

456/2  
MATHEMATICS  
Paper 2  
July/Aug. 2018  
2<sup>1</sup>/<sub>2</sub> hours



*"Together for Mathematics"*

**SECONDARY MATHEMATICS TEACHERS' ASSOCIATION**  
**SMATA JOINT MOCK EXAMINATIONS 2018**  
**Uganda Certificate of Education**  
**MATHEMATICS**

**Paper 2**

**2 hours 30 minutes**

**INSTRUCTIONS TO CANDIDATES**

Answer **all** questions in Section **A** and any **five** questions from Section **B**.

Any additional question(s) answered will **not** be marked.

All necessary calculations **must** be done on the same answer booklet provided. Therefore, no paper should be given for rough work.

Graph paper is provided.

Silent, non-programmable scientific calculators and mathematical tables with a list of formulae may be used.

State the **degree of accuracy** at the end of each question attempted using calculator or mathematical table and indicate **Cal** for calculator or **Tab** for mathematical tables.

## SECTION A: (40 MARKS)

Attempt **all** questions from this section

1. Without using mathematical tables or calculator evaluate

$$32^{2/5} \times \left(\frac{16}{81}\right)^{-1/4} \quad (04 \text{ marks})$$

2. Given that  $f^{-1}(x) = \frac{x+3}{5}$ . Find the value of  $f(2)$  (04 marks)

3. Point A (5, -4) and B(-1, -2) lie on a straight line. Find the equation of the perpendicular bisector of line AB. Give your answer in the form  $y = mx + c$  (04 marks)

4. Solve the equation  $\log_{10}(2x - 8) - \log_{10}(x + 4) = 1$ . (04 marks)

5. The scale of a map is 1:50,000. The distance between two villages on the map is 20cm. Find the actual distance in Km between the two villages. (04 marks)

6. Given that vectors  $m = \begin{pmatrix} 2 \\ -1 \end{pmatrix}$  and  $n = \begin{pmatrix} 6 \\ -4 \end{pmatrix}$

Find (i)  $m + \frac{1}{2}n$

(ii)  $|m + \frac{1}{2}n|$  (04 marks)

7. Given that two sets  $A = \{x: 0 < x \leq 9\}$  and  $B = \{x: 5 \leq x < 12\}$

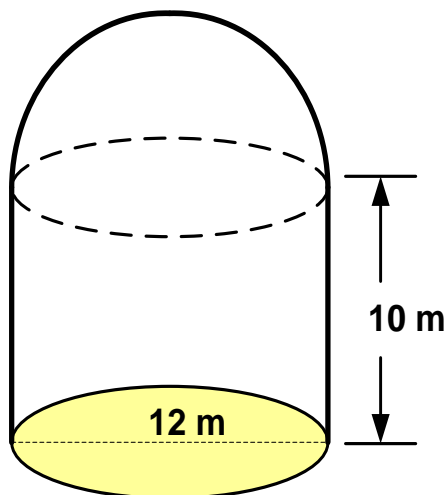
(i) Draw a venn- diagram to illustrate these sets.

(ii) List the elements of  $A' \cap B$ . (04 marks)

8. Express  $0.4\bar{3}$  into fraction in the lowest form. (04 marks)

9. A certain microfinance institution charges compound interest on money borrowed. A farmer borrowed sh. 160,000 from the microfinance institution. He paid back sh. 250,000 after 2 years. Find the interest rate per annum. (04 marks)

10. A cylindrical water tank of diameter 12m and 10m high is covered with a hemispherical top as shown in figure below.



Calculate the capacity in litres of the tank including the domed path. (Take 1 litre = 1000 cm<sup>3</sup>). (04 marks)

### SECTION B: (60 MARKS)

Attempt any **five** questions from this sections.

11. A group of 120 students at Hills high school were asked to mention the football teams they support in the world cup 2018 among the three teams of England, Brazil and France. From the survey, 26 supported England only and 33 supported France only. The number of students, who supported Brazil only, exceeded those who supported England only by 2. 18 Students supported both England and France, 20 supported Brazil and England while 19 supported France and Brazil. 4 students did not support any of the three teams.

Using a suitable Venn-diagram, find; the three teams.

