SOLUTIONS TO S.4 AND S3 MATHS SEMINAR ITEM SCHEME−2025 AT MT ST HENRY'S HIGH SCHOOL MUKONO

<table>
<tr><th>Item</th><th>Solution</th><th>Indicators (competences)</th></tr>
<tr><td>1(a)</td><td>Two million eight hundred eighty−five
thousand shillings only $= shs\ 2{,}885{,}000$
Groceries $= \frac{1}{5} \times 2{,}885{,}000$
$= shs\ 577{,}000$
She will spend $\boldsymbol{shs\ 577{,}000}$ on groceries
Parents' upkeep
$= \frac{30}{100} \times 2{,}885{,}000$
$= shs\ 865{,}500$
She will spend $\boldsymbol{shs\ 865{,}500}$ on parents' upkeep.

Personal use $\boldsymbol{shs\ 400{,}000/=}$

Investment $= 2{,}8885{,}000 - (577{,}000 + 865500 + 400{,}000)$
$= 2{,}885{,}000 - 1{,}842{,}500$
$= shs\ 1{,}042{,}500$
She will invest $\boldsymbol{shs\ 1{,}042{,}500}$</td><td></td></tr>
<tr><td>1(b)</td><td>For monthly grocery shopping
Susan : Husband
2 : 3
Total parts = $2 + 3 = 5$
Let the total amount spent on monthly grocery be G
$\frac{2}{5} \times G = 577{,}000$
$G = 1442500$
They will spend a total of 1,442,500.
Husband's contribution $\boldsymbol{= \frac{3}{5} \times 1{,}442{,}500 = 865{,}000}$
Suzan's contribution $\boldsymbol{= 577{,}000}$</td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>2(a)</td><td>Men : women = (5 : 4) × 3
= 15 : 12
Women : women = (3 : 7) × 4
= 12 : 28
Men : women : children = 15 : 12 : 28
Total ratio = 15 + 12 + 28 = 55

Let the total number of people attending be x
$\frac{28}{55} of x = 224$
$x = \frac{224 \times 55}{28}$
$x = 440$
Number of women and men $= 440 - 224$
$= 216$
∴ the total number of men and women who visited the camping site that day was 216.

Alt. 2
Total ratio of men and women $= 15 + 12 = 27$
Number of women and men
$= \frac{no.\ of\ children}{ratio\ of\ children} \times$ (total ratio of men and women)
$= \frac{224}{28} \times 27$</td><td></td></tr>
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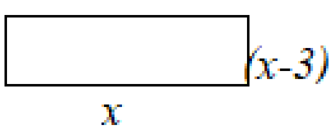
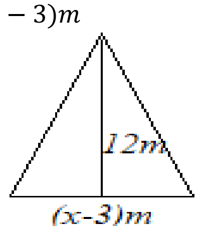
	$= 216$	
2(b)	Let the new changes for children and adults be x and y respectively For children: $x = \frac{80}{100} \times 15{,}000$ $x = \frac{1{,}200{,}000}{100}$ $x = 12{,}000$ For Adults: $y = \frac{80}{100} \times 30{,}000$ $y = \frac{2{,}400{,}000}{100}$ $y = 24{,}000$ ∴ the cost of the tickets for children and adults in 2025 are UGX 12,000 and UGX24,000	
2(c)	Children payments $= 224 \times 12000 =$ UGX2,688,000 Adults' payments $= 216 \times 24000 =$ UGX5,184,000 Total amount $= 2{,}688{,}000 + 5{,}184{,}000 =$ UGX7,872,000 ∴ The camping site collected UGX 7,872,000 altogether on that day.	
3(a)	Cost of water used = Service fee + Price × Number of units per Unit Let the cost of water used be C Let the number of units be n Let the price per unit be k $C = 3500 + kn$ When $n = 4$, $C = shs\ 15{,}500$ $\Rightarrow 15{,}500 = 3500 + 4k$……. (i) When $n = 10, C = 33{,}500$ 33,500 = 3500 + 10k ……(ii) $33{,}500 = 3500 + 10k$ $-\quad 15{,}500 = 3500 + 4k$ $18{,}000 = 0 + 6k$ $\frac{18{,}000}{6} = \frac{6k}{k}$ $k = 3{,}000$ $C = 3500 + 300n$ $Cost\ of\ water\ used = 3{,}500 + 3000n$	
3(b)	1^{st} meter 2^{nd} 3^{rd} 4^{th} 5^{th} 6^{th} 7^{th} 8^{th} 20000 21500 23000 24500 26000 27500 29000 30500 +1500 + 1500 + 1500 + 1500 + 1500 + 1500 9^{th} 10^{th} 11^{th} 32000 33500 35000 +1500 + 1500 **Alternatively** $U_n = a + (n-1)d \qquad a = 20000, d = 1500$ $= 20000 + (n-1)x1500$ $= 20000 + 1500n - 1500$ $= 20000 - 1500 + 1500n$ $= 1500n + 18500$ $For\ n = 11$ $= 1500 \times 11 + 18500$ $= 35000$ **Cost of digging the last meter is $shs\ 35{,}000$** (ii) $20{,}000 + 21{,}500 + 23{,}000 + 24{,}500 + 26{,}000 + 2750 + 29000 + 30{,}500 + 32000 + 33500 + 35{,}000$ $Shs\ 302{,}500$	

	The money will be enough for digging the well. Or $20{,}000\ =\ 1500x10$ $20{,}000\ +\ 15000$ = cost of digging last meter $35{,}000$	
4(a)	for the first line (2,-4) and (-6,9) gradient , $m_1 = \frac{9-(-4)}{-6-2}$ $m_1 = -\frac{13}{8}$ Taking point $(-6, 9)$ and (x, y) $-\frac{13}{8} = \frac{y-9}{x-(-6)}$ $-13(x+6) = 8(y-9)$ $-13x - 78 = 8y - 72$ $8y = -13x - 6$ $y = -\frac{13}{8}x - \frac{3}{4}$ for the second line, since its perpendicular to the first line then $m_1 \times m_2 = -1$ $-\frac{13}{8}m_2 = -1,$ $m_2 = \frac{8}{13}$ Taking point $(-4, 6)$ and (x, y) $\frac{8}{13} = \frac{y-6}{x-(-4)}$ $8(x+4) = 13(y-6)$ $8x + 32 = 13y - 78$ $13y = 8x + 110$ $y = \frac{8}{13}x + \frac{110}{13}$ $\therefore$ the engineer will use lines $y = -\frac{13}{8}x - \frac{3}{4}$ and $y = \frac{8}{13}x + \frac{110}{13}$	
4(b)	let the length of the rectangular park be $x\ m$ then breadth = $(x-3)m$  Area of rectangular park = area of Δ + 4 $x(x-3) = \frac{1}{2}(x-3) \times 12 + 4$ $x^2 - 3x = 6x^2 - 18 + 4$ $x^2 - 9x + 14 = 0$ Alt−1 factorization, factors (-2, -7) $x^2 - 2x - 7x + 14 = 0$ $(x^2 - 2x) + (-7x + 14) = 0$ $x(x-2) - 7(x-2) = 0$ $(x-7)(x-2) = 0$ either $x = 7$ or $x = 2$ but $x \neq 2$ because the breadth will be negative which is not possible. $\Rightarrow x = 7$ $\therefore$ length of the rectangular park is 7m and breadth is 4m	

