

7 LIKELY NABTEB MATHEMATICS QUESTION

1. (a) Ade, Eyo and Nuhu contributed ₦50,000, ₦75,000 and ₦100,000 respectively to a joint business venture. Their profit is to be shared in the ratio of their contributions. If they made a profit of ₦135,000 how much will each receive?

(b) Solve the following linear equation: $10(3x - 2) = 7(5x - 4)$

$$\begin{aligned} \text{Ade} - 50,000 &= \frac{50,000}{25,000} = 2 \\ \text{Eyo} - 75,000 &= \frac{75,000}{25,000} = 3 \\ \text{Nuhu} - 100,000 &= \frac{100,000}{25,000} = 4 \\ \hline &9 \end{aligned}$$

$$\text{Profit} = 135,000$$

$$\begin{aligned} \text{Ade Share} &= \frac{2 \times 135,000}{9} \\ &= 2 \times 15,000 = 30,000 \end{aligned}$$

$$\begin{aligned} \text{Eyo Share} &= 3 \times 15,000 = 45,000 \\ \text{Nuhu Share} &= 4 \times 15,000 = 60,000 \\ \hline &135,000 \end{aligned}$$

$$\begin{aligned} \text{b) } 10(3x - 2) &= 7(5x - 4) \\ 30x - 20 &= 35x - 28 \\ 35x - 30x &= 28 - 20 \\ 5x &= 8 \\ x &= \frac{8}{5} = 1\frac{3}{5} \end{aligned}$$

13, 14

2. If $\xi = \{\underline{1}, \underline{2}, \underline{3}, \underline{4}, \underline{5}, \underline{6}, 7, 8, 9, 10, 11, \underline{12}, \dots, \underline{15}\}$

$A = \{\text{numbers less than 7}\}$

$B = \{\text{multiples of 3}\}$ are subsets of ξ

(a) List the members of A and B

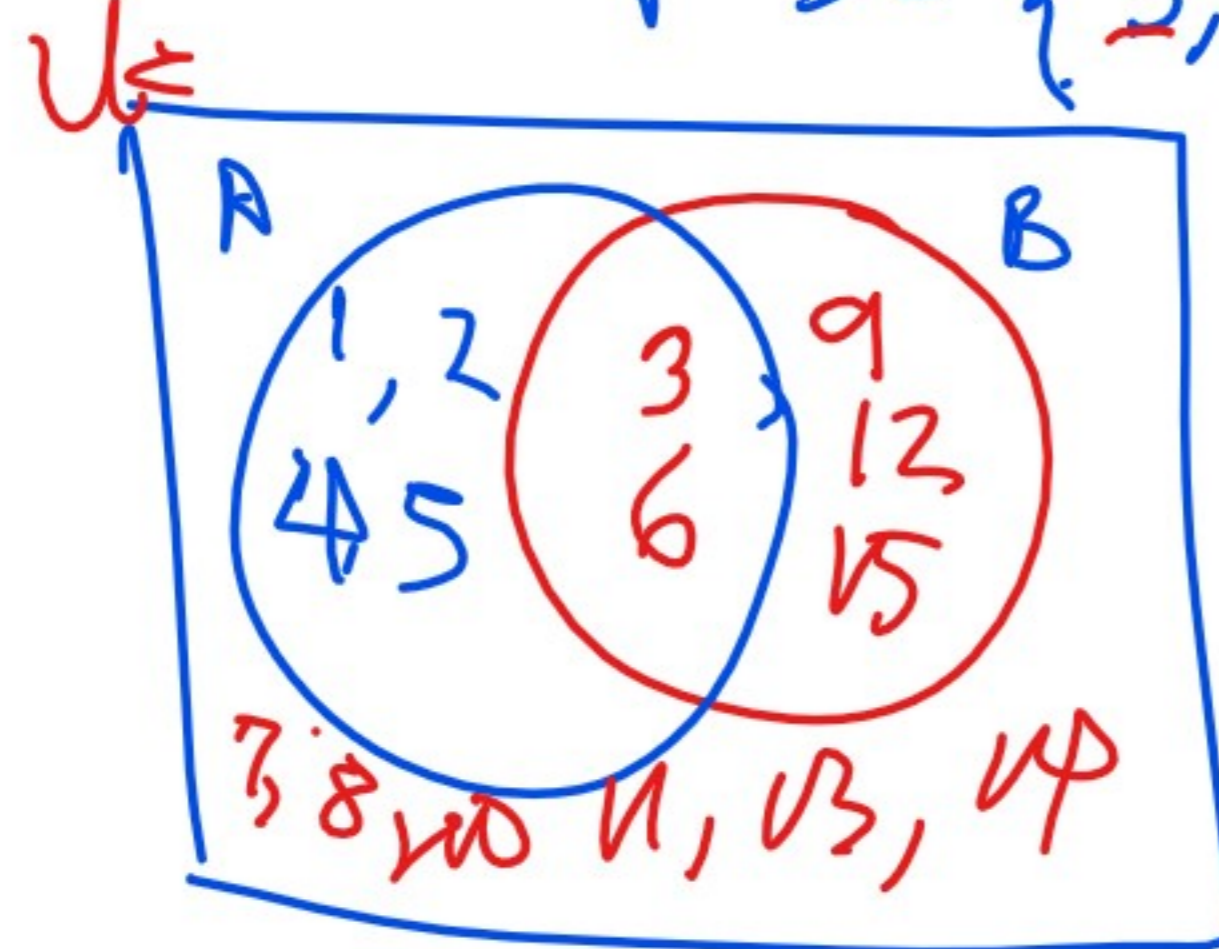
(b) Show the above sets in a Venn diagram

