END TERM 1, 2022

FORM TWO

MATHEMATICS

2 HOURS

INSTRUCTIONS TO CANDIDATES

- Write your name and admission number in the spaces provided at the top of this page.
- Answer **ALL** questions in section I and **ONLYTHREE** questions in section II.
- All answers and workings must be written on the question paper in the spaces provided below each question.
- Show all steps in the calculations, giving your answers at each stage in the spaces provided.
- Non-programmable silent electronic calculators and KNEC mathematical tables may be used, except where stated otherwise

FOR EXAMINERS USE ONLY

SECTION I

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
Marks														

SECTION II

Question	14	15	16	17	18	TOTAL
Marks						

GRAND TOTAL

SECTION I (40 Marks)- Answer all questions in this section.

1. a) Use the table of cubes to evaluate 23.5^3 (2 mark)

$23.5^3 = (2.35 \times 10^1)^3$ ✓

$= 12.978 \times 10^3$

$= 12,978$ ✓ CAO

b) Find the cube root of 3.375 using prime factor method (2marks)

$\sqrt[3]{3.375} = \sqrt[3]{\frac{3375}{10^3}} = \frac{\sqrt[3]{3375}}{10}$

$3375 = 3 \times 3 \times 3 \times 5 \times 5 \times 5$ ✓

$\sqrt[3]{3375} = 3 \times 5 = 15.$

$\therefore \sqrt[3]{3.375} = \frac{15}{10}$

$= 1.5$ ✓

2. Evaluate using the table of reciprocals: $\frac{2.5}{0.0842} + \frac{2}{64.5}$ (4 marks)

$\Rightarrow 2.5(8.42^{-1} \times 10^2) + 2(6.45^{-1} \times 10^{-1})$ ✓

$* 8.42^{-1} = 0.1188$

$* 6.45^{-1} = 0.1550$ } ✓

$= 2.5(0.1188 \times 10^2) + 2(0.1550 \times 10^{-1})$

$= 29.7 + 0.0310$ ✓

$= 29.731$ ✓

3. Simplify the expression $\sqrt[3]{\frac{27x^3y^9}{x^6y^3}}$ (2marks)

$= \left[\frac{3^3 \cdot x^3 \cdot y^9}{x^6 \cdot y^3}\right]^{\frac{1}{3}} = \frac{3 \cdot x \cdot y^3}{x^2 \cdot y}$ ✓

$= \frac{3y^2}{x}$ or $3xy^{-1}$ ✓

4. Use logarithm tables to evaluate: $\sqrt[2]{\frac{124.4 \times 35.8}{745}}$ (3 marks)

Nos.	Log
124.4	2.0948
× 35.8	1.5539 +
	3.6487
÷ 745	2.8722 −
$\sqrt{x}$	0.7765 × ½
	0.3883

✓ correct logs

✓ operations

Anti log ⇒ $10^{\cdot 3883} \times 10^{0}$

$= 2.445$ ✓

5. Solve for x given that $2^x \times 8^x \div 4 = 64$ (3 marks)

$\Rightarrow 2^x \times 2^{3x} \div 2^2 = 2^6$ ✓

$\Rightarrow 2^{(x+3x-2)} = 2^6$

$\Rightarrow 2^{(4x-2)} = 2^6$ ✓

$\therefore 4x - 2 = 6$

$\frac{4x}{4} = \frac{8}{4}$

$x = 2$ ✓

6. A bank in Kenyabuysand sells foreign currencies as follows.

Currency	Buying(Ksh)	Selling(Kshs)
1Sterling	134.20	134.65
1US dollar	71.40	71.84

A touristarrived in Kenyawith 4500 US dollars. He converted all thedollars to Kenyashillings at thebank. While in KenyahespentKshs 215,000 and then converted the remainingamount to sterlingpounds in the same bank. Calculate the amounthereceived in sterlingpound. (3marks)

$ to Kes:

$= 4,500 \times 71.40$

$=$ Kes. 321,300 ✓

Less Expenditure:

$\Rightarrow 321,300 - 215,000$

$=$ Kes 106,300

Kes to £:

$= \frac{106,300}{134.65}$ ✓

$=$ £ 789.45 ✓

7. The length of an arc of a circle is 8.8cm. If the arc subtends an angle 144° at the centre, calculate;

a)the radius of the circle (Take $\pi = 22/7$) (2 marks)

