

FORM TWO
BASIC MATHEMATICS EXAMINATION.
MARKING SCHEME

SECTION A.

1 (a) Mathematics is the study of numbers, quantities, shapes and patterns and how they relate to each other. (0.21)

(b) i) Counting skills: This is ability to determine the number of items. Example Counting money when buying something in a shop to make sure you pay the correct amount. (0.15)

ii) Measuring: This involves finding the size, length, weight or volume of something. Example measuring ingredients like flour or sugar when cooking to get the right recipe. (0.15)

iii) Estimating: This means making a quick and reasonable guess of a value without exact calculation. Example Estimating how much money you need before going to the market. (0.15)

iv) Problem Solving: This is using mathematical thinking to find solutions to real-life situations. Example Figuring out how to divide food equally amongst friends. (0.15)

v) Data Handling: This involves collections, organization and interpreting information. Example Recording daily expenses and analyzing where most of your money is spent. (0.15)

2 (a) Solution.

Data Given.

$$\text{Area (A)} = \frac{25}{484} \pi \text{ m}^2 \rightarrow \text{to determine diameter}$$

$$\text{From } A = \pi r^2, \text{ but } d = 2r$$

$$\pi r^2 = \frac{25}{484} \pi$$

$$\sqrt{r^2} = \sqrt{\frac{25}{484} \text{ m}^2} = \frac{5}{22} = 0.23 \text{ m} \quad (0.2)$$

2 (a) $r = 0.23 \text{ m}$

$d = 2r$

$d = 0.23 \text{ m} \times 2$

$d = 0.46 \text{ m}$

$\therefore$ The diameter in decimal is 0.46 m

(02)

(b) Solution

Data given

total distance = x

Speed = 40 km/h

Time = 4 hrs for whole journey

First place (case I)

$d = \frac{\text{speed} \times \text{time}}{\text{speed}}$, distance = $\frac{2}{3}x$, $t = x$, speed = 30 km/h

time = $\frac{\text{distance}}{\text{speed}} = \frac{\frac{2}{3}x}{30} = \frac{x}{45}$

time = $\frac{x}{45}$ — (i) (01)

Second place (case II)

$s = \frac{d}{t}$, $t = \frac{d}{s}$, $t = \frac{\frac{1}{3}x}{40 \text{ km/hr}} = \frac{x}{120 \text{ km/hr}}$

time = $\frac{x}{120 \text{ km/hr}}$ — (ii) (01)

total time

take (i) equation add second equation (ii)

$\frac{x}{45} + \frac{x}{120} = \frac{8x + 3x}{360} = \frac{11x}{360}$

then

time for whole journey = 4 hours

$\frac{11x}{360} = \frac{4}{1}$

$11x = 360 \times 4$

$11x = 1440$

$x = \frac{1440}{11}$

$x = 130.909 \text{ km}$

$\therefore$ The total distance

is 130.909 km (03)

3

(a) SolutionData given and required. $\frac{7}{25}$ to his son $\frac{2}{9}$ of the remaining to his daughter

rest to his wife = 11,990,300.

To determine total amount = ? x $\frac{7}{25} x \rightarrow$ son.

$$x - \frac{7}{25} x = \frac{18}{25} x \rightarrow \text{remaining} \quad (01)$$

$$\frac{2}{9} \times \frac{18}{25} x = \frac{36}{225} x = \frac{4}{25} x \rightarrow \text{daughter.}$$

$$\frac{18x}{25} - \frac{4x}{25} = \frac{14x}{25} \rightarrow \text{wife.} \quad (01)$$

then

$$\frac{14x}{25} = 11,990,300$$

$$x = 11,990,300 \times \frac{25}{14} \quad (01)$$

$$x = 21,411,250$$

 $\therefore$ Nearest ten thousand

$$\underline{21,410,000 \text{ Tshs}} \quad (02)$$

(b) Daughter $\rightarrow \frac{4}{25} x \quad (01)$

$$\frac{4}{25} \times 21,411,250 = 3,425,800$$

 $\therefore$ The Nearest thousands = 3,425,800 $\approx$

$$\underline{3,426,000 \text{ Tshs.}} \quad (04)$$

4 (a) Solution.