(c) List the elements of (i) $A^1 \cap B$ (ii) $A \cup B^1$

a) members of $A = \{1, 2, 3, 4, 5, 6\}$

members of $B = \{3, 6, 9, 12, 15\}$

b)



$A^1 = \{7, 8, 9, 10, 11, 12, 13, 14, 15\}$

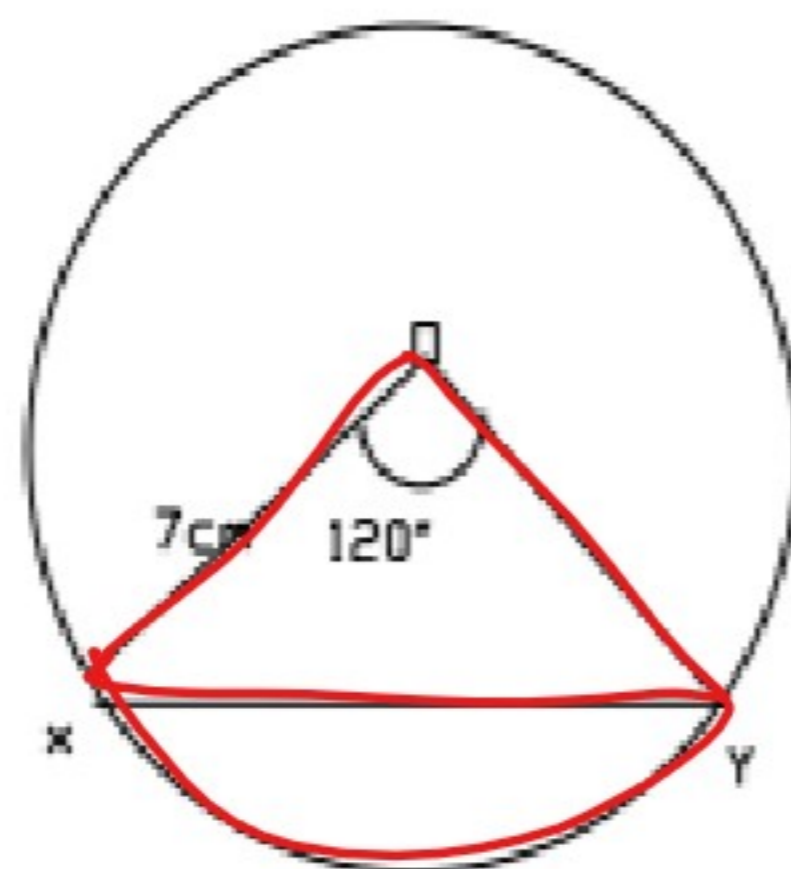
$B^1 = \{1, 2, 4, 5, 7, 8, 10, 11, 13, 14\}$