$L = 8.8\text{cm}, \ \theta = 144^\circ, \ r = ?$

$8.8 = \frac{144}{360} \times 2 \times \frac{22}{7} \times r$ ✓

$r = \frac{8.8 \times 360 \times 7}{144 \times 2 \times 22}$

$r = \frac{22,176}{6,336}$

$r = 3.5\text{cm}$ ✓

b) the area enclosed by the arc and the radii (2 marks)

$A = \frac{\theta}{360} \cdot \pi r^2$

$= \frac{144}{360} \times \frac{22}{7} \times 3.5 \times 3.5$ ✓

$A = 15.4\ cm^2$ ✓

8. Determine the number of sides of a regular polygon whose sum of interior angles is 1440^0 (2marks)

Sum $= 180^\circ(n-2)$

$\frac{1440^\circ}{180^\circ} = \frac{180^\circ(n-2)}{180^\circ}$ ✓

$8 = n-2$

$n = 8+2$; $n = 10$ sides ✓

9. A shopkeeper made a loss of 20% by selling a trouser at Sh. 960. What profit would he have made if he had sold it at sh.1500 (3marks)

80% of B.P = S.P

$\therefore \frac{80}{100} \times B.P = 960$ ✓

$B.P = 960 \times \frac{100}{80}$

$= Kes.\ 1,200$ ✓

If S.P = Kes. 1,500

Profit $= 1,500 - 1,200 = 300$

$= Kes.\ 300$ ✓

10. A student spent $^2/_7$ of his pocket money on stationeries, a third on food-stuffs and $^5/_8$ of the remainder on transport. If he had Ksh. 150 left, how much pocket money did he have at the beginning? (3marks)

Let Pocket Money $= X$

$\therefore$ Stat. + Food $= \frac{2}{7}X + \frac{1}{3}X$

$= \frac{13}{21}X$

Trans. $= \frac{5}{8}(X - \frac{13}{21}X)$

$= \frac{5}{8} * \frac{8}{21}X =$

$= \frac{5}{21}X$ ✓

Total $\Rightarrow \frac{13}{21}X + \frac{5}{21}X = \frac{18}{21}X$

Rem. $\Rightarrow X - \frac{18}{21}X = \frac{3}{21}X$

But $\frac{3}{21}X = 150$ ✓

$X = 150 * \frac{21}{3}$

$X = Kes.\ 1,050$ ✓

11. Two bells ring at intervals of 35 and 42 minutes respectively. The bells ring together at 8:48 a.m. Determine the time when the bells will ring together again. (3 marks)

LCM ⇒ 2 | 35 42
3 | 35 21
5 | 35 7
7 | 7 7
1 1 ✓

∴ LCM = 2×3×5×7
= 210 min

$\frac{210}{60}$ = 3hr 30 min ✓

∴ Time = 8:48 a.m.
+3:30
11:78
+ 1←60
12:18 P.M ✓

12. A two-digit number is 18 more than the number formed by reversing the digits. If the sum of the digits is 10. Find the number. (3 marks)

Let No. be XY

∴ (10X+y) − (10y+X) = 18
10X+y−10y−X = 18
9X−9y = 18 ---(i) ✓
Also, X+y = 10 ---(ii)
Solving Simultaneously;

$\frac{1}{9}$(9X−9y = 18)
X+y = 10
+ X−y = 2 ✓
2X+0 = 12 , X = 6
∴ 6+y = 10 , y = 4
No. XY is 64 ✓

13. Evaluate; (3 marks)

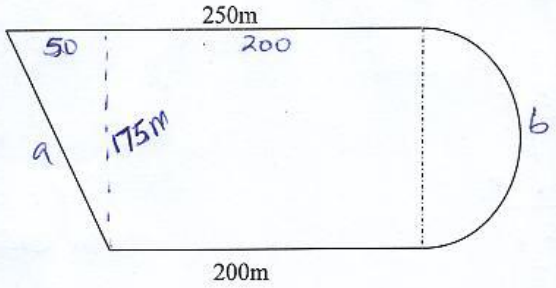
$14 \div \frac{1}{3} of\ 5\frac{1}{4} - 3\frac{3}{4} \times 1\frac{1}{3}$ ⇒ $\frac{1}{3} \times \frac{21}{4} = \frac{7}{4}$ ✓

