FORM FOUR ISESE EXAMINATION
BASIC MATHEMATICS
MARKING SCHEME

01. (a) Student should approximate the expression to one significant figure:-

$0.0695 \approx 0.07$
$19812 \approx 20000$ 01
$6.8125 \approx 7$

$$\frac{0.07 \times 20000}{7} = \frac{1400}{7} = \underline{200}$$

$$\therefore \frac{0.0695 \times 19812}{6.8125} = 200$$ 02

(b) (i) Student should find differences between LCM and GCF of numbers

LCM of prime number.

41	41	59
59	1	59
	1	1

0½

$LCM = 41 \times 59 = 2419$

GCF of the remaining number.

2	28	42	70
2	14	21	35
3	7	21	35
5	7	7	35
7	7	7	7
	1	1	1

0½

$GCF = 2 \times 7 = \underline{14}$

Difference of LCM & GCF are
$2419 - 14 = 2405$

$\therefore$ The difference between the least common multiple of prime number and the greatest common factor of remaining factor are 2405. 01

(ii) 2.4×10^3 01

2 (a). $a = 0.8\dot{5}$

$100a = 8.5\dot{5}$

$100a - a = 8.5\dot{5} - 0.8\dot{5}$

$100a = 7.7$

$a = \frac{7.7}{100}$. 00$\frac{1}{2}$

$a = 0.\dot{2}\dot{1}$ - - - - (i).

$100b = 21.\dot{2}\dot{1}$ - - - - - ii.

$100b - b = 21.\dot{2}\dot{1}$

$\frac{99b}{99} = \frac{21}{99}$

$b = \frac{7}{33}$. 00$\frac{1}{2}$

$\frac{b}{a} = \frac{21}{99} \div \frac{77}{90} = \frac{30}{121}$ 001

b)(i) Let the exterior angle be x.

Exterior angle.	interior angle.
$108° + x$	x.

00$\frac{1}{2}$

interior angle + exterior angle = 180.

$2x + 108° = 180$.

$2x = 72$.

$x = 36°$

From $Ext = \frac{360}{n}$

$n = \frac{360}{36} = 10$ sides.

it has 10 sides as Decagon 001$\frac{1}{2}$

2 (b) ii/. $25(2^{\log x}) = x$.

$\log 25(2^{\log x}) = \log x$.

let

$\log x = a$.

Solving gives $a = 2$.

$\log x = 2$.

$x = 100$.

001

2 (c) Given

$a:b = 5:2$. - - - - i/

$b:c = 2(3:4)$. - - ii/.

-Multiply by 3 in equation i/ and by 2 in eqn- -ii/.

$a:b = 3(5:2)$.

$b:c = 2(3:4)$

$a:b = (15:6)$.

$b:c = (6:8)$.

gives.

$a:b:c = 15:6:8$.

001

3 (a) Let number of cookery be $n(c) = 30$ and needle be $n(n) = 20$.

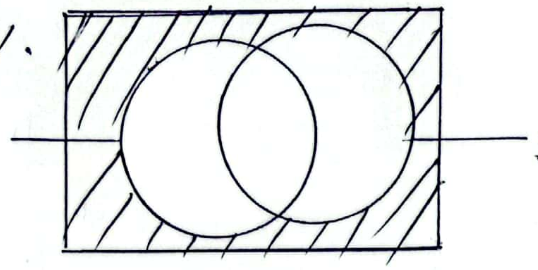
-solving gives $n(c \cap n) = 0$ since $n(c \cap n) = 50$.

No student who takes both cookery and needle

002

3 (b)

i.



$(A \cup B)'$ 002

ii. let the number of hunters be x.

$n(F) = 6 + 2x$;
$n(H) = x$
$n(F \cap H) = 3x$.

Solving. $6 + 2x + x + 3x = 40 - 4$.
$6x = 30$.
$x = 5$.

$\therefore$ Hunters were 5 families.

Both farmers and hunters were 15 families and farmers only were 16. families. 002

4 (a) i. $m = \frac{-4}{3}, \frac{-4}{3}$.

