# 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 recipe. (01½)

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

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

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

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

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

$d = 2r$

$d = 0.23m \times 2$

$d = 0.46m$

$\therefore$ The diameter in decimal is 0.46m (02)

(b) Solution

Data given:

total distance = x?

Speed = 40km/h

Time = 4 hrs for whole journey

First plate (case I)

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

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

$time = \frac{x}{45}$ ——— (i) (01)

Second Plate (case II)

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

$time = \frac{x}{120\,km/hr}$ ——— (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

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

$11x = 360 \times 4$

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

$x = 130.909\,km$

$\therefore$ The total distance is 130.909 km (03)

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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

$7/25\ x$ ⟶ son.

$x - 7/25\ x = \frac{18}{25} x$ ⟶ remaining (01)

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

$\frac{18x}{25} - \frac{4x}{25} = \frac{14x}{25}$ ⟶ wife (01)

then

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

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

$x = 21,411,250$

∴ Nearest ten thousand

21,410,000 Tshs (02)

(b) Daughter ⟶ $4/25\ x$ (01)

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

∴ The Nearest thousands $3,425,800 \approx$ 3,426,000 Tshs. (04)

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4 (a) Solution.

From

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

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

∴ The third Portion is $4.5n^2$ (05)

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

$x = 8\,kg$

then $2+4+1 = 7$

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

Then $4\,kg \times 7 = 28\,kg$

∴ 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: $10x + 20y = 24000.0$ Tshs —(ii)

∴ 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 | $10x + 20y = 24000$ | − | $500x + 1000y = 1200000$ |

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5 (b)

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

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

$y = 1000$ Tshs

Then take ① to determine x

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

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

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

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

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

$x = 400$ Tshs

∴ 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 $(4, -2)$

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

substitute Point $(-2, -5)$

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

then times ab to ① and (ii)

$4b - 2a = ab$

$-2b - 5a = ab$

equate

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

$6b + 3a = 0$

$a = -2b$ ——— (iii)

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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 $b = -4$

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

then $a = 8$

∴ The values of a and b is 8 and −4 respectfully. (05)

(b) From

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

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

$$1 + 2y = 2$$

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

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

∴ Then $x = 3/2$ and $y = 1/2$ (05)

7 (a) Solution.

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

then

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

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

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

∴ The time is 1hour and 49minutes. (04)

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

The equation make it in simplest form.

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

$= x + y = 2$ —— (i)

$x = 1 + y$

$x - y = 1$ —— (ii) (01)

Combine

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

| x | 0 | +1 |
|---|---|---|
| y | 1 | 0 |

Then,

$x + 0 = 2$ 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)

∴ 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

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

$= 1.82\text{hrs} \approx 1:49$ (04)

∴ The time is one hour and Fourty nine minutes 1hr 49min.

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

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

$= 1.25$

∴ 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

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

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

$= -1$

∴ −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

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

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

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

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

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

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

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

From the formula given

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

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

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

∴ Answer

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

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

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

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

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

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

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

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

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

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

From the formula given

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

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

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

∴ 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

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

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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.

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

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

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

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

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

$$A^0 = 1$$

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

$$8x + 4 = 7x + 8 \qquad \therefore x = 4$$ (05)

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10 (b) i) Solution.

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

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

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

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.

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

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

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

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

05

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