From

$$\frac{a}{b} = \frac{b}{c} \quad \text{let } a = 2n^2, b = 3n^2 \text{ and } c = \frac{b^2}{a}$$

$$c = \frac{(3n^2)^2}{2n^2} = \frac{9n^4}{2n^2} = \frac{9}{2} n^2 \approx 4.5n^2$$

$\therefore$ The third portion is $4.5n^2$ (05)

(b) Ratio $x:y = 2:4:1$

$$x = 8 \text{ kg}$$

$$\text{then } 2+4+1 = 7$$

$$x = \frac{8 \text{ kg}}{2} = 4 \text{ kg}$$

$$\text{Then } 4 \text{ kg} \times 7 = 28 \text{ kg}$$

$\therefore$ The mass is 28 kg required. (05)

5 (a) Solution.

Data given and required.

let x be Price of marker Pen

y be Price of correction Fluid

then equations.

$$\text{1st order: } 50x + 20y = 40,000 \text{ Tshs} \quad \text{--- (i)}$$

$$\text{2nd order: } 10x + 20y = 24000 \text{ Tshs} \quad \text{--- (ii)}$$

$\therefore$ The system of simultaneous equation is

$$\begin{cases} 50x + 20y = 40,000 & \text{--- (i)} \\ 10x + 20y = 24000 & \text{--- (ii)} \end{cases} \quad (05)$$

(b) cost of marker Pen box and correction Fluid box.

$$\begin{cases} 50x + 20y = 40,000 & \text{--- (i)} \\ 10x + 20y = 24000 & \text{--- (ii)} \end{cases}$$

10	$50x + 20y = 40,000$	=	$500x + 200y = 400,000$
50	$10x + 20y = 24000$	=	$500x + 1000y = 1200000$

5

(b)

$$-500x + 500x - 200y + 1000y = -400,000 - 1,200,000$$

$$\frac{800y}{800} = \frac{800,000}{800}$$

$$y = 1000 \text{ Tshs}$$

Then take ① to determine x

$$50x + 20y = 40,000$$

$$50x + (20 \times 1000) = 40,000$$

$$50x + 20,000 = 40,000$$

$$50x = 40,000 - 20,000$$

$$\frac{50x}{50} = \frac{20,000}{50}$$

$$x = 400 \text{ Tshs}$$

∴ The cost of marker Pen box is 400 Tshs and the correction Fluid box is 1000 Tshs

(05)

6

(q)

Solution

From

$$\frac{x}{a} + \frac{y}{b} = 1$$

Substitute Point (4, -2)

$$\frac{4}{a} + \frac{-2}{b} = 1 \quad \text{--- (i)}$$

Substitute Point (-2, -5)

$$\frac{-2}{a} + \frac{-5}{b} = 1 \quad \text{--- (ii)}$$

then times ab to ① and ②

$$4b - 2a = ab$$

$$-2b - 5a = ab$$

equate

$$4b - 2a = -2b - 5a$$

$$6b + 3a = 0$$

$$a = -2b \quad \text{--- (iii)}$$

6 (a) substitute equation (iii) to equation (i) and (ii)

Now (i)

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

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

$$\frac{-4}{b} = 1$$

$$\underline{b = -4}$$

(ii) but $b = -4$

$$-2b = -2x - 4 = 8$$

$$\text{then } a = \underline{8}$$

$\therefore$ The values of a and b is
8 and -4 respectively.

(05)

(b) From

$$\frac{x}{2} + \frac{y}{2} = 1 \quad \text{but } x + y = 2$$

$$(1+y) + y = 2$$

$$1 + 2y = 2$$

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

$$x = 1 + \frac{1}{2} = \frac{3}{2}$$

$$\therefore \text{Then } x = \frac{3}{2} \text{ and } y = \frac{1}{2} \quad (05)$$

7 (a) Solution.

A = 5 hours, B = 4 hours and C = 10 hours

then

$$\text{Rate} = \frac{1}{5} + \frac{1}{4} + \frac{1}{10} = \text{LCM} = 20$$

$$= \frac{4}{20} + \frac{5}{20} + \frac{2}{20} = \frac{11}{20}$$

$$\text{time} = \frac{1}{\frac{11}{20}} \approx 1:49 \text{ minutes}$$

$\therefore$ The time is 1 hour and 49 minutes. (04)

6

(b)
$$\begin{cases} \frac{x}{2} + \frac{y}{2} = 1 \\ x = 1 + y \end{cases}$$
 Solution.

