1. Find the **LCM** and **HCF** of 30 and 42.

2	30	42
3	15	21
5	5	7
7	1	7
	1	1

B_1 *For 30 simplified.*

B_1 *For 42 simplified.*

A_1 *C. a. o*

H.C.F $=2\times3$ $=6$

L.C.M $= 2\times3\times5\times7 = 210$

A_1 *C. a. o*

2. Find the equation of a line that cuts y-axis at 5 and parallel to line joining A(4,7) and B(10,15).

Point (0,5)

B_1

$$m_1 = \frac{15-7}{10-4}$$

M_1 *For Gradient.*

$$= {}^8/_6$$
$$= {}^4/_3$$

A_1 *C. a. o*

$$Y = \frac{4}{3} \times +5$$

B_1

3. Express $\sqrt{20} + \sqrt{125} - \sqrt{45}$ in form of $a\sqrt{b}$

$\sqrt{20} + \sqrt{125} - \sqrt{45}$

M_1

$\sqrt{4\times5} + \sqrt{25\times5} - \sqrt{9\times5}$

M_1

$2\sqrt{5} + 5\sqrt{5} - 3\sqrt{5}$

M_1

$(2\times5\text{-}3)\sqrt{5}$

A_1 *C. a. o*

$4\sqrt{5}$

4. Given that $f(x) = \frac{2x+a}{5-x}$ and that f(-1) = 2. Find the value of a.

$$f(X) = \frac{2x+a}{5-x}$$

M_1 *For substitution.*

$$f(-1) = \frac{-2+a}{5+1} = 2$$

A_1 *For equating for 2.*

$$\frac{-2+a}{6} = 2$$

B_1 *For simplification.*

-2 + a = 12

a = 14

A_1

5. Twenty men working 5 hours can offload a train in 3 days. Find how many men working 4 hours can offload the train in 5days.

$M \propto \dfrac{1}{hd}$ *M₁*

$20 = \dfrac{k}{5 \times 3}$ *A₁*

K= 300

$M = \dfrac{300}{hd}$ *M₁*

$M = \dfrac{300}{4 \times 5}$ *A₁*

M= 15men

6. Use prime factor method to find the square root of 3.24.

$3.24 = \dfrac{324}{100}$

2	324	2	100
2	162	2	50
3	81	5	25
3	27	5	5
3	9		1
3	3		
	1		

$\sqrt{\dfrac{324}{100}} = \sqrt{\dfrac{2X2X3X3X3X3}{2X2X5X5}}$ *B₁*   *Seen*

$= \dfrac{2X3X3}{2X5}$ *B₁*   *Seen*

$= \dfrac{9}{5}$ *M₁*

$= 1.8$ *A₁*   *C. a. o*

7. A train takes 15 minutes less for a journey of 156km if its speed is increased by 4kmh⁻¹ from its normal speed (V). find the normal speed V.

Normal speed

$T_1 = \dfrac{156}{V} \quad , \quad T_2 = \dfrac{156}{V+4}$

$\dfrac{156}{V} - \dfrac{156}{(V+4)} = \dfrac{15}{60}$ *M₁*

$\dfrac{156(v+4) - 156v}{v(v+4)} = \dfrac{1}{4}$

$\dfrac{624}{v^2 + 4v} = \dfrac{1}{4}$

$v^2 + 4v = 2496$

$v^2 + 4v - 2496 = 0$

$V = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ B_1

$V = \dfrac{-4 \pm \sqrt{4^2 - 4 \times 1 \times -2496}}{2 \times 1}$ M_1

$V = \dfrac{-4 \pm \sqrt{10,000}}{2}$

$V = \dfrac{-4 \pm 100}{2}$

Either $v = \dfrac{96}{2} = 48 \text{km} h^{-1}$ A_1

Or $V = \dfrac{-104}{2} = -5 \text{km} h^{-1}$

8. Given that P = 2a+b-3c and a $= \begin{pmatrix} 2 \\ 1 \end{pmatrix}$, $b = \begin{pmatrix} 4 \\ 5 \end{pmatrix}$, $c = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$. Find;

   (i) P   (ii) |**P**| to 3 significant figures.