Alt−2
Quadratic formula
$a = 1, b = -9\ , c = 14$

$$x = \frac{-(-9) \pm \sqrt{(-9)^2 - (4 \times 1 \times 14)}}{2 \times 1}$$

$$x = \frac{-9 \pm \sqrt{81 - 56}}{2} = \frac{9 \pm 5}{5}$$

either $x = \frac{9+5}{2}$ or $x = \frac{9-5}{2}$

$\therefore x = 7$ or $x = 2$

Alt−3
Completing squares

$x^2 - 9x + 14 = 0$

$x^2 - 9x = -14$

$$x^2 - 9x + \left(\frac{1}{2} \times 9\right)^2 = -14 + \left(\frac{9}{2}\right)^2$$

$$(x - 9)^2 = -14 + \frac{81}{4}$$

$$x - \frac{9}{2} = \pm\sqrt{\frac{25}{4}}$$

either $x = \frac{9+5}{2}$ or $x = \frac{9-5}{2}$

$\therefore x = 7$ or $x = 2$

5 (a) Let x represent the number of baskets and y represent the number of mats made.

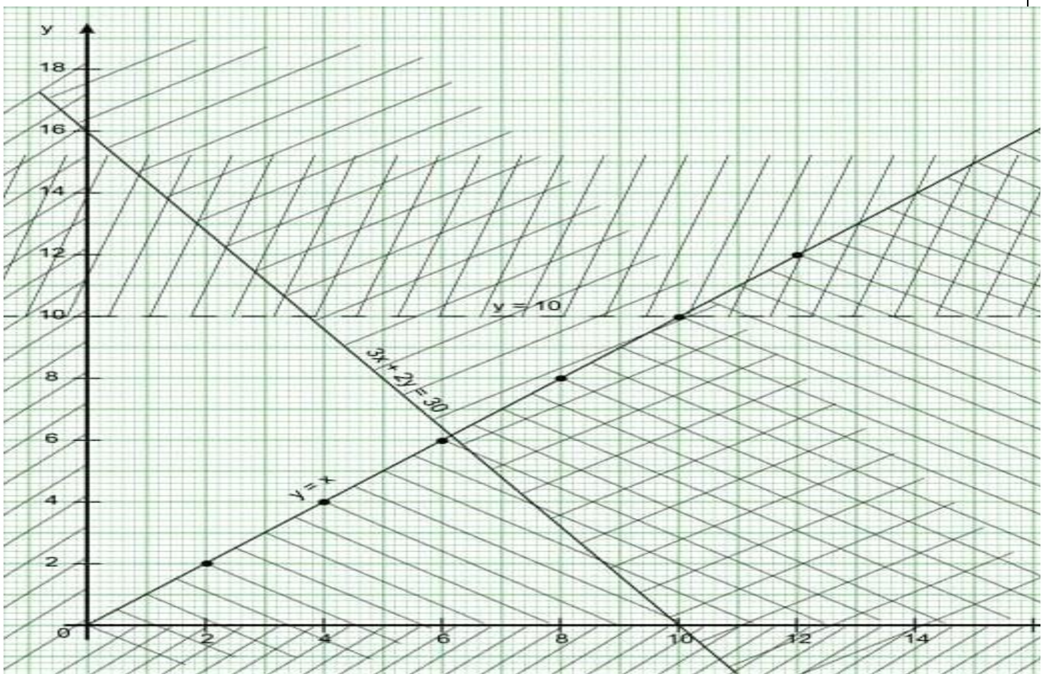
$y < 10$…………..(1)
$y \geq x$………………..(2)
$\frac{9}{4}x + \frac{3}{2}y \leq 22.5$ or $9x + 6y \leq 90$ or $3x + 2y \leq 30$………(3)
$x \geq 0$………………(4)
$y \geq 0$……………………(5)

Profit function, $P = 40x + 28y$ …………..(6)

(b)

Inequality	Line	Nature	Coordinates
$y < 10$	$y = 10$	dotted	(2, 10), (6, 10)
$y \geq x$	$y = x$	bold	(4, 4), (8, 8) , (12, 12)
$3x + 2y \leq 30$	$3x + 2y = 30$	bold	(0, 15), (10, 0)
$x \geq 0$	$x = 0$		$y - axis$
$y \geq 0$	$y = 0$		$x - axis$

A graph of linear inequalities.



(c) $P = 40x + 28y$

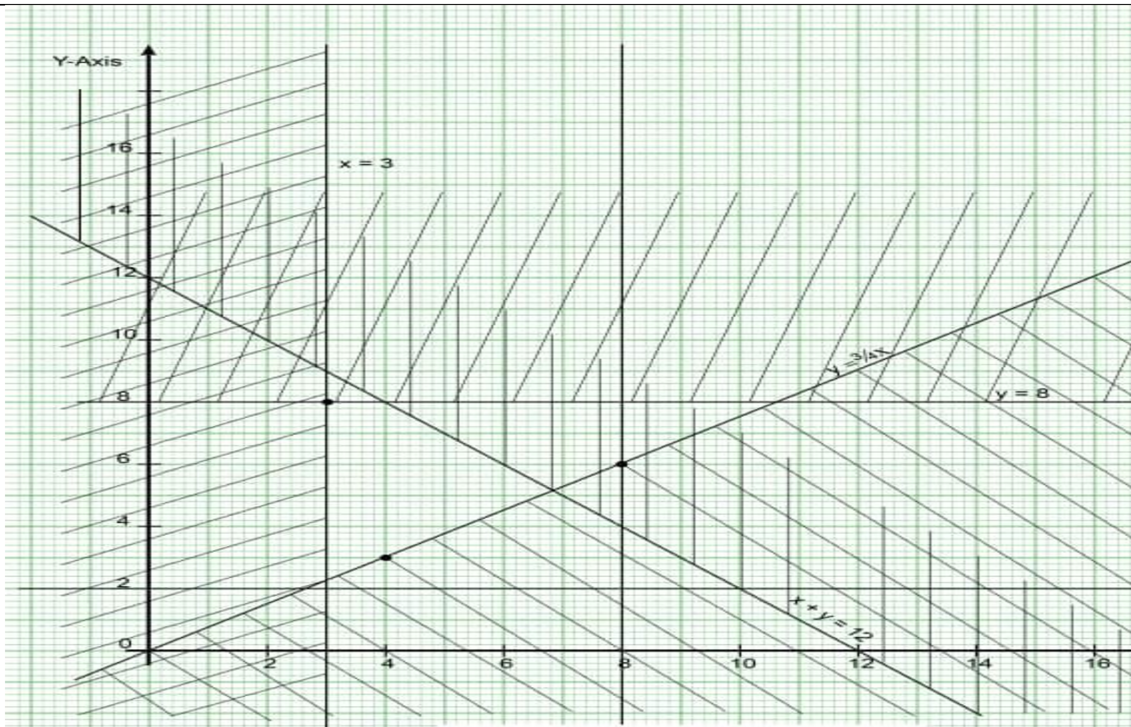
(x, y)	$40x + 28y$	$Amount$
(4,9)	40(4) + 28(9)	412
(5,8)	40(4) + 28(8)	424
(6,6)	40(6) + 28(6)	408

∴ He should make **5** baskets and **8** mats in order to get a maximum profit.