⇒ $14 \div \frac{7}{4} - \frac{15}{4} \times \frac{4}{3}$ ⇒ $14 \times \frac{4}{7} = 8$
⇒ $\frac{15}{4} \times \frac{4}{3} = 5$ ✓

⇒
⇒ 8 − 5
= 3 ✓

SECTION II (30Marks)- Answer any THREE questions

14. The figure below represents a piece of land consisting of a trapezoidal region and a semi-circular end of radius 87.5m



a) Calculate

(i) The perimeter of the land (3marks)

$a^2 = 175^2 + 50^2$

$a = \sqrt{33,125}$

$a = 182.002\ m$ ✓

$b = \frac{1}{2} \times \frac{22}{7} \times 87.5\ m$

$b = 137.5\ m$ ✓

∴ Perimeter:

$= 182.002 + 250 + 137.5 + 200$

$P = 769.502\ m$ ✓

(ii) The area of the land in hectares (3marks)

$A_1 = \frac{1}{2} \times (250+200) \times 175$

$= \frac{1}{2} \times 450 \times 175$

$= 39,375\ m^2$ ✓

$A_2 = \frac{1}{2} \times \frac{22}{7} \times 87.5^2$

$= 12,031.25\ m^2$ ✓

Tot. A = 39,375 + 12,031.25

$= 51,406.25\ m^2$

Tot. A = $\frac{51,406.25}{10,000}$

$= 5.140625\ ha$ ✓

b) A private developer bought this piece of land at a price of Ksh400,000 per hectare and later sold the all land at 2.25 million shillings. Determine;

(i) The price at which he bought the whole piece of land (2marks)

B.P = $5.140625 \times 400,000$ ✓

$= Kes\ 2,056,250$ ✓

(ii) His percentage profit (2marks)

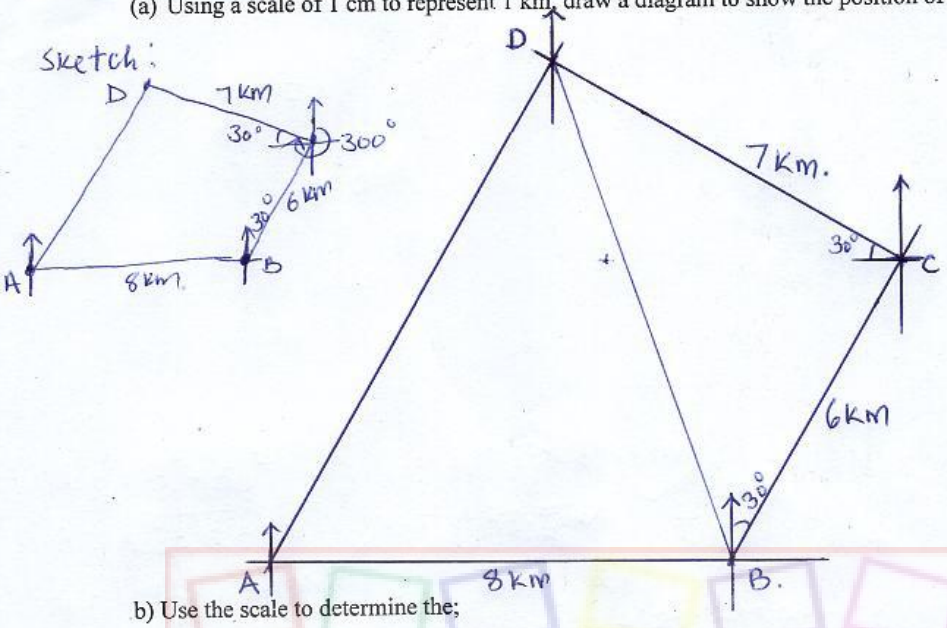
% Profit = $\frac{(2,250,000 - 2,056,250)}{2,056,250} \times 100$ ✓

$= 9.422\%$ ✓

15. The corner points A, B, C and D of a ranch are such that B is 8 km directly East of A and C is 6 km from B on a bearing of 030°. D is 7 km from C on a bearing of 300°.

