

MATHEMATICS PAPER 1
FORM THREE
END OF TERM 2

MARKING SCHEME.

1. Evaluate:

(3mks)

$$\begin{aligned}
 & \frac{1}{2} \left(\frac{3}{5} + \frac{1}{4} \left(\frac{7}{3} - \frac{3}{7} \right) \text{ of } 1\frac{1}{2} \div 5 \right) \\
 &= \frac{1}{2} \left(\frac{3}{5} + \frac{1}{4} \left(\frac{40}{21} \right) \text{ of } 1\frac{1}{2} \div 5 \right) \\
 &= \frac{1}{2} \left(\frac{3}{5} + \frac{1}{4} \left(\frac{40}{21} \times \frac{3}{7} \right) \div 5 \right) \\
 &= \frac{1}{2} \left(\frac{3}{5} + \frac{1}{4} \left(\frac{20}{7} \right) \div 5 \right) \\
 &= \frac{1}{2} \left(\frac{3}{5} + \left(\frac{1}{4} \times \frac{20}{7} \times \frac{1}{5} \right) \right) \\
 &= \frac{1}{2} \left(\frac{3}{5} + \frac{1}{7} \right) \\
 &= \frac{1}{2} \times \frac{26}{35} \\
 &= \frac{13}{35}
 \end{aligned}$$

2. A triangle has vertices A(2,5), B(1,-2) and C(-5,1). Determine;

a) The equation of line BC.

(2mks)

B (1, -2) C(-5, 1)

Gradient = $\frac{1 - (-2)}{-5 - 1}$

= $\frac{-3}{-6} = \frac{-1}{2}$

B (1,-2) (x-y)

= $\frac{y+2}{x-1} = \frac{-1}{2}$

y + 2 = -1/2 x + 1/2

y = -1/2 x + -3/2

b) The equation of perpendicular line from A to BC.

(2mks)

A (2,5) G = 2

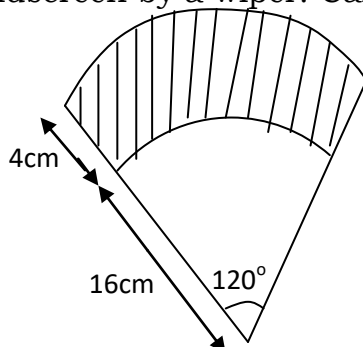
= $\frac{y-5}{x-2} = 2$

y - 5 = 2x - 4

y = 2x + 1

3. The shaded region in the figure below shows an area swept out on a flat windscreen by a wiper. Calculate the area of the region. Take $\pi = 3.142$.

(3mks)



$3.142 \times \frac{120}{360} \times 20^2 - 3.142 \times \frac{120}{360} \times 16^2$

418.93 - 268.12

= 150.81cm²

4. A piece of metal has a volume of 20cm^3 and a mass of 300g . Calculate the density of the metal in kg/m^3 . (3mks)

$$D = \frac{\text{mass}}{\text{volume}}$$

$$= \frac{20}{300} \times 1000$$

$$= 66.67\text{kg/m}^3$$

5. List the integral values of x which satisfy the inequalities below. (3mks)
- $$2x + 21 > 15 - 2x \geq x + 6$$

$$2x + 21 > 15 - 2x$$

$$4x > -6$$

$$x > -1.5$$

$$15 - 2x \geq x + 6$$

$$9 \geq 3x$$

$$3 \geq x$$

$$-1.5 < x \leq 3$$

Integral values -1, 0, 1, 2, 3

6. Janet is a saleslady earning a basic salary of Kshs. 20,000 per month and a commission of 8% for the sales in excess of Kshs. 100,000. If in January 2010 she earned a total of Kshs. 48,000 in salaries and commissions. Determine the amount of sales. She made in that month. (3mks)

$$48,000 - 20,000 = 28,000/=$$

$$28000 = \frac{8}{100} \times x$$

$$x = 350,000 + 100,000$$

$$= 450,000/=$$

7. The interior angle of a regular polygon is 108° larger than the exterior angle. Find the number of sides of the polygon. (3mks)

$$x + (x + 108) = 180$$

$$2x + 108 = 180$$

$$x = 36$$

$$\text{Interior} = 36 + 108$$

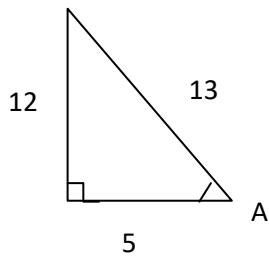
$$= 144$$

$$\text{Exterior} = 36^\circ$$

$$\text{No. of sides} = \frac{360}{36}$$

$$= 10 \text{ sides.}$$

8. Given that $\cos A = \frac{5}{13}$ and angle A is acute. Find the value of $2 \tan A + 3 \sin A$ without calculators. (3mks)