6(a)

let x represent the number of maize seed sacks
y represent the number of g-nut seed sacks
$x \geq 3$
$y \leq 8$
$x + y < 12$
$y > \frac{3}{4}x$

Line	Nature	Coordinates
$x = 3$	________ bold	
$y = 8$	________ bold	
$x + y = 12$	…………. broken	(0,12), (12,0)
$y = \frac{3}{4}x$	…………. broken	(0,0), (4, 3), (8, 6)

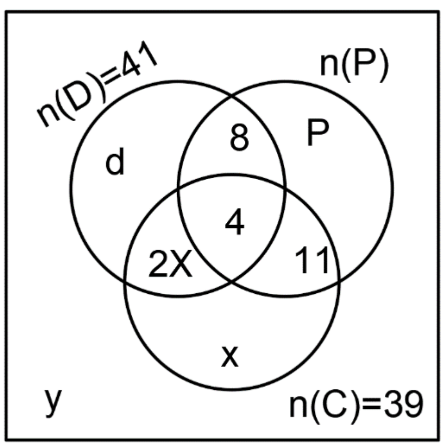


(x, y)	x + y	Number of sucks
(3, 3)	3 + 3	6
(3, 8)	3 + 8	11
(6, 5)	6 + 5	11
(5, 4)	5 + 4	9

- Therefore, she planted a number of 6 sacks altogether in one week.
- She planted 3 sacks of maize seeds and 3 sacks of g-nut suck.

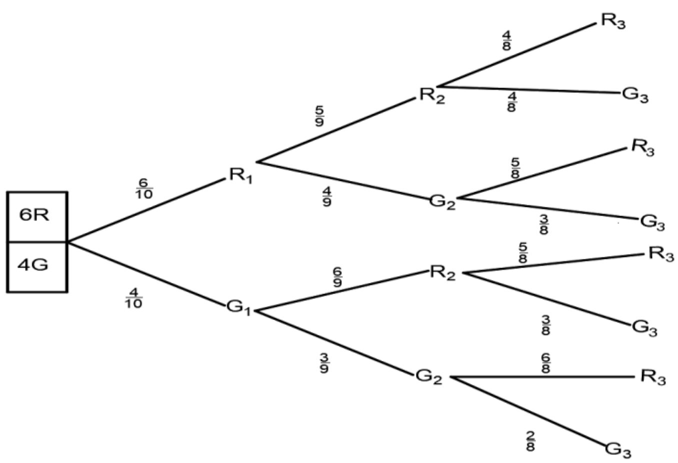
7(a)(i)

A Venn diagram



Let D represent Dubai, C represent Cairo and P represent Paris
Let $n(C)_{only} = x, n(D \cap C)_{0nly} = 2x, n(D' \cap P' \cap C') = y$

For Cairo:
$39 = x + 2x + 4 + 11$
$39 = 3x + 15$
$x = 8$
For Dubai;
$41 = d + 8 + 4 + 2x$
$41 = d + 28$
$d = 13$

(ii)	For at least one city $74 = (d + p + x) + (8 + 16 + 11 + 4)$ $74 = p + 21 + 39$ $p = 14$ $n(P) = 14 + 8 + 4 + 11 = 37$ ∴ 37 people had visited Paris. Had not visited any of the three cities $y = 90 - 74$ $y = 16$ ∴ 16 people had not visited any of the three cities.	
7(b)	P(visited at least two cities) n(at least two cities) $= 8 + 16 + 11 + 4 = 39$ probability of visiting at least two cities $= \frac{39}{90} \times 100$ $= 43.333\%$ Advice: Since 43.333% is less than 50%, I advise the company travel agent to organize the tour.	
8(a)	Sample space $= 2^n$, n= number of times tossed For $n = 3$, S = $2^3 = 8$ Let the coin be represented by H−Head, T−Tail Sample space, $S = [HHT, HTH, HTT, HHH, THH, THT, THH, TTT]$ Probability of starting the game $= \frac{1}{8}$	
(b)	Let R represent red marbles G represent green marbles  P(winning the game)= $P(R_1 \cap R_2 \cap R_3) + P(G_1 \cap G_2 \cap G_3)$ $= \left(\frac{6}{10} \times \frac{5}{9} \times \frac{4}{8}\right) + \left(\frac{4}{10} \times \frac{3}{9} \times \frac{2}{8}\right)$ $= \frac{120 + 24}{720} = \frac{144}{720} = \frac{1}{5}\ or\ 0.2$ The probability of winning the game is $\frac{1}{5}$ or 0.2	
(c)	P(being kicked out of the game) $= P(R_1 \cap R_2 \cap G_3) + P(G_1 \cap G_2 \cap R_3)$ $= \left(\frac{6}{10} \times \frac{5}{9} \times \frac{4}{8}\right) + \left(\frac{4}{10} \times \frac{3}{9} \times \frac{6}{8}\right)$ $= \frac{120+72}{720} = \frac{192}{720} = \frac{4}{15}\ or\ 0.2667$ (At least 4dp) The probability of winning the game is $\frac{4}{15}$ or 0.2667	

9(a)	Assumed mean, A = 154.5cm	

A frequency distribution table

$class$	f	x	$d = x - A$	fd	Cbs
110-119	1	114.5	-40	-40	109.5-119.5
120-129	3	124.5	-30	-90	119.5-129.5
130-139	10	134.5	-20	-200	129.5-139.5
140-149	28	144.5	-10	-280	139.5-149.5
150-159	65	154.5	0	0	149.5-159.5
160-169	98	164.5	10	980	159.5-169.5
170-179	55	174.5	20	1100	169.5-179.5
180-189	15	184.5	30	450	179.5-189.5
	$\sum f$ =275			$\sum fd$ =1920	

