PRESIDENT'S OFFICE
REGIONAL ADMINISTRATION AND LOCAL GOVERNMENT
MTAMA DISTRICT COUNCIL

FORM FOUR DISTRICT PROFICIENCY TEST FEBRUARY, 2024

041 **BASIC MATHEMATICS**

MARKING SCHEME

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1(a) By using the concept of L.C.M **(0.5 mark)**
Given the time intervals for four bells
$56 = 2 \times 2 \times 2 \times 7$
$70 = 2 \times 5 \times 7$
(1 marks)
$2 \times 2 \times 2 \times 5 \times 7 = 700 minutes$

The L.C.M for the time intervals is $700 minutes$
After $700 minutes$ they will both light flashes on to gather.
$1\ hour = 60 minutes$ **(0.5 mark)**
$360 minutes = 6 hours$
The time started to toll is $7{:}28 AM$
$7{:}28\ a.m + 6 hours = 1328 hours$ (1 marks)
They toll together at $1328 hours$ or $01{:}28\ p.m$
(b)Let x be the total amount of money at the beginning (0.5 marks)
Chocolate $\frac{1}{4}x$
$Remaining\ \ amount\ x - \frac{1}{4}x = \frac{3}{4}x$ (1 marks)
Ice cream $\frac{2}{3} \times \frac{3}{4}x = \frac{1}{2}x$,
Remaining + Ice cream +Chocolate = x
$\frac{1}{2}x + \frac{1}{4}x + 42,000 = x$
$\frac{x-2x-x}{4} = 42,000$ (0.5 marks)
then
$\frac{x}{4} = 42,000$
$x = 168,000$

The amount of money she had at the beginning is $168,000/-$ (1 marks)

2(a)Given that $25(2^{logx}) = x$

Apply log in both side

$\log(25(2^{logx}) = logx$ **(1 mark)**

$\log 25 + \log 2^{logx} = logx$

$\log 25 + logx \log 2 = logx$

$\log 25 = logx - logx \log 2$

$\log 25 = logx(1 - log2)$ **(1 mark)**

$\log 25 = logx(\log log \frac{10}{2})$

$\frac{\log log 5^2}{log5} =$, $2 = logx$, change into exponential form

$x = 10^2 = 100$ **(1 mark)**

$x = 100$

(b)Given that $\frac{1}{3\sqrt{2} - 2\sqrt{3}}$. ,

Rationalizing factor $3\sqrt{2} + 2\sqrt{3}$ **(0.5 mark)**

$\left(\frac{1}{3\sqrt{2} - 2\sqrt{3}}\right) \times \left(\frac{3\sqrt{2} + 2\sqrt{3}}{3\sqrt{2}+2\sqrt{3}}\right)$. **(1 mark)**

$\frac{3\sqrt{2} + 2\sqrt{3}}{18 - 12}$, $\frac{3\sqrt{2} + 2\sqrt{3}}{6}$ **(0.5 mark)**

$\therefore \frac{3\sqrt{2} + 2\sqrt{3}}{6}$ **(1 mark)**

3(a)Given that $\varepsilon = \{x: -3 \leq x < 10\}$, $A = \{x: -1 \leq x < 5\}$ and

$B = \{x: x \ is \ a \ whole \ number \ less \ than \ or \ equal \ to \ nine\}$ $number \ of \ subset \ of \left(A^c \cap B\right)$?

