456/2
MATHEMATICS PAPER 2
JULY / AUGUST 2017
2 ½ HOURS

ST. JOSEPH OF NAZARETH HIGH SCHOOL

INTERNAL MOCKS EXAMINATION 2017

S.4 MATHEMATICS

PAPER 2

TIME: 2 ½ HOURS

INSTRUCTIONS:

- Attempt **all** the questions in Section **A** and any **five** questions from section **B**.
- Each question in Section A takes 4 marks and each in Section B takes 12 marks.
- Mathematical tables and scientific calculators may be used.
- Answers should all be written in the booklets provided.
- Graph paper is provided

SECTION A (40 MARKS)

1. Simplify: $\left(\frac{2\frac{4}{5}+1\frac{1}{4}}{3\frac{3}{5}}\right)-\frac{5}{16}$ (04 marks)

2. Find the equation of a line which passes through $(-4,5)$ and is perpendicular to the line whose equation is $2x+3y=7$. (04 marks)

3. Given that point $\boldsymbol{P}$ is $(\mathbf{3},\mathbf{7})$ and $\boldsymbol{PQ}=\begin{pmatrix}\mathbf{5}\\-\mathbf{1}\end{pmatrix}$; find

(i) the coordinates of $\boldsymbol{Q}$

(ii) modulus of $\overrightarrow{\boldsymbol{OQ}}$; where "$\boldsymbol{O}$" is the origin.

(04 marks)

4. Find the area in $\boldsymbol{km^2}$ represented by $\mathbf{24}\boldsymbol{cm^2}$ on a map whose scale is $\mathbf{1:250,000}$. (04 marks)

5. The volume of a cylinder is $7040cm^3$. Find its diameter if its height is $35cm$. (04 marks)

6. The cash price of a mattress is shs. $\mathbf{350,000}$. Its hire purchase price is $\mathbf{12}\%$ higher than the cash price. A buyer pays $\mathbf{10}$ monthly installments of $\boldsymbol{shs}.\ \mathbf{24,000}$ each after paying a deposit. Find the amount paid as a deposit. (04 marks)

7. A class of $\mathbf{38}$ students had to choose between Computer $(\boldsymbol{C})$ and Sub math$(\boldsymbol{M})$ in their combinations. $\mathbf{15}$ chose Sub math while $\mathbf{19}$ chose Computer. The number of students who chose both subjects is half the number of those who do not like any of the two subjects. Find the number of students that like both subjects. (04 marks)

8. Given that $\boldsymbol{h}$ varies directly as $\boldsymbol{V}$ and inversely as the square of $\boldsymbol{r}$. Find the percentage change in $\boldsymbol{h}$ if $\boldsymbol{V}$ is increased by $\mathbf{20\%}$ and at the same time $\boldsymbol{r}$ is increased by $\mathbf{50\%}$. (04 marks)

9. Express $\frac{2\sqrt{3}}{3\sqrt{3}+3\sqrt{2}}$ in form of $a - b\sqrt{6}$ and state the values of a and b. (04 marks)

10. If $m = \{2, 3, 6, 8, 9, 12, 15\}$ are integers. Draw a papygram showing "$is\ a\ factor\ of$" (04 marks)

SECTION B (60 MARKS)

11. (a) Find the value of x for the equation below;

$$\log_2 x + \log_2(x - 30) = 6$$ (04 marks)

(b) Using logarithm tables; evaluate;

$$\frac{0.6327 \times (2.834)^2}{68.03}$$

(08 marks)

12. (a) Given that; $g(y) = \left(\frac{2}{y+2}\right) + \left(\frac{3y+4}{y^2-4}\right)$

(i) Find $g(-1)$

(ii) Find the values of "y" for which $g(y)$ is undefined.

(06 marks)

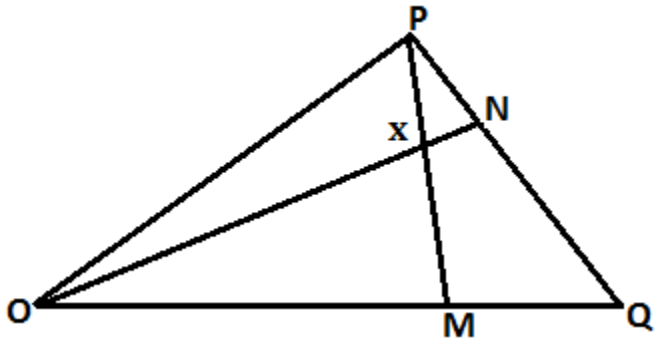
(b) Given that; $f^{-1}(x) = \sqrt{x+1}$ and $h(x) = x + 3$.

(i) Find $f(-2)$

(ii) Find the values of x if; $hf(x) = fh(x)$.

(06 marks)

13.



The figure above shows a triangle OPQ. Lines PM and ON meet at x. Given that; $3\overline{OM} = 2\overline{OQ}$; $4\overline{PN} = \overline{PQ}$; $\overline{OP} = p$ and $\overline{OQ} = q$.