Average height $= A + \frac{\sum fd}{\sum f}$

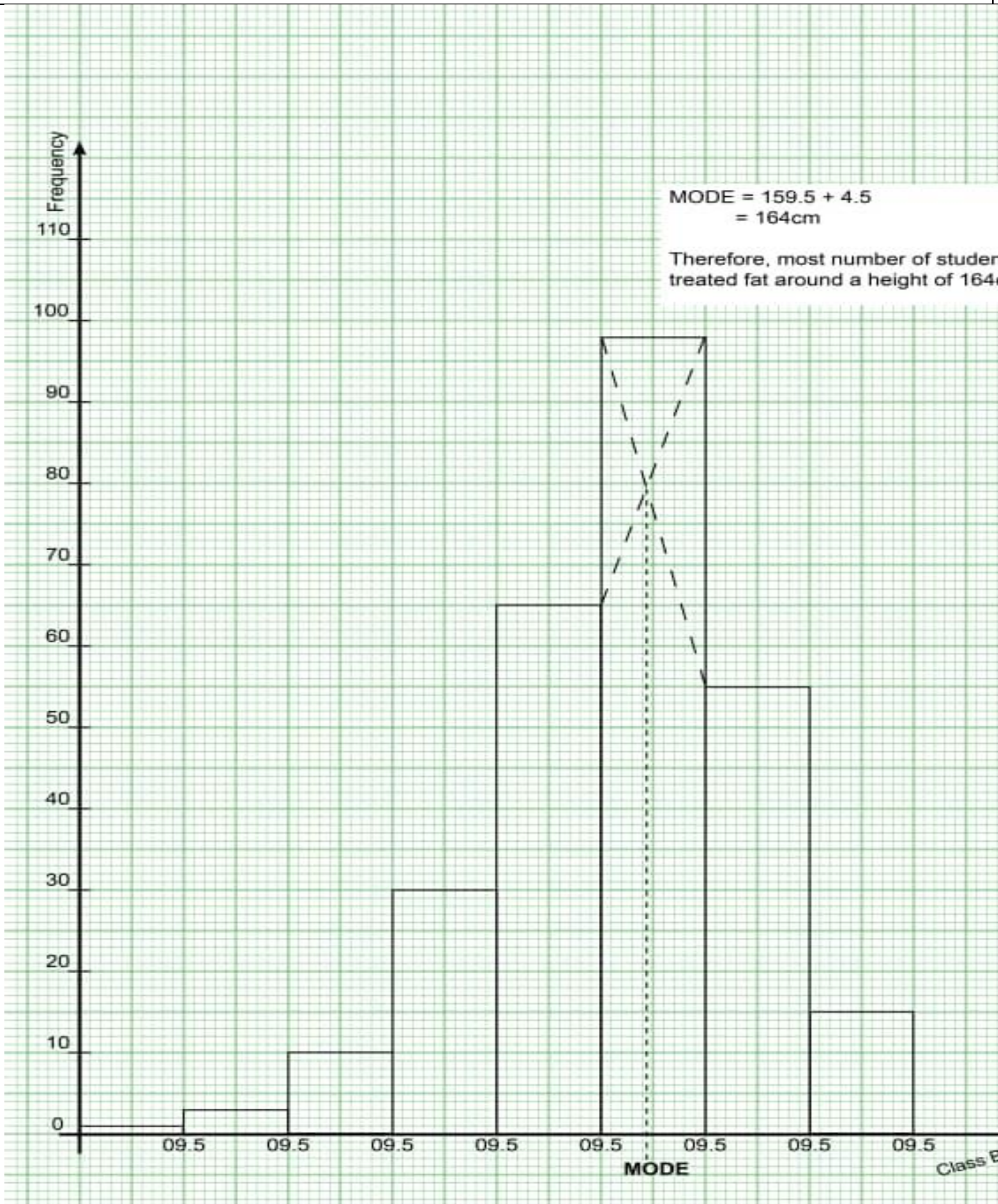
$= 154.5 + \frac{1920}{275}$

$= 154.5 + 6.9818$

$= 161.4818$

≈ 161.48 cm (at least 2dp)

∴ the average height of students is 161.48 cm.

	(b) A histogram	
9(b)		

10		

A frequency distribution table.

Mass kg	Number of bags (f)	Mid mass (x)	fx
10 - 19	50	145	725
20 – 29	65	24.5	1592.5
30 – 39	95	34.5	3277.5
40 - 49	105	44.5	4672.5
50 – 59	95	54.5	5177.5
60 – 69	75	64.5	4837.5
70 – 79	65	74.5	4842.5
80 – 89	40	84.5	3380
90 – 99	10	94.5	945
	$\sum f = 600$		$\sum fx$ = 29,450

Mean production $= \frac{\sum fx}{\sum f}$

$= \dfrac{29{,}450}{600}$

$= 49.08$

≈ 49.1

The mean production per year was 49.1 kg

(b) (i) Modal mass $= l_1 + \left(\frac{D_1}{D_1+D_2}\right)c$

$l_1 = 39.5$

$D_1 = 105 - 95 = 10$

$D_2 = 105 - 95 = 10$

c = 10

Modal mass $= 39.5 + \left(\frac{10}{10+10}\right)10$

$= 39.5 + \dfrac{10}{20} \times 10$

$= 39.5 + 5$

$= 44.5\ kg$

The commonest mass produced is 44.5kg.

(ii) The farmer with change to a new seed variety because the commonest mass produced is much less than 55kg.

11(a)

A frequency distribution table

Class	tally	f	c.f	Class boundaries
20−29	////	4	4	19.5−29.5
30−39	//// ////	10	14	29.5−39.5
40−49	//// /	6	20	39.5−49.5
50−59	//// //// /	11	31	49.5−59.5
60−69	//// /	6	37	59.5−69.5
70−79	//// ////	9	46	69.5−79.5
80−89	////	4	50	79.5−89.5

11(b)

Alt. 1

median, $\frac{N}{2} = \frac{50}{2} = 25^{th}$ position

median class 50−59, Cbs=49.5−59.5, $cf_b = 20$, $f_m = 11$, $c = 10$

$$\text{median} = 49.5 + \left(\frac{25-20}{11}\right)10$$
$$= 49.5 + \frac{50}{11}$$
$$= 49.5 + 4.5455$$
$$= 54.0455$$
≈ 54.05 (at least 2dp)

$\therefore$ Half of the candidates scored 54.05% in the aptitude test.