   $P = 2\begin{pmatrix} 2 \\ 1 \end{pmatrix} + \begin{pmatrix} 4 \\ 5 \end{pmatrix} - 3\begin{pmatrix} 3 \\ 2 \end{pmatrix}$ M_1

   $= \begin{pmatrix} 4 \\ 2 \end{pmatrix} + \begin{pmatrix} 4-9 \\ 5-6 \end{pmatrix}$

   $P = \begin{pmatrix} -1 \\ 1 \end{pmatrix}$ A_1

   $|P| = \sqrt{(1-)+(1)^2}$ M_1

   $= \sqrt{2}$

   $= 1.41$ $(35.f)$ A_1

9. John bought a techno phone bought at shs 35,000, depreciating at a rate of 20% per annum. Musa bought it after $1\frac{1}{2}$ years from John at Shs 4000 less its value then. Find how much money Musa paid.

Value $= p(1 - {}^r/_{100})^n$

   $= 35000(1 - {}^{20}/_{100})^{1.5}$ M_1

   $= 35000(0.8)^{1.5}$

   $= 25,043.96$

   $\simeq . 25,044.$ A_1

   $= 25044 - 4000$ M_1

   $= 21044$

                                                        A_1

3

10.
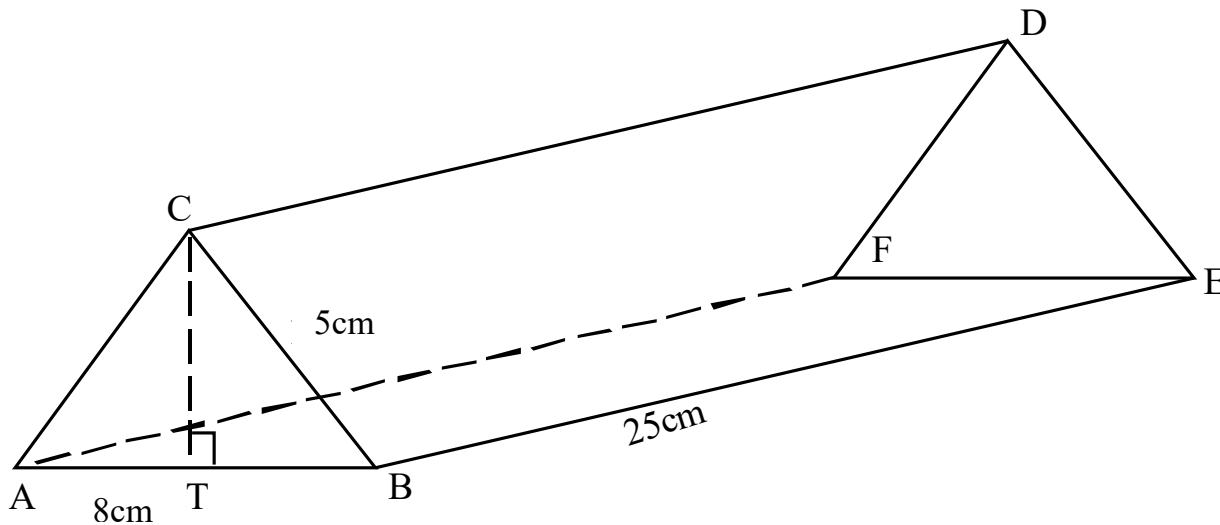
In the prism ABCDEF, AB=8cm, CB=5cm, BE=25cm and CT is the height of the cross-section figure ABC. Find the volume of the prism.

Area of cross section

$$=\frac{1}{2} \times 8 \times CT \qquad B_1$$

But $CT = \sqrt{5^2 - 4^2}$

$$= \sqrt{9}$$

$$= 3$$

$$= \frac{1}{2} \times 8 \times 3$$

$$= 12 cm^2 \qquad A_1$$

Volume=Area of cross section x

8cm $\qquad M_1$

$$= 12 \times 25 \qquad A_1$$

$$= 300 cm^3$$

SECTION B (60 marks)

Attempt not more than five questions from this section.