The equation make it in simplest form.

$$\frac{x}{2} + \frac{y}{2} = 1, \quad = 2 \times \frac{x}{2} + \frac{y}{2} \times 2 = 1 \times 2$$

$$= x + y = 2 \quad \text{--- (1)}$$

$$x = 1 + y$$

$$x - y = 1 \quad \text{--- (2)} \quad (01)$$

combine

$$\begin{cases} x + y = 2 \\ x - y = 1 \end{cases}$$

Then,

x	0	+1
y	1	0

$$x + 0 = 2 \quad \text{and} \quad 0 + y = 2$$

$$x = 2$$

$$y = 2$$

$$x - y = 1 \quad \text{and} \quad x - 0 = 1$$

$$0 - y = 1$$

$$x = 1$$

$$x (1.5) \text{ and}$$

$$y (0.5)$$

$$y = -1$$

$$\therefore \text{Points } (1.5, 0.5) \quad (02)$$

7. (a) Solution.

$$\text{Pump A} = 5 \text{ hrs}$$

$$\text{Pump B} = 4 \text{ hrs}$$

$$\text{Pump C} = 10 \text{ hrs}$$

Then

$$\text{Pump A} = \frac{1}{5}$$

$$\text{Pump B} = \frac{1}{4}$$

$$\text{Pump C} = \frac{1}{10}$$

Total.

$$\frac{1}{5} + \frac{1}{4} + \frac{1}{10} =$$

LCM 20

$$\frac{4}{20} + \frac{5}{20} + \frac{2}{20} = \frac{11}{20}$$

$$\frac{11}{20} \text{ means that in one hour}$$

$$7 \quad (a) \quad \frac{1}{11/20} = \frac{20}{11}$$

$$= 1.82 \text{ hrs} \approx 1:49$$

$\therefore$ The time is One hour and Forty nine minutes 1hr 49min. (04)

(b) i, From 0ft to 5 (thousand feet) For 4 minutes

$$\text{Rate} = \frac{5-0}{4-0}$$

$$= 1.25$$

$\therefore$ 1.25 thousand feet Per minute. (02)

ii, From E 6.5 thousand feet to F 4.5 thousand feet

$$\text{time taken} = 15 - 13 = 2$$

$$\text{Rate} = \frac{4.5 - 6.5}{2}$$

$$= \frac{-2}{2}$$

$$= -1$$

$\therefore$ -1 thousand feet Per minute. (02)

iii, Is Negative, because the Plane is descending its altitude is decreasing. (02)

$$8 \quad (a) \quad i, \quad \frac{x^2}{(1\frac{1}{2} - x)(2 - x)} = 4$$

Solution.

Multiply both side by the denominator

$$x^2 = 4(1\frac{1}{2} - x)(2 - x)$$

Expand

$$x^2 = 4[\frac{1}{2}(2) - \frac{1}{2}x - 2x + x^2]$$

$$x^2 = 4[1 - \frac{x}{2} - 2x + x^2]$$

$$x^2 = 4[1 - \frac{5x}{2} + x^2]$$

$$x^2 = 4 - 10x + 4x^2$$

$$8 \text{ (a) } i) 0 = 4 - 10x + 4x^2 - x^2$$

$$0 = 3x^2 - 10x + 4$$

$$3x^2 - 10x + 4 = 0$$

From the Formula given

$$X = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{10 \pm \sqrt{(-10)^2 - 4(3 \times 4)}}{2(3)} = \frac{10 \pm \sqrt{100 - 48}}{6}$$

$$x = \frac{10 \pm \sqrt{52}}{6} = \frac{10 \pm 2\sqrt{13}}{6} = \frac{5 \pm \sqrt{13}}{3}$$

$\therefore$ Answer

$$x = \frac{5 + \sqrt{13}}{3} \approx 2.87 \text{ also } x = \frac{5 - \sqrt{13}}{3} \approx 0$$

ii) Solution

Wire of 40 cm.

Let the first Piece be x cm, and the second Piece be $(40-x)$ cm

First square

Side length

$$\frac{x}{4}$$

Area

$$\left(\frac{x}{4}\right)^2 = \frac{x^2}{16}$$

Second square

$$\frac{40-x}{4}$$

$$4$$

Area

$$\left(\frac{40-x}{4}\right)^2 = \left(\frac{40-x}{16}\right)^2$$

8 a) ii) Total area is 68m^2

$$\frac{x^2}{16} + \left(\frac{40-x}{16}\right)^2 = 68$$

multiply both side by 16

$$x^2 + (40-x)^2 = 1088$$

Expand

$$x^2 + 1600 - 80x + x^2 = 1088$$

$$2x^2 - 80x + 512 = 0$$

Divide by 2

$$x^2 - 40x + 256 = 0$$

Factorize

$$(x-32)(x-8) = 0$$

so:

$$x = 32 \text{ or } x = 8$$

lengths of the two pieces is 32cm and 8cm.