$\varepsilon = \{x: x = -3, -2, -1, 0, 1, 2, 3, 4, 5, 6, 7, 8\}$

$A = \{x: x = -1, 0, 1, 2, 3, 4.\}$

$A^c = \{x: x = -3, -2, 5, 6, 7, 8, 9\}$ **(1 mark)**

$B = \{x: x = 0, 1, 2, 3, 4, 5, 6, 7, 9.\}$

$A^c \cap B = \{x: x = 5, 6, 7, 9\}$ **(1 mark)**

From

Number of subset = 2^n but n = 4 **(0.5 mark)**

Number of subset = $2^4 = 64$

The number of subset of $A^c \cap B = 64$ **(0.5 mark)**

3(b) Let $x \ be \ the \ Exterior$

$The \ interior = 108^\circ + x$ **(1 mark)**

$interior + Exterior = 180^\circ$

$108^\circ + x + x = 180^\circ$

$2x = 180^{\circ} - 108^{\circ}$

$2x = 72^{\circ}$

$x = 36^{\circ}$

$Exterior\ Angle\ is = 36^{\circ}$ **(1 mark)**

From

$Exterior\ Angle = \frac{360^{\circ}}{number\ of\ side}$

$Number\ of\ side = \frac{360^{\circ}}{Exterior\ Angle}$

$Number\ of\ side = \frac{360^{\circ}}{72} = 10$

The polygon have 10 sides **(1 mark)**

4.(a) soln

From

4y-3x-18=0

Where y = 6

X= k 1 mark

4(6)-3(k)-18=0

24-18-3k=0 1 mark

6-3k=0

K=2. 1 mark **(3 MARKS)**

4(b) Given $2^{x+5} = \left(\frac{1}{2}\right) \times 32^{-x}$

$2^{x+5} = 2^{-1} \times (2^{5})^{-x})$ **(1 mark)**

$2^{x+5} = 2^{-1} \times 2^{-5x}$

$2^{x+5} = 2^{-5x+-1}$ **(1 mark)**

$x + 5 = -5x - 1$

$6x = -6$

$x = -1$ **(1 mark)**

5(a) Consider the triangle ABC is Similar to triangle PQR

(1 mark)

$5cm$ $6cm$ $18cm$

B C

$4cm$ Q R

Take the ratio of corresponding sides :

$\frac{\overline{PQ}}{\overline{AB}} = \frac{\overline{PR}}{\overline{AC}} = \frac{\overline{QR}}{\overline{BC}}$ **(1 mark)**

$\frac{\overline{PQ}}{5cm} = \frac{\overline{QR}}{4cm} = \frac{18cm}{6cm}$

$\frac{\overline{PQ}}{5cm} = 3$, $\overline{PQ} = 15cm$ and $\frac{\overline{QR}}{4cm} = 3$, $\overline{QR} = 12cm.$

$\therefore The\ length\ of\ the\ other\ sides\ are\ 15cm\ \ and\ 12cm$ **(1 mark)**

(b) Identify the corresponding sides

$\overline{AB}$ is corresponding to $\overline{PQ}$

$\overline{AC}$ is corresponding to $\overline{PR}$ This corresponding sides are equal **(1 mark)**

$\overline{BC}$ is corresponding to $\overline{QR}$

Corresponding angle .

$< ABC$ is corresponding $< PQR$

$< ACB$ is corresponding $< PRQ$ This corresponding angles are equal **(1 mark)**

$< BAC$ is corresponding $< QPR$

$\Delta ABC \approx \Delta PQR$ **(1 mark)**

6(a) let n be number of tiles and l be the length of a side of a tiles.

$n\ \alpha\ \frac{1}{l^2}$, $n = \frac{k}{l^2}$

$k = nl^2$ **(1 mark)**

Given that $n =$ 2016 and $l = 0.4$ m

$k = 2016 \times (0.4)^2$

$k = 322.56$

Constant $(k) = 322.56$ **(1 mark)**

From

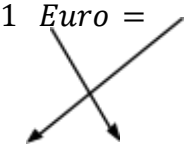
$n = \frac{k}{l^2}$, $n = \frac{322.56}{(0.3)^2} = 3584,$

The number of tiles required for 0.3 m are 3584 **(1 mark)**

(b) Given the cost of Radio in USA is US dollar 650 and in London Euro is 450

Convert the Cost of Radio in USA dollars into Euro

$1\ Euro = 2.45\ US\ dollars$



(1 mark)

$? = 650\ US\ dollars$

$650\ US\ dollars = 265.31\ Euro.$ **(1 mark)**

Then $450\ Euro. - 265.31\ Euro = 184.69\ Euro.$

The difference of the cost of Radio in USA and London is $184.69\ Euro.$ **(1 mark)**

7(a) Buying Price $20,000/ =$

$\%\ loss$ is $15\ \%$

From:-

loss made = $\frac{Loss\ made}{Buying\ price} \times 100\%$ **(0.5 mark)**

$15\ \% = \frac{Loss\ made}{20{,}000} \times 100\%$

$Loss\ made = \frac{20{,}000 \times 15\ \%}{100\%}$

$Loss\ made = 3{,}000/$ **(0.5 mark)**

From Selling Price = Buying price - Loss made

Selling Price = 20,000/ - 3,000/- = 17,000/- **(0.5 mark)**

$\therefore The\ Selling\ Price\ is\ 17{,}000/ -$ **(0.5 mark)**

7(b)(i) Purchases

Cost of goods available for sale = Opening stock + Net purchase.

Also:-

Cost of goods sold (Cost of sales) = Cost of goods available for sale - Closing stock.