- How many students supported all the three teams.
  - How many students supported France.
  - Find the probability that a student chosen at random supported at least two teams. (12 marks)
12. (a) Given that  $f(x) = px^2 - q$ ,  $f(0) = -3$  and  $f(-2) = 13$ . Determine values of  $p$  and  $q$ . (06 marks)

(b) The functions  $h(x) = x^2 + 1$  and  $g(x) = 4x$

Find (i)  $hg(x)$

(ii) the value of  $x$  for which  $hg(x) = gh(x)$

(06 marks)

13. The charge, C shillings per person for attending a certain workshop is partly fixed and partly inversely proportional to the total number N of people.

(a) Write down an expression for C in terms of N.

(b) When 50 people attend, the charge is sh. 6,000 per person while for 25 people the charge is sh. 9,000 per person. Calculate the fixed charge.

(c) Find the charge per person when 200 people attend.

(12 marks)

14. (a) Smart phone whose marked price is sh. 400,000 is sold at sh. 560,000 on hire purchase terms. Odongo bought the smart phone on hire purchase terms. He paid a deposit of 25% of the hire purchase price and cleared the balance by equal monthly instalments of sh. 26,250.

Calculate the number of instalments he made. (05 marks)

(b) Muhindo's monthly gross salary is shs. 3,000,000 before charging income tax, all the following allowances are deducted from his gross salary.

- Welfare allowance shs. 90,000.

- Child allowance shs. 50,000.

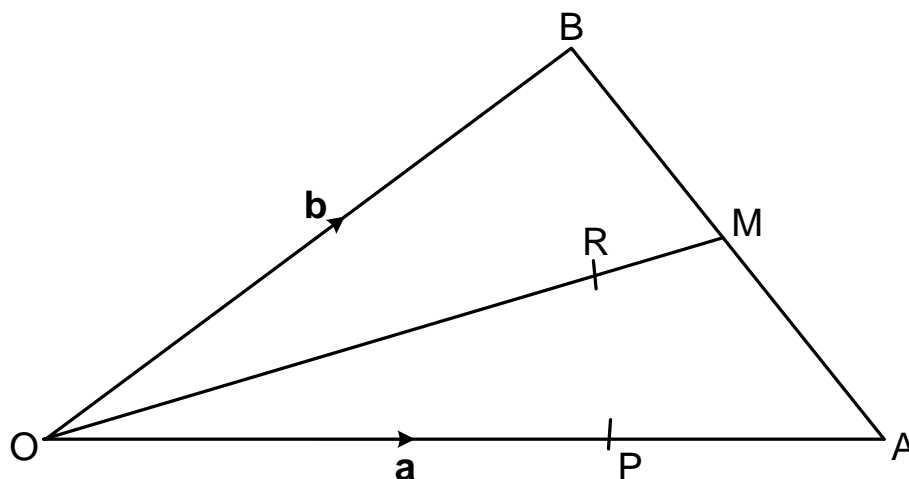
- Marriage allowance shs. 40,000.

Calculate his;

(i) Monthly taxable income.

(ii) Net income, if he pays income tax of 30% of his monthly taxable income. (07 marks)

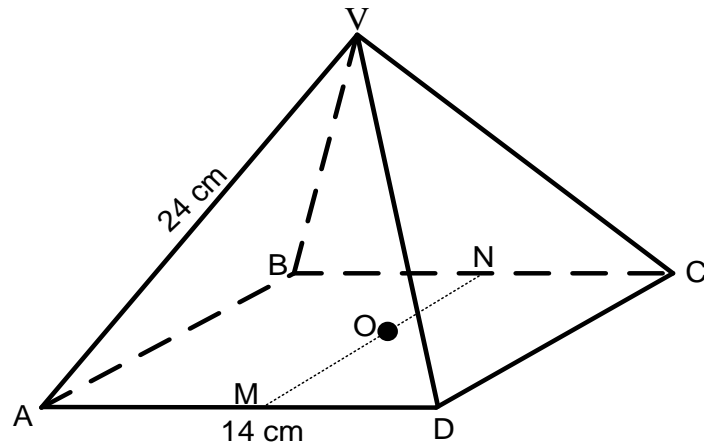
15. In the figure below,  $\mathbf{OA} = \mathbf{a}$ ,  $\mathbf{OB} = \mathbf{b}$ . M is the mid-point of AB.  $OP : PA = 3:2$  and  $OR : RM = 3 : 1$ .