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

$$\frac{24}{5} + \frac{36}{13}$$

$$= \frac{492}{65}$$

9. Without using a calculator evaluate:

(2mks)

$$\frac{-9 + (-7) \times (-8) - (-5)}{-2 + (-6) \div 3 \times 6}$$

$$-9 + 56 + 5$$

$$= \frac{52}{-14} = \frac{-26}{7} =$$

$$= -3\frac{5}{7}$$

$$-2 + (-2) \times 6$$

$$-14$$

10. Solve for x in the equation below.

(3mks)

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

$$\left(\frac{6x - 4}{3}\right) - \left(\frac{2x - 1}{2}\right) = \frac{6 - 5x}{6}$$

$$2(6x - 4) - 3(2x - 1) = 6 - 5x$$

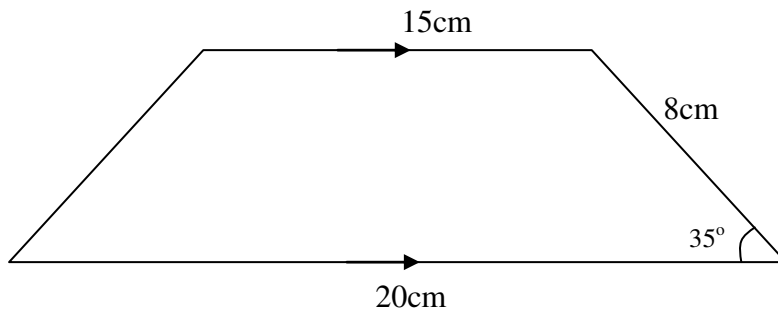
$$12x - 8 - 6x + 3 = 6 - 5x$$

$$11x = 11$$

$$x = 1$$

11. Calculate the area of the trapezium show below.

(3mks)



$$A = \frac{1}{2} \times (15 + 20) \times 8 \sin 35$$

$$= 80.3 \text{ cm}^2$$

12. Solve the simultaneous equation.

(4mks)

$$x^2 + y^2 = 26$$

$$x + y = 4$$

$$x = 4 - y$$

$$(4 - y)^2 + y^2 = 26$$

$$16 - 8y + y^2 + y^2 = 26$$

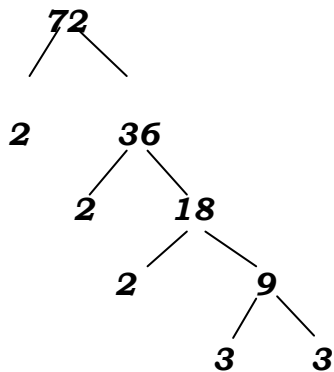
$$2y^2 - 8y - 10 = 0$$

$$y^2 - 4y - 5 = 0$$

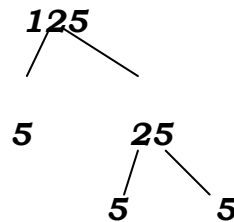
$$y = -1 \quad x = 5$$

$$y = 5 \quad x = -1$$

13. Express 72 and 125 as products of their prime factors. (2mks)



$$72 = 2 \times 2 \times 2 \times 3 \times 3$$



$$125 = 5 \times 5 \times 5$$

14. A service vehicle left town P for town Q at 1000hrs had a puncture after travelling for 4 hrs 20 mins. Fixing a new tyre took 33 minutes. The vehicle then travelled for 1 hr 20mins to reach town Q. At what time did it arrive in 12 hour clock system. (3mks)

1000hrs

420

1420 hrs

33

1453

120

1613

4:13p.m

15. A tourist visited Kenya with 2500 US dollars and changed the US dollars into Kenya shillings at a local bank in Kenya when the exchange rates at the time were as follows:

	<i>Buying</i>	<i>Selling</i>
1 US dollar	shs. 78.45	shs. 78.55
1 Sterling Pound	shs. 120.25	shs. 120.45

- a) How much did he get in Kenya shillings? (2mks)

$$2500 \times 78.45$$

$$= 196125$$

- b) While in Kenya he used shs. 80,000 and after his stay he converted the remaining amount into Sterling pounds. Calculate to 2 decimal places the Sterling pounds that he got. (2mks)

$$\begin{array}{r} 196125 \\ - 80000 \\ \hline 116125 \end{array}$$

$$\begin{array}{r} \underline{116123} \\ 120.45 \end{array}$$

$$= 964.09 \text{ sterling pounds}$$

16. Use logarithms tables to evaluate: (4mks)

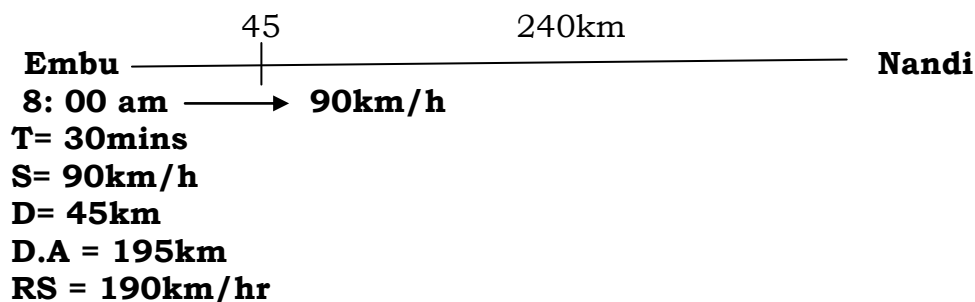
$$\sqrt[3]{\frac{497 \times 9.84}{5.24 \times 7.65}}$$

No.	std term	log
497	4.97×10^2	2.6964
9.84	9.84×10^0	0.9930
		<u>3.6894</u>
5.24	5.24×10^0	0.7193
		<u>2.9701</u>
7.65	7.65×10^0	0.8837
		<u>2.0864</u>

$$\frac{2.0864}{3} = 0.6955$$

$$\begin{aligned} & \text{Anti log } 0.6955 \\ & = 4.959 \\ & = 4.96 \end{aligned}$$

17. A motorist left Embu for Nairobi a distance of 240km at 8:00 a.m and travelled at average speed of 90km/hr. Another motorist left Nairobi for Embu at 8:30a.m and travelled at 100km/hr. Find;
a) The time they met. (3mks)



$$T = \frac{39}{38}$$

8.30 am

62

9.32 am

- b) How far they met from Nairobi. (3mks)

$$T = \frac{39}{38} \text{hr}$$

$$S = 100 \text{km/hr}$$

$$D = 102.63 \text{ km}$$

- c) The time of the day each motorist arrived at his destination. (4mks)

Embu → Nairobi

$$D = 240 \text{km}$$

$$S = 90 \text{km/hr}$$

$$T = 2 \text{hr } 40 \text{mins}$$

8.00

2.40

10.40am

Nairobi → Embu

$$D = 240 \text{km}$$

$$S = 100 \text{km/hr}$$

$$T = 2 \text{h } 24 \text{mins}$$

8.30

2.24

10.54 am

18. A farmer has a rectangular farm which measures 100m by 80m. The farmer intends to fence the plot using post at intervals of 4m apart leaving a gate of 4m. Also he will use four strands of barbed wire. Each post cost shs. 125 and wire is sold at rolls of 60m costing 1,500/=. Calculate;

- a) The number of post he will use. (2mks)

$$P = 180 \times 2$$

$$= \frac{360-4}{4} = 89 + 1$$

$$= 90 \text{ posts}$$

- b) The total length of the barbed wire. (2mks)

$$(360 - 4) \times 4$$

$$= 1424 \text{ m}$$

- c) The total cost of fencing the farm if the cost of the gate is 8,000/= and labour is shs. 1,500. (5mks)

$$(90 \times 125) + \frac{1424 \times 1500}{60} + 8000$$

60

$$11250 + 35600 + 8000 + 1500$$

$$= \text{sh. } 56350$$

- d) The farmer wishes to subdivide further the farm into square plot. Find the maximum area of the plot.

