Kenya Certificate of Secondary Education.

121/2-MATHEMATICS (ALT A)-Paper 2

OCTOBER 2021

Time: 2½ hours

Name Marking scheme

Index Number................/.......

Candidate's Signature............................ Date..................................

***Instructions to candidates:***

(a) *Write your name, Index number, in the spaces provided above.*

(b) *Sign and write the date of examination in the spaces provided above.*

(c) *The paper contains* ***two*** *sections:* ***Section I*** *and* ***Section II.***

(d) *Answer* ***All*** *the questions in* ***Section I*** *and only* ***five*** *questions from* ***Section II***

(e) *All answers and working must be written on the question paper in the spaces provided below each question.*

(f) ***Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.***

(g) ***Non – programmable*** *silent electronic calculators and KNEC Mathematical tables may be used, except where stated otherwise.*

(h) ***This paper consists of 17 printed pages. Candidates should check the question paper to ascertain that all the pages are printed as indicated and no questions are missing.***

(i) ***Candidates should answer the questions in English.***

For Examiner's Use Only

Section I

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | |

Section II

| 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | Total |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

| Grand Total | |
|---|---|
| | |

## SECTION I (50MARKS)

*Answer* ***ALL*** *the questions in this section in the spaces provided.*

1. Use logarithm tables to evaluate $\sqrt[3]{\frac{0.4239 \times 149.6}{\log 6}}$ (3 marks)

| NO | Standard form | log |
|---|---|---|
| 0.4239 | $4.239 \times 10^{-1}$ | $\bar{1}.6272$ |
| 149.6 | $1.496 \times 10^{2}$ | $2.1750$ |
| | | $1.9022$ |
| $\log 6 = 0.7782$ | $\bar{1}.782 \times 10^{-1}$ | $\bar{1}.8911$ - |
| | | $1.9111$ |
| 4.335 | $4.335 \times 10^{0}$ | ← 0.6370 |

$\frac{1.9111}{3} = 0.6370$

2. Without using a calculator or mathematical table evaluate $\frac{2tan60^0}{sin45^0 - cos30^0}$ leaving your answer in simplified form. (3 marks)

$\frac{2\tan 60}{\sin 45^0 - \cos 30}$ $\quad \frac{2 \times \frac{\sqrt{3}}{1}}{\frac{1}{\sqrt{2}} - \frac{\sqrt{3}}{2}}$ $\quad \frac{2\sqrt{3}}{\frac{1}{\sqrt{2}} - \frac{\sqrt{3}}{2}}$ $\quad \frac{2\sqrt{3}}{\frac{1}{\sqrt{2}} - \frac{\sqrt{3}}{2}} \times \frac{\frac{1}{\sqrt{2}} + \frac{\sqrt{3}}{2}}{\frac{1}{\sqrt{2}} + \frac{\sqrt{3}}{2}}$

$\frac{\frac{2\sqrt{3}}{\sqrt{2}} - 3}{\frac{1}{2} - \frac{\sqrt{3}}{2\sqrt{2}} + \frac{\sqrt{3}}{2\sqrt{2}} - \frac{3}{2}}$

$= \frac{-2\sqrt{3} + 3}{\sqrt{2}}$

$= \frac{-2\sqrt{2}\sqrt{3} + 3}{2} = -\sqrt{2}\sqrt{3} + 3$

3. Expand $(1+\frac{1}{2}x)^{10}$ up to the term in $x^3$ in ascending powers of x .Hence find the value of $(1.005)^{10}$ correct to four decimal places. (3 marks)

$1^{10}(\frac{1}{2}x)^0 + 1^9(\frac{1}{2}x)^1 + 1^8(\frac{1}{2}x)^2 + 1^7(\frac{1}{2}x)^3$

$1 + 10 \cdot \frac{1}{2}x + 45 \cdot \frac{1}{4}x^2 + 120 \cdot \frac{1}{8}x^3$

$1 + 5x + \frac{45}{4}x^2 + 15x^3$

$(1.005)^{10} = (1 + \frac{1}{2}x)^{10}$

$0.005 = \frac{1}{2}x$

$0.01 = x$

$(1.005)^{10} = 1 + 5(0.01) + \frac{45}{4}(0.01)^2 + 15(0.01)^3 = 1.0511$ (4dp)

4. Solve for x in the equation

$5 \; 2\log_{10}x + \log_{10}5 = 1 + 2\log_{10}4$ (2marks)