- (a) Express the following vectors in terms of  $\mathbf{a}$  and  $\mathbf{b}$
- (i)  $\mathbf{OM}$
  - (ii)  $\mathbf{OR}$
  - (iii)  $\mathbf{PR}$
  - (iv)  $\mathbf{PB}$
- (b) Show that P, R and B lie on straight line. (12 marks)
16. Town A and Town B are 360km apart. A Prado left Town B for A at 7:00am at an average speed of  $50\text{kmh}^{-1}$ . It then stopped for half an hour for servicing at town C after covering a distance of 200km and later continued at an average speed of  $80\text{kmh}^{-1}$ . At 8:30am, a bus leaves Town A at an average speed of  $100\text{kmh}^{-1}$  without stopping to town B.
- (a) Using a horizontal scale of 1cm to represent 30 minutes and a vertical scale of 2cm to represent 50km, show the two journeys on the same graph.
  - (b) Determine where and when did the bus meet the Prado car?
  - (c) Find the distance from town B between the two vehicles at noon.
  - (d) Calculate the average speed for the Prado car.

(12 marks)

17. The figure below represents a rectangular based pyramid VABCD.  $AB = 10$  cm and  $AD = 14$  cm. Point O is vertically below V and  $VA = 24$  cm.



- (a) Calculate the;
- height of the pyramid, correct to two decimal places.
  - Length of projection of VA onto the base ABCD.
  - Given that M and N are mid-points of AD and BC respectively. Find the angle between the plane VMN and VDC.
- (b) Determine the volume of the pyramid, correct to **one** decimal place. (12 marks)

**END**

SMATA JOINT MOCK MATHEMATICS EXAMS, 2018

S. H MATH P-2

No.	SOLUTION	MKS	COMMENT
1.	$= (2^5)^{2/5} \times \left(\frac{81}{16}\right)^{1/4}$ $= (2^2) \times \left(\frac{3^4}{2^4}\right)^{1/4}$ $= 2^2 \times 3^1 \times 2^{-1}$ $= 2^0 \times 3^1$ $= 3$	<p>M<sub>1</sub></p> <p>M<sub>1</sub></p> <p>M<sub>1</sub></p> <p>A<sub>1</sub></p>	<p>for powers of 2 and 3</p>
		04	
2.	<p>Let <math>f^{-1}(x) = m</math></p> $m = \frac{x+3}{5}$ $5m = x+3$ $5m-3 = x$ $f(x) = 5x-3$ $\Rightarrow f(2) = 5(2)-3$ $\therefore f(2) = 7$	<p>M<sub>1</sub></p> <p>M<sub>1</sub></p> <p>M<sub>1</sub></p> <p>A<sub>1</sub></p>	<p>substituting 2 in f(x)</p>
		04	
3.	<p>Mid-point of AB = <math>\left(\frac{5+1}{2}, \frac{-4+2}{2}\right)</math></p> $= \left(\frac{4}{2}, \frac{-6}{2}\right)$ $= (2, -3)$ <p>Gradient of AB = <math>\frac{-2-4}{-1-5} = \frac{2}{-6}</math></p> $= -\frac{1}{3}$	<p>M<sub>1</sub></p> <p>M<sub>1</sub></p>	<p>finding the mid-pt</p> <p>finding the grad.</p>

	<p>Gradient of perpendicular bisector = 3</p> <p>Equation: <math>\frac{y-3}{x-2} = 3</math></p> $y+3 = 3x-6$ $y = 3x-9$	<p>M<sub>1</sub></p> <p>A<sub>1</sub></p>	
		04	
4-	$\log_{10}(2x-8) - \log_{10}(x+4) = \log_{10} 10$ $\log_{10} \left( \frac{2x-8}{x+4} \right) = \log_{10} 10$ $\frac{2x-8}{x+4} = 10$ $2x-8 = 10x+40$ $-8x = 48$ $\therefore x = -6$	<p>M<sub>1</sub></p> <p>M<sub>1</sub></p> <p>M<sub>1</sub></p> <p>A<sub>1</sub></p>	<p>A&amp;T</p> $\log_{10} \left( \frac{2x-8}{x+4} \right) = 1$ $\frac{2x-8}{x+4} = 10^1$ $2x-8 = 10x+40$ $x = -6$
		04	
5-	<p>1 cm <math>\equiv</math> 50,000 cm on ground</p> <p>1 cm <math>\equiv</math> <math>\left( \frac{50,000}{100,000} \right)</math> Km</p> <p>1 cm <math>\equiv</math> 0.5 Km</p> <p>20 cm <math>\equiv</math> <math>(0.5 \times 20)</math> Km</p> <p><math>=</math> 10 Km</p> <p><math>\therefore</math> The distance is 10 Km between the two villages.</p>	<p>M<sub>1</sub></p> <p>M<sub>1</sub></p> <p>M<sub>1</sub></p> <p>A<sub>1</sub></p>	
		04	
6	<p>(i) <math>\vec{m} + \frac{1}{2}\vec{n} = \begin{pmatrix} 2 \\ -1 \end{pmatrix} + \frac{1}{2}\begin{pmatrix} 6 \\ -4 \end{pmatrix} = \begin{pmatrix} 2 \\ -1 \end{pmatrix} + \begin{pmatrix} 3 \\ -2 \end{pmatrix}</math></p> $= \begin{pmatrix} 5 \\ -3 \end{pmatrix}$ <p>(ii) <math>\left  \vec{m} + \frac{1}{2}\vec{n} \right  = \sqrt{5^2 + (-3)^2} = \sqrt{25+9} = \sqrt{34}</math> units</p>	<p>M<sub>1</sub></p> <p>A<sub>1</sub></p> <p>M<sub>1</sub></p>	

