and Bella. (5 marks)

Ratio B : J : T

$= 112 : 128 : 210$ B1

$= 56 : 64 : 105$

Bella $\frac{1}{3} \times \frac{30}{100} \times 1,350,000 + \frac{56}{225} \times \frac{30}{100} \times 1,350,000$ M1 $= 235,800/-$

Trinity $= \frac{1}{3} \times \frac{30}{100} \times 1,350,000 + \frac{105}{225} \times \frac{30}{100} \times 1,350,000$ M1 $= 324,000/-$

$324,000 - 235,800$ M1

$= 88,200$ A1.

(c) Express Joan's share as percentage of the total amount of money shared between the three partners. (3 marks)

Joan $= \frac{1}{3} \times \frac{30}{100} \times 1350000 + \frac{64}{225} \times \frac{30}{100} \times 1,350,000$ M1

$= 250,000$

$250,000 + 324,000 + 235,800 = 809800$

$\frac{250,000}{809,800} \times 100$ M1

$= 30.87\%$ A1.

20. A straight line L_1 passes through the points P (5, 2) and Q (3, 4).

(a) Find the equation of L_1 in the form **ax +by+ c = 0**where *a*, *b* and *c* are integers. (3mks)

L_1

$m_1 = \frac{4-2}{3-5} = \frac{2}{-2} = -1$. B1

$\frac{y-2}{x-5} = -1$ ——— M1

$y-2 = -x+5$

$x+y = 7$. ——— A1 CAO.

(b) A line L_2 passes through a point R (0, 3) and is perpendicular to L_1.

(i) Find the equation of L_2 in the form **y= m x+ c** where ***m*** and ***c***are constants. (2mks)

$L_2 : m_2 = 1$.

$\frac{y-3}{x-0} = 1$ ——— M1

$y-3 = x$

$y = x+3$. ——— A1. CAO

(ii) Determine the point of intersection between L_1 and L_2. (3 marks)

$y = x+3$ — i
$x+y = 7$ — ii } M1

$x + x + 3 = 7$

$2x = 4$.

$x = 2$

$y = 2+3 = 5$ } A1 P(2, 5) B1

(c) Another line L_3 is parallel to L_1 and passes through R. Find the x – intercept of L_3. (2 marks)

L_3.

$m_3 = -1$

$\frac{y-3}{x-0} = -1$ M1

$y-3 = -x$

$y = -x+3$.

$0 = -x+3$

$x = 3$ ∴ $y = 0$

$(3, 0)$. A1.

21. On the graph paper provided, plot the triangle (1mark)

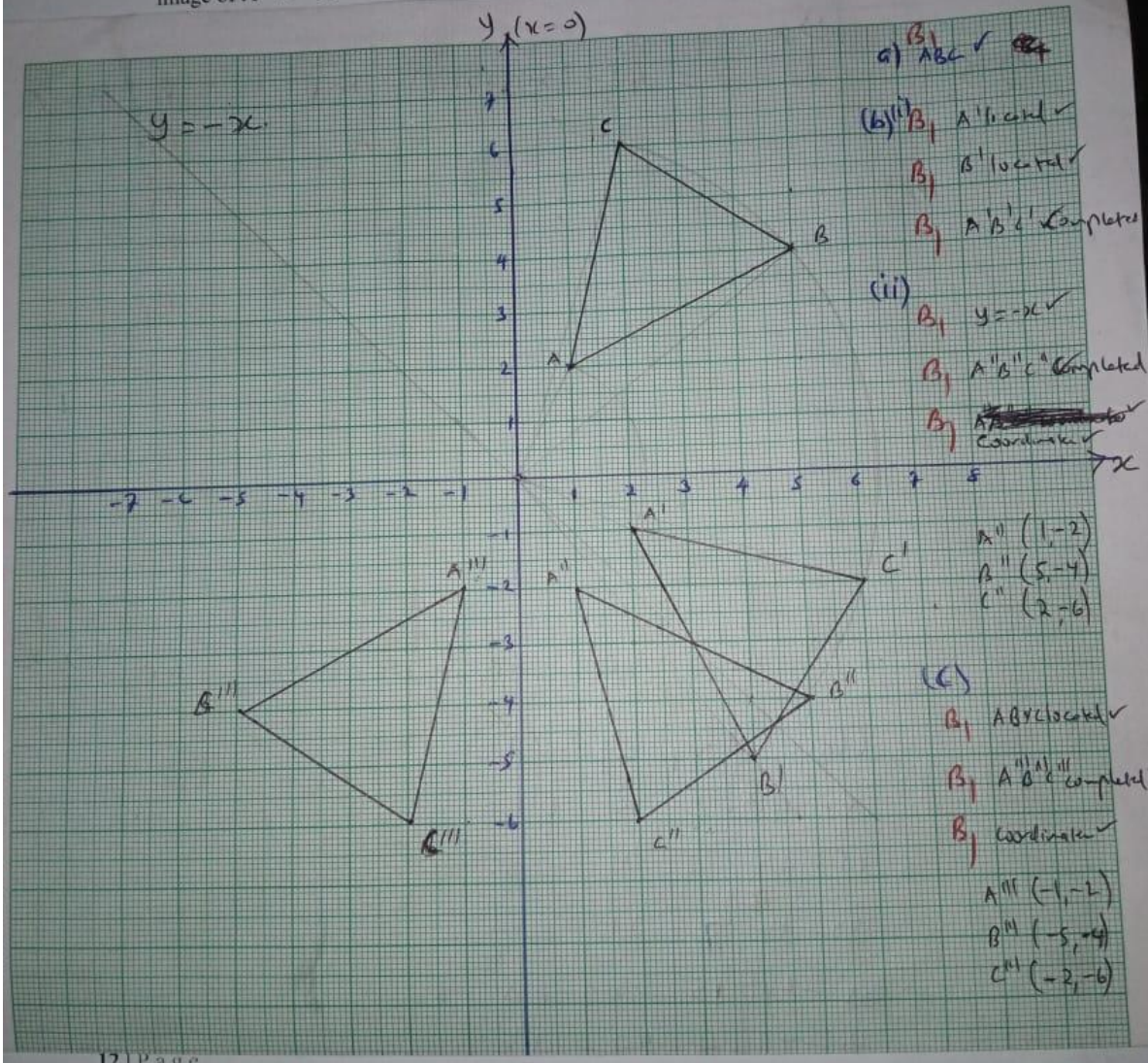
a) Whose co-ordinates are A (1, 2) B (5, 4) and C (2, 6)