11.a) Given that $f(x) = nx^2 - 15$, $f(2) = 65$.

   i) Find the value of n

$$f(X) = nx^2 - 15 \qquad M_1$$

$$f(2) = 4n - 15 = 65$$

$$4n = 80 \qquad B_1$$

$$n = 20 \qquad A_1$$

4

ii) Find $f^{-1}(x)$ and $f^{-1}(85)$

$\therefore f(x)=20x^2-15$ M_1

Let $y=20x^2-15$

$\sqrt{\dfrac{y+15}{20}}=\sqrt{x^2}$ B_1

$X=\sqrt{\dfrac{y+15}{20}}$

$\therefore f^{-1}(x)=\sqrt{\dfrac{x+15}{20}}$ A_1

$f^{-1}(85)=\sqrt{\dfrac{85+15}{20}}$ M_1

$\quad=\sqrt{5}$ A_1

$\quad=\pm\,2.24$

b) If $g(x)=\dfrac{x-4}{x^2-25}$ find the value(s) of x for which;

i) $g(x)=0$ M_1

$\quad\dfrac{x-4}{x^2-25}=0$

$\quad X-4=0$

$\quad x=4$ A_1

ii) $g(x)$ is not defined.

$\quad\dfrac{x-4}{x^2-25}=\dfrac{1}{0}$

           M_1

$\quad x^2-25=0$

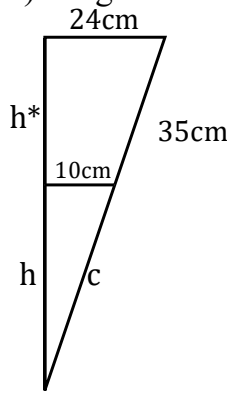$\quad\sqrt{x^2}=\sqrt{25}$

$\quad X=\pm5$ A_1

12. Below is a tin in form of a frustrum of radii 24cm and 10cm. it's slanting sides measure 35cm.

24cm

h*

35cm

10cm
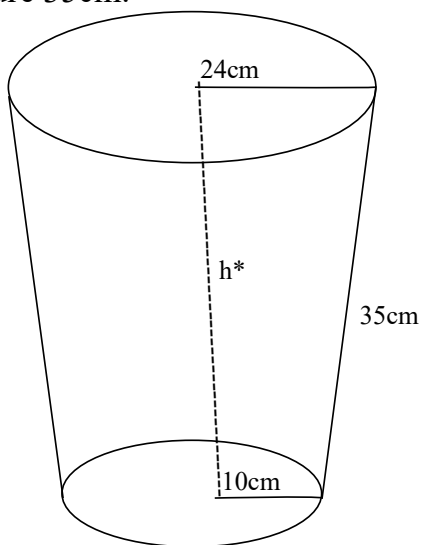
calculate the;
a) Height h* of a frustrum