$$6. (ii) \therefore |m + \frac{1}{2}n| = \sqrt{34} = 5.831 \text{ (3d.p)}$$

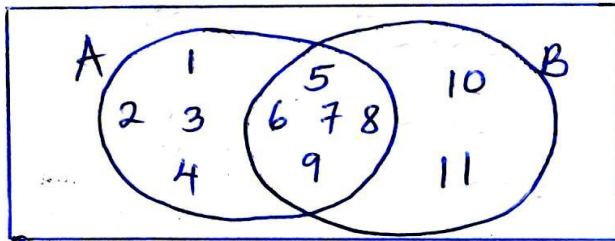
A<sub>1</sub>

04

$$7. A = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$$

$$B = \{5, 6, 7, 8, 9, 10, 11\}$$

(i)



B<sub>1</sub>

$$(ii) A' \cap B = \{10, 11\}$$

A<sub>1</sub>

04

$$8. \text{ Let } y = 0.4333 \dots$$

$$10y = 4.333 \dots \quad (i)$$

$$10(10y) = 43.333 \dots$$

$$100y = 43.333 \dots \quad (ii)$$

$$\text{Eqn. (ii)} - \text{Eqn. (i)} \quad 100y = 43.333 \dots$$

$$- \quad 10y = 4.333 \dots$$

$$\hline 90y = 39$$

$$y = \frac{13}{30}$$

$$\therefore 0.4\dot{3} = \frac{13}{30}$$

M<sub>1</sub>

M<sub>1</sub>

M<sub>1</sub>

A<sub>1</sub>

04

9. Let the interest rate be  $r\%$

$$A = P \left(1 + \frac{r}{100}\right)^n$$

$$250,000 = 160,000 \left(1 + \frac{r}{100}\right)^2$$

$$\left(\frac{250,000}{160,000}\right) = \left(1 + 0.01r\right)^2$$

$$\sqrt{1.5625} = \sqrt{\left(1 + 0.01r\right)^2}$$

$$1.25 = 1 + 0.01r$$

$$0.25 = 0.01r$$

$$r = 25\%$$

$\therefore$  The compound interest rate is  $25\%$

B<sub>1</sub>

M<sub>1</sub>

M<sub>1</sub>

A<sub>1</sub>

04

10- Volume of tank = Volume of cylinder  
+ Volume of hemisphere

$$= \pi r^2 h + \frac{2}{3} \pi r^3$$

$$= \pi r^2 \left(h + \frac{2}{3} r\right)$$

$$= \frac{22}{7} (6)^2 \left[10 + \frac{2}{3} \times 6\right]$$

$$= \frac{792}{7} \times 14$$

$$\text{Volume of tank} = 1584 \text{ m}^3$$

$$1 \text{ m}^3 = 1000,000 \text{ cm}^3$$

$$\text{Volume in cm}^3 = 1584000,000 \text{ cm}^3$$

$$\text{Capacity} = \frac{1584000,000}{1000} = 1584000 \text{ litres}$$

M<sub>1</sub>

B<sub>1</sub>

M<sub>1</sub>A<sub>1</sub>

04

11-

$n(E) = 120$       Let E denote England

$n(E \text{ only}) = 26$       F " France

$n(F \text{ only}) = 33$       B " Brazil

$n(B \text{ only}) = 26 + 2 = 28$

$n(E \cap F) = 18$

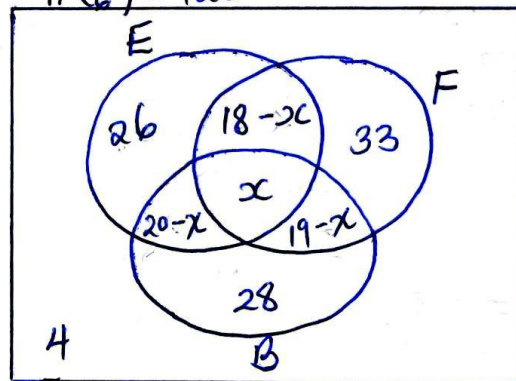
$n(B \cap E) = 20$

$n(F \cap B) = 19$

$n(E \cup F \cup B)^c = 4$

$n(E) = 120$

(a)



B<sub>3</sub>