b) On the same axes

i) Draw the image $A^1B^1C^1$ of ABC under a rotation of 90° clockwise about origin. (3mks)

ii) Draw the image $A^{11}B^{11}C^{11}$ of $A^1B^1C^1$ under a reflection in the line y = -x. State the coordinates of $A^{11}B^{11}C^{11}$. (3mks)

c) $A^{111}B^{111}C^{111}$ is the image of $A^{11}B^{11}C^{11}$ under the reflection in the line x = 0. Draw the image of $A^{111}B^{111}C^{111}$ and state its coordinates. (3mks)



a) B1 ABC ✓

(b)(i) B1 A'located ✓

B1 B' located ✓

B1 A'B'C' Completed

(ii) B1 y = -x ✓

B1 A''B''C'' Completed

B1 Coordinates ✓

A'' (1, -2)

B'' (5, -4)

C'' (2, -6)

(c) B1 ABC clocked ✓

B1 A'''B'''C''' completed ✓

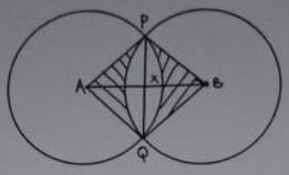
B1 Coordinates ✓

A''' (-1, -2)

B''' (-5, -4)

C''' (-2, -6)

22. **(a)** In the figure below A and B are the centers of the circles intersecting at point P and Q. Angle PBQ = 97.2^0, angle PAQ = 52^0, PB = 4cm and AP = 10cm.



Determine:-

(a) The length AB. (3 marks)

AB = AX + XB.

AX = 10 cos 26 = 8.9879 M1 ✓ attempt for AX or XB.

XB = 4 cos 48.6 = 2.6452 + M1 ✓ addition

AB 11.633 A1.

(b) The area of minor sector APQ. (2 marks)

$\frac{52}{360} \times \frac{22}{7} \times 10 \times 10$ M1 Expression ✓

= 45.357 cm^2 A1.