Purchases (Net Purchases) = Closing stock +Cost of Sales – opening stock

Closing stock = $\frac{20 \times 255{,}000}{100} = 51{,}000/$

Cost of Sales = $\frac{75}{100} \times 340{,}000 = 255{,}000/$ **(1 mark)**

Purchases (Net Purchases) = $51{,}000 -+255{,}000 - 90{,}000 = 216{,}000.$

Purchases is $216{,}000.$ **(0.5 mark)**

(ii) Cost of Sales

Cost of Sales = $\frac{75}{100} \times 340{,}000 = 255{,}000/$ **(0.5 mark)**

(iii) Closing stock……is .20% of cost of goods sold .

$\frac{20 \times 255{,}000}{100} = 51{,}000/$ **(0.5 mark)**

Closing stock is $.51{,}000/$

(iv)Expenses

Expenses = Gross profit - Net profit.
Also
Gross profit = sales - Cost of sales
Gross profit = 340,000 - 255,000 = 85,000 **1 mark)**
Gross profit = 85,000
Net profit is . 20% of sales.
Net profit = $\frac{20}{100} \times 340,000 = 68,000/$
Net profit is $68,000$
Expenses = 85,000 - 68,000=17,000.
$\therefore The\ Expenses\ is\ 17,000$ **(0.5 mark)**

8(a) Given that

$$A_1 + 6d = 27 \ldots\ldots\ldots\ldots\ldots\ldots\ equation(i)$$

(0.5 mark)

$$A_1 + 9d = 60 \ldots\ldots\ldots\ldots\ldots\ldots\ equation(ii)$$

mark)

Solve two equation simultaneous .

$$A_1 = 27 - 6d \ldots\ldots\ldots\ldots\ldots\ldots\ equation(ii)$$

$$27 - 6d + 9d = 60$$

$$3d = 60 - 27$$

$3d = 33$ **(0.5 mark)**

$$d = 11$$

From

$$A_1 = 27 - 6d \ldots\ldots\ldots\ldots\ldots\ldots\ equation(ii)$$

$$but\ d = 11$$

$$A_1 = 27 - 66$$

$A_1 = -33$ **(0.5 mark)**

$\therefore The\ first\ term\ of\ Progression\ is\ -33\ and\ common\ difference\ is\ 11$

(0.5 mark)

(b) Principal (p) = 2,000,000. Rate(R) = 8% $n = 2$
From

$A_n = P\left(1 + \frac{RT}{100}\right)^n$ **(0.5 mark)**

$A_2 = 2,000,000\left(1 + \frac{8\times1}{100}\right)^2$

$A_2 = 2,000,000\ (1 + 0.08)^2$ **(1 mark)**

A_2=$2,000,000\ (1.08)^2$

$A_2 = 2,000,000 \times 1.1664 = 2,332,800$

The money that will be accumulated after two years is $2,332,800$ **(0.5 mark)**

(ii) From $A_2 = P + I$ **(0.5 mark)**

$2,332,800 = 2,000,000 + I$

$I = 2,332,800 - 2,000,000 = 332,800.$ **(0.5 mark)**

The interest after two years is $4,040,000$**.** **(1 mark)**

9.(a) Let x be the distance to be covered

Consider the diagram below

(1 mark)

$500m = 0.5km$ **(0.5 mark)**

From $Sin\theta = \frac{OPPOSITE}{HYPOTENUS}$, $Sin30^0 = \frac{x}{0.5km}$ **(0.5 mark)**

$Sin30^0 = 0.5$ **(0.5 mark)**

$x = 0.5km \times 0.5,$

$x = 0.25km.$

Mwanahawa will walk $0.25km$ to reach to the top of the building **(0.5 mark)**

(b)Given $\frac{a}{b} = \sqrt{3}$,then $a = \sqrt{3}$ and $b = 1$, substitute into **(1 mark)**

$\frac{a^2-b^2}{a^2+b^2} = \frac{(\sqrt{3})^2-1^2}{(\sqrt{3})^2+1^2} = \frac{3-1}{3+1}$ **(1 mark)**