(a) Using a scale of 1 cm to represent 1 km, draw a diagram to show the position of A, B, C and D. (4 marks)

Sketch:



b) Use the scale to determine the;

(i) compass bearing of A from D. (1 mark)

= S 30° W ✓

(ii) distance BD in kilometers. (2 marks)

BD = 9.2cm x 1km/cm ✓

= 9.2 km ± 0.1km ✓

(iii) bearing of D from B (1 mark)

340° or N 20° W ✓

(iv) perimeter of the ranch in kilometers. (2 marks)

AD = 10 km ± 0.1km ✓

P = 31 km ± 0.1 km ✓

∴ Perimeter = 8+6+7+10

16. a) A straight line L_1, whose equation is $3y - 2x = -2$ meets the x-axis at R. Determine the coordinates of R. (2 marks)

At x-axis, y = 0

∴ 3y - 2x = -2

0 - 2x = -2

$\frac{-2x}{-2} = \frac{-2}{-2}$ ✓

X = 1

∴ R is (1, 0) ✓

b) A second line L_2 is perpendicular to L_1 at R. Find the equation of L_2 in the form $y = mx + c$, where m and c are constants. (3 marks)

$m_1 = \frac{2}{3}$, $m_1 m_2 = -1$

$\therefore \frac{2}{3} \cdot m_2 = -1$

$m_2 = -\frac{3}{2}$ ✓

using $(1,0)$ (x,y)

$L_2 \Rightarrow \frac{y-0}{x-1} = -\frac{3}{2}$ ✓

$y = -\frac{3}{2}(x-1)$

$y = -\frac{3}{2}x + \frac{3}{2}$ ✓

a) A third line L_3 passes through (-4, 1) and is parallel to L2.Find:

(i) the equation of L_3 in the form $y = mx + c$, where m and c are constants. (2 marks)

$m_2 = m_3 = -\frac{3}{2}$

Using $(-4,1)$ (x,y)

$\frac{y-1}{x+4} = -\frac{3}{2}$ ✓

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

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

$y = -\frac{3}{2}x - 5$ ✓

(ii) The coordinates of a point S, at which L_1 and L_3 intersects (3 marks)

$L_1 \Rightarrow \frac{2}{3}x - \frac{2}{3} = y$

$L_3 \Rightarrow -\frac{3}{2}x - 5 = y$

At Intersection,

$\frac{2}{3}x - \frac{2}{3} = -\frac{3}{2}x - 5$ ✓

$\frac{2}{3}x + \frac{3}{2}x = -5 + \frac{2}{3}$

$\frac{6}{13} \cdot \frac{13}{6}x = -\frac{13}{3} \cdot \frac{6}{13}$

$x = -2$ ✓

$\therefore y = \frac{2}{3}(-2) - \frac{2}{3}$

$y = -\frac{4}{3} - \frac{2}{3}$

$y = -2$

$\therefore S(-2,-2)$ ✓

17. A cylindrical tank of diameter 3.6m and height 2.5m internally is two-thirds full of juice.

a) Calculate the volume of the juice in litres. (3 marks)

$V = \frac{2}{3} \times \frac{22}{7} \times 1.8^2 \times 2.5$

$= 16.97143\ m^3$ ✓

$1\ m^3 = 1000\ l$

$\therefore V = 16.97143 \times 1000$ ✓

$= 16,971.43\ l$ ✓

c) The juice is packed in small packets measuring 8cm by 5cm by 12cm. A packet retails at Kes. 40. Calculate;

i) the capacity of each packet in cm^3 (2 marks)

$V = 8 \times 5 \times 12 \ cm^3$ ✓

$= 480 \ cm^3$ ✓

ii) the number of full packets obtained (3 marks)

$1 \text{ Pct} = 480 \ cm^3 = \frac{480 \ ml}{1000}$

$= 0.48 \ l$ ✓

$\therefore$ no. of Pcts $= \frac{16,971.43}{0.48}$ ✓

$= 35,357.145$

Full Pcts $= 35,357$ ✓

iii) the amount of money realized from the sale of the juice (2 marks)

Sales $= 35,357 \times 40$ ✓

$=$ Kes. $1,414,280$ ✓

18. Triangle PQR has vertices P(3,2), Q(-1,1) and R(-2,-1).

(a) Draw PQR on the grid provided. (1mark)

