UCE 2023 PAPER 2
SOLUTIONS
BY: Tr. Kabuzi

Find videos on youtube channel @ Tr. Kabuzi maths.
0701335517 / 0775901133.

1.

$5 \times 16.75^2 - 3.25^2 \times 5$.

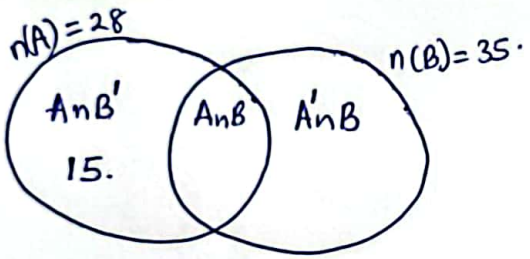
$5(16.75^2 - 3.25^2)$.

$5(16.75+3.25)(16.75-3.25)$

$5(20)(13.5)$

1350.

2.



(a) $n(A \cap B') + n(A \cap B) = n(A)$

$15 + n(A \cap B) = 28$

$n(A \cap B) = 13$.

(b) $n(A' \cap B) = 35 - 13$

$= 22$.

3. $y = mx + c$; $m = -\frac{4}{3}$, $c = 4$ $(0, 4)$ C

(a) $y = -\frac{4}{3}x + 4$.

(b) $y = 0$; $0 = -\frac{4}{3}x + 4$

$0 = -4x + 12$

$x = 3$.

4.

$3a - b = 3\begin{pmatrix}2\\-1\end{pmatrix} - \begin{pmatrix}4\\9\end{pmatrix}$

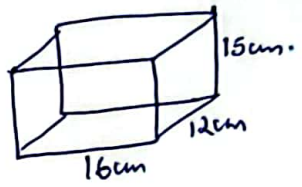
$= \begin{pmatrix}6\\-3\end{pmatrix} - \begin{pmatrix}4\\9\end{pmatrix}$

$= \begin{pmatrix}2\\-12\end{pmatrix}$.

$|3a-b| = \sqrt{(2)^2 + (-12)^2}$

$= 12.1655$ units (4 dps)

5.



Surface area $= 2(lw + lh + wh)$

$= 2[(16 \times 12) + (16 \times 15) + (12 \times 15)]$

$= 1224\ cm^2$.

6.

$A.S.F = (L.S.F)^2$

$\frac{A_B}{A_S} = \left(\frac{5}{2}\right)^2$.

$\frac{420}{A_S} = (2.5)^2$

$A_S = 72\ cm^2$.

∴ Area of small circle is $72\ cm^2$.

7. Let $f(x) = x^2 - 3x$

$f(-4) = (-4)^2 - 3(-4) = 28$

$f(-2) = (-2)^2 - 3(-2) = 10$

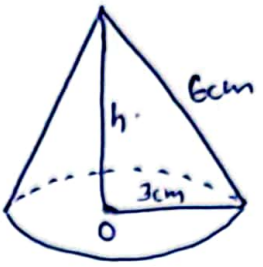
$f(0) = (0)^2 - 3(0) = 0$

$f(3) = (3)^2 - 3(3) = 0$.

$f(5) = (5)^2 - 3(5) = 10$.

$\therefore$ Range $= \{0, 10, 28\}$.

9. (a)



(b) $h^2 + (3)^2 = 6^2$

$h = \sqrt{36 - 9}$

$h = 3\sqrt{3}$ cm

$h = 5.1962$ cm (4 dps).

8.

$\overline{AB} = \frac{1}{2} \times 80$

$\overline{AB} = 40$km.

$\overline{BC} = (120 - 40) = 80$km.

Time $= \frac{\overline{BC}}{\text{speed}}$

$= \frac{80}{60}$

$= \frac{4}{3}$ hrs. or $1\frac{1}{3}$ hrs.

$= \left(\frac{4}{3} \times 60\right)$ mins

$= 80$ mins.

10.

S.P $= (100 + 20)\%$ of $650,000$

$= \frac{120}{100} \times 650,000$

$= 780,000$ Ghs.