(c) Number of candidates whose score exceed 54.5

Alt. 1

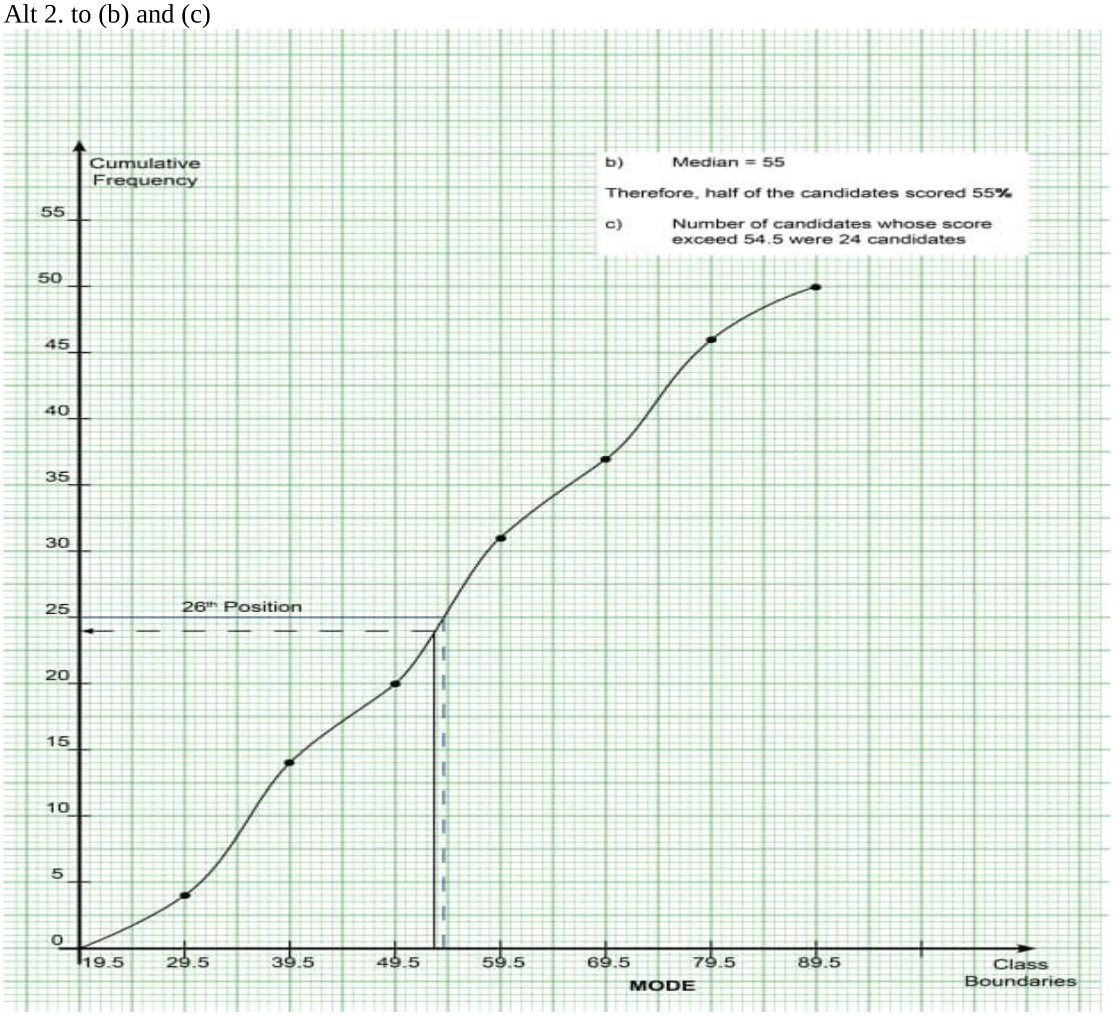
Let the number be N for candidates below 54.5

$$54.5 = 49.5 + \left(\frac{N-20}{11}\right)10$$
$$5.5 = N - 20$$
$N = 25.5 \approx 26$ candidates

Above $= 50 - 26 = 24$

$\therefore$ Number of candidates whose score exceed 54.5 was 24 candidates.

Alt 2. to (b) and (c)



12 (a) Performance of tiger house

	1st	2nd	3rd
Track	3	4	0
Relay	1	2	1

$\begin{pmatrix} 3 & 4 & 0 \\ 1 & 2 & 1 \end{pmatrix}$ 2×3

Points

$\begin{pmatrix} 3 \\ 2 \\ 1 \end{pmatrix}$ $\quad 3 \times 1$

Number of points

$= \begin{pmatrix} 3 & 4 & 0 \\ 1 & 2 & 1 \end{pmatrix} \begin{pmatrix} 3 \\ 2 \\ 1 \end{pmatrix}$

$= \begin{pmatrix} 3 \times 3 + 4 \times 2 + 0 \times 1 \\ 1 \times 3 + 2 \times 2 + 1 \times 1 \end{pmatrix}$

$= \begin{pmatrix} 17 \\ 8 \end{pmatrix}$

Total points for tiger $= 387 + 17 + 8$

$= 412$

Tiger got 25 points in the races.

(b)Tiger house emerged the winner with 412 points

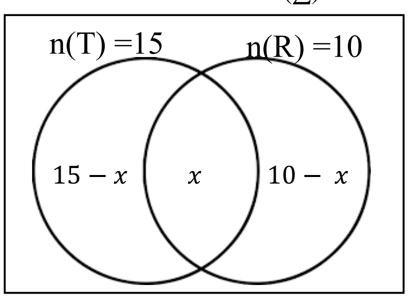
(c) Let those excellent in the track be T

Let those excellent in Relay be R

A Venn diagram

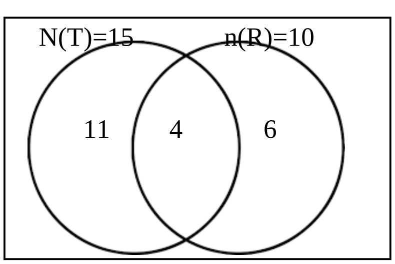
let those who are good in both track and relays be x

N(∑)=21



$$15 - x + x + 10 - x = 21$$
$$25 - x = 21$$
$$-x = 21 - 25$$
$$\frac{-x}{-1} = \frac{-4}{-1}$$
$$x = 4$$

N(∑)=21



Those who were excellent in both events were only 4

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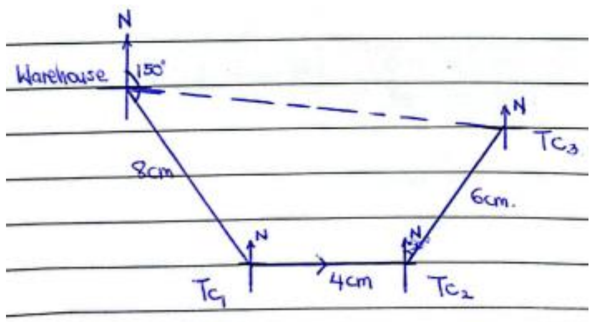
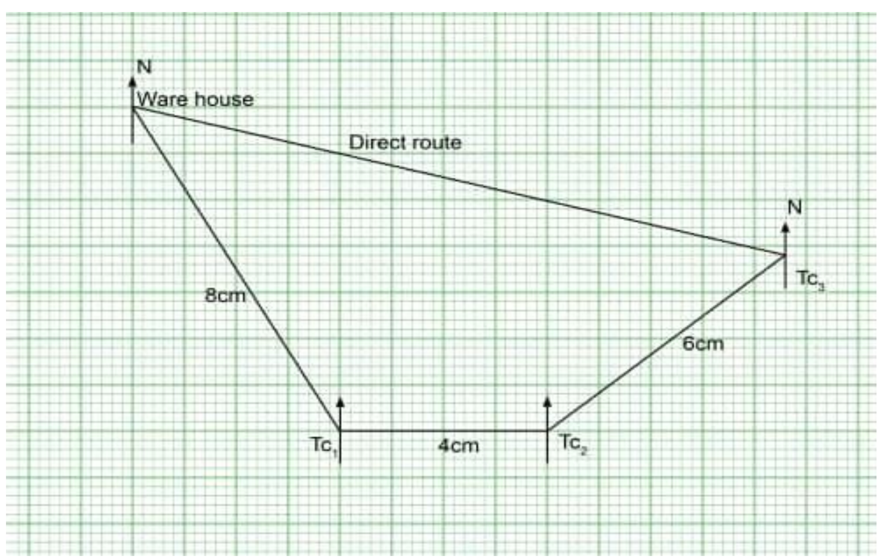
<tr><td>13(a)</td><td>