$A^1 \cap B = \{9, 12, 15\}$

$A \cup B^1 = \{1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 13, 14\}$

3. A chord XY of a circle of radius 7cm, subtends an angle of 120° at the centre. Find the:

- (i) length of arc XY
- (ii) area of the major segment which XY cuts off,
- (iii) area of the sector XOY.



Area of Major Seg = Area Circle - Area of minor seg.

Area of minor seg = Area of Sector - Area of triangle

$$= \frac{\theta}{360} \times \pi r^2 - \frac{1}{2} r^2 \sin \theta$$

$$\frac{120}{360} \times \frac{22}{7} \times 7 \times 7 - \frac{1}{2} \times 7 \times 7 \times \sin 120$$

$$51.33 - 21.22 = 30.11$$

Length of arc = $\frac{\theta}{360} \times 2\pi r$

$$= \frac{120}{360} \times 2 \times \frac{22}{7} \times 7$$

$$= \frac{2 \times 22}{3} = 14.67 \text{ cm}$$

Area of Circle = πr^2

$$= \frac{22}{7} \times 7^2$$

$$22 \times 7 = 154$$

Major Seg = $154 - 30.11$

$$= 123.89 \text{ cm}^2$$

Area of Sector = $\frac{\theta}{360} \pi r^2$

$$= \frac{120}{360} \times \frac{22}{7} \times 7 \times 7$$

$$= \frac{154}{3} = 51.33$$

4. The scores in an ICT Quiz is given below

Score(x)	2	3	4	5	6 ⁶⁶	7	8	9	10
Frequency(f)	2	2	4	7 ₁₅	8 _↑	3 ₁₅	4	5	3

Calculate:

(i) total number of students = 38 students

(ii) mean scores

(iii) median scores

(iv) modal scores

$$\text{Mean Score} = \frac{\sum fx}{\sum f} = \frac{4 \times 2 + 6 \times 2 + 16 \times 4 + 48 + 21 + 32 + 45 + 30}{38} = \frac{237}{38} = 6.24$$