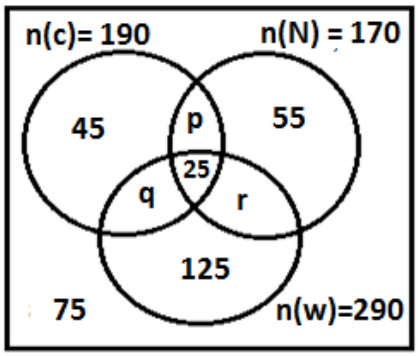
(a) Express the following vectors in terms of p and q.

(i) $\overline{PQ}$
(ii) $\overline{PM}$
(iii) $\overline{ON}$

(06marks)

(b) Given that; $\overline{OX} = k\overline{ON}$ and $\overline{PX} = h\overline{PM}$. By expressing $\overline{QX}$ in two ways; find the values of h and k. (06 marks)

14. The Venn diagram below shows the number of guests who visited three different regions in Uganda. The Northern region (N); Central region (C) and the Western region (W)



(a) Determine the values of p, q and r. (06 marks)
(b) Find the total number of guests. (02 marks)
(c) Given that a guest is selected at random; find the probability that the guest visited ;
(i) both Central and Western regions
(ii) atmost two regions

(04 marks)

15. Micheal cycles from Kisigula to Kanoni starting at **8:00am** after one hour while cycling at a uniform speed of $30km/hr$; he reached Kawempe and rested for $half\ an\ hour$. He then continued cycling at the same speed for another $30km$ to Kanoni.
(a) (i) What is Micheal's average speed?
(ii) Using a scale of $2cm$ to represent $10km$ and $2cm$ to represent $1\ hour$; draw a distance – time graph showing Micheal's journey.
(b) If David decided to follow Micheal one and half hours later by a bodaboda moving steadily at a speed of $80km/hr$; show his journey on the same axes.

From the graph determine;

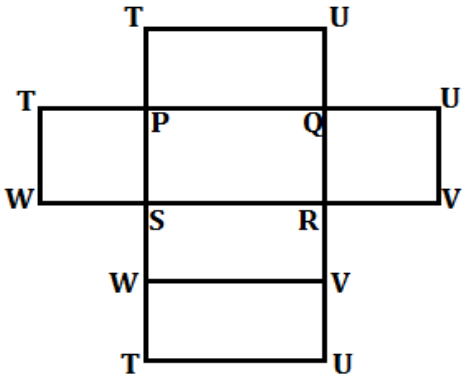
(i) when and what distance from Kisigula David over took Micheal?

(ii) their time of arrival at Kanoni.

(iii) for how long Micheal waited at Kanoni before David arrived.

(12 marks)

16.



The figure above shows a rectangular prism $\boldsymbol{PQRSTUVW}$ whose base is $\boldsymbol{PQRS}$; $\boldsymbol{PR = 12cm}$; $\boldsymbol{PS = 8cm}$ and $\boldsymbol{PT = 6cm}$.

(a) Sketch the figure $\boldsymbol{PQRSTUVW}$. (03 marks)

(b) Find the length $\boldsymbol{PV}$. (03 marks)

(c) Find the angle between $\boldsymbol{PV}$ and the plane $\boldsymbol{PQRS}$. (03 marks)

(d) Find the angle between planes $\boldsymbol{PQRS}$ and plane $\boldsymbol{PUVS}$. (03 marks)

17. In a certain country; income tax is computed after deducting the following allowances; from an employee's gross monthly salary.

Type of allowance	Amount
Housing	80,000/= per month.
Transport and lunch	45,000/= per month.
Medical	900,000/= per annum.
Water and electricity	1100/= per day.

In addition to the above allowances: the employee is given a family allowance for only three children as seen below

Age	Amount
0 – 12	20,000/=
13 – 18	15,000/=
Above 18	10,000/=

Mr. Batamye has five children with the older child aged $\boldsymbol{22\ years}$; one with $\boldsymbol{15\ years}$ and the rest between $\boldsymbol{2\ years}$ and $\boldsymbol{12\ years}$. His income tax is calculated as follows;

Income (Ushs)	Tax rate (%)
01 – 120,000	0
120,001 – 400,000	10
400,001 – 800,000	20
800,001 and above	40

Given that Mr. Batamye paid a total income tax of $\mathbf{920,000/=}$ for a month of $\mathbf{30}\ \boldsymbol{days}$;

(a) Calculate his;

(i) gross monthly income. (08 marks)

(ii) net income (02 marks)

(b) Express his income tax as a percentage of his gross monthly salary. (02 marks)

END~

SUCCESS IS A STRUGGLE!

Ag. ①

ST.JOSEPH OF NAZARETH HIGH SCHOOL

KAVULE - MPIGI

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Class ... S.4 ... Index No. ... MATHS ...

Signature: ... PAPER 2 ... Subject ... 45612 ...