10	100	80
<u>2</u>	<u>10</u>	<u>8</u>
	5	4

$$\text{G.C.D} = 20$$

$$\begin{aligned} \text{AREA} &= 20 \times 20 \\ &= 400\text{m}^2 \end{aligned}$$

19. The parents of a certain mixed school decided to buy a school van worth Kshs. 900,000. Each student was to contribute the same amount of money. 50 students were transferred from the school; as a result each of the remaining students had to pay kshs. 600 more.

a) Find the original number of the students in the school. (5mks)

$$\frac{900000}{(x - 50)} - \frac{900000}{x} = 600$$

$$\frac{900000x - 900000(x - 50)}{x(x - 50)} = 600$$

$$4500000 = 600x^2 - 30000x$$

$$600x^2 - 30000x - 4500000 = 0$$

$$x^2 - 50x - 75000 = 0$$

$$\frac{50 \pm \sqrt{2500 - 4 \times 75000}}{2}$$

$$\frac{50 + 550}{2} \quad \frac{50 - 550}{2}$$

$$x = 300 \text{ students}$$

b) Find the percentage change in contributions per student. (3mks)

$$\text{Original} = \frac{900000}{300}$$

$$= 3000$$

$$\text{New} = \frac{900000}{250}$$

$$= 3600$$

$$= \frac{600 \times 100}{3000}$$

$$= 20\%$$

c) If the ratio of boys to girls in the school was 11:7, find the amount of money contributed by boys alone. (2mks)

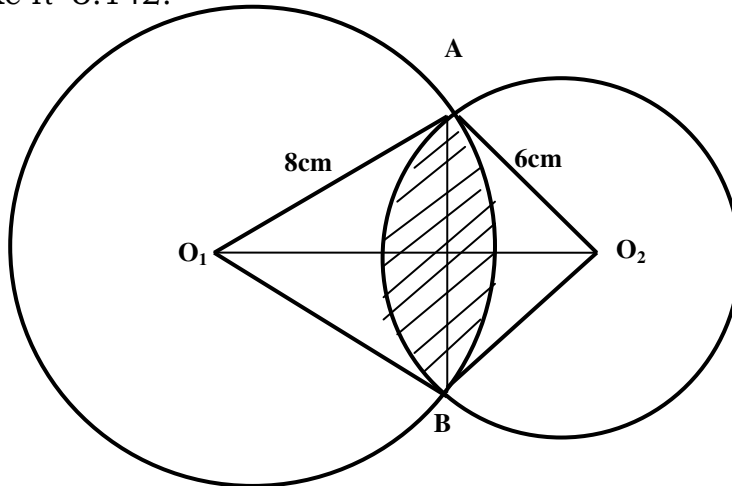
B
11

G
7

$$= \frac{11 \times 900000}{18}$$

$$= \text{sh. } 55,000$$

20. The figure below shows two circles of radii 8cm and 6cm with centres O_1 and O_2 respectively. The circles intersect at points A and B. The lines O_1O_2 and AB are perpendicular to each other. If the common chord is 9cm; (Take $\pi=3.142$.)



Calculate to 4s.f

- a) Angle AO_1B

(2mks)

$$\sin^{-1} \theta = \frac{4.5}{8}$$

$$\theta = 34.23$$

$$\begin{aligned} \mathbf{AO_1B} &= \mathbf{34.23 \times 2} \\ &= \mathbf{68.46^\circ} \end{aligned}$$

- b) Angle AO_2B

$$\sin^{-1} \theta = \frac{4.5}{6}$$

$$\theta = 48.59$$

$$\begin{aligned} \mathbf{AO_2B} &= \mathbf{48.59 \times 2} \\ &= \mathbf{97.18^\circ} \end{aligned}$$

- c) Area of the shaded region.