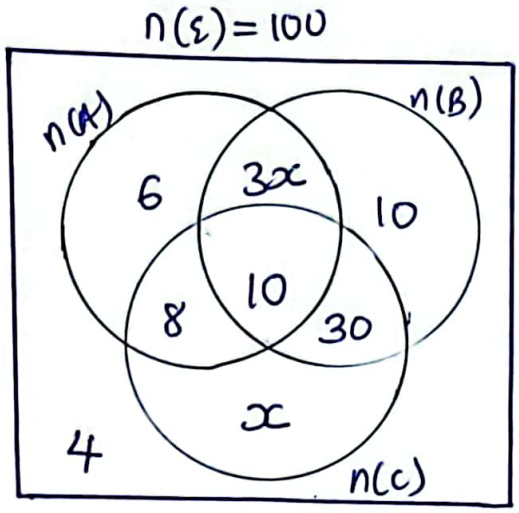
Cash term $= (100 - 5)\%$ of $780,000$

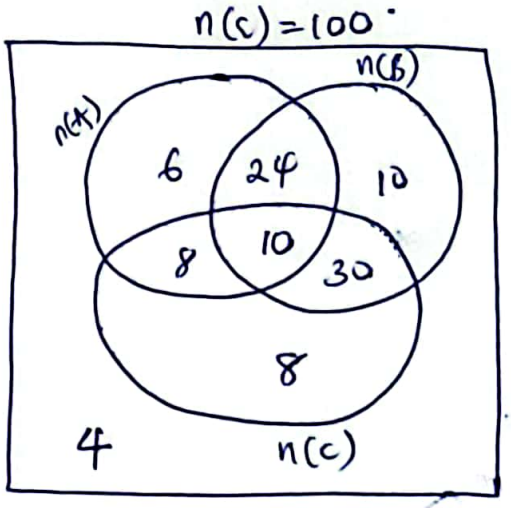
$= \frac{95}{100} \times 780,000$

$= 741,000$ Ghs.

No. 11

(a)





(b) $6+8+10+10+30+4+3x+x = 100$

$68+4x = 100$

$4x = 32$

$x = 8$ students.

(i) 8 students did section C only.

(ii) 10 students.

(c) $P(\text{Atmost 2 sections}) = \dfrac{24+8+30+6+8+10+4}{100}$

$= \dfrac{90}{100}$

$= \underline{0.9}$.

No. 12.

Allowances.

Housing	150,000
Marriage	34,000
children	11,500 + 14,000 + 16,500 = 42,000.

Total allowances = shs 226,000.

(a) Taxable income = Gross income − Allowances

= (630,000 − 226,000)

= shs. 404,000.

(b)

1st tax	$\frac{10}{100} \times 100{,}000$	10,000.
2nd tax	$\frac{20}{100} \times 100{,}000$	20,000
3rd tax	$\frac{30}{100} \times 204{,}000$	61,200.

Income tax = 10,000 + 20,000 + 61,200

= shs 91,200.

(c) Jane's netpay = Gross income − income tax

= 630,000 − 91,200

= shs 538,800.

13.

13(a) $\log_{10}(7x-1) - \log_{10}(x-1) = 1$

$\log_{10}\left[\frac{7x-1}{x-1}\right] = 1$

$\frac{7x-1}{x-1} = 10^1$

$7x-1 = 10x-10$

$9 = 3x$

$x = 3$.

(b)(i) 1 bag = C shs.

360 bags = 360C shs.

Sold 1 bag = S shs.

300 bags = 300S shs.

$300S = \frac{3}{2} \times 360C$

$300S = 540C$

$S = 1.8C$

(ii) Total sales = 360S.

$= 360 \times 1.8C$

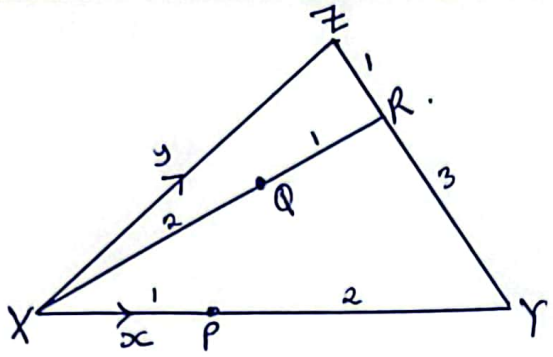
$= 648C$

$\%$ profit $= \frac{(648C - 360C)}{360C} \times 100$

$= 0.8 \times 100$

$= 80$.