SECTION A

No.1

$$\left(\frac{2\frac{4}{5}+1\frac{1}{4}}{3\frac{3}{5}}\right)-\frac{5}{16}$$

$$\left(\frac{\frac{14}{5}+\frac{5}{4}}{\frac{18}{5}}\right)-\frac{5}{16} \quad M_1$$

$$\left(\frac{56+25}{20}\div\frac{18}{5}\right)-\frac{5}{16}$$

$$=\left(\frac{81}{20}\times\frac{5}{18}\right)-\frac{5}{16} \quad M_1$$

$$=\frac{9}{8}-\frac{5}{16} \quad M_1$$

$$\left(\frac{18-5}{16}\right)$$

$$=\frac{13}{16}$$

$$=\frac{13}{16} \quad A_1$$

=

No.2

$2x+3y=7$

$3y=-2x+7$

$y=-\frac{2}{3}x+\frac{7}{3}$

$m=-\frac{2}{3}$ M_1

$m_1 \times m_2 = -1$

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

$m_2=\frac{3}{2}$ M_1

$y=mx+c \quad (-4,5)$

$5=\left(\frac{3}{2}x-4\right)+c$

$5=-6+c$

$c=5+6$

$c=11$ M_1

$\therefore y=\frac{3}{2}x+11$ A_1

Alternatively

$\frac{y-5}{x-4}=\frac{3}{2}$

$2(y-5)=3(x+4)$

$2y-10=3x+12$ M_1

$2y=3x+12+10$

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No.3 $OP = \begin{pmatrix} 3 \\ 7 \end{pmatrix}$

$PQ = PO + OQ$

$\begin{pmatrix} 5 \\ -1 \end{pmatrix} = \begin{pmatrix} -3 \\ -7 \end{pmatrix} + OQ$

$OQ = \begin{pmatrix} 5 \\ -1 \end{pmatrix} - \begin{pmatrix} -3 \\ -7 \end{pmatrix}$ M1

$OQ = \begin{pmatrix} 5+3 \\ -1+7 \end{pmatrix}$

$OQ = \begin{pmatrix} 8 \\ 6 \end{pmatrix}$

(i) Coordinates of Q (8, 6) A1

(ii) $|OQ| = \sqrt{8^2 + 6^2}$ M1

$= \sqrt{64 + 36}$

$= \sqrt{100}$

$= 10$ units A1

No.4

1 : 250,000

L.S.F $= \frac{1}{250,000}$

$\frac{A_m}{A_g} = \left(\frac{1}{250,000}\right)^2$ M1

$\frac{24}{x} = \frac{1}{6.25 \times 10^{10}}$

$x = 24 \times 6.25 \times 10^{10}$

$x = 150 \times 10^{10}\ cm^2$ M1

$1km^2 = 10^{10}\ cm^2$

$x = \frac{150 \times 10^{10}}{10^{10}}$ M1

$x = 150\ km^2$ A1

Alternatively

$1cm : 250,000\ cm$

$1cm^2 = 6.25 \times 10^{10}\ cm^2$ M1

$24cm^2 = 24 \times 6.25 \times 10^{10}\ cm^2$

$24cm^2 = 150 \times 10^{10}\ cm^2$ M1

but $1km^2 = 10^{10}\ cm^2$

$= \frac{150 \times 10^{10}}{10^{10}}$ M1

$= 150\ km^2$ A1

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No.5

$V = \pi r^2 h$

$V = 7040\ cm^3$

$h = 35\ cm$

$7040 = \pi r^2 \cdot 35$

$7040 = \frac{22}{7} \times r^2 \times 35$ M1

$7040 = 22 \times 5 \times r^2$

$7040 = 110 r^2$

$r^2 = \frac{7040}{110}$ M1

$r^2 = 64$

$r = 8\ cm$ M1

Diameter $= 8 \times 2$

$= 16\ cm$ A1

No.6

Cash price $= 350,000$ ₣

Hire purchase $(12\% + 100\%)$

$= \frac{112}{100} \times 350,000$

$= 392,000$ ₣ M1

Monthly installments

$= 10 \times 24,000$

$= 240,000$ ₣ M1

Deposit

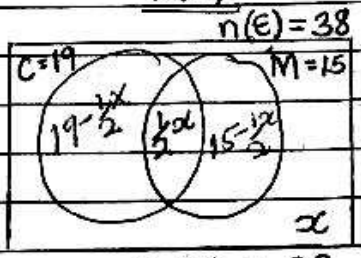
H.P = Dep + monthly installment

$392,000 =$ Deposit $+ 240,000$

Deposit $= 392,000 - 240,000$ M1

$= 152,000$ ₣ A1

No.7



$n(\varepsilon) = 38$

$19 - \frac{1}{2}x + \frac{1}{2}x + 15 - \frac{1}{2}x + x = 38$ M1

$34 + \frac{1}{2}x = 38$ M1

$\frac{1}{2}x = 38 - 34$

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

$x = 8$ M1

Therefore for both is

$\frac{1}{2} \times 8 = 4$ students A1

The final answer with the word students.