Minutes to hrs., time $= \frac{40}{60} = \frac{2}{3} hrs$
Distance from TC_1 to TC_2
$= 60 \times \frac{40}{60}$ or $60 \times \frac{2}{3}$
$= 40$ km
Scale 1cm : 10 km
Ware house to $TC_1 = \frac{80}{10} = 8cm$
$TC_1 to\ TC_2 = \frac{40}{10} = 4cm$
$TC_2 to\ TC_3 = \frac{60}{10} = 6cm$
Sketch



Accurate



Distance of the direct route from the third Centre to the company's ware house $= 13cm$ (accept 13 ± 0.1)cm (12.9−13.1)cm
Distance in km $= 13 \times 10$
$= 130$ km

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<tr><td>(b)</td><td>

Total distance: warehouse to TC_3
$= 80 + 40 + 60$
$= 180$ km
Fuel for 180 km $= \frac{180}{15}$
$= 12$ litres
litres $= 20 - 12 = 8$ litres

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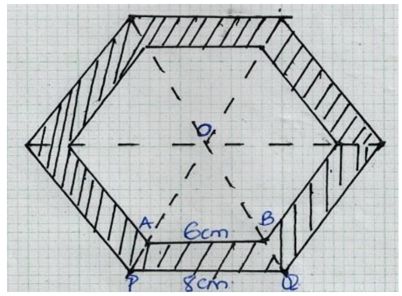
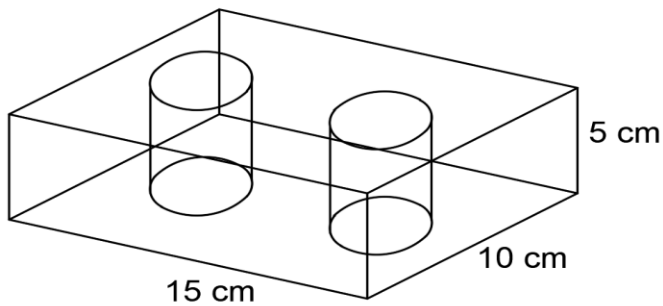
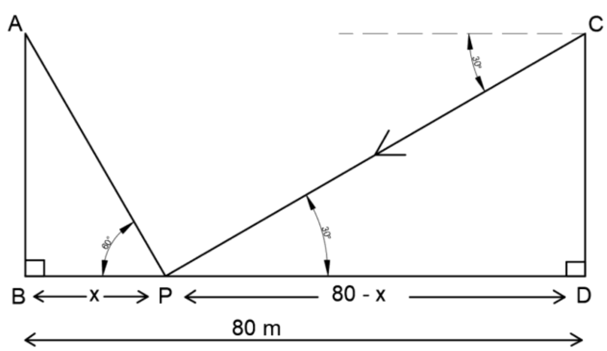
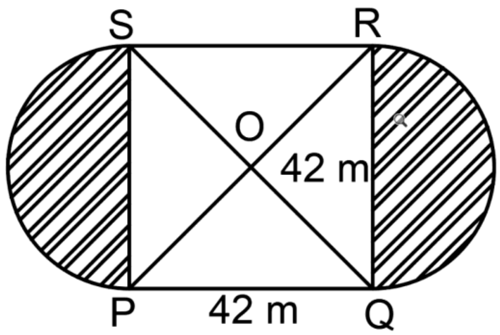
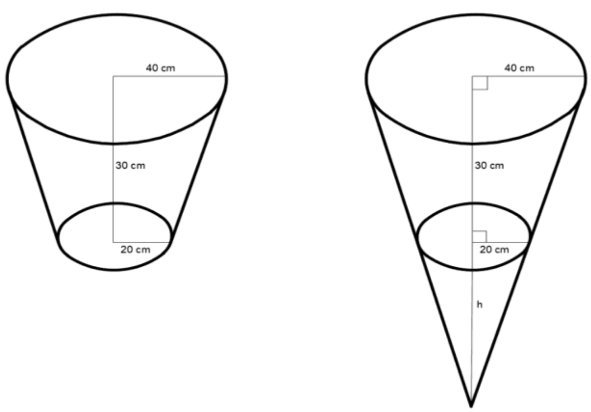
	fuel for direct route $= \frac{130}{15}$ $= 8.6667$ litres Daniel should add more fuel in the car. Since the direct route requires 8.6667 litres and there remains only 8 liters, he should add more 0.6667 liters or more in the car.	
14	Hexagon $= 6\ sides$ Interior angle $\frac{360}{6} = 60°$  Triangle OAB and OPQ are equilateral triangles Area of triangle OAB $= \frac{1}{2} \times 6 \times 6\ sin\ 60$ $= \frac{1}{2} \times\ 36\ sin\ 60$ $= 18\ sin\ 60$ Area of triangle OPQ $= \frac{1}{2} \times 8 \times 8 sin 60$ $= 32 sin\ 60$ Area of shaded trapezium $= 32\ sin 60 -\ 18\ sin\ 60$ $= 14 sin\ 60$ $= 12.1243$ Total area of shaded part $= 12.7243 \times 6$ $= 72.7461$ $= 72.7\text{cm}^2$ Area between the two hexagons on sketch $=\ 72.7\ cm^2$ b) Area of actual pool $=\ 5 \times$ area of sketch $= 5 \times 72.7$ $= 363.5 cm^2$ Volume of water to a depth of 100 cm $= area\ \times depth$ $= 363.5 \times 100$ $= 36{,}350 cm^3$ The volume of water that will be required to fill the pool will be $36{,}350 cm^3$	
15(a)(i) (ii)	$A = P\left(1 + \frac{r}{100}\right)^n$ $P = 20{,}000, r = 30\%\ per\ hour, n = 4\ hrs$ $A = 20{,}000\left(1 + \frac{30}{100}\right)^4$ $= 20{,}000 \times 1.3^4$ $= 20{,}000 \times 2.8561$ $= 57{,}122$ ∴ After 4 hrs there will be 57,122 bacteria. $P = 20{,}000$, $r = 30\%$ per hour, $n = 4$ hrs $20{,}000\left(1 + \frac{30}{100}\right)^n = 1{,}000{,}000$ $1.3^n = 50$ Introduce logarithm on both sides $\log 1.3^n = \log 50$ $n = \frac{\log 50}{\log 1.3}$	