(c) The area of the quadrilateral, APBQ. (3 marks)

$\frac{1}{2} \times 10 \times 10 \sin 52 = 39.4$ M1 Any Δ ✓

$\frac{1}{2} \times 4 \times 4 \sin 97.2 = 7.937$ + M1 Addition of ✓ Values

47.337 A1.

(d) Area of the shaded region. (2 marks)

$Seg_1 = \left(\frac{97.2}{360} \times \frac{22}{7} \times 4 \times 4\right) - 7.937 = 5.6401$

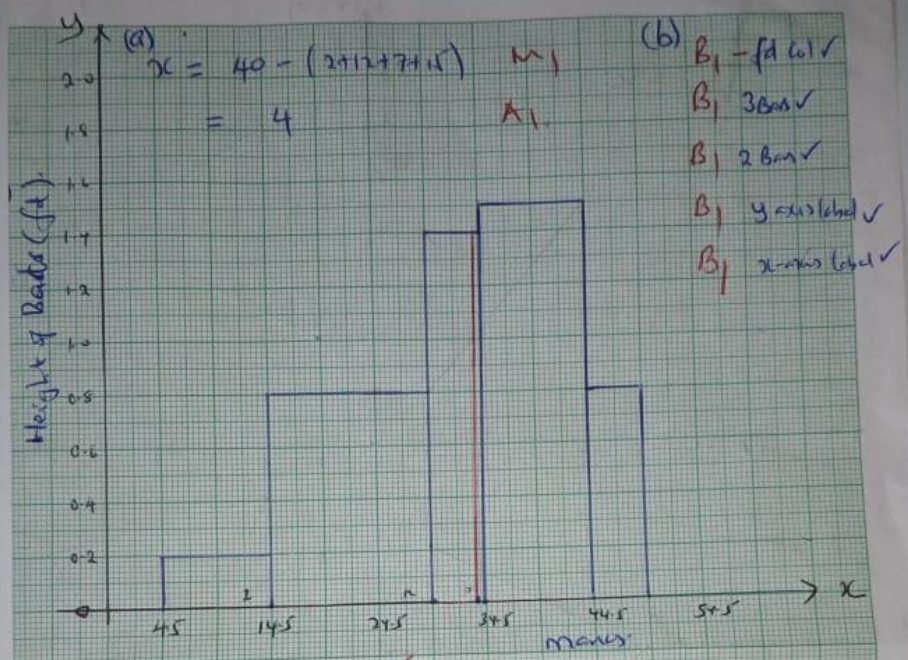
Seg 2 = 45.357 − 39.4 = 5.9965

Seg 1 & 2 = 5.9965 + 5.6401 = 11.636

Shaded A = 47.337 − 11.636 ——— M1

= 35.70 cm^2 ——— A1.

23 The table shows the marks obtained by 40 candidates in an examination



(a) $x = 40 - (2+12+7+15)$ M1

$= 4$ A1

(b) B1 – fd col ✓
B1 3 Bars ✓
B1 2 Bars ✓
B1 y axis labelled ✓
B1 x-axis labelled ✓

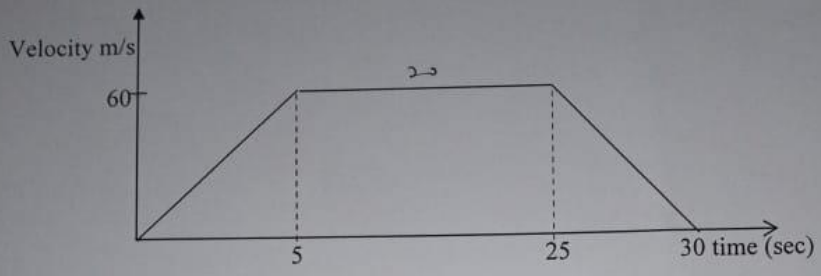
Class	freq	cf	fd (f)
5 – 14 B	2	2	0.2
15 – 24	12	14	0.8
25 – 34 B1	7	21	1.4
35 – 44 B	15	36	1.5
45 – 49 B1	4	40	0.8

$1.4 \times x = 6$. $x = 6/1.4 = 4.285 \simeq 4.3$ M1

Median $24.5 + 4.3 = 33.8$ A1.

B1 line ✓

24. The figure shows a velocity- time graph of a car



i) Find the total distance covered by the car in metres (3mks)

$\frac{1}{2} \times 60\ (30+20)$ M1 M1

$= 30 \times 50$

$= 1,500$ A1.

ii) Calculate the deceleration of the car (3mks)

$a = \frac{0-60}{30-25} = \frac{-60}{5} = -12.$ M1 A1.

deceleration = 12m/s. B1

b) A lorry left Kisumu at 8.00am towards Nakuru at an average speed of 72km/h. At 8.30am a matatu left Kisumu and followed the lorry at an average speed of 96km/h. Determine the time of the day when the matatu caught up with the lorry. (4mks)

Distance covered by lorry at 8.30a.m.

$72 \times \frac{1}{2} = 36$ km. B1.

R. distance = 36 km.

R. speed = 96 − 72 = 24 km/h.

Time taken = $\frac{36}{24}$ M1 = 1½ hrs.

8.30 a.m + ½ —— M1

1.30 p.m

10.00 am —— A1.