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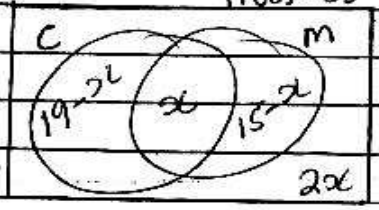
Alternatively for No.7

$n(\mathcal{E}) = 38$



$19 - x + x + 15 - x + 2x = 38$ M1

$34 + x = 38$ M1

$x = 38 - 34$ M1

$x = 4$

∴ for both

4 students A1

No.8

$h \propto \frac{V}{r^2}$

$h = \frac{KV}{r^2}$ ---(i) M1

After increase:

V by 20%

$\frac{120V}{100}$

r by 50%

$\frac{150r}{100}$

$h = K\left(\frac{120V}{100} \div \left(\frac{150r}{100}\right)^2\right)$

$h = K \cdot \frac{120V \cdot 100 \cdot 100}{100 \cdot 150r \cdot 150 \cdot r}$

$h = \frac{8}{15}\left(\frac{KV}{r^2}\right)$ ---(ii) M1

% change in h

$\frac{\left(\frac{KV}{r^2}\right) - \left(\frac{8}{15}\frac{KV}{r^2}\right)}{\left(\frac{KV}{r^2}\right)} \times 100\%$ M1

$\frac{KV}{r^2}\left(1 - \frac{8}{15}\right) \times 100\%$

$\frac{KV}{r^2}$

$= \frac{7}{15} \times 100\%$

$= 46.67\%$ A1

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No. 9

$$= \frac{2\sqrt{3}}{3\sqrt{3}+3\sqrt{2}} \cdot \frac{3\sqrt{3}-3\sqrt{2}}{3\sqrt{3}-3\sqrt{2}}$$

$$= \frac{6\sqrt{9}-6\sqrt{6}}{9\sqrt{9}-9\sqrt{6}+9\sqrt{6}-9\sqrt{4}}$$

$$= \frac{18-6\sqrt{6}}{27-18}$$ M1

$$= \frac{18-6\sqrt{6}}{9}$$ M1

$$= \frac{18}{9} - \frac{6}{9}\sqrt{6}$$

$$= 2 - \frac{2}{3}\sqrt{6}$$

$a = 2$ A1

$b = \frac{2}{3}$ A1

Alternatively

$$\frac{2\sqrt{3}}{3\sqrt{3}+3\sqrt{2}} \cdot \frac{3\sqrt{3}-3\sqrt{2}}{3\sqrt{3}-3\sqrt{2}}$$ M1

$$= \frac{6\sqrt{9}-6\sqrt{6}}{(3\sqrt{3})^2-(3\sqrt{2})^2}$$

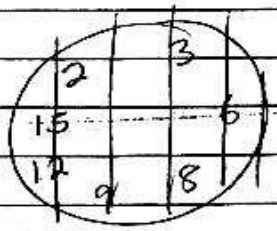
$$= \frac{18-6\sqrt{6}}{27-18}$$

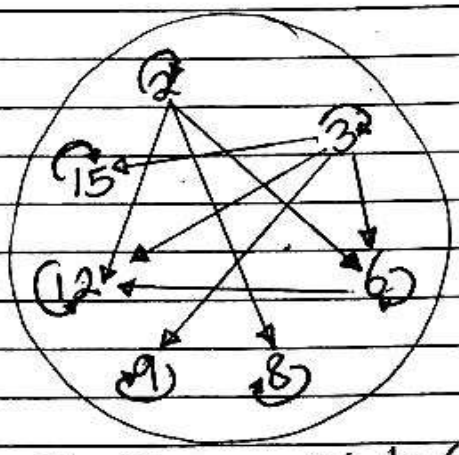
$$= \text{M1}\ \frac{18-6\sqrt{6}}{9} = 2-\frac{2}{3}\sqrt{6}$$

10

$m = (2, 3, 6, 8, 9, 12, 15)$

M1





Marking points (All arrows drawn C)

* factor of itself B1
* factors from 2 B1
* factors from 3 B1
* factors from 6 B1

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SECTION B

No. 11

(a) $\log_2 x + \log_2 (x-30) = 6$

$\log_2 (x(x-30)) = 6$

$\log_2 x^2 - 30x = 6$ M1

$x^2 - 30x = 2^6$

$x^2 - 30x = 64$

$x^2 - 30x - 64 = 0$ M1

$X = \frac{30 \pm \sqrt{(-30)^2 - 4 \times 1 \times -64}}{2 \times 1}$

$X = \frac{30 \pm \sqrt{900 + 256}}{2}$ M1

$X = \frac{30 \pm \sqrt{1156}}{2}$

$X = \frac{30 \pm 34}{2}$

either

$X = \frac{30 + 34}{2}$ OR $X = \frac{30 - 34}{2}$

$X = 32$ $X = -2$

Therefore the value of X is, 3

$X = 32$ A1

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11 (b)

$$\frac{0.6327 \times (2.834)^2}{68.03}$$

Number	Standard form	Logarithm	
0.6327	6.327×10^{-1}	$\bar{1}.8012$	B1
$(2.8324)^2$	2.834×10^{0}	0.4524	B1
		0.4524×2	
		$= 0.9048$	B1
68.03	6.803×10^{1}	1.8327	B1
		$\bar{1}.8012$	
$0.6327 \times (2.834)^2$		$+ 0.9048$	
		0.7060	B1
		0.7060	
		-1.8327	
0.07469 A1	7.469×10^{-2} M1	$\bar{2}.8733$	B1