$= \frac{9+3}{K-5}$ solving gives $K = -4$. $001\frac{1}{2}$

(ii) $(x, y) = (4, 0)$ and $(-4, 9)$.

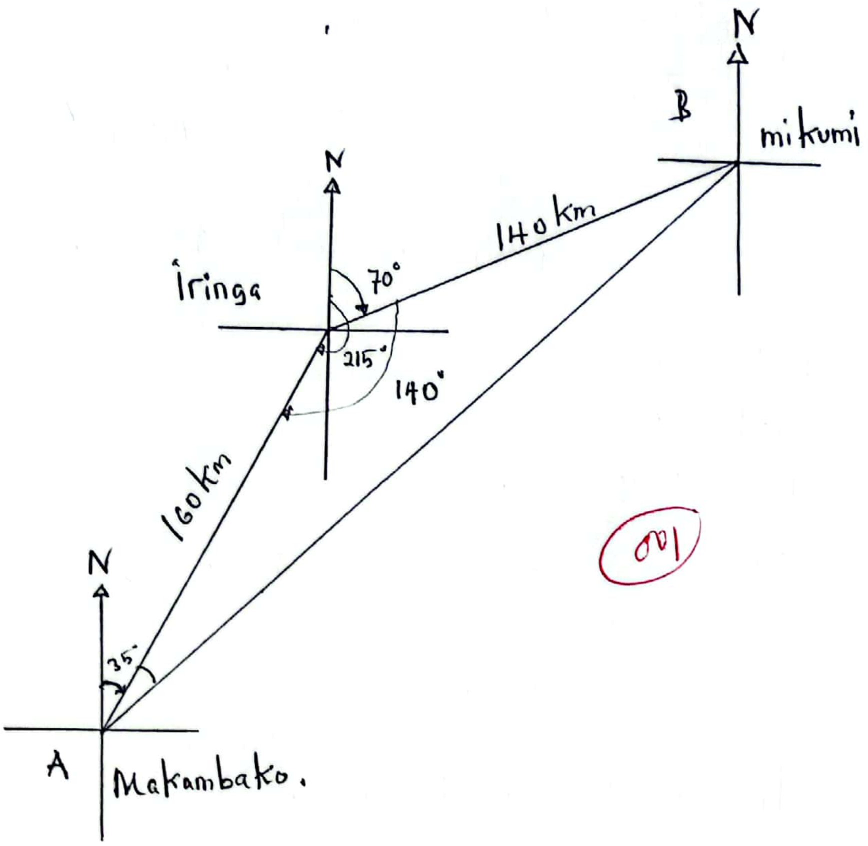
Slope$(m) = \frac{9-0}{-4-4} = -\frac{9}{8}$

Solving: the equation becomes.

$y = \frac{-9}{8}x + \frac{9}{2}$. $001\frac{1}{2}$

CamScanner

4 (b).



By Cosine rule $AB = \sqrt{(160^2 + 140^2 - 2 \times 160 \times 140 \cos 145)}$

≈ 286 km.

By Sine rule $\frac{\sin A}{140.} = \frac{\sin 145}{286.}$

$A^\circ = 16.3^\circ$

002

5 (a) let the area of sphere be As and that of cylinder be Ac

$A_s = A_c$ given

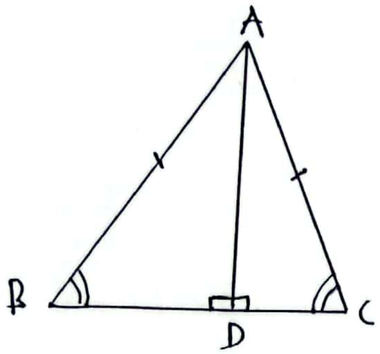
Radius of sphere = 6cm radius of cylinder = 2cm.

$\frac{4}{3}\pi r_s^3 = \pi r_c^2 h.$

5 (a) $h = \frac{4 \times 6^3 \times 6}{3 \times 2 \times 2} = 72$ cm.