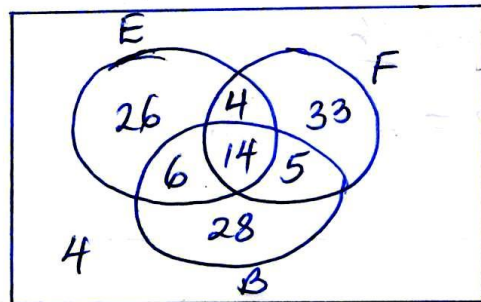
Let  $n(E \cap F \cap B) = x$

$4 + 26 + 18 - x + x + 20 - x + 33 + 19 - x + 28 = 120$       M<sub>1</sub>

$-20x + 148 = 120$

$-20x = -28$       M<sub>1</sub>

$\therefore x = 14$



B<sub>2</sub>

<p>11. (a) 14 students supported all the three teams.</p> <p>(b) Students who supported France  <math>n(F) = 14 + 4 + 33 + 5</math>  <math>= 56</math></p> <p>(c) <math>P(\text{At least 2 teams}) = \frac{n(E)}{n(S)}</math>  <math>= \frac{6 + 4 + 5 + 14}{120}</math>  <math>= \frac{29}{120}</math></p>	<p>A<sub>1</sub></p> <p>M<sub>1</sub></p> <p>A<sub>1</sub></p> <p>M<sub>1</sub></p> <p>A<sub>1</sub></p>	
<p>12. (a) <math>f(x) = px^2 - q</math>  <math>f(0) = p(0)^2 - q = -3</math>  <math>-q = -3</math>  <math>\therefore q = 3</math></p> <p><math>f(-2) = p(-2)^2 - q = 13</math>  <math>4p - q = 13</math>  <math>4p = 13 + q</math>  <math>4p = 13 + 3</math>  <math>p = \frac{16}{4}</math>  <math>\therefore p = 4</math></p>	<p>M<sub>1</sub></p> <p>A<sub>1</sub></p> <p>M<sub>1</sub></p> <p>M<sub>1</sub></p> <p>M<sub>1</sub></p> <p>A<sub>1</sub></p>	

12 (b)  $h(x) = x^2 + 1$ ,  $g(x) = 4x$

(i)  $hg(x) = h(4x)$

$$h(4x) = (4x)^2 + 1$$

$$\therefore hg(x) = 16x^2 + 1$$

M<sub>1</sub>

A<sub>1</sub>

(ii)  $gh(x) = g(x^2 + 1)$

$$g(x^2 + 1) = 4(x^2 + 1)$$

$$gh(x) = 4x^2 + 4$$

M<sub>1</sub>

M<sub>1</sub>

for  $hg(x) = gh(x)$

$$16x^2 + 1 = 4x^2 + 4$$

M<sub>1</sub>

$$12x^2 = 3$$

$$x^2 = \frac{3}{12}$$

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

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

A<sub>1</sub>

12

13-

$C \neq C_0$ ,  $C \propto \frac{1}{N}$   
 where  $C_0 = \text{Fixed charge}$

(a)  $C = C_0 + \frac{K}{N}$

B<sub>1</sub>

(b) for  $N = 50$ ,  $C = 6000$

$$6000 = C_0 + \frac{K}{50}$$

M<sub>1</sub>

$$50C_0 + K = 300,000 \dots (i)$$

M<sub>1</sub>

for  $N = 25$ ,  $C = 9000$

$$9000 = C_0 + \frac{K}{25}$$

M<sub>1</sub>

$$25C_0 + K = 225,000 \dots (ii)$$

M<sub>1</sub>

Eqn (i) - Eqn (ii)

