

NAME: _____ ADM NO: _____ CLASS: _____

DATE: _____ SIGN: _____

ANESTAR VICTORY BOYS HIGH SCHOOL
MATHEMATICS FORM 2
CAT ONE
TERM 3, 2023



MARKS HERE

INSTRUCTIONS: (Answer all the question in Section A & any two in section B)

TIME: (1H 30 Min)

SECTION A

1. Without using a mathematical table or calculator solve the following. (3mks)

| | | | | | | | | | | | | | | |
|---|-----------------------------|-------------------------|---------|-------|-------------------------|----------|--|--|---------------|--|-----------------------------|--|---|-----------|
| $\frac{3\sqrt{0.729 \times 409.6}}{0.1728}$ <p>No step log</p> <table border="0" style="width: 100%;"> <tr> <td style="width: 33%;">0.729</td> <td style="width: 33%;">7.29 × 10⁻¹</td> <td style="width: 33%;">-1.8627</td> </tr> <tr> <td>409.6</td> <td>4.096 × 10²</td> <td>2.6124 +</td> </tr> <tr> <td></td> <td></td> <td><u>2.4751</u></td> </tr> <tr> <td></td> <td>$\frac{2.4751}{3} = 0.8250$</td> <td></td> </tr> </table> | 0.729 | 7.29 × 10 ⁻¹ | -1.8627 | 409.6 | 4.096 × 10 ² | 2.6124 + | | | <u>2.4751</u> | | $\frac{2.4751}{3} = 0.8250$ | | 1.728×10^{-1} -1.2375 0.8250 $\hline 1.2375$ $\hline 1.5875$ $10^1 \times \log^{-1}(0.5875)$ | $= 38.68$ |
| 0.729 | 7.29 × 10 ⁻¹ | -1.8627 | | | | | | | | | | | | |
| 409.6 | 4.096 × 10 ² | 2.6124 + | | | | | | | | | | | | |
| | | <u>2.4751</u> | | | | | | | | | | | | |
| | $\frac{2.4751}{3} = 0.8250$ | | | | | | | | | | | | | |

2. Three bells are programmed to ring after an interval of 15 minutes, 25 minutes and 50 minutes. If they all rang together at 6:45am, when will they next ring together? (3mks)

| | | | | | | | | | | | | | | | | | | | | | | |
|--|----|----|----|----|---|----|----|----|---|---|----|----|---|---|---|---|--|---|---|---|--|--|
| <table border="0" style="width: 100%;"> <tr> <td style="width: 33%;">2</td> <td style="width: 33%;">15</td> <td style="width: 33%;">25</td> <td style="width: 33%;">50</td> </tr> <tr> <td>3</td> <td>15</td> <td>25</td> <td>25</td> </tr> <tr> <td>5</td> <td>5</td> <td>25</td> <td>25</td> </tr> <tr> <td>5</td> <td>1</td> <td>5</td> <td>5</td> </tr> <tr> <td></td> <td>1</td> <td>1</td> <td>1</td> </tr> </table> | 2 | 15 | 25 | 50 | 3 | 15 | 25 | 25 | 5 | 5 | 25 | 25 | 5 | 1 | 5 | 5 | | 1 | 1 | 1 | $2 \times 3 \times 5 \times 5 = 150$ $\frac{150}{60} = 2 \frac{1}{2} \text{ hrs.}$ $6:45$ $+ 2:30$ $\hline 8:75$ | $\frac{8:75}{9:15}$ $= 9:15 \text{ am.}$ |
| 2 | 15 | 25 | 50 | | | | | | | | | | | | | | | | | | | |
| 3 | 15 | 25 | 25 | | | | | | | | | | | | | | | | | | | |
| 5 | 5 | 25 | 25 | | | | | | | | | | | | | | | | | | | |
| 5 | 1 | 5 | 5 | | | | | | | | | | | | | | | | | | | |
| | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | |

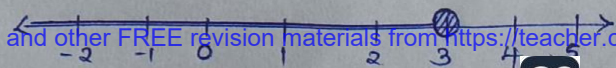
3. Solve $2^{8x} = 512$ (2mks)

| | |
|---|-------------------------------------|
| $2^{8x} = 2^9$ $\frac{8x}{8} = \frac{9}{8}$ | $x = \frac{9}{8} \text{ or } 1.125$ |
|---|-------------------------------------|