$$\text{Median Score} = \frac{6 + 6}{2} = \frac{12}{2} = 6$$

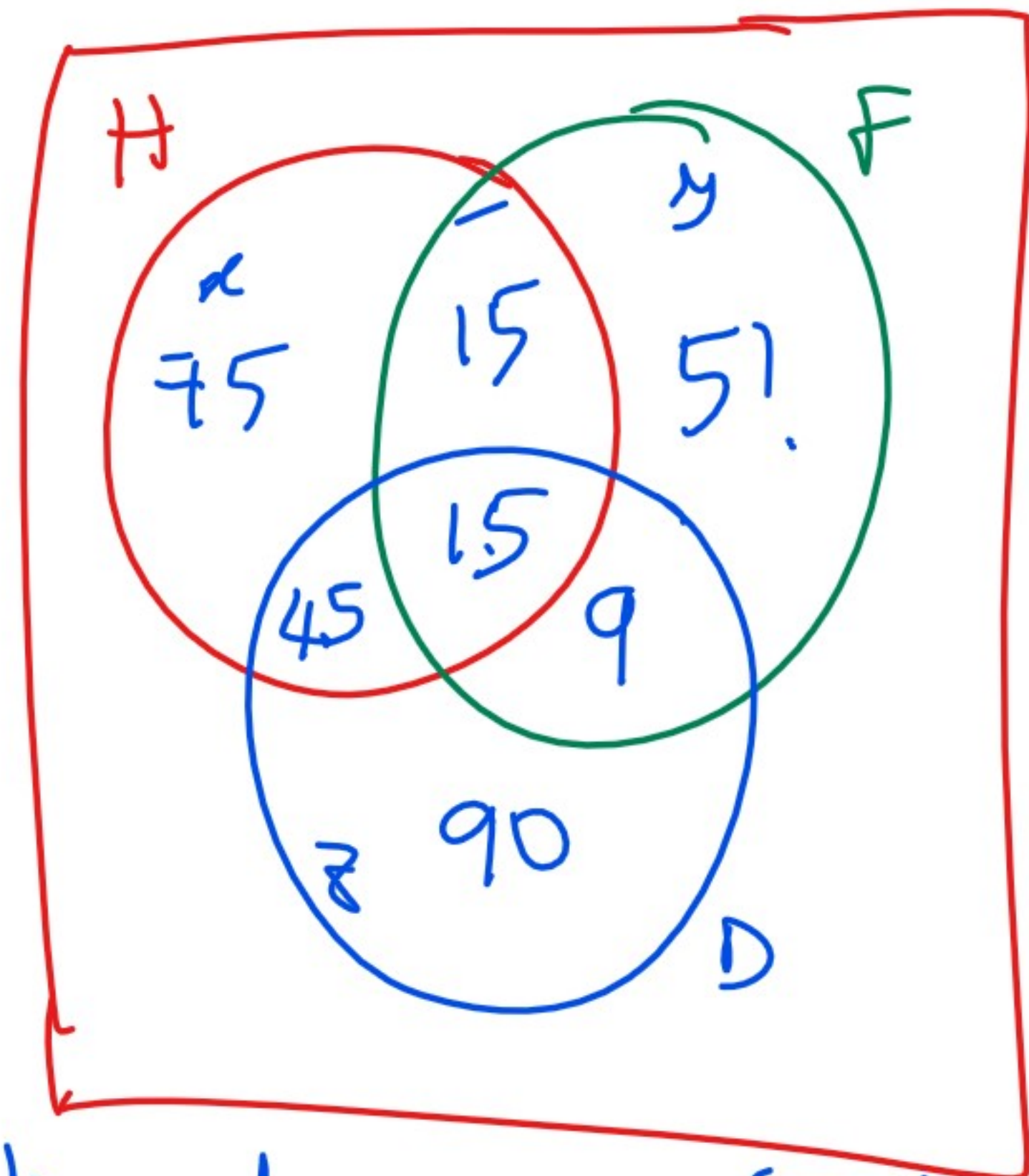
$$\text{Modal score} = 6$$

Finishing = 90
 Hardness = 150
 Dimension = 159
 H & F = 30
 F & D = 24
 H & D = 60
 All = 15

(i) only one defect
 H only + F only + D only
 $75 + 51 + 90 = 216$

(ii) only 2 defect
 $15 + 45 + 9 = 69$

$P(\text{only 2 defect}) = \frac{\text{No. of items with 2 defects}}{\text{Total number}}$
 $= \frac{69}{300} = \frac{23}{100} = 0.23$



Hardness only = $150 = x + 15 + 15 + 45$
 $x = 150 - 75 = 75$

Finishing only = $90 = y + 15 + 15 + 9$
 $y = 90 - 39 = 51$

Dimension only = $159 = z + 45 + 15 + 9$
 $z = 159 - 69 = 90$

5. (a) After examining 300 defective items, a factory quality controller came up with the following report. Defects in finishing 90, defects in hardness 150 and defects in dimension 159. Defects in hardness and finishing 30, defects in both finishing and dimension 24 and defects in both hardness and dimension 60. All three defects 15.

- (i) Use a Venn diagram to illustrate this report
- (ii) Find how many items have only one defect.
- (iii) Find how many items have only two defects.
- (iv) Calculate the probability of items with only two defects.