$$25 C_0 = 75000$$

$$C_0 = 3000/\text{f}$$

∴ The fixed charge is 3000/f

(c)  $C = ?$ ,  $N = 200$

$$C_0 = 3000$$

$$K = 225,000 - 25C_0$$

$$= 225000 - 75000$$

$$\therefore K = 150,000$$

$$C = 3000 + \frac{150,000}{N}$$

for  $N = 200$

$$C = 3000 + \frac{150,000}{200}$$

$$= 3000 + 750$$

$$\therefore C = 3750/\text{f}$$

14. (a). Marked price = sh- 400,000  
Hire purchase price = sh- 560,000

$$\text{Deposit} = \frac{25}{100} \times 560,000 = 140,000/\text{f}$$

let number of instalment =  $n$

Hire purchase price = Deposit + Instalment

$$= 140,000 + (26250 \times n)$$

$$560,000 = 26250n + 140,000$$

$$420,000 = 26250n$$

14.	$\frac{26250n}{26250} = \frac{420,000}{26250}$ $n = 16$ <p>∴ He made 16 monthly instalments.</p>	M <sub>1</sub> A <sub>1</sub>																
		05																
14. (b)	<table border="0" style="width: 100%;"> <thead> <tr> <th style="text-align: left;"><u>Allowance</u></th> <th style="text-align: left;"><u>Amount</u></th> <th></th> </tr> </thead> <tbody> <tr> <td>Welfare</td> <td>= 90,000</td> <td></td> </tr> <tr> <td>child</td> <td>= 50,000</td> <td></td> </tr> <tr> <td>Marriage</td> <td>= 40,000</td> <td></td> </tr> <tr> <td><b>TOTAL</b></td> <td><u>180,000</u></td> <td></td> </tr> </tbody> </table> <p>i) Taxable income = Gross income - Total allowances</p> $= 3000,000 - 180,000$ $= 2,820,000 \text{ f}$ <p>ii) Income tax = <math>\frac{30}{100} \times 2,820,000</math></p> $= \text{sh. } 846,000 \text{ f}$ <p>Net income = Gross income - Income tax</p> $= 3000,000 - 846,000$ $= \text{sh. } 2,154,000 \text{ f}$	<u>Allowance</u>	<u>Amount</u>		Welfare	= 90,000		child	= 50,000		Marriage	= 40,000		<b>TOTAL</b>	<u>180,000</u>		M <sub>1</sub> M <sub>1</sub> A <sub>1</sub> M <sub>1</sub> B <sub>1</sub> M <sub>1</sub> A <sub>1</sub>	
<u>Allowance</u>	<u>Amount</u>																	
Welfare	= 90,000																	
child	= 50,000																	
Marriage	= 40,000																	
<b>TOTAL</b>	<u>180,000</u>																	
		07																

15.

$$\underline{OA} = \underline{a}, \underline{OB} = \underline{b}$$

$$OP : PA = 3 : 2 \text{ and } OR : RM = 3 : 1$$

$$(i) \quad \underline{OM} = \underline{OA} + \underline{AM}$$

$$= \underline{OA} + \frac{1}{2} \underline{AB}$$

$$= \underline{a} + \frac{1}{2} (\underline{OB} - \underline{OA})$$

$$= \underline{a} + \frac{1}{2} (\underline{b} - \underline{a})$$

$$= \frac{1}{2} \underline{a} + \frac{1}{2} \underline{b}$$

$$\underline{OM} = \frac{1}{2} (\underline{a} + \underline{b})$$

M<sub>1</sub>A<sub>1</sub>

$$(ii) \quad \underline{OR} = \frac{3}{4} \underline{OM}$$

$$= \frac{3}{4} \left[ \frac{1}{2} (\underline{a} + \underline{b}) \right]$$

$$= \frac{3}{8} (\underline{a} + \underline{b})$$

M<sub>1</sub>A<sub>1</sub>

$$(iii) \quad \underline{PR} = \underline{PO} + \underline{OR}$$

$$= -\frac{3}{5} \underline{OA} + \underline{OR}$$

$$= -\frac{3}{5} \underline{a} + \frac{3}{8} (\underline{a} + \underline{b})$$

$$= \frac{3}{8} \underline{a} - \frac{3}{5} \underline{a} + \frac{3}{8} \underline{b}$$

$$= \frac{3}{8} \underline{b} - \frac{9}{40} \underline{a}$$

$$= \frac{15\underline{b} - 9\underline{a}}{40} = \frac{3}{40} (5\underline{b} - 3\underline{a})$$