002

(b) (i).



001/2

line AD bisect the angles, BAC to BAD and CAD

Then $B\hat{A}D = C\hat{A}D$ ($\overline{AD}$ bisect an angle $B\hat{A}C$

$\overline{AD}$ is common.

001/2

$A\hat{B}D = C\hat{A}D$ given.

$\therefore A\hat{D}B = A\hat{D}C = 90^\circ (\overline{AD} \perp \overline{BC})$

Hence proved by AAA.

001

(ii) $A = \frac{1}{2} nr^2 \sin\left(\frac{360}{n}\right)$

$A = \frac{1}{2} \times 10 \times 10^2 \sin\left(\frac{360}{10}\right)$

$A = 293.89 \text{cm}^2$.

002

6 (a). let n be number of tiles and l length of sides. of a tile.

$$n \alpha \frac{1}{l^2} \Rightarrow n = \frac{k}{l^2}.$$

$$k = nl^2 = 2016 \times 0.4^2.$$

$$k = 322.56.$$

$$n = \frac{k}{l^2} = \frac{322.56}{0.3^2}$$

$$n = 3584 \text{ tiles.}$$

$\therefore$ the number of tiles required for 0.3 are 3584 tiles.

002

(b) (i) total sweets were 500.

let number of cheaper sweet be x and number of expensive sweets be y

Now $\quad x + y = 500$ ------ i).

$$8y = 100 + 5y \Rightarrow y = \frac{100+5x}{8} \text{ --- ii).}$$

— solving equations i) and ii).

$$x = 300 \text{ sweets and } y = 200 \text{ sweets.}$$

$\therefore$ the cheaper sweets are 300 sweets.

the expensive one are 200 sweets. 002

6 (b) iv. For US expenses (will spend 300 × 5 = Tsh 1500/= for cheaper sweets)

now.

$1 \text{ USD} = 1200/=$

$x = 1500/=$.

$X = \frac{1500}{1200} = 1.25 \text{ USD}$

002

- in US one will use 1.25 USD for cheaper sweets.

7. (a) Original price = 150,800.

percentage discount = $5/2$ %.

Discount arrested = $\frac{2}{100} \times 150,800$.

$= \frac{5}{2} \times \frac{1}{100} \times 150,800$.

$= 3770$ Tshs.

Discount price = Original price − discount

$= 150,800 - 3770$

$= 147030$.

∴ the discount price 147030 Tshs.

002

(b) (i) Double entry is the system where by one transaction is recorded twice in the book of account. the book used for recording business transactions. is called ledger

004

(ii) ledger is a main or principal book of account in which business transactions are recorded in double entry system.

001

07 (b) iii). closing stock, these are unsold goods at the end of trading period, always are detected in december. 001

iv) long term liabilities; these are depts to be repaid after a long period of time example a loan from bank 001

08 (a) i).

$A_1 = G_1$; $A_5 = G_2$ and $A_7 = G_3$.

Now Common ratio $(r) = \frac{G_2}{G_1} = \frac{G_3}{G_2}$

$$\Rightarrow \frac{A_1+4d}{A_1+d} = \frac{A_1+6d}{A_1+4d}.$$

Solving gives $A_1 = -10d \Rightarrow \frac{-10d+4d}{-10d+d}$

$$= \frac{-6d}{-9d} = \frac{2}{3} = 2:3.$$

$G_2 = -6d$ 002

(b) i). let a number be n

$6, n, 38$, of AP

$38 - n = n - 6$ solving gives $n = 22$ terms 002

ii). $5, 10, 200 \ldots 100$.

$A_1 = 5$

$d = 5$ and

$A_n = 100$

from

$A_n = A_1 + (n-1)d$

8 (b) Solving gives.

$n = 20$.

$S_{20} = 10(5+100) = 1050$.

and now $1+2+3+4+\cdots+100$.

$A_n = 100$, $d = 1$ and $A_1 = 1$

Now

$100 = 1 + 1(n-1)$

Solving gives $n = 50$.