Therefore

$$\frac{0.6327 \times (2.834)^2}{68.03} = 0.07469$$

b8

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No. 12

$$g(y) = \frac{2}{y+2} + \frac{3y+4}{y^2-4}$$

(i) $g(-1) = \frac{2}{-1+2} + \frac{3x-1+4}{(-1)^2-4}$ M1

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

$= 2 - \frac{1}{3}$ M1

$= \frac{6-1}{3}$

$g(-1) = \frac{5}{3}$ A1

$g(y) = \frac{2(y-2)+(3y+4)(y+2)}{y^2-4}$

for undefined

$y^2 - 4 = 0$ M1

$y^2 = 4$

$y = \pm 2$

either

$y = 2$ A1 OR $y = -2$ A1

12 (b) Ag. ⑨

$f^{-1}(x) = \sqrt{x+1}$ and $h(x) = x+3$

Let $m = \sqrt{x+1}$

$m^2 = x+1$

$x = m^2 - 1$

$\therefore f(x) = x^2 - 1$ M1

$f(-2) = (-2)^2 - 1$ M1

$= 4 - 1$

$f(-2) = 3$ A1

$hf(x) = fh(x)$

$(x^2-1) + 3 = (x+3)^2 - 1$ M1

$x^2 + 2 = x^2 + 3x + 3x + 9 - 1$

$2 = 3x + 3x + 8$

$2 - 8 = 6x$ M1

$6x = -6$

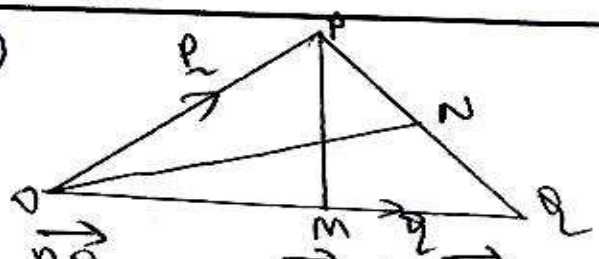
$x = -1$ A1

B.(10)

No. 13

SOLUTION	MKS	COMMENT

(13)



i. $\vec{PQ} = \vec{PO} + \vec{OQ}$ — m1
$= -\underset{\sim}{p} + \underset{\sim}{q}$ — B1

ii. $\vec{PM} = \vec{PO} + \vec{OM}$
$= \vec{PO} + \frac{2}{3}\vec{OQ}$ — m1
$= -\underset{\sim}{p} + \frac{2}{3}\underset{\sim}{q}$ — B1

~~iii. $\vec{ON} = \frac{1}{3}(2\underset{\sim}{q} - 3\underset{\sim}{p})$~~

iii. $\vec{ON} = \vec{OP} + \vec{PN}$
$= \vec{OP} + \frac{1}{4}\vec{PQ}$ — m1
$= \underset{\sim}{p} + \frac{1}{4}(\underset{\sim}{q} - \underset{\sim}{p})$
$= \frac{1}{4}(3\underset{\sim}{p} + \underset{\sim}{q})$ — B1

$\vec{QX} = \vec{QP} + \vec{PX}$
$= \vec{QP} + h\vec{PM}$
$= \underset{\sim}{p} - \underset{\sim}{q} + h(-\underset{\sim}{p} + \frac{2}{3}\underset{\sim}{q})$
$\vec{QX} = (1-h)\underset{\sim}{p} + (\frac{2}{3}h - 1)\underset{\sim}{q}$ — B1

A1G

$\vec{QX} = \vec{QO} + \vec{OX}$
$= \vec{QO} + K\vec{ON}$
~~$= \underset{\sim}{q} + K[\underset{\sim}{p} + \frac{1}{4}(\underset{\sim}{q} - \underset{\sim}{p})]$~~
$= -\underset{\sim}{q} + \frac{K}{4}(3\underset{\sim}{p} + \underset{\sim}{q})$
$\vec{QX} = \frac{3}{4}K\underset{\sim}{p} + (\frac{K}{4} - 1)\underset{\sim}{q}$ — B1

Qn. 13

SOLUTION	MKS	COMMENT
On equating		
$\Rightarrow (1-h)\underset{\sim}{p} + \left(\frac{2}{3}h-1\right)\underset{\sim}{q} = \frac{3}{4}K\underset{\sim}{p} + \left(\frac{K}{4}-1\right)\underset{\sim}{q}$		
$\Rightarrow 1-h = \frac{3}{4}K$ --(1)		
$\frac{2}{3}h-1 = \frac{K}{4}-1$ --(2)		
From (1) $h = 1-\frac{3}{4}K$		
Subst for h in (2)		
$\frac{2}{3}\left(1-\frac{3}{4}K\right)-1 = \frac{K}{4}-1$ ———	M_1	Subst $h=1-\frac{3}{4}K$
$\frac{2}{3}-\frac{1}{2}K-1 = \frac{K}{4}-1$		
$-\frac{1}{2}K-\frac{K}{4} = -\frac{2}{3}$		
$-\frac{3K}{4} = -\frac{2}{3}$		
$-9K = -8$		
$K = \frac{8}{9}$ ✓	A_1	Value for K
But $h = \frac{K}{4}$ $h = 1-\frac{3}{4}K$		
$h = 1-\frac{3}{4}\left(\frac{8}{9}\right)$	M_1	
$h = 1-\frac{2}{3}$		
$h = \frac{1}{3}$ ✓	A_1	
	12	