M<sub>1</sub>A<sub>1</sub>

15

$$(a) (iv) \vec{PB} = \vec{OB} - \vec{OP}$$

$$= \vec{b} - \frac{3}{5} \vec{OA}$$

$$= \vec{b} - \frac{3}{5} \vec{a}$$

$$= \frac{5\vec{b} - 3\vec{a}}{5}$$

$$\therefore \vec{PB} = \frac{1}{5} (5\vec{b} - 3\vec{a})$$

M1

A1

$$(b) PR = kPB$$

$$k = \frac{3}{40} (5\vec{b} - 3\vec{a}) \div \frac{1}{5} (5\vec{b} - 3\vec{a})$$

$$k = \frac{3(5\vec{b}/3\vec{a})}{40} \times \frac{5}{(5\vec{b}/3\vec{a})}$$

$$k = \frac{3}{8}$$

$$PR = \frac{3}{8} PB$$

M1 M1

A1

Since  $\vec{PR}$  is parallel to  $\vec{PB}$  and they share a common point  $P$ , therefore; points  $P$ ,  $R$  and  $B$  lie on a straight line.

B1

16. (b) - The bus meets the Prado at a distance of 170Km  $A_1$  from Town B.

- They meet at 10:24am  $A_1$

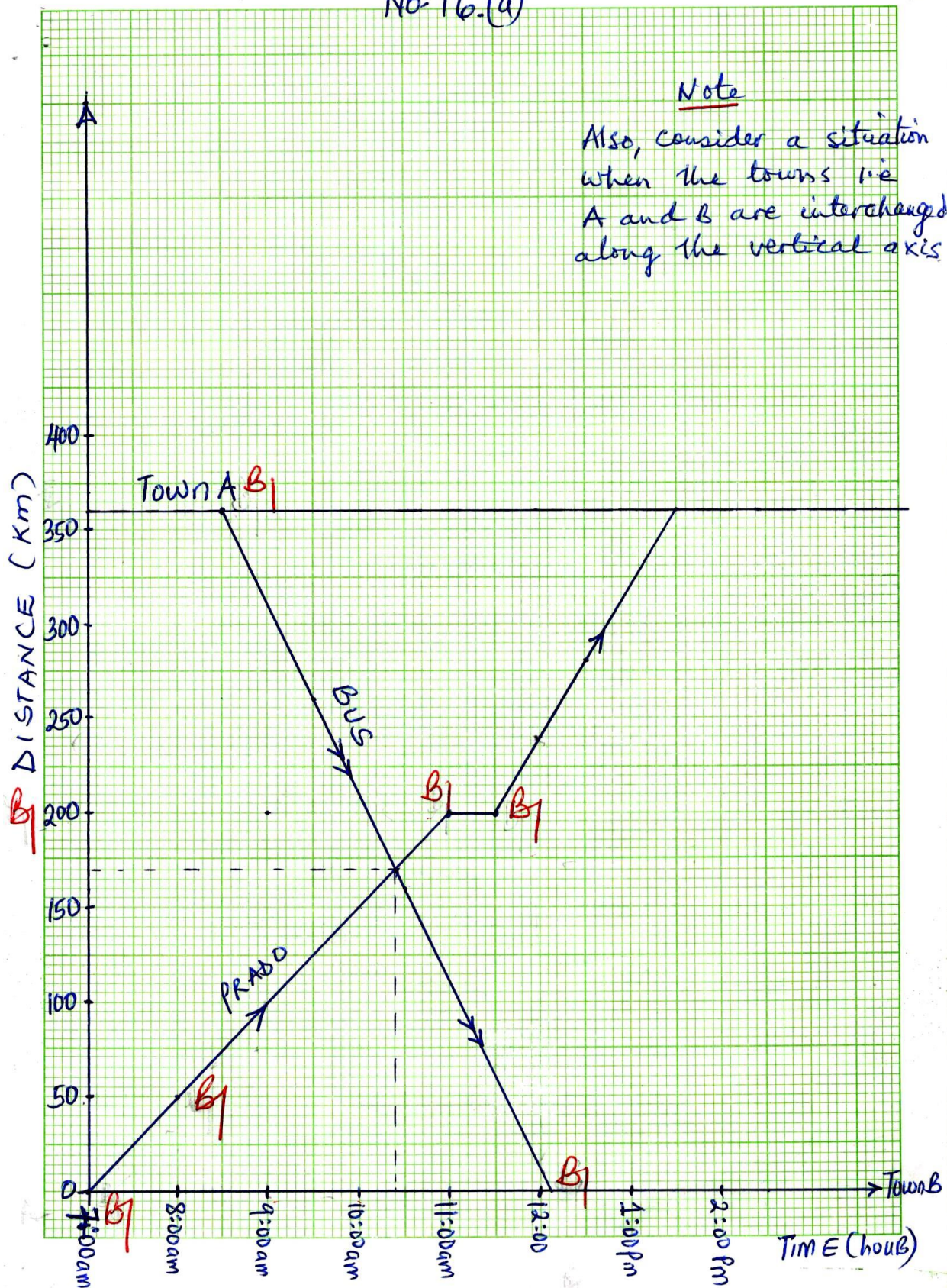
(c) - Prado was 240Km from Town B at noon and the bus was 10Km from Town B