$\frac{2}{4} = \frac{1}{2}$

$\frac{(\sqrt{3})^2-1^2}{(\sqrt{3})^2+1^2} = \frac{1}{2}$ **(1 mark)**

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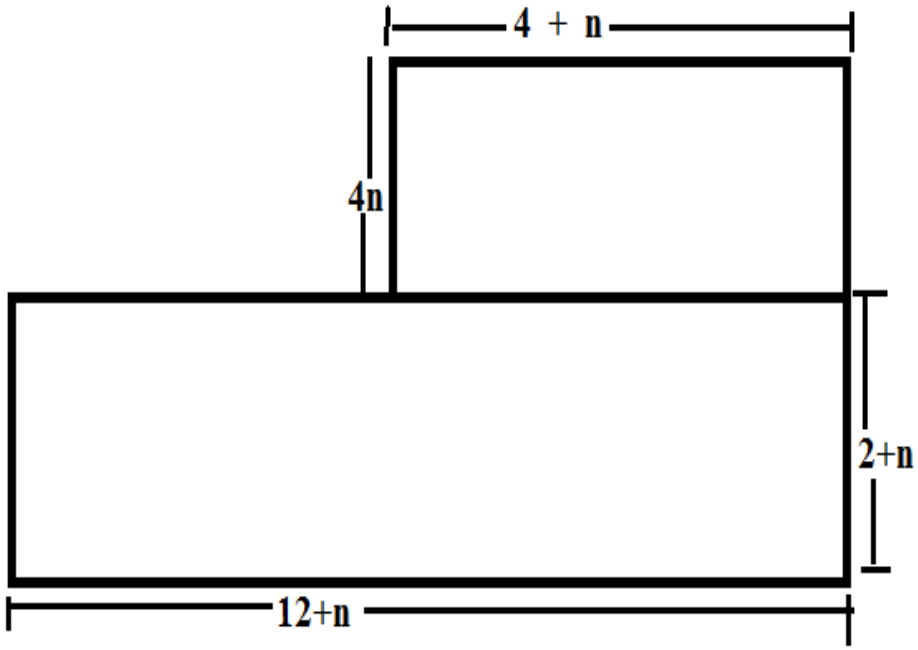
10. Let n a certain number.

(a)Diagram



(2 mark)

$= (2 + n)(12 + n) = n + 14n + 24$. **(1 mark)**

Area of down of stair is $n^2 + 14n + 24$

(c) Given the total area of the stairs is $104cm^2$

Total area of the stairs =Area of a down of stair + Area of a upper of stair **(1 mark)**

$$4n^2 + 4n + n^2 + 14n + 24 = 104cm^2$$

$$5n^2 n^2 + 14n + 24 = 104cm^2$$

(1 mark)

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11. (a)(i) Consider the frequency distribution table below .

$A = 35.5$ **(0.5 mark)**

(1 mark)	**(1 mark)**	**(1mark)**	**(1 mark)**	**(1 mark)**
Class interval	Class mark(x)	Frequency (f)	Deviation$(d = x - A)$	$\sum(fd)$

$1-10$	5.5	2	-30	-60
$11-20$	15.5	5	-20	-100
$21-30$	25.5	5	-10	-50
$31-40$	35.5	9	0	0
$41-50$	45.5	5	10	50
$51-60$	55.5	4	20	80
$61-70$	65.5	5	30	120
$71-80$	75.5	3	40	120
$81-90$	85.5	2	50	100
		$\sum f = 40$		$\sum(fd) = 260$

(ii)From the frequency distribution table above

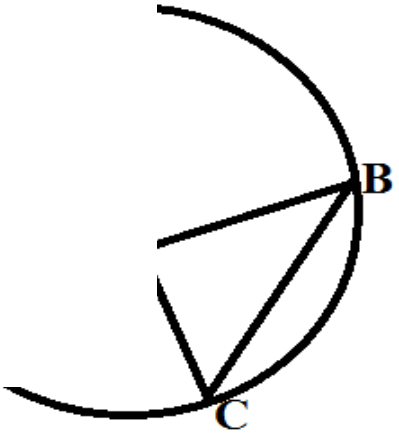
$Mean = A + \frac{\sum(fd)}{\sum f}$ **(0.5 mark)**

$Mean = 35.5 + \frac{260}{40}$

$= 35.5 + 6.5 = 42$ **(0.5 mark)**

$Mean\ is\ 42.$ **(0.5 mark)**

(b)Consider the figure below



Given that $\angle ABC = 65^{\blacksquare}$

$\angle AOC = 2\angle ABC(Angle\ at\ the\ centre\ of\ a\ circle\ \ and\ subtended\ arc)$ **(1 mark)**