	$n = \dfrac{1.69897}{0.11394}$ $n = 14.911$ $n \approx 15$ hrs ∴ After 15 hrs from the start of the experiment, the number of bacteria will be greater than one million.	
(b)	Cylinder diameter = 7cm, Radius = $\frac{7}{2} = 3.5cm$, Height, $h = 5$cm  S.A of remaining block = (T.S.A of cuboidal block + curved SA of 2 cylinders)−(Areas of 2 circles) $= 2(lw + wh + lh) + 2(2\pi rl) - 2(\pi r^2)$ $= 2(15 \times 10 + 10 \times 5 + 5 \times 15) + 2\left(2 \times \frac{22}{7} \times \frac{7}{2} \times 5\right)$ $- \left[2 \times \frac{22}{7} \times \left(\frac{7}{2}\right)^2\right]$ $= 550 + 220 - 77$ $= 693\ cm^2$ Amount needed = surface area x rate $= 693 \times 100$ $= UGX69{,}300.$ ∴ The amount of money needed to vanish the remaining block is UGX 69,300.	
16(a)	Let AB and CD be two poles  In right ΔPBA, $\tan 60° = \frac{AB}{PB}$ $\sqrt{3} = \dfrac{AB}{x}$ $AB = \sqrt{3}x$……….(1) In right ΔCDP, $\tan 30° = \frac{CD}{PD}$ $CD = \tan 30(80 - x)$ $CD = \frac{1}{\sqrt{3}}(80 - x)$……….(2) ∵ AB = CD (the poles have equal height) $\Rightarrow \sqrt{3}x = \dfrac{1}{\sqrt{3}}(80 - x)$ $3x = 80 - x$ $4x = 80$	

<table>
<tr><td></td><td>$x = 20\ m$
Now $AB = \sqrt{3} \times 20 = 20\sqrt{3}\ m$ or $34.64\ m$
$\therefore$ Height of each pole is $20\sqrt{3}\ m$
Distance of point P from the pole with angle of elevation 60° is 20m and distance of point P from the pole with angle of depression 30° is 40m.</td><td></td></tr>
<tr><td>(b)</td><td>

Since $OS = 0P = 21\sqrt{2}m, < POS = 90°$
$PR^2 = PQ^2 + QR^2$
$PR^2 = 42^2 + 42^2$
$= 3528$
$PR = 42\sqrt{2}\ m$
$PO = \frac{1}{2} \times 42\sqrt{2} = 21\sqrt{2}\ m$
Area of the sector POS $= \frac{90°}{360} \times \pi\left(21\sqrt{2}\right)^2$
$= \frac{1}{4} \times \frac{22}{7} \times 21 \times 21 \times 2$
$= 693\ m^2$
Area of Δ POS $= \frac{1}{2} \times (PS \times height)$
$= \frac{1}{2} \times 42 \times 21$
$= 441\ m^2$
Area of flower bed $= 693 - 441$
$= 252\ m^2$
Area of the two flower beds $= 2 \times 252$
$= 504\ m^2$
$\therefore$ the total area of the two circular flower beds to be put on the square lawn is $504\ m^2$.</td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>17(a)</td><td>

from similarity of figures
$\frac{H}{h} = \frac{R}{r}$
$\frac{30 + h}{h} = \frac{40}{20}$</td><td></td></tr>
</table>

	$h = \frac{600}{20}$ $h = 30\ cm.$ Volume of container = volume larger cone – volume of smaller cone $= \frac{1}{3}\pi R^2 - \frac{1}{3}\pi r^2$ $= \frac{1}{3} \times \frac{22}{7} \times (40^2 \times 60 - 20^2 \times 30)$ Volume $= 88{,}000\ cm^3$. 1 litre = $1000\ cm^3$ 880 litres $= 880 \times 1000$ $= 880{,}000\ cm^3$ Number of containers of milk required $= \frac{number\ of\ litres}{volume\ of\ the\ bucket}$ $= \frac{880{,}000}{88{,}000}$ $= 10$ buckets / containers. ∴ 10 containers of milk are needed daily for the camp.	
(b)	Cost $= 880 \times 15{,}000$ UGX$= 1{,}320{,}000$ ∴ the organization will pay UGX1, 320,000 daily to make sure milk is available daily in the camp.	
(c)	Value indicated: Kindness	
18(a)	Allowances	

Item		Amount
Marriage		25,000
Insurance		15,000
Children	10 yrs	5,000
	14 yrs	8000
Total		53,000

Let the taxable income be x

Taxable income	Income tax
$10{,}000 \times \frac{10}{100}$	10,000
$10{,}000 \times \frac{15}{100}$	15,000
$10{,}000 \times \frac{20}{100}$	20,000
$10{,}000 \times \frac{25}{100}$	25,000
$10{,}000 \times \frac{30}{100}$	30,000
$(x - 500{,}000) \times \frac{35}{100}$	$0.35x - 175{,}000$

Note: income tax per month $= 65{,}000$.

Total income tax $= 10{,}000 + 15{,}000 + 20{,}000 + 25{,}000 + 30{,}000 + 0.35x - 175{,}000$
$65{,}000 = 0.35 - 75{,}000$
$0.35x = 140{,}000$
$x = 400{,}000$
$Taxable\ income\ =\ gross\ income - total\ allowance$
$400{,}000 = G - 53{,}000$
$G = 453{,}000$
∴ The gross monthly income Anne earns is UGX 453,000.

(b) Portion of Anne's income available for taxation (taxable income) = UGX 400,000.

(c) Percentage of Anne's income that goes to taxes

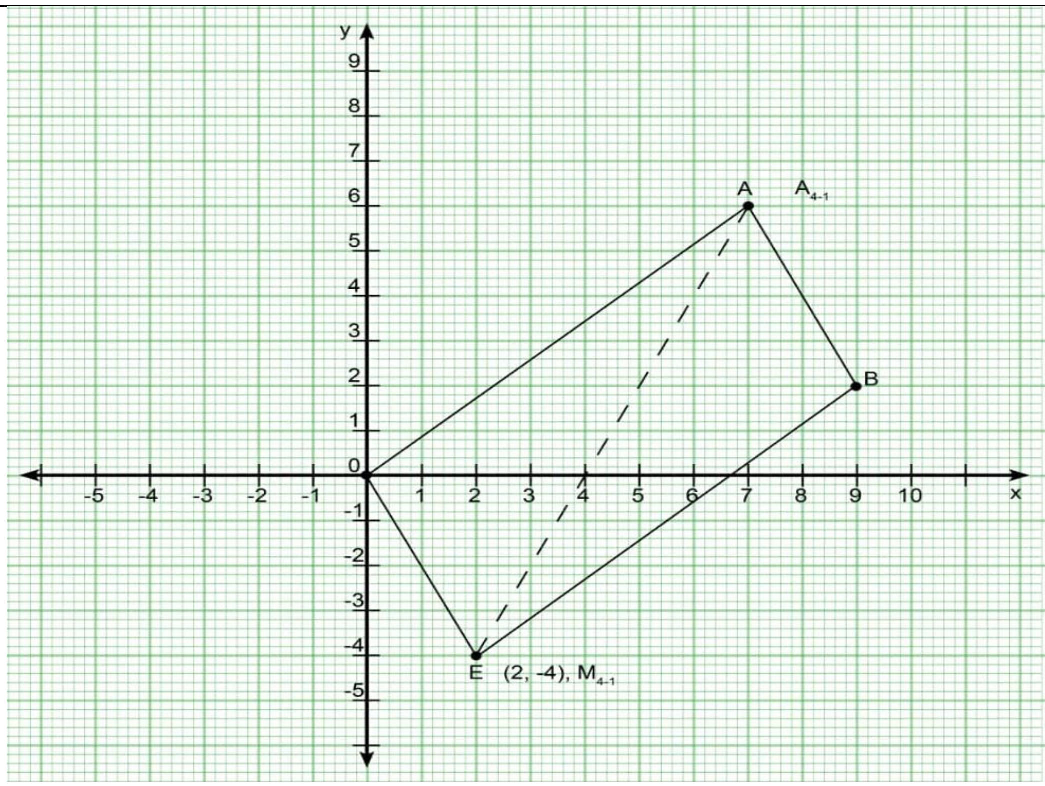
$$= \frac{income\ tax}{taxable\ income} \times 100$$