$5\log_{10}x + \log_{10}5 = \log_{10}10 + 2\log_{10}4$ M1

$\log_{10} 5x^5 = \log_{10} 160$

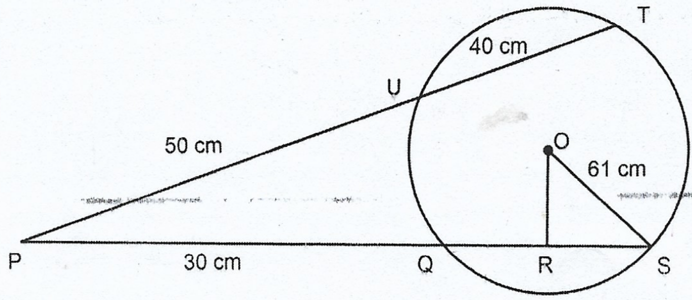
$5x^5 = 160$ M1

$x^5 = 32$

$x^5 = 2^5$

$x = 2$ A1

5. In the figure below OS is the radius of a circle centre O. Chords SQ and TU are extended to meet at P and OR is perpendicular to QS at R. OS = 61 cm, PU = 50 cm, UT = 40 and PQ = 30 cm.




Calculate the length of

a) QS (2 marks)

$PT \cdot PU = PS \cdot PQ$

$90 \times 50 = (30 + QS) \times 30$

$4500 = 900 + 30QS$

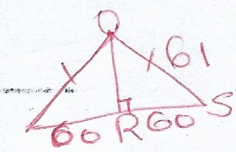
$30QS = 3600$

$QS = 120$

b) OR to 2 decimal places (1 mark)

$OR = \sqrt{61^2 - 60^2}$

$= \sqrt{121} = 11.00cm.$




6. Simplify as far as possible leaving your answer in surd form (3marks)

$$\frac{1}{\sqrt{14}-2\sqrt{3}} - \frac{1}{\sqrt{14}+2\sqrt{3}}$$

$\frac{1}{\sqrt{14}-2\sqrt{3}} \times \frac{\sqrt{14}+2\sqrt{3}}{(\sqrt{14}+2\sqrt{3})} - \frac{1}{(\sqrt{14}+2\sqrt{3})} \frac{\sqrt{14}-2\sqrt{3}}{(\sqrt{14}-2\sqrt{3})}$ M1

$\left(\frac{\sqrt{14}+2\sqrt{3}}{14-2\sqrt{42}+2\sqrt{42}-12}\right) - \left(\frac{\sqrt{14}-2\sqrt{3}}{14+2\sqrt{42}-2\sqrt{42}-12}\right)$

$\left(\frac{\sqrt{14}+2\sqrt{3}}{2}\right) - \left(\frac{\sqrt{14}-2\sqrt{3}}{2}\right)$ M1

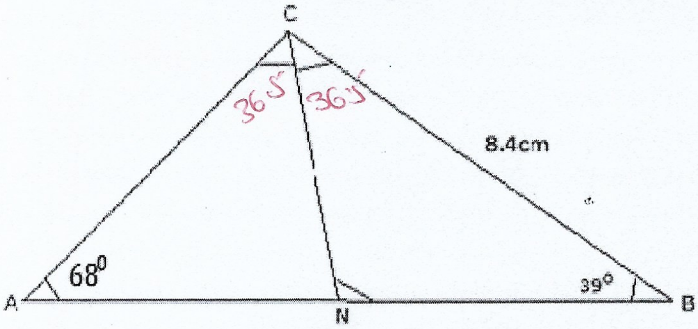
$\frac{\sqrt{14}+2\sqrt{3}-\sqrt{14}+2\sqrt{3}}{2}$

$\frac{4\sqrt{3}}{2}$

$= 2\sqrt{3}$ A1

7. In the figure below angle A=68⁰, B= 39⁰, BC= 8.4cm and CN is the bisector of angle ACB. Calculate the length CN to 1decimal place. (3 marks)

7. In the figure below angle A=$68^0$, B= $39^0$, BC= 8.4cm and CN is the bisector of angle ACB. Calculate the length CN to 1decimal place. (3 marks)




$$\angle ACN = \frac{180-(68+39)}{2}$$

$$= 36.5^0$$

$$\frac{8.4}{\sin 68^0} = \frac{x}{\sin 39^0}$$

$$x = 5.701\text{cm}$$

8. Given that the matrix $\begin{pmatrix} x & -3 \\ 0 & x-1 \end{pmatrix}$ is a singular matrix, find the values of x. (3marks)

$$x(x-1) - 0 = 0$$

$$x = 0$$

$$x = 1$$

9. Make $x$ the subject of the equation (3 marks)

$$\frac{t}{s} = \frac{b}{\sqrt{x-4}}$$

$$\left(\frac{t}{s}\right)^2 = \frac{b^2}{x-4}$$

$$t^2(x-4) = s^2b^2$$

$$t^2x - 4t = s^2b^2$$

$$t^2x = s^2b^2 + 4t$$

$$x = \frac{s^2b^2+4t}{t^2}$$

10. The equation of the circle is given by $x^2 + y^2 + 8x - 2y - 1 = 0$. Determine the radius and the centre of the circle. (4marks)

$$x^2 + 8x + 16 + y^2 - 2y + 1 = 1 + 16 + 1$$

$$(x+4)^2 + (y-1)^2 = 18$$

centre $(-4, 1)$

radius $= \sqrt{18} = 4.243$ units

or $r = 3\sqrt{2}$ units

11. A coffee blender mixes 6 parts of type A with 4 parts of type B. if type A cost him sh. 24 per kg and type B cost him sh. 22 per kg, at what price per kg should he sell the mixture in order to make 5% profit. Give your answer to 2 decimal places (3marks)