(b) If $213_n = 117_{\text{seven}}$, find n.

$a=2$
 $b=1$
 $c=-60$

$213_n = 217_n$
 $2 \times n^2 + 1 \times n + 3 = 1 \times n^2 + 1 \times n + 7$
 $2n^2 + n + 3 = 49 + 7 + 7$
 $2n^2 + n + 3 = 63 \Rightarrow 2n^2 + n - 60 = 0$

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

$$\frac{-1 \pm \sqrt{1^2 - 4 \times 2 \times -60}}{2 \times 2}$$

$$\frac{-1 \pm \sqrt{1 + 480}}{4}$$

$$\frac{-1 \pm \sqrt{481}}{4}$$

$$\frac{-1 \pm 21.93}{4}$$

$$\frac{-1 + 21.93}{4} = \frac{20.93}{4}$$

$$\Rightarrow 5.2325$$

$$\frac{-1 - 21.93}{4} = \frac{-22.93}{4}$$

$$= -5.7325$$

$$\approx 5.23$$

$$M \propto AT$$

$$M = kAT$$

$$250 \text{ cm}^2 = \text{Area}$$

$$\text{mass} = 200 \text{ g}$$

$$\text{Thickness} = 1 \text{ mm} = 0.1 \text{ cm}$$

$$200 = k \times 250 \times 0.1$$

$$200 = 25k$$

$$k = \frac{200}{25} = 8$$

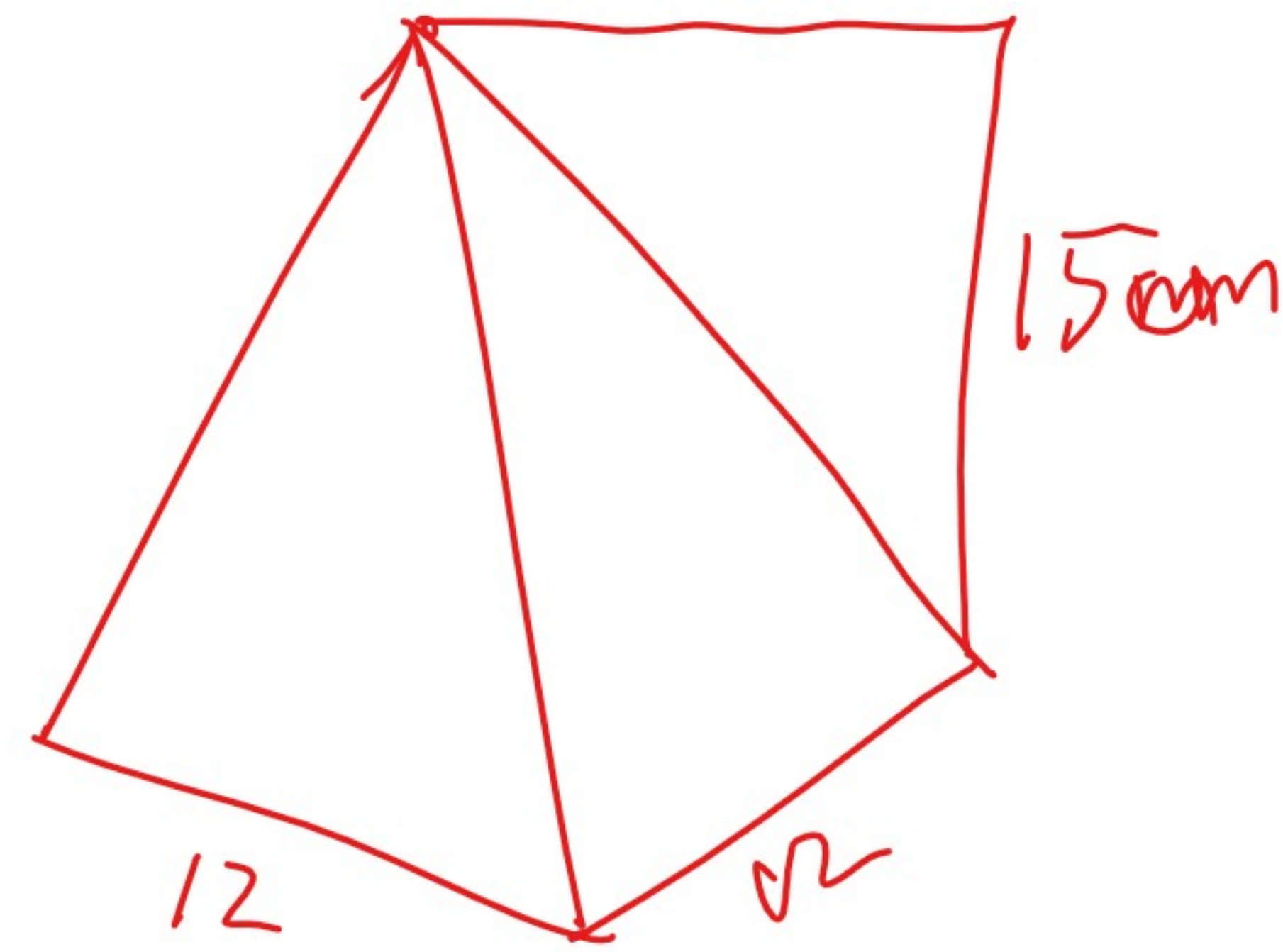
$$M = 8AT$$

Connecting formula

$$A = \frac{M}{8T}$$

$$T = 3 \text{ mm} = 0.3 \text{ cm}$$