$$\begin{aligned} \text{Difference} &= 240\text{Km} - 10\text{Km} \quad M_1 \\ &= 230\text{Km} \quad A_1 \end{aligned}$$

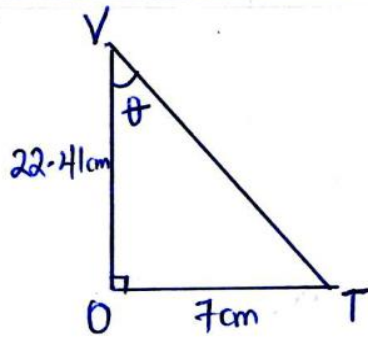
$\therefore$  They were 230Km apart by noon.

$$\begin{aligned} \text{(d) Average speed for Prado} &= \frac{\text{Total distance}}{\text{Total time}} \\ &= \frac{360\text{km}}{6.5\text{hrs}} \quad M_1 \\ &= 55.385\text{km/hr.} \quad A_1 \end{aligned} \quad \left\{ \begin{aligned} &= \frac{360\text{Km}}{6.5\text{hours}} \quad M_1 \\ &= 55.38\text{km h}^{-1} \quad A_1 \end{aligned} \right.$$

No 16.(a)



17.



$$\tan \theta = \frac{OT}{VO}$$

$$\tan \theta = \frac{7}{22.41}$$

$$\theta = \tan^{-1}\left(\frac{7}{22.41}\right)$$

$$\theta = 17.3^\circ \text{ (1 d.p.)}$$

$\therefore$  The angle between the plane VMN and VBC is  $17.3^\circ$ .

(b) Volume of pyramid =  $\frac{1}{3} \times \text{base Area} \times h$

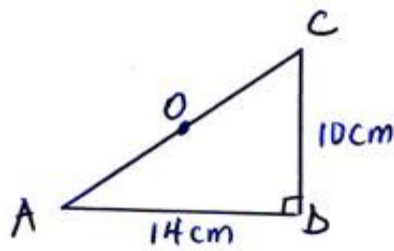
$$= \frac{1}{3} \times (14 \times 10) \times 22.41$$

$$= 1045.8 \text{ cm}^3$$

M<sub>1</sub>M<sub>1</sub>A<sub>1</sub>M<sub>1</sub> M<sub>1</sub>A<sub>1</sub>



17. (a).



$$AC = \sqrt{14^2 + 10^2}$$

$$= \sqrt{296}$$

$$\bar{AC} = 17.2047 \text{ cm (4d.p)}$$

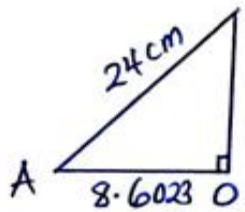
$$AO = \frac{1}{2}(17.2047)$$

$$\bar{AO} = 8.6023 \text{ cm}$$

M<sub>1</sub>

B<sub>1</sub>

(i) let height of pyramid =  $\bar{OV}$



$$\bar{VO} = \sqrt{24^2 - (8.6023)^2}$$

$$= \sqrt{502.0004}$$

$$\bar{VO} = 22.4054 \text{ cm}$$

M<sub>1</sub>

A<sub>1</sub>

$\therefore$  Height of pyramid = 22.41 cm (2d.p)

(ii) The length of projection of VA =  $\bar{AO}$

$$\bar{AO} = \frac{1}{2}(17.2047)$$

$$= 8.6023 \text{ cm}$$

$$= 8.6 \text{ cm (1d.p)}$$

M<sub>1</sub>

A<sub>1</sub>

(iii) let the  $\angle$  between VMN and VDC be  $\phi$ .

$\phi = \angle OVT$  where T is the mid-point of DC.