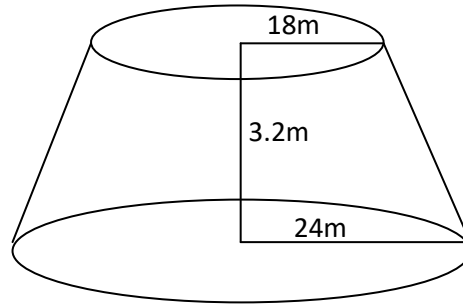
(6mks)

$$\begin{aligned} &\frac{68.46}{360} \times 3.142 \times 8^2 - \frac{1}{2} \times 8 \times 8 \sin 68.46 \\ &\mathbf{38.24 - 29.76} \\ &= \mathbf{8.48cm^2} \end{aligned}$$

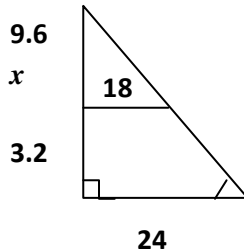
$$\begin{aligned} &\frac{97.18}{360} \times 3.142 \times 6^2 - \frac{1}{2} \times 6 \times 6 \sin 97.18 \\ &\mathbf{30.53 - 17.86} \\ &= \mathbf{12.67} \end{aligned}$$

$$\begin{aligned} \mathbf{Shaded Area} &= \mathbf{8.48 + 12.67} \\ &= \mathbf{21.15cm^2} \end{aligned}$$

21. A village water tank is in the form of a frustum of a cone of height 3.2m. The top and bottom radii of 18m and 24m respectively as shown below.



- a. Calculate;
i. The surface area of the tank excluding the bottom. (4mks)



$$\begin{aligned}\frac{24}{18} &= \frac{3.2+x}{x} \\ 24x &= 57.6 + 18x \\ 6x &= 57.6 \\ x &= 9.6m\end{aligned}$$

$$\begin{aligned}\text{S.A Big Cone} &= \frac{22}{7} \times 24 \times 27.2 \\ &= 2051.66\text{cm}^2\end{aligned}$$

$$\begin{aligned}\text{S.A Big Cone} &= \frac{22}{7} \times 18 \times 20.4 \\ &= 1154.06\end{aligned}$$

$$\begin{aligned}\text{S.A Big Cone} &= 2051.66 - 1154.06 + \left(\frac{22}{7} \times 24 \times 27.2\right)^2 \\ &= 897.6 + 1018.29 \\ &= 1915.89\text{m}^2\end{aligned}$$

- ii. The capacity of the tank in litres. (3mks)

$$V = \frac{1}{3} \times \frac{22}{7} \times 24 \times 24 \times 12.8$$

$$\begin{aligned}\text{Big cone} \\ &= 7723.89\text{m}^3\end{aligned}$$

$$V = \frac{1}{3} \times \frac{22}{7} \times 18 \times 18 \times 9.6$$

$$\begin{aligned}\text{Small cone} \\ &= 3258.51\end{aligned}$$

$$V = 7723.89 - 3258.51$$

$$4465.3757 \times 1000$$

$$4465375.7 \text{ litres}$$

- b. 15 families each having 15 members use the water tank and each person uses 65 litres daily. How long will it take for the full tank to be emptied?
(3mks)