4. Solve the inequality and represent the solution on a number line

| | |
|--|---|
| $4 - 5x \geq -11 \quad (2\text{mks})$ $4 - 5x \geq -11$ $-5x \geq -11 - 4$ | $\frac{-5x}{-5} \geq \frac{-15}{-5}$ $x \leq 3$ |
|--|---|

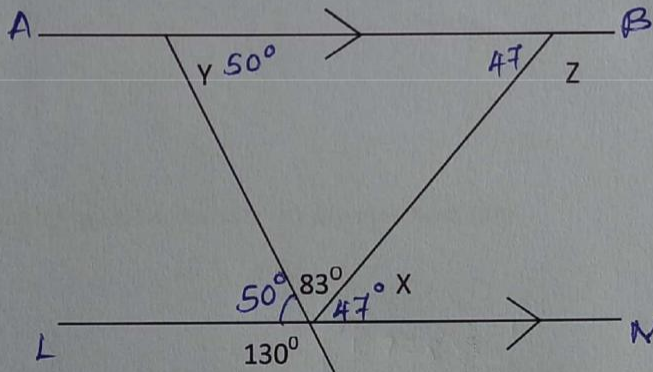
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5. Find the equation of a line passing through point (2,3) and is perpendicular to $(y=3x-1)$ (3mks)

$$\begin{array}{l}
 y = 3x - 1 \\
 M_1 = 3 \\
 M_1 \times M_2 = -1 \\
 \therefore M_2 = -\frac{1}{3}
 \end{array}
 \quad \left| \quad
 \begin{array}{l}
 (2, 3) \quad (x, y) \quad -\frac{1}{3} \\
 g = \frac{\Delta y}{\Delta x} \\
 -\frac{1}{3} = \frac{y-3}{x-2}
 \end{array}
 \quad \left| \quad
 \begin{array}{l}
 3y - 9 = -x + 2 \\
 3y = -x + 11 \\
 y = \underline{\underline{-\frac{1}{3}x + 11}}
 \end{array}$$

6. In the figure below, lines AB AND LM are parallel. Find angle X, Y and Z. (3mks)



$$180 - 130 = 50$$

$$180 - (50 + 83) = 47$$

$$180 - (83 + 47) = 50^\circ$$

$$\angle XYZ = 50^\circ$$

7. Solve the following quadratic equation. (2mks)

$$5x^2 - 21x + 4$$

$$5x^2 - 21x + 4 = 0$$

$$\begin{array}{l}
 S = -21 \\
 P = 4
 \end{array}
 \left. \begin{array}{l} \\ \\ \end{array} \right\} -1, -20$$

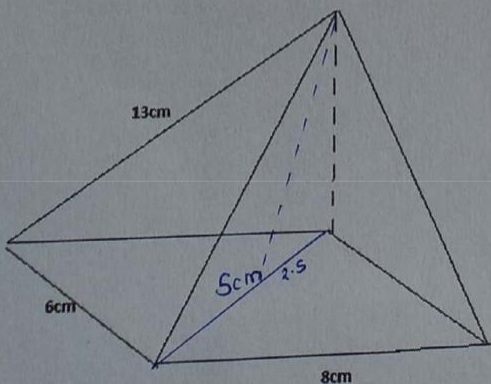
$$5x^2 - x - 20x + 4 = 0$$

$$x(5x-1) - 4(5x-1) = 0$$

$$(x-4)(5x-1) = 0$$

$$x = 4 \text{ or } \underline{\underline{\frac{1}{5}}}$$

8. Calculate surface area of the rectangular based pyramid below. (4mks)



$$SA = \text{Base Area} \times \text{height}$$

$$8^2 + 6^2 = \sqrt{100}$$

$$\text{Diagonal} = 10$$

$$\text{Perpendicular Height}$$

$$13^2 - 2.5^2 = \sqrt{162.75}$$

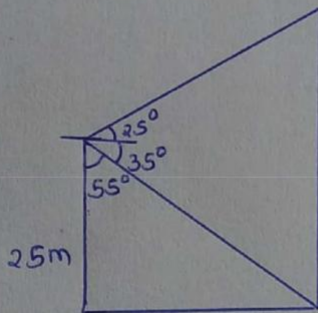
$$= 12.757 \text{ cm}$$

$$SA = 6 \times 8 \times 12.757$$

$$= \underline{\underline{612.35 \text{ cm}^2}}$$

9. From a window 25m above a street, the angle of elevation of the top of a wall on the opposite side is 15° . If the angle of depression of the base of the wall from the window is 35° find:

a) The width of the street. (2mks)



$$\tan 35^\circ = \frac{x}{25}$$

$$x = 25 \tan 35$$

$$= \underline{\underline{35.70 \text{ m.}}}$$

b) The height of the wall on the opposite side. (2mks)

$$\tan 15^\circ = \frac{x}{35.70}$$

$$x = 35.70 \tan 15^\circ$$

$$= 16.65 + 25$$

$$= \underline{\underline{41.65 \text{ m.}}}$$

10. a) Solve the inequalities $2x-5 > 11$ and $3+2x \leq 13$, giving the answer as combined inequality (3mks)

$$2x - 5 > 11$$

$$2x > 16$$

$$x > 8$$

$$3 + 2x \leq 13$$

$$2x \leq 10$$

$$x \leq 5$$

$$\underline{\underline{8 < x \leq 5}}$$

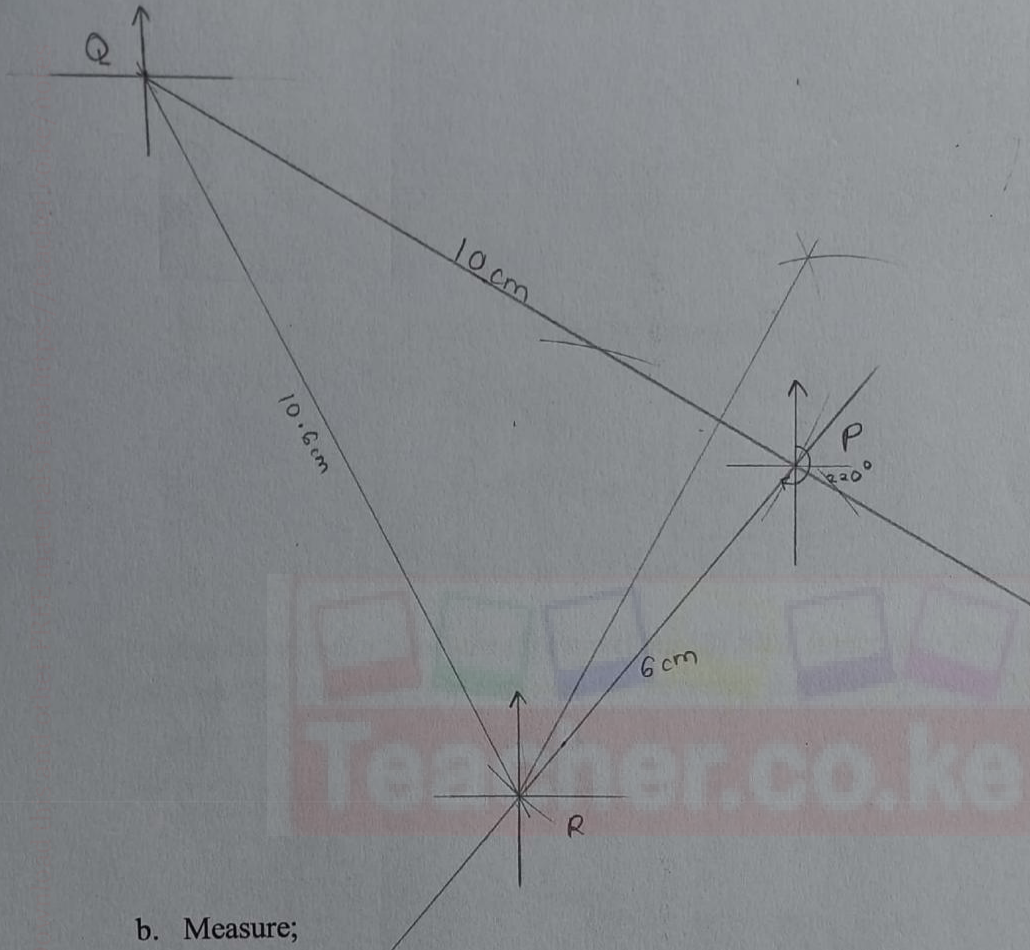
c) List the integral values of x that satisfy the combined inequality in (a) above (1mk)

5, 4, 3, 2, 1, 0, ..., 9, 10, 11, 12, ...