Average cost = $\frac{\text{Total cost}}{\text{Total}}$

$= \frac{(24\times 6) + (22\times 4)}{6+4}$

$\frac{144+88}{10} = \frac{232}{10} = 23.2$

$\frac{105}{100} \times 23.2 = 24.36$

12. Musau invested a sum of money which earned him 10% compound interest in the first year. In the second year, the investment earned him 20% compound interest and in the third year, it earned him 25% compound interest. At the end of the three years, the investment was worth sh. 11,550,000. What sum did he invest. (3marks)

1st year

$A = P(1+\frac{r}{100})^n$

$A = P(1+\frac{10}{100})^1$

$A = 1.1P$

2nd year

$A = 1.1P(1+\frac{20}{100})^1$

$= 1.1P(1+0.2)$

$A = 1.1P \times 1.2$

$A = 1.32P$

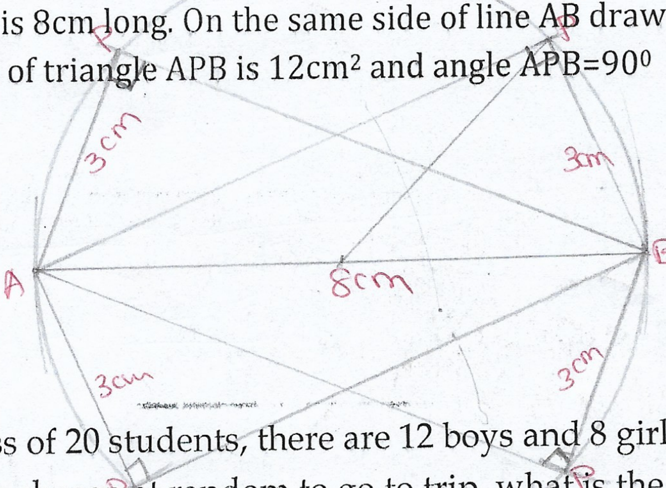
3rd year

$A = 1.32P(1+\frac{25}{100})$

$= 1.65p = 11550000$

$p =$ sh. 7000 000

13. Line AB is 8cm long. On the same side of line AB draw the locus of point P such that the area of triangle APB is $12cm^2$ and angle APB=$90^0$ (3marks)




P is a point subtended by chord AB to the circumference of a semi-circle or circle.

14. In a class of 20 students, there are 12 boys and 8 girls. If two students from the class are chosen at random to go to trip, what is the probability that both of them are boys (3marks)

P(BB)

$\left(\frac{12}{20} \times \frac{11}{19}\right) = \frac{132}{380} = \frac{33}{95}$

15. After transformation T represented by the matrix $\begin{pmatrix} 2 & 1 \\ 0 & 1 \end{pmatrix}$, the triangle ABC was mapped onto triangle $A_1B_1C_1$ where $A_1, B_1, C_1$ had coordinates (2,0), (4,0) and (4,6) respectively. Determine the coordinates A, B, and C (3marks)

$$\begin{pmatrix} 2 & 1 \\ 0 & 1 \end{pmatrix}\begin{array}{c} \begin{array}{ccc} A & B & C \end{array} \\ \begin{pmatrix} x_1 & x_2 & x_3 \\ y_1 & y_2 & y_3 \end{pmatrix} \end{array} = \begin{array}{c} \begin{array}{ccc} A_1 & B_1 & C_1 \end{array} \\ \begin{pmatrix} 2 & 4 & 4 \\ 0 & 0 & 6 \end{pmatrix} \end{array}$$

$2x_1 + y_1 = 2$ $\quad 2x_2 + y_2 = 4$ $\quad 2x_3 + y_3 = 4$

$0 + y_1 = 0$ $\quad 0 + y_2 = 0$ $\quad 0 + y_3 = 6$

$y_1 = 0$ $\quad y_2 = 0$ $\quad y_3 = 6$

$x_1 = 1$ $\quad x_2 = 2$ $\quad 2x_3 = -2$

$x_3 = -1$

A (1, 0)

B (2, 0)

C (−1, 6)

16. The length and breadth of a rectangular floor were measured and found to be 4.1m and 2.2m respectively. If a possible error of 0.01m was made in each of the measurements; find the:

(a) Maximum and minimum possible area of the floor (2marks)

Maximum Area = $4.11m \times 2.21m = 9.0831m^2$

minimum Area = $4.09m \times 2.19m = 8.9571m^2$

(b) Maximum wastage in the carpet ordered to cover the whole floor. (1mark)

Actual Area = $4.1 \times 2.2$

$= 9.02m^2$

Wastage $= \dfrac{(9.02 - 8.9571) + (9.0831 - 9.02)}{2}$

$= 0.063$.