$$= \frac{65{,}000}{400{,}000} \times 100$$

$$= 16.25\%$$

∴ On Anne's income 16.25% goes to paying taxes.

19



For a parallelogram

$AB = OC$ Let coordinates of C be (x, y)

$OC = OB - OA = \begin{pmatrix} 9 \\ 2 \end{pmatrix} - \begin{pmatrix} 7 \\ 6 \end{pmatrix} = \begin{pmatrix} 2 \\ -4 \end{pmatrix}$

Coordinates of point C are $(2, -4)$

From the graph column vector $AC = (-5, -10)$

Distance $AC^2 = 5^2 + 10^2$

$= 25 + 100$

$= \sqrt{125}$

$= 11.18$

$= 11.2$ units

Distance of A to C is 11.2 Units

(b) Taxable income = 1800,000 – 200,000

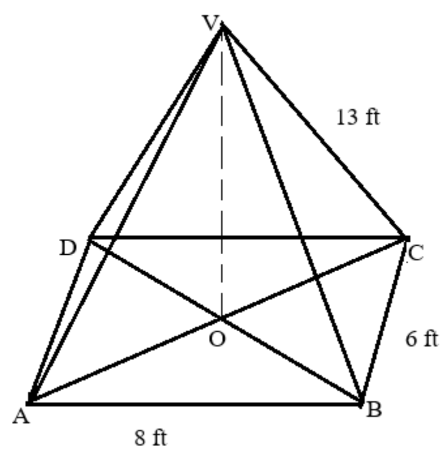
=1,600,000

INCOME	RATE	TAX
235,000	0	0
235001 – 400,000	15	$15\% \times (400{,}000 - 235{,}000) = 24{,}750$
400,000 - above	30	$30\% \ (91{,}600{,}000 - 400{,}000) = 360{,}000$
		Total Tax = 384,750

Income after Tax = 1600,000 – 384, 750
= 1,215, 250

I think the surveyor should accept the new job officer because it offers a greater net income than the current job.

20 Let the rectangular base be ABCD and vertex, V with center O



(a) Volume = $\frac{1}{3} \times (base\ \ area) \times$ height

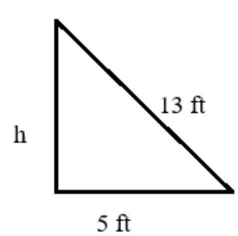
Height, VO $AC^2 = AB^2 + BC^2$

$= 8^2 + 6^2$

$= 100$

$AC = 10\ ft$

$$OC = \frac{1}{2}AC = \frac{1}{2} \times 10 = 5ft$$



$VO^2 = 13^2 - 5^2$

$= 169 - 25$

$= 144$

$VO = 12\ ft$

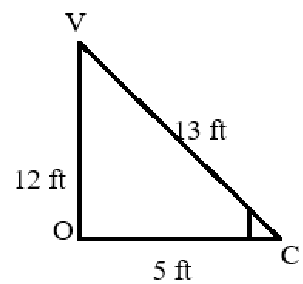
Height, h = 12 ft.

1 ft. = 30.48 cm
$8ft\ =\ 30.48 \times 8 = 243.84\ cm$
$6ft\ =\ 30.48 \times 6 = 182.88\ cm$
$12ft\ =\ 30.48 \times 12 = 365.76\ cm$

$$\therefore Volume = \frac{1}{3} \times (243.84 \times 182.88)\ \times 365.76 = 5{,}436{,}834.546\ cm^3$$

The volume to which the demonstration items will contain is 5,436,834.546cm^3.

(b)

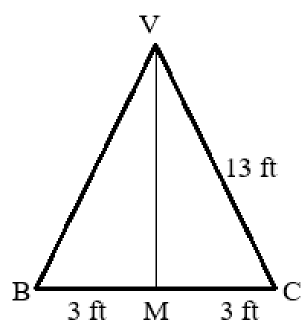


$\tan\theta = \frac{12}{5}$
$\theta = \tan^{-1}\left(\frac{12}{5}\right)$
$\theta = 67.38°$
Each slanting pole will be put at an angle of $67.380°$ with the base of the foot pyramid.

(c)

Total surface area of pyramid $= 2(area\ of\ VBC) + 2(area\ of\ VAB) + area\ of\ the\ base$

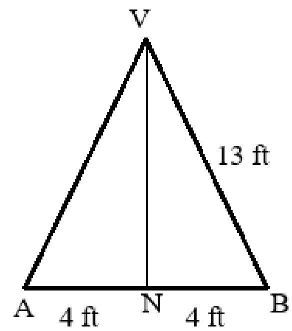
Area of VBC



$$13^2 = VM^2 + 3^2$$
$$= 169 - 9$$
$$= \sqrt{160}$$
$$VM = 12.649\ ft$$

$$Area = \frac{1}{2} \times 182.88\ \times (12.649 \times 30.48) = 35253.9166\ cm^2$$

Area of VAB



$$13^2 = VN^2 + 4^2$$
$$= 169 - 16$$
$$= \sqrt{153}$$
$$VM = 12.369\ ft$$

$$Area = \frac{1}{2} \times 243.84\ \times (12.369 \times 30.48) = 45964.7081\ cm^2$$

Area of the base $= 243.84 \times 182.88 = 44593.4592\ cm^2$

Total surface area of pyramid $= 2(35253.9166) + 2(45964.7081) + 44593.4592$

$= 207030.7086\ cm^2$

$$1m = 100cm$$
$$1m^2 = 10000cm^2$$
$$207030.7086cm^2 = \frac{207030.7086}{10{,}000}$$
$$= 20.70307086\ m^2$$

Total cost $= 20.70307086 \times 4500$

$= UGX\ 93163.81887$

$\approx UGX 94000$

The total cost of painting the plane surfaces is UGX 94,000