$$\underline{4465375.7}$$

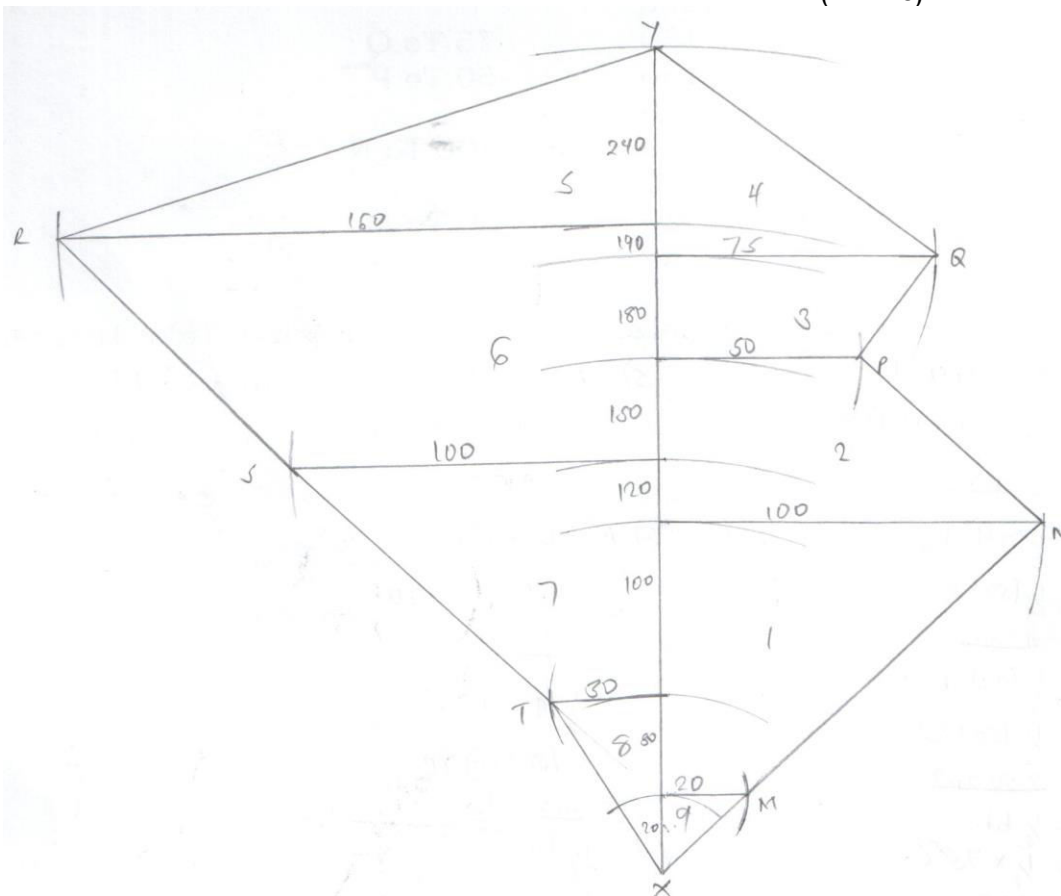
$$15 \times 15 \times 65$$

= 305.3 days.

22. Measurements of a maize field using baseline XY were recorded as shown below in metres

	Y	
	240	
To R 160	190	
	180	75 To Q
	150	50 To P
To S 100	120	
	100	100 To N
To T 30	50	
	20	20 To M
	X	

- a) Show the map of the maize field by scale drawing. Take 1cm rep 20m.
(4mks)



1. $A = \frac{1}{2} (a + b)h$
 $= \frac{1}{2} (20 + 100)80$
 $= 4800m^2$
2. $A = \frac{1}{2} (a + b) h$
 $= \frac{1}{2} (20 + 100)60$
 $= 4500m^2$
3. $A = \frac{1}{2} (a + b)h$
 $= \frac{1}{2} (50 + 75) 40$
 $= 2500m^2$
4. $A = \frac{1}{2} bh$
 $= \frac{1}{2} \times 75 \times 60$
 $= 2250m^2$
5. $A = \frac{1}{2} bh$
 $= \frac{1}{2} \times 160 \times 50$
 $= 4000m^2$
6. $A = \frac{1}{2} (a + b)h$
 $= \frac{1}{2} (100 + 160) 70$
 $= 4550m^2$
7. $A = \frac{1}{2} bh$
 $= \frac{1}{2} \times 30 \times 50$
 $= 750$
8. $A = \frac{1}{2} bh$
 $= \frac{1}{2} \times 20 \times 20$
 $= 200m^2$

b) Find the area of the field in hectares. (4mks)