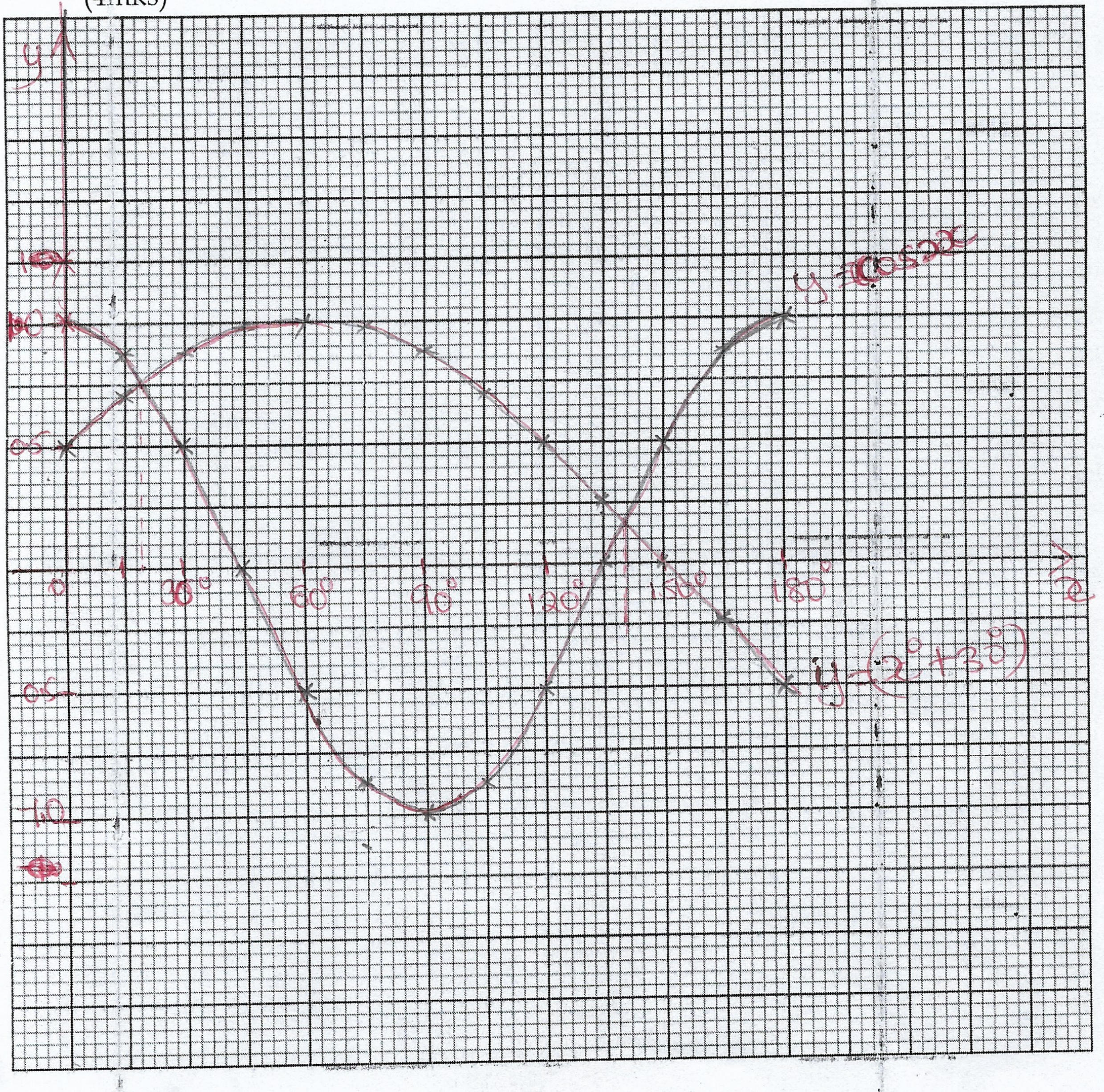
## SECTION II (50 MARKS)

**INSTRUCTIONS: Answer ANY FIVE questions only in this section**

17. complete the table below, giving the values correct to 2 decimal places (2mks)

| $X^0$ | $0^0$ | $15^0$ | $30^0$ | $45^0$ | $60^0$ | $75^0$ | $90^0$ | $105^0$ | $120^0$ | $135^0$ | $150^0$ | $165^0$ | $180^0$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cos $2X^0$ | 1.00 | 0.87 | 0.50 | 0.00 | -0.5 | -0.87 | -1.00 | -0.87 | -0.5 | 0.00 | 0.50 | 0.87 | 1.00 |
| Sin $(X^0+30^0)$ | 0.50 | 0.71 | 0.87 | 0.97 | 1.00 | 0.97 | 0.87 | 0.71 | 0.50 | 0.26 | 0.00 | -0.26 | -0.5 |