No. 14

SOLUTION	MKS	COMMENT
a) $p+q+45+25 = 190$		
$p+q = 120$ ------ (1) ✓	B1	
$p+r+25+55 = 170$		
$p+r = 90$ -- (2) ✓	B1	
$q+r+25+125 = 290$		
$q+r = 140$ -- (3) ✓	B1	
Using (1) − (2)		
$q-r = 30$ -- (4)		
Using (3) + (4)		
$q+r = 140$		
$+q-r = 30$		
$2q = 170$		
$q = 85$ ✓	A1	
From (1) $p = 120-q$		
$= 120-85$		
$\therefore p = 35$ ✓	A1	
From (2)		
$r = 90-p$		
$= 90-35$		
$r = 55$ ✓	A1	
b) Total number of guests		
$= 190+55+55+125+175$	M1	
$= 500$ ✓	A1	

No. 14

SOLUTION	MKS	COMMENT
(a) $p+q+45+25 = 190$		
$p+q = 120$ ------ (1) ✓	B1	
$p+r+25+55 = 170$		
$p+r = 90$ -- (2) ✓	B1	
$q+r+25+125 = 290$		
$q+r = 140$ -- (3) ✓	B1	
Using (1) − (2)		
$q-r = 30$ -- (4)		
Using (3) + (4)		
$q+r = 140$		
$+q-r = 30$		
$2q = 170$		
$q = 85$ ✓	A1	
From (1) $p = 120-q$		
$= 120-85$		
$\therefore p = 35$ ✓	A1	
From (2)		
$r = 90-p$		
$= 90-35$		
$r = 55$ ✓	A1	
(b) Total number of guests		
$= 190+55+55+125+75$	M1	
$= 500$ ✓	A1	

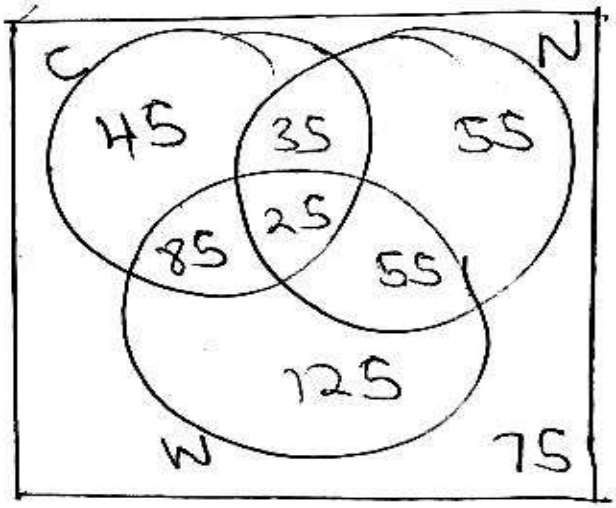
No-14

SOLUTION	MKS	COMMENT
a. $p+q+45+25 = 190$		
$p+q = 120$ ------ (1) ✓	B1	
$p+r+25+55 = 170$		
$p+r = 90$ -- (2) ✓	B1	
$q+r+25+125 = 290$		
$q+r = 140$ -- (3) ✓	B1	
Using (1) - (2)		
$q-r = 30$ -- (4)		
Using (3) + (4)		
$q+r = 140$		
$+q-r = 30$		
$2q = 170$		
$q = 85$ ✓	A1	
From (1) $p = 120-q$		
$= 120-85$		
$\therefore p = 35$ ✓	A1	
From (2)		
$r = 90-p$		
$= 90-35$		
$r = 55$ ✓	A1	
b. Total number of guests		
$= 190+55+55+125+75$	M1	
$= 500$ ✓	A1	

No. 14

SOLUTION	MKS	COMMENT

Q



i probability that the guest visited both central and western regions $= \frac{85+25}{500} = \frac{110}{500}$ M1