$$A = \frac{960}{8 \times 0.3} = \frac{960}{2.4} = 400 \text{ cm}^2$$



$$\text{Vol of Pyramid} = \frac{1}{3} \times \text{area} \times h$$

$$= \frac{1}{3} \times 12 \times 12 \times 15$$

$$= 144 \times 5$$

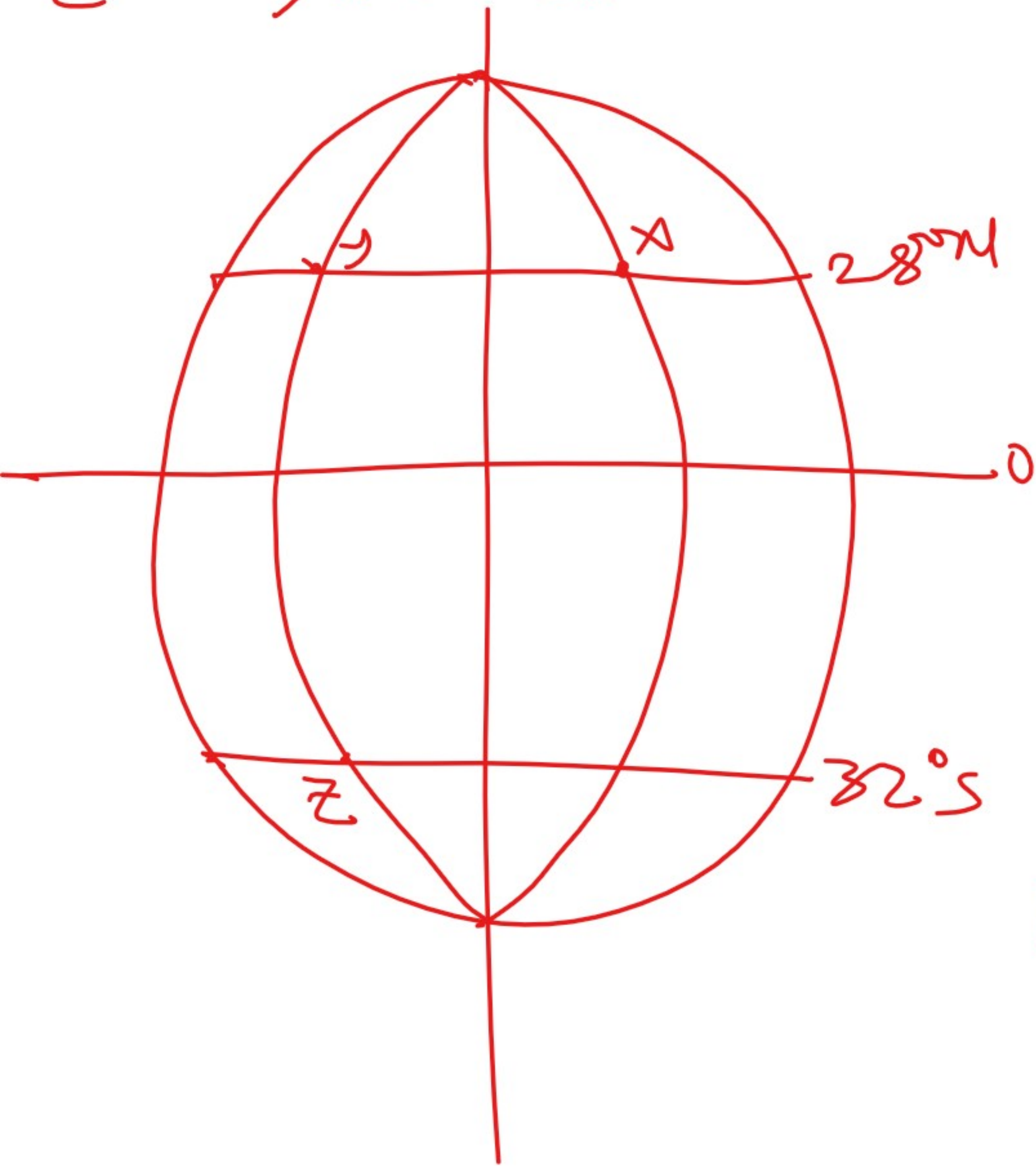
$$= 720 \text{ cm}^3$$

6. (a) The mass M of a sheet of metal varies jointly with its area A and its thickness T . If a sheet of metal of area 250 cm^2 and thickness of 1 mm has a mass of 200 g :
- Find the formula which connects M , A and T
 - From the formula in (i) make A the subject of the formula
 - Hence find A when $M = 960 \text{ g}$ and $T = 3 \text{ mm}$
- (b) A right pyramid of height 15 cm stands on a square base of sides 12 cm . Calculate the volume.

$$X = 28^{\circ}N \ 15^{\circ}E$$

$$Y = 28^{\circ}N \ 25^{\circ}W$$

$$Z = 32^{\circ}S \ 25^{\circ}W$$



$$r R \cos \theta = 64000 \cos 28$$

$$= 5650.86 \text{ km}$$

$$\approx 5651 \text{ km}$$

$$w) l = \frac{\theta}{360} \times 2\pi R \cos \theta$$

$$= \frac{40}{360} \times 2 \times \frac{25}{7} \times 64000 \cos 28$$

$$\frac{2 \times 25 \times 5650.865}{9 \times 7}$$

$$= 3946.64 \text{ km}$$

$$\approx 3947 \text{ km}$$

$$m) l = \frac{\theta}{360} \times 2\pi R$$

$$= \frac{60}{360} \times 2 \times \frac{25}{7} \times 64000$$

$$= \frac{60}{3} \times \frac{200000}{7}$$

$$= 6704.76$$

$$\approx 6705 \text{ km}$$

7. An aircraft moves from a location X ($28^{\circ}N$, $15^{\circ}E$) to another location Y ($28^{\circ}N$, $25^{\circ}W$) and then to location Z ($32^{\circ}S$, $25^{\circ}W$). The movement from X and Y is along the parallel of latitude and that from Y to Z is along the meridian.

Calculate the:

- the radius of parallel of latitude $28^{\circ}N$
- distance from X to Y
- distance from Y to Z
- total length of the journey from X to Z.
- average speed of the aircraft if the journey takes 15 hours. (Take $R = 6400\text{km}$, $\pi = 3.142$)