(ii) Using the grid provided draw on the same axes the graph of $y=\cos 2X^0$ and $y=\sin(X^0+30^0)$ for $0^0 \leq X \leq 180^0$. (4mks)



(iii) Find the period of the curve y=cos $2x^0$
(1mk)

$\frac{360}{b}$

$=\frac{360}{2}=180^\circ$

(iv) Using the graph, estimate the solutions to the equations;
(a) $\sin(X^0+30^0)=\cos 2X^0$
(1mk)

$x = 18.5 \pm 2^\circ$

$x = 139^\circ \pm 2^\circ$

(b) Cos $2X^0=0.5$
(1mk)

$x = 30^\circ$.

18. A Quantity P varies partly as the square of m and partly as n. When p= 3.8, m = 2 and n = -3. When p = - 0.2, m = 3 and n= 2.

a) Find

i) The equation that connects p, m and n (4marks)

$P = xm^2 + yn$

$3.8 = 4x - 3y$

$-0.2 = 9x + 2y$

$7.6 = 8x - 6y$ +

$-0.6 = 27x + 6y$

$7 = 35x$

$\frac{7}{35} = x$

$x = \frac{1}{5} = 0.2$

$3.8 = 0.8 - 3y$

$3 = -3y$

$-1 = y$

$P = 0.2m^2 - n$

ii) The value of p when m = 10 and n = 4 (1mark)

$p = 0.2m^2 - n$

$\cancel{0.2m^2 = P + n}$

$P = \cancel{0.2 \times 100} - 4$

$= 20 - 4$

$p = 16$

b) Express m in terms of p and n (2marks)

$P = 0.2m^2 - n$

$0.2m^2 = P + n$

$m^2 = \frac{P + n}{0.2}$

$m = \sqrt{\frac{P+n}{0.2}}$

$m = \pm\sqrt{\frac{P+n}{0.2}}$

c) If P and n are each increased by 10%, find the percentage increase in m correct to 2 decimal place. (3marks)

$m_0 = \sqrt{\frac{P+n}{0.2}}$

$m_1 = \sqrt{\frac{1.1P + 1.1n}{0.2}}$

$m_1 = \sqrt{\frac{1.1(P+n)}{0.2}} = \sqrt{5.5(P+n)} = 2.3452\sqrt{P+n}$

$m_0 = \sqrt{\frac{P+n}{0.2}} = \sqrt{5(P+n)}$

$= 2.2361\sqrt{(P+n)}$

% change in m $= \left(\frac{m_1 - m_0}{m_0}\right) \times 100\%$

$= \frac{2.3452\sqrt{P+n} - 2.2361\sqrt{P+n}}{2.2361\sqrt{P+n}} \times 100$

$= \frac{2.3452 - 2.2361}{2.2361} \times 100\%$

$= \frac{0.1091}{2.2361} \times 100\%$

$= 0.04879 \times 100\%$

$= 4.88\%$ 2dp

19. The $5^{th}$ term of an AP is 16 and the $12^{th}$ term is 37.
Find;

i) The first term and the common difference (3 marks)

$T_n = a + (n-1)d$

$T_5 = a + 4d = 16$

$T_{12} = a + 11d = 37$ M1

$-7d = -21$

$d = 3$ A1

$a + 4(3) = 16$

$a + 12 = 16$

$a = 4$ B1

ii) The sum of the first 21 terms (2 marks)

$S_n = \frac{n}{2}(2a + (n-1)d)$

$= \frac{21}{2}((2 \times 4) + (20 \times 3))$ M1

$= 714$ A1

b) The second, fourth and the seventh term of an AP are the first 3 consecutive terms of a GP. If the common difference of the AP is 2.

Find:

c) The common ratio of the GP (3 marks)

$a+d,\ a+3d,\ a+6d$

$a+2,\ a+6,\ a+12$

$\frac{a+6}{a+2} = \frac{a+12}{a+6}$

$(a+6)^2 = (a+2)(a+12)$

$a^2 + 12a + 36 = a^2 + 14a + 24$

$2a = 12$

$a = 6$

G.P

8, 12, 18

$r = \frac{12}{8}$

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

d) The sum of the first 8 terms of the GP (2 marks)

$S_8 = \frac{8\left(\left(\frac{3}{2}\right)^8 - 1\right)}{1\frac{1}{2} - 1}$

$= 394.0625$

20. The table below shows the rates of taxation in a certain year.

| Income in K£ pa | Rate in Ksh per K£ |
|---|---|
| 1 - 3900 | 2 |
| 3901 - 7800 | 3 |
| 7801 - 11700 | 4 |
| 11701 - 15600 | 5 |
| 15601 - 19500 | 7 |
| Above 19500 | 9 |

In that period, Juma was earning a basic salary of sh. 21,000 per month. In addition, he was entitled to a house allowance of sh. 9000 p.m. and a personal relief of ksh.1056 p.m He also has an insurance scheme for which he pays a monthly premium of sh. 2000. He is entitled to a relief on premium at 15% of the premium paid.

