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. (02½)

(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. (01½)

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 reclipe. (01½)

iii) Estimating: This means making a quick and reasonable guess of a value without exact calulation. Example Estimating how much money you need before going to the market. (01½)

iv) Problem Solving: This is using mathematical thinking to find solutions to real-life situations. Example Figuring out how to divide food equally amount among friends. (01½)

v) Data Handling: This involves collections, organization and interpreting information. Example Recording daily expenses and analyzing where most of your money is spent. (01½)

2 (a) Solution.

Data Given.

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

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

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

$\sqrt{r^2} = \sqrt{\frac{25}{484} m^2} = \frac{5}{22} = 0.23m$ (02)

2 (a) $r = 0.23\,m$

$d = 2r$

$d = 0.23\,m \times 2$

$d = 0.46\,m$

$\therefore$ 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. speed $= \frac{distance}{time\ (t)}$, distance $= \frac{2}{3}x$, $t = x$, speed $= 30\,km/h$

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

$$time = \frac{x}{45} \text{ --- (i)}$$ 01

Second Place (case II)

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

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

total time

take (1) 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

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

$$11x = 360 \times 4$$

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

$$x = 130.909\,km$$

$\therefore$ The total distance is $130.\dot{9}0\dot{9}$ km 02

3 (a) Solution

Data given and required.

$7/25$ to his son

$2/9$ of the remaining to his daughter

rest to his wife = 11,990,300.

To determine total amount = ? x

$7/25\,x \longrightarrow$ son.

$x - 7/25\,x = \frac{18}{25}x \longrightarrow$ remaining 01

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

$\frac{18x}{25} - \frac{4x}{25} = \frac{14x}{25} \longrightarrow$ wife 01

then

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

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

$x = 21,411,250$

$\therefore$ Nearest ten thousand

21,410,000 Tshs 02

(b) Daughter $\longrightarrow 4/25\,x$ 01

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

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

3,426,000 Tshs. 04

4 (a) Solution.

From

$\frac{a}{b} = \frac{b}{c}$ let $a = 2n^2$, $b = 3n^2$ 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 $x:y = 2:4:1$

$x = 8$ kg

then $2+4+1 = 7$

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

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

1st order : $50x + 20y = 40,000$ Tshs —— (i)

2nd order : $10x + 20y = 24000$ Tshs —— (ii)

$\therefore$ The system of simultaneous equation is

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

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	$50x + 20y = 40,000$	=	$500x + 200y = 400000$
50	$10x + 20y = 24000$	−	$500x + 1000y = 1200000$

5 (b)

$-\cancel{50}0x + \cancel{50}0x - 200y + 1000y = -400{,}000 - 1{,}200{,}000$

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

$y = 1000$ Tshs

Then take ① to determine x

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

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

$50x + 20000 = 40{,}000$

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

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

$x = 400$ Tshs

$\therefore$ The cost of marker pen box is 400 Tshs and the correction Fluid box is 1000 Tshs. 05

6 (a) Solution

From

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

Substitute Point $(4, -2)$

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

substitute Point $(-2, -5)$

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

then times ab to (i) and (ii)

$4b - 2a = ab$

$-2b - 5a = ab$

equate

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

$6b + 3a = 0$

$a = -2b$ --- (iii)

6 (a) substitute equation (III) to equation (I) and (II)

Now (I)

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

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

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

$b = -4$

(II) but $b = -4$

$-2b = -2 \times -4 = 8$

then $a = 8$

∴ The values of a and b is 8 and -4 respectifully.

05

(b) From

$$\frac{x}{2a} + \frac{y}{2b} = 1 \qquad \text{but } x + y = 2$$

$(1+y) + y = 2$

$1 + 2y = 2$

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

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

∴ Then $x = 3/2$ and $y = 1/2$

05

7 (a) Solution.

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

then

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

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

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

∴ 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.

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

$= x + y = 2$ — (i)

$x = 1 + y$

$x - y = 1$ — (ii) 01

combine

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

Then,

x	0	+1
y	1	0

$x + 0 = 2$ and $0 + y = 2$

$x = 2$ $y = 2$

$x - y = 1$ and $x - 0 = 1$

$0 - y = 1$ $x = 1$ 01

$y = -1$ 01

x (1.5) and

y (0.5)

$\therefore$ Points (1.5 , 0.5) 03

7. (a) Solution.

Pump A = 5hrs

Pump B = 4hrs

Pump C = 10hrs

Then

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

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

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

Total.

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

LCM 20

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

$\frac{11}{20}$ Means that in one hour

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

$= 1.82 hrs \approx 1:49$ 04

$\therefore$ The time is One hour and Fourty nine minutes 1hr 49min.

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

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

time taken $= 15 - 13 = 2$

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

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 (a) i) $0 = 4 - 10x + 4x^2 - x^2$

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

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

From the Formula given

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

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

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

$\therefore$ Answer

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

03

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

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

Area

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

8 a) ii) Total area is $68 cm^2$

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

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:

$x = 32$ or $x = 8$

Lengths of the two pieces is 32 cm and 8 cm. 03

(b) Solution

Scaling square:

Original side

$\sqrt{5}$

Scaled by factor $\sqrt{3}$

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

New area

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

∴ Answer is $15 m^2$ 04

9 (a) Solution

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

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

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

∴ Thus, $\Delta ABC \sim \Delta DEC$ by SSS theorem. 05

CamScanner

8 (a) i) $0 = 4 - 10x + 4x^2 - x^2$

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

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

From the formula given

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

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

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

$\therefore$ Answer

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

03

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

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

Area

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

9 (b) **Solution.**

Total Number of students $= 45 = n(\xi)$

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.

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

but $n(C \cup P) = n(\xi) - n(C \cup P)'$

Now, $n(C \cup P) = n(\xi) - n(C \cup P)'$

$= 45 - 10$

$= 35$ 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.

$\sin 60° (\cos 45° + \sin 30°)$

$\sin 60° = \frac{\sqrt{3}}{2}$

$\cos 45° = \frac{\sqrt{2}}{2}$ and $\sin 30° = \frac{1}{2}$

The given expression becomes

$\frac{\sqrt{3}}{2}\left(\frac{\sqrt{2}}{2} + \frac{1}{2}\right) = \frac{\sqrt{3}}{2}\left(\frac{1+\sqrt{2}}{2}\right)$

$= \frac{1}{4}\left(\sqrt{3} + \sqrt{6}\right)$

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

ii) Solution.

Given.

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

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

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

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

05