$= \frac{11}{50}$ A1

ii probability that the guest visited almost two regions

$= \frac{35+55+85+45+55+125+75}{500}$ M1

$= \frac{475}{500}$

$= \frac{19}{20}$ A1

12

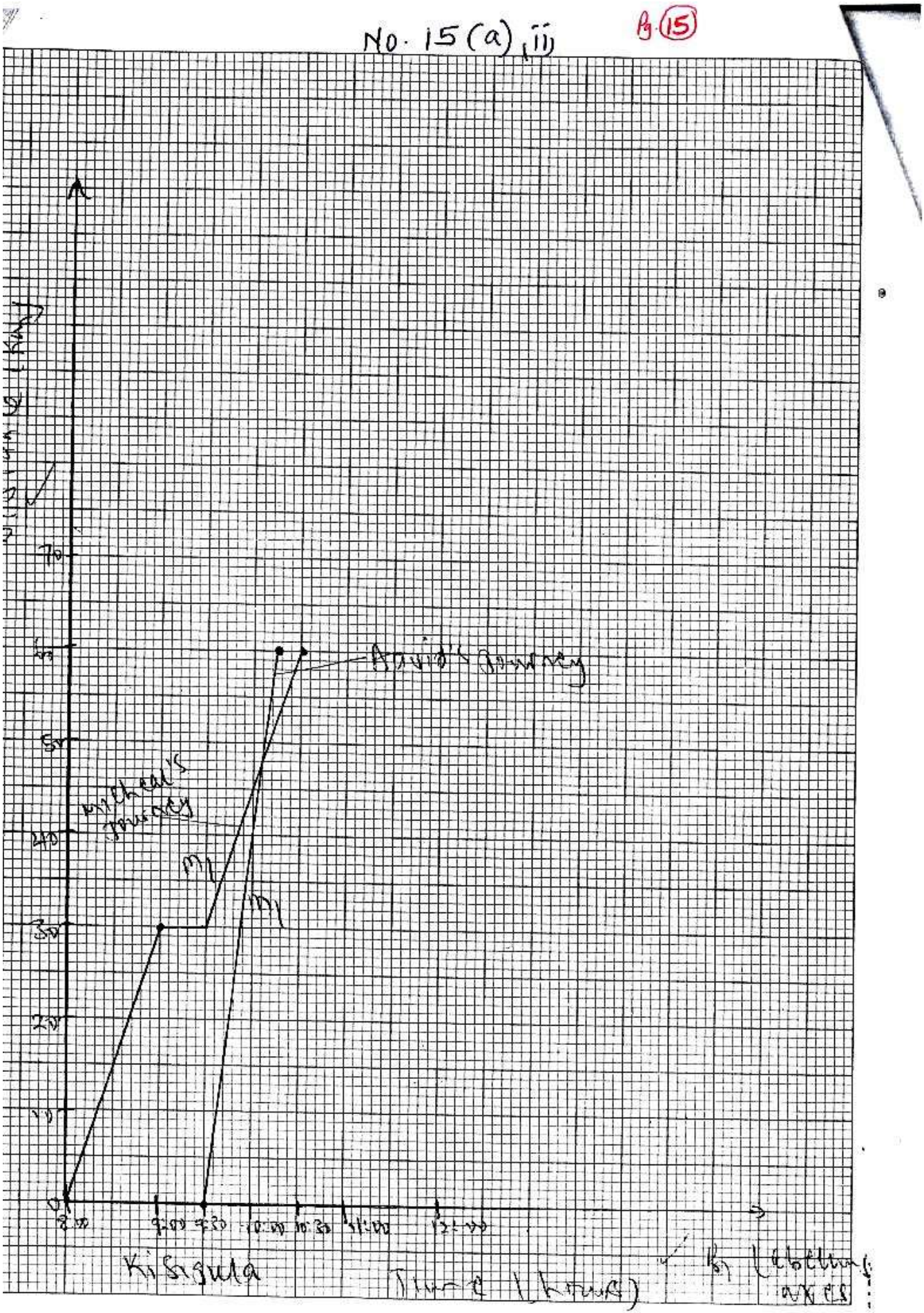
B. (14)

No. 15

(3)

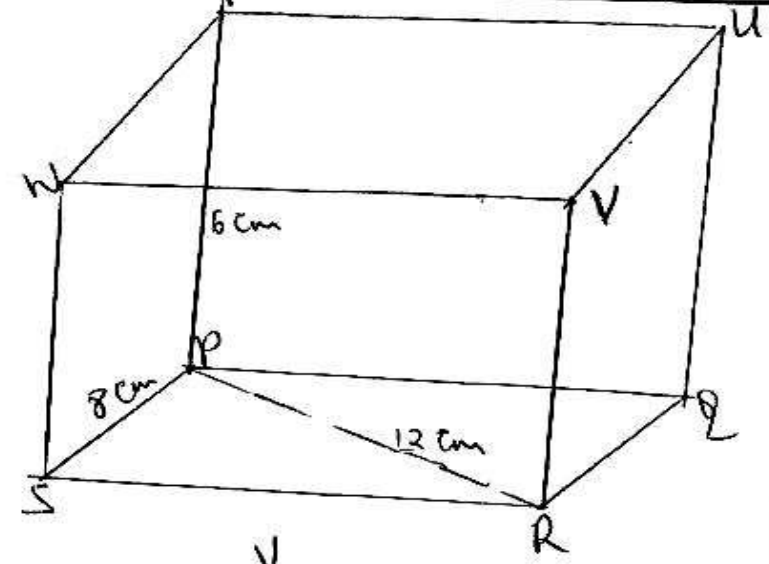
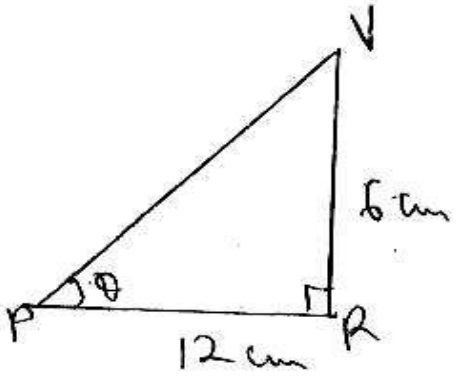
SOLUTION	MKS	COMMENT
Distance travelled by micheal from Kisigwa to ~~Kanoni~~ Kawempe = 30 × 1 = 30 Km ✓	B1	
Time taken by micheal to move from ~~Kanoni~~ Kawempe to Kanoni = $\frac{30}{30}$ = 1 hr	B1	
micheal's average speed = $\frac{30+30}{1+0.5+1}$ = $\frac{60}{2.5}$ = 24 Km/hr	M1	B1
Time taken by David to move from Kisigwa to Kanoni = $\frac{60}{80}$ = 0.75 hours = 0.75 × 60 = 45 minutes	M1 B1	
(i) David overtook micheal at 10:06 am ✓	A1	
David overtook micheal after covering a distance of 47.5 Km	A1	
(ii) micheal arrived at Kanoni at 10:30 am David arrived at Kanoni at 10:15 am	A1 A1	
(iii) David waited at Kanoni before micheal after 15 minutes ✓	A1	