$\angle AOC = 135^{\blacksquare}$

$\angle AOC\ reflex = 360^{\blacksquare} - 135^{\blacksquare}$ **(0.5 mark)**

$\angle AOC\ reflex = 225^{\blacksquare}$

$\therefore\ \angle AOC\ reflex = 225^{\blacksquare}$ **(0.5 mark)**

12.(a)Given that

Length of an arc of πcm , Central angle of $\frac{\pi}{6}$ is 6cm

Required to show that radius of a circle (r) = is 6cm

From

Length of an arc = $\frac{\pi r\theta}{180}$ or

Radius = $\frac{180 \times Length\ of\ an\ arc}{\pi\theta}$ **(0.5 mark)**

,r= $\frac{\pi cm \times 180}{\pi \times \frac{\pi}{6}}$

r = $\frac{6cm \times 180}{\pi}$, and $\pi = 180$ **(1 mark)**

r= $\frac{6cm \times 180}{180}$= 6cm

$r = 6cm$ shown **(0.5 mark)**

(b) Consider the figure below

Towns	Latitude	Longitude
Dar es Salaam	60^0S	30^0E
Dodoma	50^0S	30^0E

Since two town are on the same Longitude and difference in Latitude.

Determine the distance in Nautical mile$(nm) Distance = \frac{(60^0 - 50^0) \times 60\ nm}{1^\circ} = 600\ nm$ **(1 mark)**

The distance from Dar es Salaam to Mtwara is $600\ nm$ **(0.5 mark)**

Speed = $80 knots = 80 \frac{nm}{hrs}$ **(0.5 mark)**

Speed = $\frac{Distance}{Time}$ **(0.5 mark)**

Also

Time = $\frac{Distance}{Speed} = \frac{600nm}{80\frac{nm}{hrs}} = 7.5 hours = 7hrs\ and\ 30\ minutes$ **(1 mark)**

Time used from Dar es Salaam to Dodoma is $7hrs\ and\ 30\ minutes$.

(c) Since the ship sails due east the latitude does not change and difference in Longitude. **(1 mark)**

Consider the figure below

Points	Latitude	Longitude
A	40^0S	28^0E
B	40^0S	x

Determine the distance in Nautical mile$(nm) Distance$ =

$\frac{(x^0 - 28^0) \times cos cos\, 40 \times 60\, nm}{1^\circ} = 600\, nm$ **(1 mark)**

$40 = 0.7660$ **(0.5 mark)**

$$\frac{(x^0 - 28^0) \times 0.7660 \times 60\, nm}{1^\circ} = 1000nm$$

$$(x^0 - 28^0) \times 45.96 = 1000nm$$ **(1 mark)**

$$x^0 - 28^0 = 21.8^0$$

$$x = 49.8^0 E \approx 50^0 E$$

The new latitude is $40^0 S$ *and longitude is* $50^0 E$ **(1 mark)**

(b)Solve by elimination

Solve for x eliminate y

$1 \quad 3x + 2y = 4$

$2 \quad 2x - y = 5$ **(1 mark)**

$3x + 2y = 4$

$+ \quad 4x - 2y = 10$

$7x = 14$

$x = 2$ **(0.5 mark)**

Solve for y eliminate x

$2 \quad 3x + 2y = 4$

$3 \quad 2x - y = 5$ **(1 mark)**

$6x + 4y = 8$

$+ \quad 6x - 3y = 15$

$7y = -7$

$y = -1$ **(0.5 mark)**

(x, y) = (2,-1).

(b) Given the point (0,6) to (0,10).

(0,6) (0,4) (0,10).

(2,-3) (0,4) (2+0,-3+4). **(1 mark)**

(2,-3) (0,4) (2,-1). **(1 mark)**

(c) Given the object P $(2, -3)$ is reflected along line $y = x$
Consider the graph below

s

0.5Mark

0.5mark

1mark

0.5 Mark

0.5 mark

1mark

1 mark

l

Domain $= \{All\ \ real\ number\ of\ x\}$
Range $= \{All\ \ real\ number\ of\ y\}$ **(0.5 @ mark)**

(b) Table value **(0.5 @ mark)**

$y = 2x \ \ if\ x \leq -1$

x	-1	-2	-3	-4	-5	-6	→
$y = 2x$	-2	-4	-6	-8	-10	-12	→

$y = x - 1 \ \ if\ -2 \leq x < 3$

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

$y = 2 \ if\ x > 1$

x	2	3	4	5	6	→
$y = 2$	2	2	2	2	2	→

0.5 mark

1 mark

1 mark

0.5 mark

1 mark

$$f(-\ 6.28) = 2\times\ -\ 6.28$$

$$=-\ 12.56$$

$f(-\ 2\pi) =-\ 12.56$ **0.5 mark)**

(iii) The function $f(x)$ is a step function **0.5 mark)**