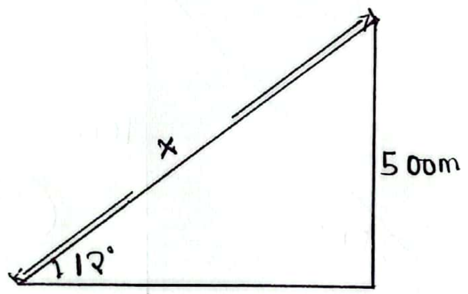
Now $S_{100} = 50(2+(100-1)) = 5050$.

then $S_{100} - S_{20} = 5050 - 1050 = 4000$.

$\therefore$ the Sum of integers from 1 to 100 which are not divisible by 5 is 4000

002

9 (a) Let x be the distance to Cover.



$00\frac{1}{2}$

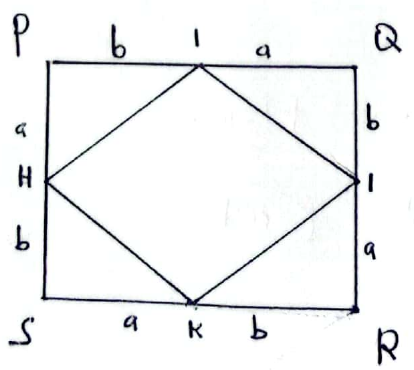
$\sin 12° = \frac{500}{x}$

$x = \frac{500}{\sin 12}$,

$x = 2404.87$ km.

$00\frac{1}{2}$

(b)



$00\frac{1}{2}$

9 (b)

$PS = a + b$

$SR = a + b$

Area of larger square is $PS \times SR \Rightarrow (a+b)(a+b)$

$= (a+b)^2$ 001/2

let $HI = c$ of small circle and because it's a square then

$HI = IJ = IK = HK$

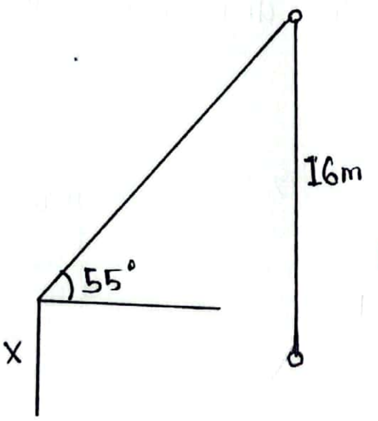
Now area of a larger square = Area of a small square + area of 4 Triangles. 001/2

$(a+b^2) = c^2 + 4 \times \frac{1}{2} ab$ 001/2

$a^2 + b^2 + 2ab = c^2 + 2ab.$ 001/2

$\therefore a^2 + b^2 = c^2$ hence Verified. 001/2

(b) ii).



001/2

$\tan 55° = \frac{y}{10}$

$y = 10 \tan 55°$ 001/2

but $16 = y + x$

$x = 16 - 14.28 = 1.72m.$

$\underline{\underline{x = 1.72\text{ m}.}}$ 001

10 (a) i. let the unknown be m.

$m^2 + 12m$.

The number to be added is $\left(\frac{b}{2}\right)^2$

$b = -12,\ \left(\frac{12}{2}\right)^2 \Rightarrow b = 36$.

Therefore 36 must be added to make it perfect.

$m^2 - 12m + 36$. 00½

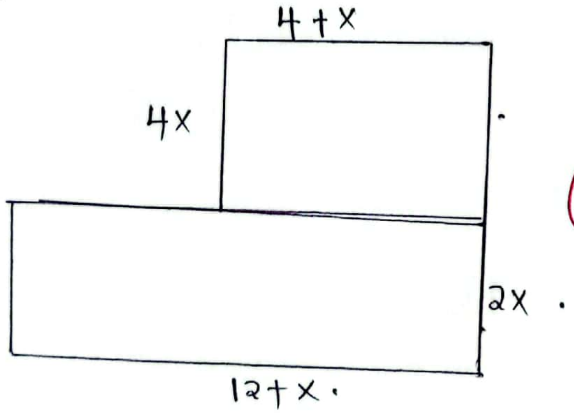
ii. let the numbers be m and m+1

$m^2 + (m+1)^2 = 5$.