No. 15 (a) (ii) Pg 15



B-(16)

NO.16

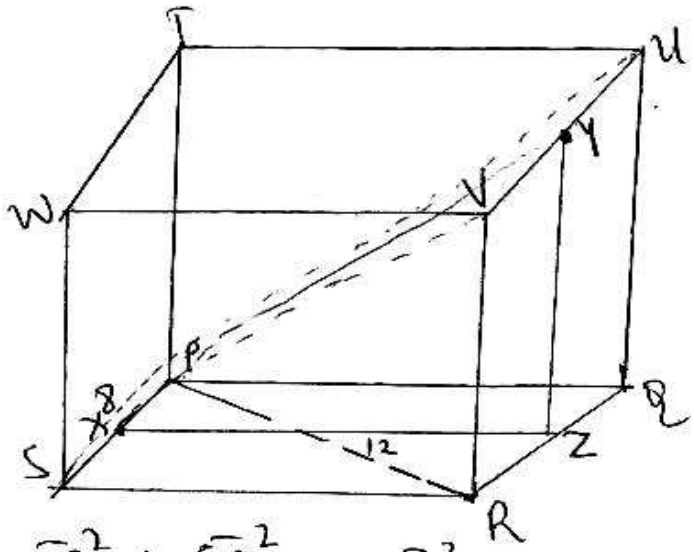
SOLUTION	MKS	COMMENT
(a) 	B_2	
(b) 		
$\overline{PV}^2 = \overline{PR}^2 + \overline{RV}^2$ $= 12^2 + 6^2$ $= 144 + 64$ $= 180$ $PV = \sqrt{180}$ $= 13.416$ cm	M_1 A_1	Accept 13.42
(c) $\tan\theta = \frac{6}{12}$	M_1	
$\theta = \tan^{-1} 0.5$	M_1	
$\theta = 26.57^\circ$		
∴ Angle btn PV and plane PQRS $= 26.57^\circ$	A_1	

B. (17)

(4)

SOLUTION	MKS	COMMENT

Q2



$\bar{PS}^2 + \bar{SR}^2 = \bar{PR}^2$

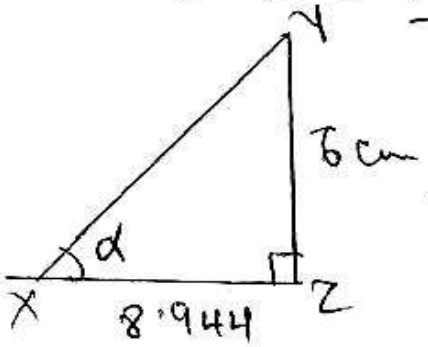
$\bar{SR}^2 = \bar{PR}^2 - \bar{PS}^2$

$\bar{SR} = \sqrt{12^2 - 8^2}$ M1

$= \sqrt{144 - 64}$

$= \sqrt{80}$

$\bar{SR} = 8.944$ cm A1



$\tan\alpha = \frac{6}{8.944}$

$\alpha = \tan^{-1}(0.67084)$ M1

$\alpha = 33.86°$

∴ angle btw planes PQRS and plane PUVS = ~~38.2~~ 33.86° A1

No. 17

SOLUTION	MKS	COMMENT
Total Allowances		
Housing ---------- 80,000		
Transport and Lunch ---- 45,000		
medical ---- $\frac{900,000}{12}$ = 75,000	M1	
water & electricity -- 3×11,000 = 33,000		
Childbirth allowances -- 3×20,000 = 60,000		
Total Allowances 293,000/=	A1	

Income Ushs	Tax paid		
120,000	$\frac{10}{100}$×0	= 0	
280,000	$\frac{10}{100}$×280,000	= 28,000	M1
400,000	$\frac{20}{100}$×400,000	= 80,000	
X	$\frac{40}{100}$X	= 812,000	
	X = $\frac{812,000 \times 100}{40}$		
	= 2,030,000/= ✓	B1	for 2,030,000/=

Taxable income = 120,000 + 280,000 + 400,000 + 2,030,000 — M1
= 2,830,000/= — A1

Gross monthly income
= Taxable income + Allowances
= 2,830,000 + 293,000 — M1
= 3,123,000/= — A1

No. 17 (b)

SOLUTION	MKS	COMMENT
(i) Net income = Gross monthly income − income tax		
= 3,123,000 − 920,000	M1	
= 2,203,000/=	A1	
(ii) $\frac{920,000}{3,123,000} \times 100$	M1	
= 29.46	A1	
	6	