No. 14.



a (i) $\underset{\sim}{YZ} = \underset{\sim}{YX} + \underset{\sim}{XZ}$

$= -\underset{\sim}{XY} + \underset{\sim}{XZ}$

$= -\underset{\sim}{x} + \underset{\sim}{y}$

$= \underline{\underset{\sim}{y} - \underset{\sim}{x}}$.

(ii) $\underset{\sim}{XR} = \underset{\sim}{XY} + \underset{\sim}{YR}$

$= \underset{\sim}{x} + \frac{3}{4}\underset{\sim}{YZ}$

$= \underset{\sim}{x} + \frac{3}{4}(\underset{\sim}{y} - \underset{\sim}{x})$

$= \underline{\frac{4\underset{\sim}{x} + 3\underset{\sim}{y} - 3\underset{\sim}{x}}{4}}$

$= \underline{\underline{\frac{1}{4}(\underset{\sim}{x} + 3\underset{\sim}{y})}}$.

(iii) $\underset{\sim}{PZ} = \underset{\sim}{PY} + \underset{\sim}{YZ}$

$= \frac{3}{3}\underset{\sim}{XY} + \underset{\sim}{YZ}$

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

$= \underline{\frac{2\underset{\sim}{x} + 3\underset{\sim}{y} - 3\underset{\sim}{x}}{3}}$

$= \underline{\underline{\frac{1}{3}(3\underset{\sim}{y} - \underset{\sim}{x})}}$.

(b) $\underset{\sim}{PZ} = \frac{1}{3}(3\underset{\sim}{y} - \underset{\sim}{x})$.

$\underset{\sim}{PQ} = \underset{\sim}{PX} + \underset{\sim}{XQ}$

$= -\underset{\sim}{XP} + \frac{2}{3}\underset{\sim}{XR}$

$= -\frac{1}{3}\underset{\sim}{XY} + \frac{2}{3}\underset{\sim}{XR}$

$= -\frac{1}{3}\underset{\sim}{x} + \frac{2}{3}\left(\frac{1}{4}(\underset{\sim}{x} + 3\underset{\sim}{y})\right)$.

$= \underline{\frac{-4\underset{\sim}{x} + 2\underset{\sim}{x} + 6\underset{\sim}{y}}{12}}$

$= \underline{\frac{6\underset{\sim}{y} - 2\underset{\sim}{x}}{12}} = \frac{2}{12}(3\underset{\sim}{y} - \underset{\sim}{x})$.

$\underline{\underline{\underset{\sim}{PQ} = \frac{1}{6}(3\underset{\sim}{y} - \underset{\sim}{x})}}$

$\frac{PQ}{PZ} = \frac{\frac{1}{6}(3\underset{\sim}{y} - \underset{\sim}{x})}{\frac{1}{3}(3\underset{\sim}{y} - \underset{\sim}{x})} = \frac{1}{6} \div \frac{1}{3}$.

$\frac{PQ}{PZ} = \frac{1}{6} \times \frac{3}{1} = \frac{1}{2}$

$PQ : PZ = 1 : 2$, or $2PQ = PZ$.

Since PZ is a scalar multiple of PQ, then P, Q and Z are collinear.

No. 15.

(a) $y = 2x - 4$.

$2y + x = 12$.

$2(2x-4) + x = 12$

$4x - 8 + x = 12$

$5x - 8 = 12$

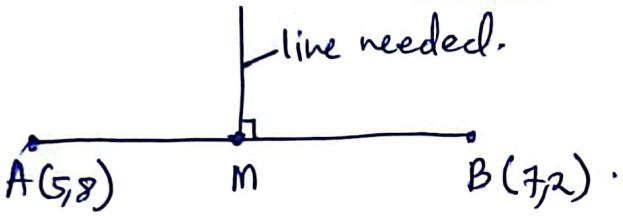
$5x = 20$

$x = 4$.

$y = 4$.

Point of intersection is $\underline{(4,4)}$.

(b)



Midpoint; $M\left(\frac{5+7}{2}, \frac{8+2}{2}\right)$

$M(6,5)$.

Gradient of $\overline{AB} = \frac{8-2}{5-7} = \frac{6}{-2} = -3$.

$m_1 m_2 = -1$

$-3m_2 = -1$

$m_2 = \frac{1}{3}$.