Solving it gives $m = 1$, now numbers are 1 and 2

04½

(b) i. let number be x.



00½

Area of top stair $= 4x(4+x) \Rightarrow 4x^2 + 6x$.

Area of the base stair $= (2+x)(12+x)$

$= x^2 + 14x + 24$ 001

ii. $4x^2 + 16x + x^2 + 14x + 24 = 104$

$x^2 + 6x - 16 = 0$. Solve quadratic equation gives.

$x = 2$ or $x = -8$. 02½

We have no negative length then the required number is 2cm. 001

SECTION B "40 MARKS"

11 (a) Frequency distribution table

class interval	classmark	Frequency	Cumulative frequency
0 – 10	5	4	4
10 - 20	15	16	20
20 – 30	25	x	$x + 20$
30 – 40	35	y	$x + y + 20$
40 – 50	45	z	$x + y + z + 20$
50 – 60	55	6	$x + y + z + 26$
60 - 70	65	4	$x + y + z + 30$

001½

(i) The median class is 30 – 40 001

(ii) The modal class is 30 – 40 001

(b) $4 + 16 + x + y + z + 6 + 4 = 230$.

$x + y + z + 30 = 230$.

$x + y + z = 200$ ---- (i)

$$\text{Median} = L + \left(\frac{\frac{N}{2} - nb}{nw}\right)i$$

001½

$$33.5 = 30 + \left[\frac{\frac{230}{2} - (x + 20)}{y}\right]10$$

$$33.5 - 30 = \frac{(115 - x - 20)10}{y}$$

$$3.5 = \frac{(95 - x)10}{y}$$

$$3.5 = \frac{950 - 10x}{y}$$

11 b) $3.5y = 950 - 10x$

$10x + 3.5y = 950$

$100x + 35y = 9500$ ------(i).

$$\text{Mode} = L + \left(\frac{t_1}{t_1+t_2}\right)i$$

$$34 = 30 + \left(\frac{y-x}{(y-x)+(y-z)}\right)10$$

$$34 - 30 = \left(\frac{y-x}{2y-x+z}\right)10.$$

$$4 = \frac{10y - 10x}{2y-x-z}$$

$4(2y-x-z) = 10y - 10x$

$8y - 4x - 4z = 10y - 10x$

$10x - 4x - 4z = 10y - 8y.$

$6x - 4z = 2y.$

$2(3x - 2z) = 2y.$

$y = 3x + 2z$ -----(iii), $00\frac{1}{2}$

- make z the Subject in equation (i) above

$z = 200 - x - y$ -----(iv).

- subtitute equation (iv) into equation (iii) above.

$y = 3x - 2(200 - x - y)$

$y = 3x - 400 + 2x + 2y$

$y - 2y = 3x + 2x - 400$

$-y = 5x - 400.$

$y = -5x + 400.$

$y = 400 - 5x.$ $00\frac{1}{2}$

- Subtitute equation (v) into equation (ii) above

$100x + 35(400 - 5x) = 9500$

$100x + 14000 - 175x = 9500$

11 b) $100x + 1400 - 175x = 9500 - 14000$

$-75x = -4500$

$x = 60$

- Subsititute $x = 60$ into equation (v) above

$y = 400 - 5(60)$.

$y = 400 - 300$

$y = 100$.

- Subsititute $x = 60$ and $y = 100$ into equation (iv) above -

$z = 200 - 60 - 100 = 40$.

$\therefore$ $x = 60$, $y = 100$ and $z = 40$. 001

c)

class interval	class mark (x)	frequency (f)	Fx.
0 – 10	5	4	20
10 - 20	15	16	240
20 - 30	25	60	1500
30 - 40	35	100	3500
40 - 50	45	40	1800
50 – 60	55	6	330
60 - 70	65	4	260.
		N = 230.	$\sum fx = 7650$.