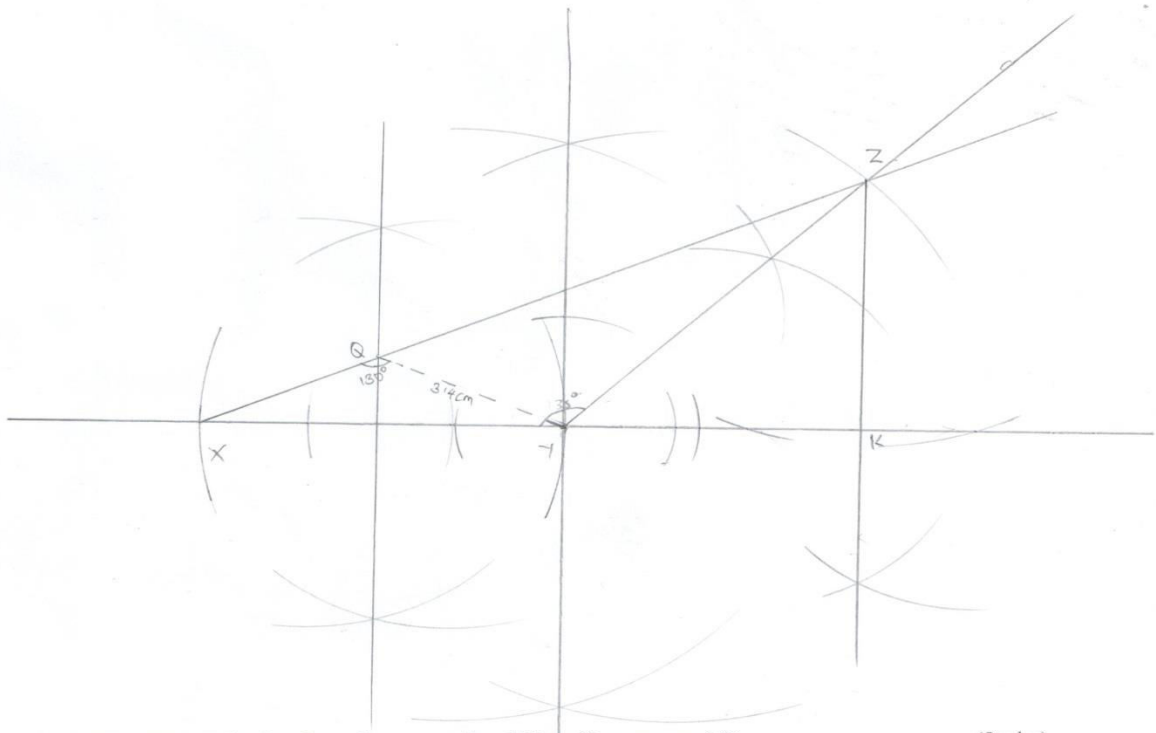
$$\begin{aligned}
 &= 4800 + 4500 + 2500 + 2250 + 4000 + 5600 + 4550 + 750 + 200 \\
 &= 29150m^2 \\
 &1 \text{ ha} = 10,000m^2 \\
 &= 29,150m^2 \\
 &= \frac{29150 \times 1}{10000} \\
 &= 2.9150\text{ha}
 \end{aligned}$$

c) If the cost of one hectare is Kshs. 65,000, find the total cost of the maize field. (2mks)

$$\begin{aligned}
 &1 \text{ ha} = \text{shs } 5000 \\
 &2.9150 \text{ ha} = \\
 &= \frac{2.9150 \times 65000}{1} \\
 &= \text{ksh. } 189475
 \end{aligned}$$

23. Using a ruler and pair of compass only construct the following.
- Triangle XYZ where XY is 6cm and angle XYZ is 135° and YZ=7cm. Measure XZ. (3mks)
 - Drop a perpendicular from Z to meet line XY at K. measure YK. (3mks)
 - Bisect line XY and let the bisector meet line XZ at Q. (2mks)
 - Join Q to Y and measure angle XQY. (2mks)

23. Using a ruler and pair of compass only construct the following.
 a) Triangle XYZ where XY is 6cm and angle XYZ is 135° and YZ=7cm. Measure XZ. (3mks)



- Drop a perpendicular from Z to meet line XY at K. measure YK. (3mks)
- Bisect line XY and let the bisector meet line XZ at Q. $YK = 4.8 \text{ cm}$ (2mks)
- Join Q to Y and measure angle XQY. (2mks)

$$XQY = 130^\circ$$

24. Complete the table for the function.

a) $y=1 - 2x - 3x^2$ in the range $-3 \leq x \leq 3$ (2mks)

x	-3	-2	-1	0	1	2	3
$-3x^2$	-27	-12	-3	0	-3	-12	-27
$-2x$	6	4	2	0	-2	-4	-6
1	1	1	1	1	1	1	1
y	-20	-7	0	1	-4	-15	-32

b) Use the table above to draw a graph of $y=1 - 2x - 3x^2$ on the graph provided. (4mks)



c) Use the graph in (b) above to solve;

i. $y=1 - 2x - 3x^2 = 0$ (2mks)

$$1 - 2x - 3x^2 = 0$$

$$-1, 0.2$$

ii. $2 - 5x - 3x^2 = 0$
 $1 - 2x - 3x^2 = 0$
 $2 - 5x - 3x^2 = 0$

 $-1 + 3x = 0$
 $3x = 1$
 $x = 1/3$

(2mks)