03

(b) Solution

Scaling square:

Original side

$$\sqrt{5}$$

Scaled by Factor $\sqrt{3}$

$$\sqrt{5} \times \sqrt{3} = \sqrt{15}$$

New area

$$(\sqrt{15})^2 = 15$$

$\therefore$ Answer is 15m^2

04

9 (a) Solution

$$\text{Since } \frac{AC}{CE} = \frac{24}{20} = \frac{6}{5}$$

$$\frac{AB}{BE} = \frac{36}{30} = \frac{6}{5}$$

$$\frac{BC}{CD} = \frac{24}{20} = \frac{6}{5}$$

$\therefore$ Thus, $\triangle ABC \sim \triangle DEC$

by SSS theorem.

05

$$8 \text{ (a) i) } 0 = 4 - 10x + 4x^2 - x^2$$

$$0 = 3x^2 - 10x + 4$$

$$3x^2 - 10x + 4 = 0$$

From the formula given

$$X = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{10 \pm \sqrt{(-10)^2 - 4(3 \times 4)}}{2(3)} = \frac{10 \pm \sqrt{100 - 48}}{6}$$

$$x = \frac{10 \pm \sqrt{52}}{6} = \frac{10 \pm 2\sqrt{13}}{6} = \frac{5 \pm \sqrt{13}}{3}$$

$\therefore$ Answer

$$x = \frac{5 + \sqrt{13}}{3} \approx 2.87 \text{ also } x = \frac{5 - \sqrt{13}}{3} \approx 0$$

03

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Area.

$$\left(\frac{x}{4}\right)^2 = \frac{x^2}{16}$$

Second square

$$\frac{40-x}{4}$$

Area

$$\left(\frac{40-x}{4}\right)^2 = \left(\frac{40-x}{4}\right)^2$$

9 (b) Solution:

Total Number of students = 45 = $n(E)$

Number of students who study Physics, $n(P) = 23$

Number of students who study chemistry $n(C) = 33$

Number of students who study neither physics nor chemistry
= $n(C \cup P)'$

Let x be the number of students who study both physics and chemistry ($x = n(C \cap P)$)

Using Formula.

$$n(C \cup P) = n(C) + n(P) - n(C \cap P)$$

$$\text{but } n(C \cup P) = n(E) - n(C \cup P)'$$

$$\text{Now, } n(C \cup P) = n(E) - n(C \cup P)'$$

$$= 45 - 10$$

$$= 35 \quad (02)$$

$$n(C \cup P) = n(C) + n(P) - n(C \cap P)$$

$$35 = 33 + 23 - n(C \cap P)$$

$$n(C \cap P) = 33 + 23 - 35$$

$$n(C \cap P) = 21$$

$\therefore 21$ students study both physics and chemistry (03)

10 (a) Solution:

Given.

$$\log(2x+1) + \log 4 = \log(7x+8)$$

$$\log 4(2x+1) = \log(7x+8)$$

$$\log 4(2x+1) - \log(7x+8) = 0$$

$$\log \left(\frac{4(2x+1)}{7x+8} \right) = 0$$

$$10^0 = \frac{8x+4}{7x+8}$$

$$A^0 = 1$$

$$1 = \frac{8x+4}{7x+8}$$

$$8x+4 = 7x+8$$

$$\therefore x = 4$$

(05)

10 (b) i) Solution.

$$\sin 60^\circ (\cos 45^\circ + \sin 30^\circ)$$

$$\sin 60^\circ = \frac{\sqrt{3}}{2}$$

$$\cos 45^\circ = \frac{\sqrt{2}}{2} \text{ and } \sin 30^\circ = \frac{1}{2}$$

The given expression becomes

$$\begin{aligned} \frac{\sqrt{3}}{2} \left(\frac{\sqrt{2}}{2} + \frac{1}{2} \right) &= \frac{\sqrt{3}}{2} \left(\frac{1 + \sqrt{2}}{2} \right) \\ &= \frac{1}{4} (\sqrt{3} + \sqrt{6}) \end{aligned}$$

$$\therefore \text{answer is } \frac{1}{4} (\sqrt{3} + \sqrt{6})$$

ii) Solution.

Given.

$$\tan 45^\circ (4 \cos 60^\circ - \sqrt{3} \tan 30^\circ)$$

$$\tan 45^\circ = 1, \cos 60^\circ = \frac{1}{2} \text{ and } \tan 30^\circ = \frac{\sqrt{3}}{3}$$

$$\text{So, } \left(4 \times \frac{1}{2} - \sqrt{3} \times \frac{\sqrt{3}}{3} \right)$$

$$2 - \frac{3}{2} \text{ ; gives } \frac{1}{2}$$

(05)

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