001

Mean, $\bar{x} = \frac{\sum fx}{N}$ $00\frac{1}{2}$

$\bar{x} = \frac{7650}{230}$.

$\bar{x} = 33.26$.

$\therefore$ Mean of the data is 33.26. 001

11 d) given

$L = \pi m$ and $\theta = \frac{\pi}{60} = 30^\circ$ 00$\frac{1}{2}$

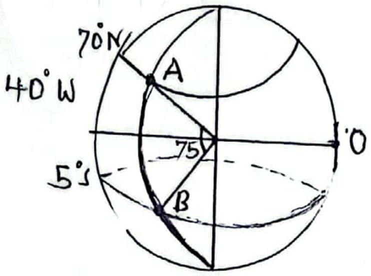
$l = \frac{\pi \theta \times r}{180}$ 00$\frac{1}{2}$

Substituting the data gives

$\pi m = \frac{\pi \times 30 \times r}{180}$ 00$\frac{1}{2}$

$\underline{r = 6m.}$ 001

12 (a)



<u>data given.</u>

- speed of the ship, P $V_P = 40 km/h$.
- speed of sheep Q, $V_Q = 45 km/h$. 001
- Departure = 8:00 am on Jan 1
- When will they meet

<u>From the theorem</u>

Meeting time, $t = \frac{\text{Distance of separation } \overline{AB}}{\text{Sum of Velocity.}}$ 001

$= \frac{L\overline{AB}}{V_P + V_Q}$

but

$L\overline{AB} = \frac{\pi R(\alpha + \beta)}{180.}$ 00$\frac{1}{2}$

$= \frac{3.14 \times 6400 km \times 75^\circ}{180.}$

$L\overline{AB} = 8378.67 km.$

$$\Rightarrow \frac{8378\cdot67\ \text{km}.}{40\ \text{km/h} + 45\ \text{km/h}}$$

12(a).

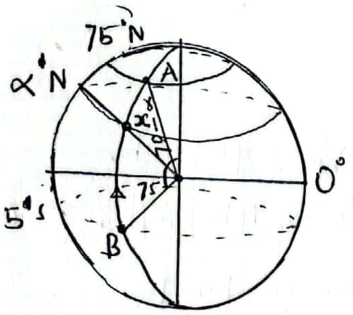
$$= \frac{8378\cdot67\ \text{km}}{85\ \text{km/h}.}$$

$$= 98\cdot5\text{h}.$$

$t = 4$ days $+ 2\cdot6$ h
$= 4$ days $+ 2$h $+ 0\cdot6$h.
$= 4$ days $+ 2$h $+ 36$ min.
$= 4$ days $+ 2{:}36$

$\therefore$ They will meet on January 5 at 10:36 $00\frac{1}{2}$

– Where will they meet



$00\frac{1}{2}$

– Consider ship P.

From.

$$V_P = \frac{X_P}{t}$$

$$X_P = V_P \cdot t$$

$$= 40\ \text{km/h} \times 98\cdot6\ \text{h}$$

$$= 3944\ \text{km}.$$ $00\frac{1}{2}$

– Let α be the latitude where the ships meet
from the diagram.

$$L\,\overline{AB} = \frac{\pi R(70-\alpha)}{180}.$$

12 (a). $X_P = \dfrac{\pi R(70-\alpha)}{180}$

$180 \cdot X_P = \pi R (70-\alpha)$.