(a) Calculate how much income tax Juma paid per month. (7mks)

Taxable income = 21000 + 9000
= Sh. 30000

P.a. = $\frac{30000 \times 12}{20}$ = K£ 18,000 pa.

2 × 3900 = Sh. 7800
3 × 3900 = Sh. 11700
4 × 3900 = sh. 15600
5 × 3900 = Sh. 19500
7 × 2400 = Sh. 16800
Sh. 71400

Tax paid 71400 - 16272
= Sh. 55,128

P.A.Y.E. = $\frac{55128}{12}$
= Sh. 4594

$\frac{15}{100} \times 2000 = 300$

Total relief P.a = (300 + 1056) × 12 = Sh. 16272.

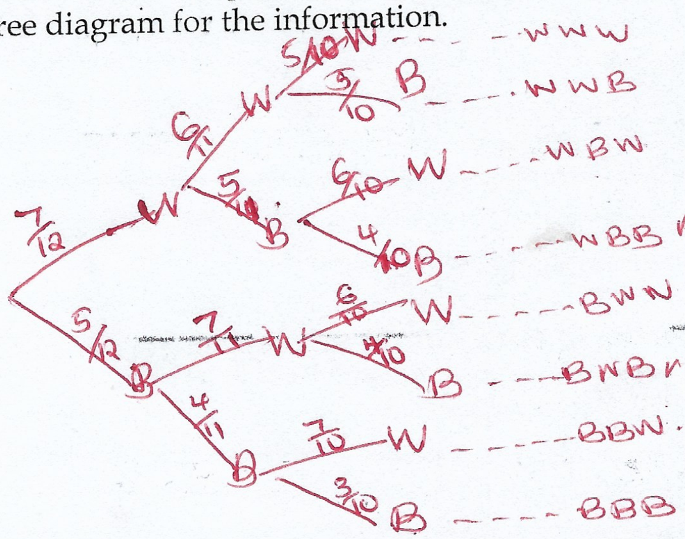
(b) Juma's other deductions per month were cooperative society contributions of sh. 2000 and a loan repayment of sh. 2500. Calculate his net salary per month. (3mks)

Total deduction = 4594 + 2000 + 2000 + 2500
= Sh. 11,094 per month.

Net salary = 30,000 - 11,094.
= Sh. 18,906.00

21. A cupboard has 7 white cups and 5 brown ones all identical in size and shape. There was a blackout in the town and Mrs. Kamau had to select three cups, one after the other without replacing the previous one.

(a) Draw a tree diagram for the information. (2mks)




(b) Calculate the probability that she chooses.

(i) Two white cups and one brown cup. (2mks)

$$\left(\frac{7}{12}\times\frac{6}{11}\times\frac{5}{10}\right)+\left(\frac{7}{12}\times\frac{5}{11}\times\frac{6}{10}\right)+\left(\frac{5}{12}\times\frac{7}{11}\times\frac{6}{10}\right)$$

$$=\frac{21}{44}$$

(ii) Two brown cups and one white cup. (2mks)

$$\left(\frac{7}{12}\times\frac{5}{11}\times\frac{4}{10}\right)+\left(\frac{5}{12}\times\frac{7}{11}\times\frac{4}{10}\right)+\left(\frac{5}{12}\times\frac{4}{11}\times\frac{7}{10}\right)$$

$$=\frac{7}{22}$$

(iii) At least one white cup. (2mks)

$$\left(\frac{5}{12}\times\frac{4}{11}\times\frac{7}{10}\right)+\left(\frac{5}{12}\times\frac{7}{11}\times\frac{4}{10}\right)+\left(\frac{7}{12}\times\frac{5}{11}\times\frac{4}{10}\right)+\left(\frac{5}{12}\times\frac{7}{11}\times\frac{6}{10}\right)+\left(\frac{7}{12}\times\frac{5}{11}\times\frac{6}{10}\right)+\left(\frac{7}{12}\times\frac{6}{11}\times\frac{5}{10}\right)+\left(\frac{7}{12}\times\frac{6}{11}\times\frac{5}{10}\right)=\frac{427}{440}$$

(iv) Three cups of the same colour. (2mks)

$$\left(\frac{7}{12}\times\frac{6}{11}\times\frac{5}{10}\right)+\left(\frac{5}{12}\times\frac{4}{11}\times\frac{3}{10}\right)$$

$$=\frac{9}{44}$$

22. The For a sample of 100 bulbs, the time taken for each bulb to burn was recorded. The table below shows the result of the measurements.