SECTION B

11. Three towns P, Q and R are such that, P is on a bearing of 120° and 20km from Q. Town R is on a bearing of 220° and 12km from P.

a. Using a scale of 1cm to 2km, draw and locate the position of the three towns (3mks)



b. Measure;

i. The distance between Q and R in Kilometres. (2mk)

$$\begin{aligned} & \cancel{10 \text{ cm}} \quad 10.6 \text{ cm} \times 2 \\ & = \underline{21.2 \text{ km}} \end{aligned}$$

ii. The bearing of P from R. (1mk)

$$= \underline{040^{\circ}}$$

iii. The bearing of R from Q. (1mk)

$$= \underline{155^{\circ}}$$

iv. Calculate the area bounded by PQR. (3mks)

$$\text{Height} = 5.9 \text{ cm.}$$

$$A = \frac{1}{2} \times 10 \times 5.9$$

$$= \underline{29.5 \text{ cm}^2} \quad \text{or} \quad \underline{118 \text{ km}^2}$$

12. Makau made a journey of 700km partly by train and partly by bus. He started his journey at 8:00 am by train which travelled at 50km/h. After alighting from the train which travelled 50km/h. After alighting from the train, he took a lunch break of 30 minutes. He then continued his journey by bus which travelled at 75km/h. The whole journey took $11\frac{1}{4}$ hours.

a) Determine;

i. The distance travelled by bus (4mks)

$$\begin{aligned} \text{Total time taken} &= \frac{x}{50} + \frac{1}{2} + \frac{(700-x)}{75} & 4x + 5900 &= 6750 \\ \frac{45}{4} &= \frac{x}{50} + \frac{1}{2} + \frac{(700-x)}{75} & \frac{4x}{4} &= \frac{850}{4} \\ \frac{45}{4} &= \frac{x+1475}{150} & x &= 212.5 \text{ km.} \\ & & 700 - 212.5 & \\ & & & = \underline{487.5 \text{ km.}} \end{aligned}$$

ii. The time Makau started travelling by bus (3mks)

$$\begin{aligned} \text{Time travelled by train} &= \frac{212.5}{50} & & 8:00 \\ &= 4\frac{1}{4} \text{ hrs.} & & + 4:15 \\ & & & \hline & & & 12:15 \\ & & & + 30 \\ & & & \hline & & & 12:45 \\ & & & = \underline{12:45 \text{ pm.}} \end{aligned}$$

b) The bus developed a puncture after travelling 187.5km. It took him 15 minutes to replace the wheel. Find the time taken to complete the remaining part of the journey (3mks)

$$\begin{aligned} 487.5 - 187.5 &= 300 \text{ km.} & \frac{13}{2} &= \frac{187.5}{75} + \frac{1}{4} + x \\ \text{Time taken by bus} &= \frac{487.5}{75} & \frac{13}{2} &= 2.75 + x \\ &= 6\frac{1}{2} \text{ hrs.} & x &= \frac{13}{2} - 2.75 \\ & & & = \underline{3.75 \text{ hrs.}} \end{aligned}$$

13. A Rhombus has its vertices as PQRS. The co-ordinates of the vertex P and Q of the rhombus are P(-1, 3) and Q(2, 4). The diagonal QS and PR meet at point M. Given that the equation of the line PR is $y = x + 4$.

a) Find the equation of the diagonal QS. (1 mark)

$$\begin{aligned} & \text{P}(-1, 3) & \text{Q}(2, 4) & \text{R}(0, 8) & \text{S}(1, -1) \\ & y = x + 4 & & & \\ & M_1 = 1 & & & \\ & M_2 = -1 & & & \end{aligned}$$

$$\begin{aligned} & (-1) \text{ } (x, y) & & y - 3 = -x - 1 & -1 = \frac{y-4}{x-2} \\ & \frac{-1}{1} = \frac{y-3}{x+1} & & y = -x + 2 & y = -x + 6 \end{aligned}$$

b) Find the co-ordinates of the mid-point M of QS. (2 marks)

$$\begin{aligned} -x + 6 &= x + 4 & y &= -1 + 6 \\ 2x &= 2 & y &= 5 \\ x &= 1 & & \end{aligned}$$

M (1, 5)

c) Find the co-ordinates of the points R and S. (4 marks)

$$\begin{aligned} SR &= (2-1), (4-5) & R &= (-1+1) (3+5) \\ S &= (1, -1) & R &= (0, 8) \end{aligned}$$

d) Calculate the length of diagonal PR. (3 marks)

$$P(-1, 3) \quad R(0, 8)$$

$$(-1 - 0)^2 + (3 - 8)^2$$

$$= \sqrt{1 + 25}$$

$$= \underline{\underline{5.099}}$$