$y - y_1 = m(x - x_1)$ $\quad x_1, y_1 \; (7,2)$

$y - 2 = \frac{1}{3}(x-7)$

$3y - 6 = x - 7$

$3y = x - 1$

No. 16.

(a) $g(x) = mx - 3$

$g(1) = 5$

$m(1) - 3 = 5$

$m = 8$

$f(x) = nx - 2.$

$f(-2) = 6.$

$n(-2) - 2 = 6$

$-2n = 8$

$n = -4$

(b) $g(x) = 8x - 3.$ $f(x) = -4x - 2.$

Let $p = 8x - 3.$

$p + 3 = 8x$

$\frac{p+3}{8} = x$

$g^{-1}(x) = \frac{x+3}{8}$

(c) $gf(x)$

(i)

$g(x) = 8x - 3$

$gf(x) = 8[f(x)] - 3$

$= 8[-4x - 2] - 3$

$= -32x - 16 - 3$

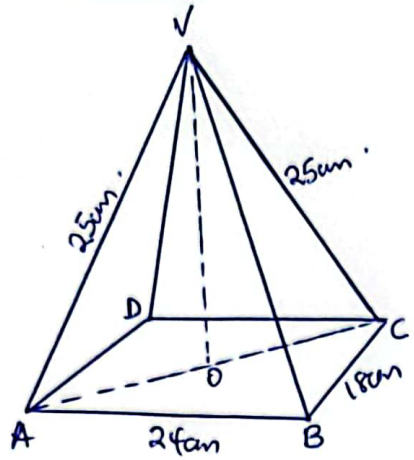
$gf(x) = -32x - 19.$

(ii) $gf(-6) = -32(-6) - 19$

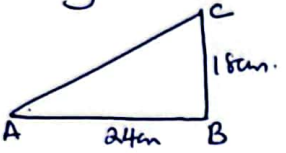
$= 192 - 19$

$= 173.$

No. 17.



(a) Using Δ ABC



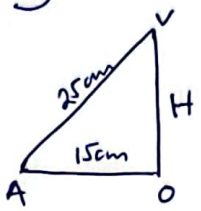
$AC^2 = 24^2 + 18^2$

$\overline{AC} = \sqrt{900}$

$\overline{AC} = 30\text{cm}$.

$\overline{AO} = \frac{1}{2}AC = \frac{1}{2} \times 30 = 15\text{cm}$.

Using Δ AOV



$H^2 + 15^2 = 25^2$

$H^2 = 25^2 - 15^2$

$H = 20\text{cm}$.

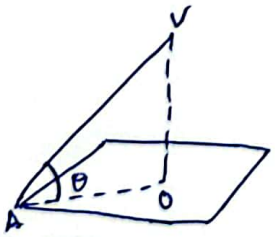
$\therefore$ Height of pyramid $= 20\text{cm}$.

(b) Volume $= \frac{1}{3} \times$ base area $\times$ h.

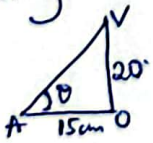
$= \frac{1}{3} \times (24 \times 18) \times 20$

$= 2880\text{cm}^3$.

(c)



Using Δ AOV

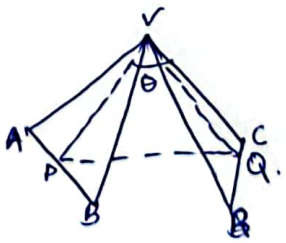


$\tan\theta = \frac{20}{15}$

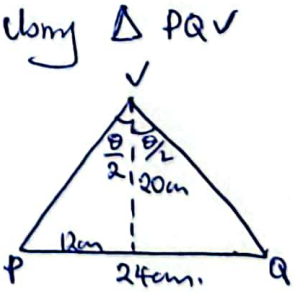
$\theta = 53.13^\circ$ (2dp)

$\angle$ btn AV & ABCD is 53.13°.

(d)



Using Δ PQV



$\tan\left(\frac{\theta}{2}\right) = \frac{12}{20}$.

$\frac{\theta}{2} = \tan^{-1}\left(\frac{12}{20}\right)$

$\frac{\theta}{2} = 30.96^\circ$ (2dp)

$\theta = 61.92^\circ$ (2dp)

$\therefore$ $\angle$ btn ABV & BCV is 61.92°