| Time(in hours) | 15-19 | 20-24 | 25-29 | 30-34 | 35-39 | 40-44 | 45-49 | 50-54 | 55-59 | 60-64 | 65-69 | 70-74 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number of bulbs | 6 | 10 | 9 | 5 | 7 | 11 | 15 | 13 | 8 | 7 | 5 | 4 |

(a) Using an assumed mean of 42, calculate

(i) the actual mean of distribution

(4mks)

| class | midpoint x | f | $t = \frac{x-A}{c}$ | ft | $t^2$ | $ft^2$ |
|---|---|---|---|---|---|---|
| 15-19 | 17 | 6 | -5 | -30 | 25 | 150 |
| 20-24 | 22 | 10 | -4 | -40 | 16 | 160 |
| 25-29 | 27 | 9 | -3 | -27 | 9 | 81 |
| 30-34 | 32 | 5 | -2 | -10 | 4 | 20 |
| 35-39 | 37 | 7 | -1 | -7 | 1 | 7 |
| 40-44 | 42 | 11 | 0 | 0 | 0 | 0 |
| 45-49 | 47 | 15 | 1 | 15 | 1 | 15 |
| 50-54 | 52 | 13 | 2 | 26 | 4 | 52 |
| 55-59 | 57 | 8 | 3 | 24 | 9 | 72 |
| 60-64 | 62 | 7 | 4 | 28 | 16 | 112 |
| 65-69 | 67 | 5 | 5 | 25 | 25 | 125 |
| 70-74 | 72 | 4 | 6 | 24 | 36 | 144 |
| | | $\Sigma f = 100$ | | $\Sigma ft = 28$ | | $\Sigma ft^2 = 873$ |

$\bar{x} = 42 + \left(\frac{28}{100} \times 5\right)$

$= 43.4$

(ii) the standard deviation of the distribution

(3mks)

$$S = \frac{\Sigma ft^2}{\Sigma f} - \left(\frac{\Sigma ft}{\Sigma f}\right)^2 =$$

$$\frac{873}{100} - \left(\frac{28}{100}\right)^2 = 0.7856$$

(b) Calculate the quartile deviation

(3mks)

$$\left(49.5 + \left(\frac{75-63}{13}\right)5 + 29.5 + \left(\frac{30-25}{5}\right)5\right)\frac{1}{2}$$

$\cancel{34.5}$

44.3075

23. The position of town A and B on the earth's surface are ($36^0$N, $49^0$E) and ($36^0$N, $131^0$W) respectively.

(a) Find the difference in longitude between town A and town B. (2marks)

A(36°N, 49°E) B(36°N, 131°W)

Longitudinal difference

$49° + 131° = 180°$.

(b) Given that the radius of the earth is 6370km, calculate the distance between town A and B along;

(i) Parallel of longitude (2marks)

Distance $= \frac{\alpha}{360} 2\pi R\cos\theta$

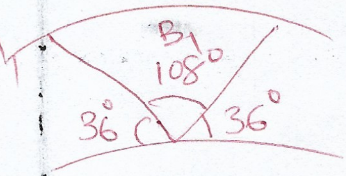
$\frac{180 \times 2}{360} \times \frac{22}{7} \times 6370 \cos 36°$ M1

Dist = 16196.52023 km. A1

(ii) A great circle (3marks)

Dist. $= \frac{\theta}{360} 2\pi R$.

$= \frac{108}{360} \times 2 \times \frac{22}{7} \times 6370$ M1



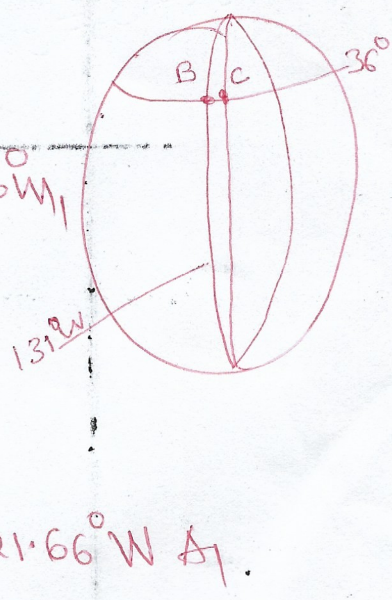

Dist = 12,012 Km. A1

(c) Another town C is 840km east of town B and on the same latitude as town A and B. find the longitude of town C (3marks)

B(36°, 131°W)

$D = \frac{\alpha}{360} 2\pi R\cos\theta$

$840 = \frac{\alpha}{360} \times 2 \times \frac{22}{7} \times 6370 \cos 36°$ M1




$840 = 89.9807\alpha$

$9.34° = \alpha$ A1

$131° - 9.34° = 121.66°$

longitude of town C = 121.66°W A1.