$\dfrac{180 \cdot X_P}{\pi R} = 70 - \alpha$

$\alpha = 70 - \dfrac{180 \cdot X_P}{\pi R}$

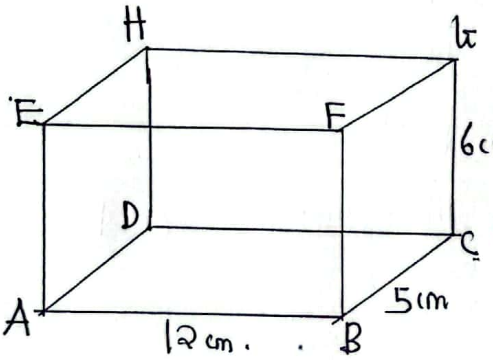
$\alpha = 70^\circ - \dfrac{180 \times 3944 \text{ km}}{3.142 \times 6400 \text{ km}}$

$\alpha = 70^\circ - 35^\circ 42'$

$\alpha = 35^\circ N$

$\therefore$ The ships will meet at $35^\circ N$. 001

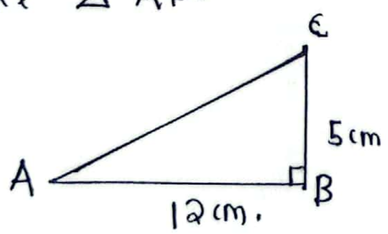
12 (b).



001

(i). AC.

Take $\triangle ABC$.



Recall.

$a^2 + b^2 = c^2$.

$12^2 + 5^2 = c^2$.

$c^2 = 144 + 25$

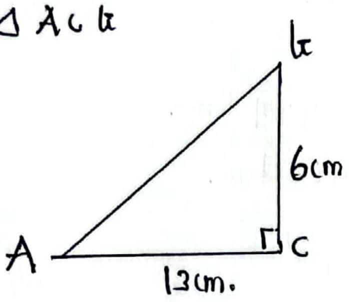
$c^2 = 169$

12 (b) $\sqrt{c^2} = \sqrt{169}$

$c = 13\,cm$

$\therefore \overline{AC} = 13cm.$

Take $\triangle ACG$



Recall.

$a^2 + b^2 = c^2$

$13^2 + 6^2 = c^2$

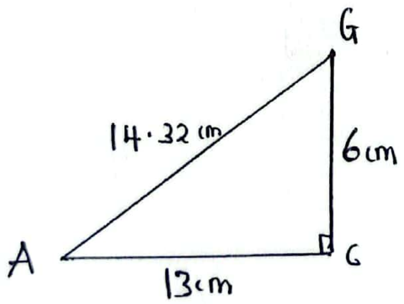
$c^2 = 169 + 36.$

$c^2 = 205$

$\sqrt{c^2} = \sqrt{205}.$

$\therefore c = 14.32\,cm.$ 001

ii)



$\tan\theta = \frac{6\,cm}{13\,cm}.$

$\tan\theta = 0.4615.$

$\theta = \tan^{-1}(0.4615).$

$\theta = 24^\circ 47'$

$\theta = 25^\circ$ 001

12 (b) iii) yes, because they are neither parallel nor intersect each other. 001

iv) Faces = 6.

edges = 12

Vertices = 8 001

13 (a). $(P-1)\times 6p-(p+3)=0$ 001

$6p^2-7p-3=0$ by factorizing

$(2p-3)(3p+1)=0$ $00\frac{1}{2}$

$P=\frac{3}{2}=1.5$ or $P=\frac{-1}{3}$. 002

(b) Given $A=\begin{pmatrix}2 & -3\\ -2 & 1\end{pmatrix}$

Thus $f(x)=x^2-3x-4I$

$f(A)=A^2-3A-4I$ 001

$f(A)=\begin{pmatrix}2 & -3\\ -2 & 1\end{pmatrix}^2-3\begin{pmatrix}2 & -3\\ -2 & 1\end{pmatrix}+4\begin{pmatrix}2 & -3\\ -2 & 1\end{pmatrix}$ $00\frac{1}{2}$

Simplifying function gives.