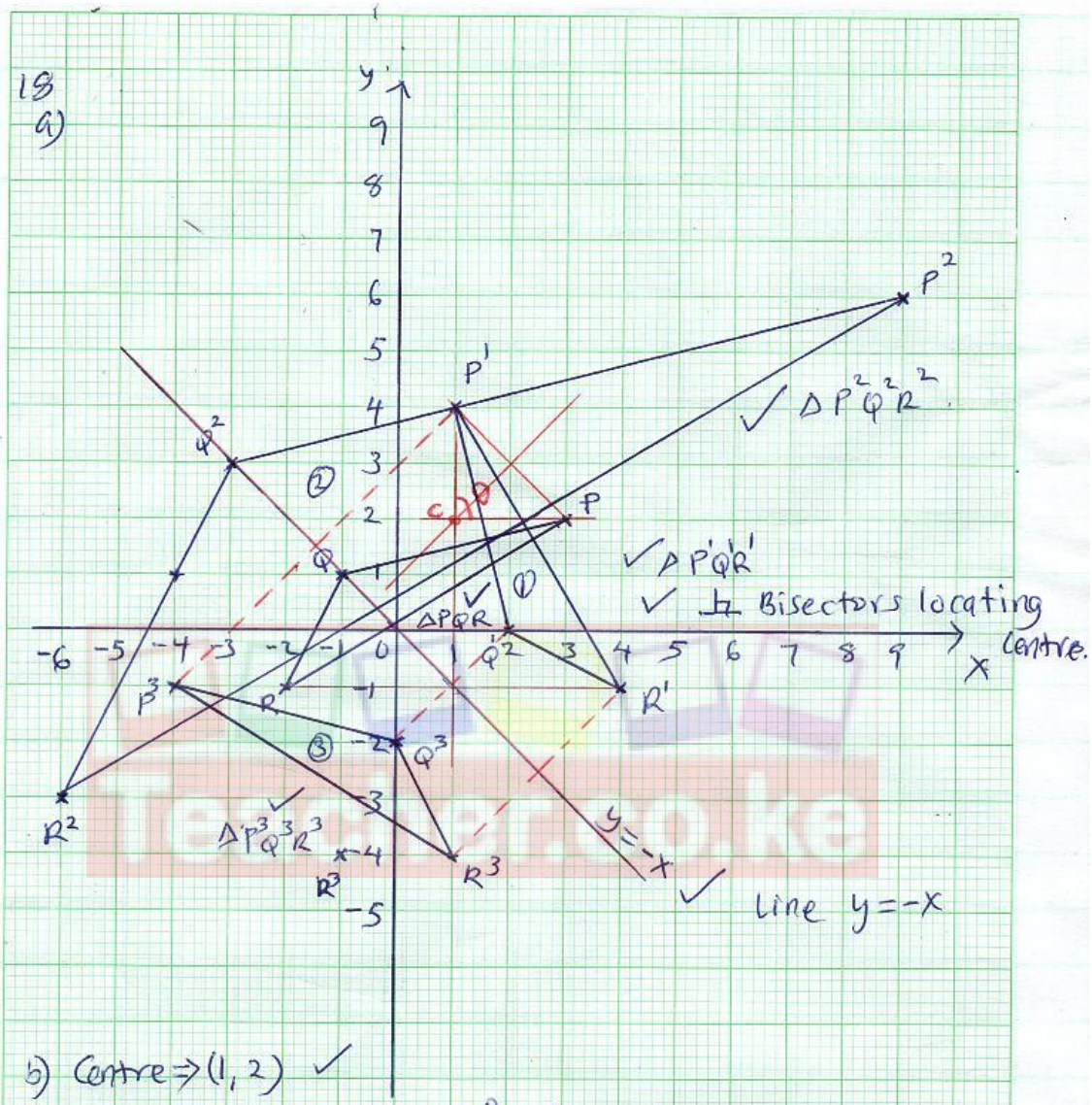
(b) Under a rotation the vertices of $P^1Q^1R^1$ are $P^1(1,4)$, $Q^1(2,0)$ and $R^1(4,-1)$. Find the centre and angle of rotation using points P and Q. (4marks)

(c) Triangle PQR is enlarged with scale factor 3 centre O (0,0) to give triangle $P^2Q^2R^2$. Draw triangle $P^2Q^2R^2$ and state its co-ordinates. (2marks)

(d) Triangle $P^1Q^1R^1$ undergoes reflection in line $y = -x$ to give triangle $P^3Q^3R^3$. Draw $P^3Q^3R^3$ and state its coordinates. (3armks)

18

a)



b) Centre ⇒ (1, 2) ✓

θ = Angle of rotation = 90° ✓

c) $P^2(9,6)$ $Q^2(-3,3)$ $R^2(-6,-3)$ ✓

d) $P^3(-4,-1)$ $Q^3(0,-2)$ $R^3(1,-4)$ ✓