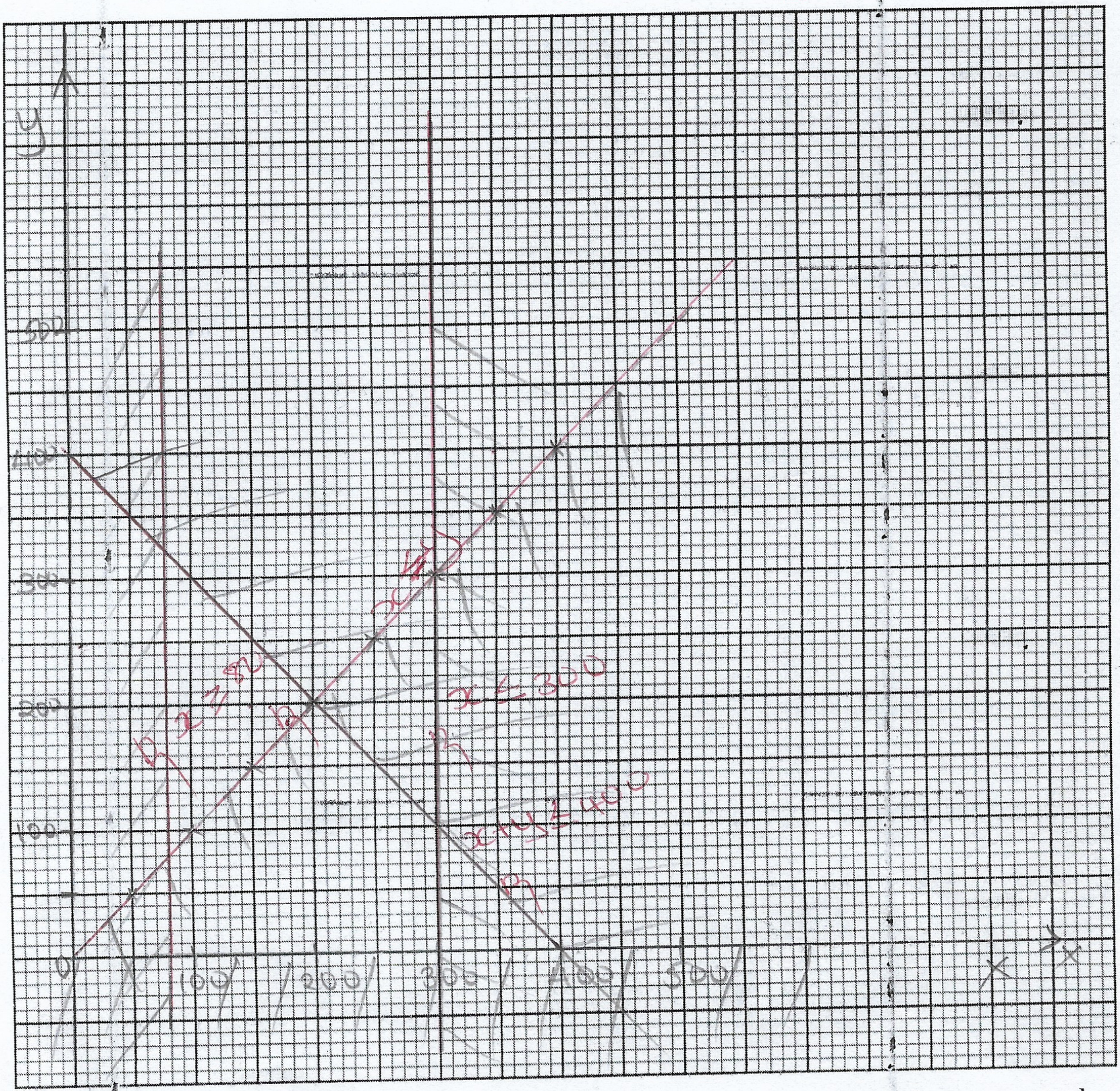
24. A trader is required to supply two types of shirts, type A and type B. the total number of shirts must not be more than 400. He has to supply more of type A than type B shirts. However the number of type A shirts must not be more than 300 and the number of type B shirts must not be less than 80. Let x be the number of type A shirts and y be the number of type B shirts.

(a) Write down in terms of x and y all the linear inequalities representing the information above (4marks)

(1) $x+y \leq 400$  $x \leq 300$

$x \geq y$  $y \geq 80$

$x > 0$  $y > 0$




(b) On the grid provided, draw the inequalities and shade the unwanted regions (4marks)

(c) The profits were as follows;

Type A: sh. 600 per shirt

Type B: sh. 400 per shirt

(i) Use the graph to determine the number shirts of each type that he should make to maximize the profit (1mark)

Sample (150, 200)

(200, 200)

(180, 220)

(150, 250)

(100, 300)

200 Type A $B_1$

200 Type B.

(ii) Calculate the maximum possible profit (1mark)

600A + 400B = max Profit.

(600 × 200) + (400 × 200)

120000 + 80000

Sh. 200000 $B_1$