$f(A)=\begin{pmatrix}0 & 0\\ 0 & 0\end{pmatrix}$ This is the null matrix 002

(c) let first Commodity be x and second Commodity be y.

$$\begin{cases} 3x+\frac{1}{2}y=1200 \\ 2x-3y=400.0 \end{cases}$$ 001

By Cramer's rule.

$$X=\frac{\begin{vmatrix}1200 & 0.5\\ 400 & -3\end{vmatrix}}{\begin{vmatrix}3 & 0.5\\ 2 & -3\end{vmatrix}}=\frac{-3600-200}{-9-1}$$

$$X = \frac{-3800}{-10} = 380.$$

$$Y = \frac{\begin{vmatrix} 3 & 1200 \\ 2 & 400 \end{vmatrix}}{\begin{vmatrix} 3 & 0.5 \\ 2 & -3 \end{vmatrix}} = \frac{1200-2400}{-9-1} = 120.$$

He has to buy more first Commodity about 380 quantities.

002

14 (a).

Type	Space in m^2	Amount
Refrigerator	1.8	300,000.
Washing machine	1.5	500,000.
Total	27	6,000,000.

001

Let refrigerator be X and washing machine be y.

$1.8x + 1.5y \leq 27.$

$18X + 15y \leq 270$

$300{,}000X + 500{,}000y \leq 6{,}000{,}000.$

$3X + 5y \leq 60.$

$X \geq 0, \ y \geq 0.$

002

(b) $f(X, y) = 30000x + 4000y$ is the objective function.

$(X, Y) = (0, 18)$ and $(15, 0)$ its equation is:

$18x + 15y = 270.$

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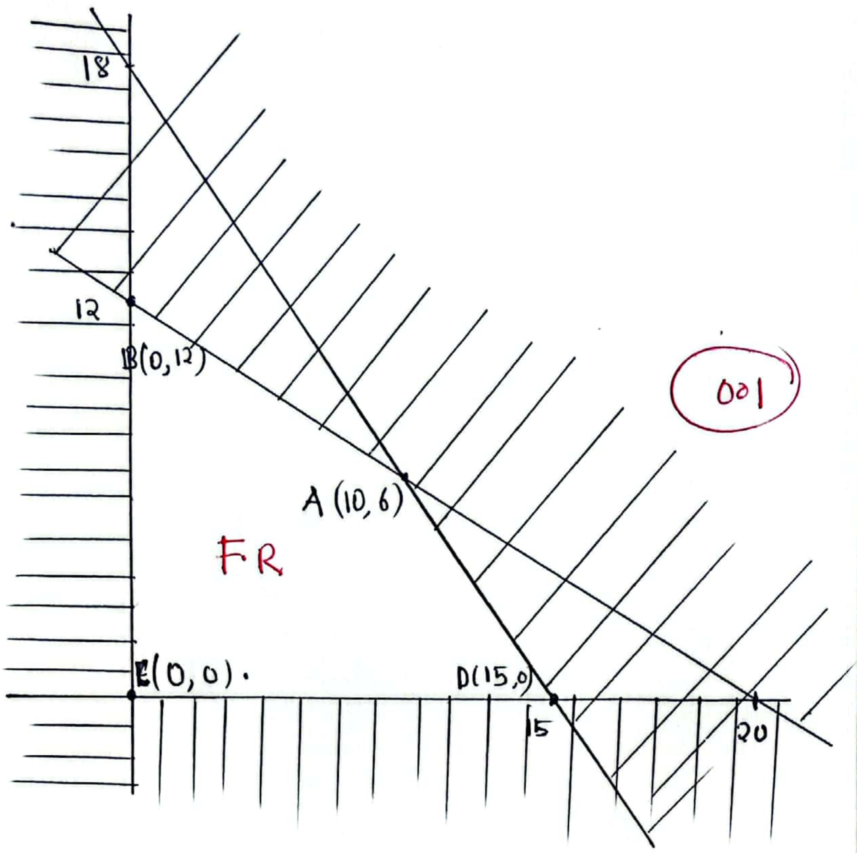
$(X, y) = (20, 0)$ and $(0, 12).$

Graph

14 b. A · graph.



A (10, 6), B(0,12), C = (0,0) and D (15,0) .

F(0,12) = 100,000 . 001

F (0,0) = 0. 001

F (15,0) = 450,000 /2 001

He should make 10 refrigerators and 6 Washing machines. 002