Using similarity

$$\frac{R}{r} = \frac{L}{l}$$

$$\frac{24}{10} = \frac{35+l}{l} \qquad M_1$$

2.4l =35 $\qquad\qquad A_1$

l=25cm

Meaning L=35+25

          =60cm

Let H=h*+h

But H $= \sqrt{60^2 - 24^2}$

     =54.99cm $\qquad\qquad B_1$

And h $= \sqrt{25^2 - 10^2}$

   ∴h*=54.99-22.91 $\qquad M_1$

     =32.08cm $\qquad\qquad A_1$

Accept Alternates ,

b) Volume of the frustrum

Volume of frustum - volume of big cone - volume of small cone

$$Vb = \frac{1}{3} \times \frac{22}{7} \times 24^2 \times 54.99 \qquad M_1$$

$$= 33,182.54 cm^3 \qquad A_1$$

$$Vs. = \frac{1}{3} \times \frac{22}{7} \times 10^2 \times 22.91 \qquad M_1$$

$$= 2400.10 cm^3 \qquad A_1$$

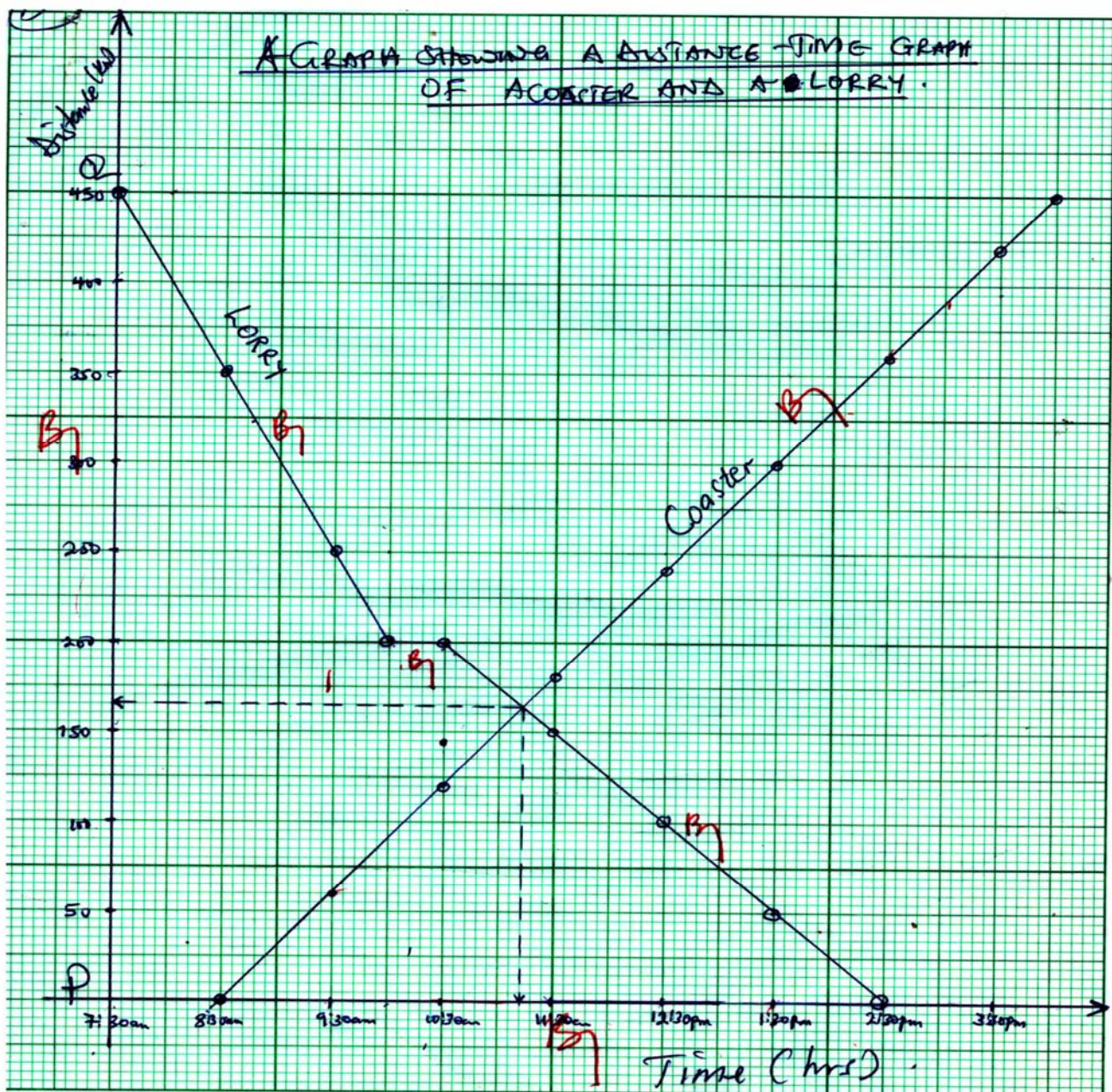Volume of frustum =33,183.54-2400.10 $\qquad M_1$

                =30782.44 cm^3 $\qquad A_1$

13. Towns P and Q are 450km apart. At 7:30am, a lorry starts from Q towards town P at an average speed of 100kmh^{-1} nonstop while a coaster starts from town P an hour after the lorry had gone moving at an average speed of 60kmh^{-1}. At 10:00am the lorry broke down for 30 minutes and then continued after at a reduced speed of 50kmh^{-1} until it reaches.
    a) Draw on the same axes, the distance time graph showing the journeys of the lory and the coaster.

A GRAPH SHOWING A DISTANCE-TIME GRAPH OF A COASTER AND A LORRY.

Distance (km)

Q
450
400
350
300
250
200
150
100
50
P

Lorry
Coaster

7:30am 8:30am 9:30am 10:30am 11:30am 12:30pm 1:30pm 2:30pm 3:30pm

Time (hrs)

b) State the time of arrival of the two vehicles at their destination.

Time of arrival
Lorry at 2:30pm
Coaster at 4:00pm

c) Determine when and what distance from town Q the vehicles met.

At distance of 175km $\pm$ 5 km from Q
Time is 11:12Am

d) Find the average speed of the lorry.

Average speed $= \dfrac{450}{7} = 64.29 km\ h^{-1}$

7

14a) Given that y varies jointly as x^2 and inversely as $\sqrt{z}$. When y=225, x=3 and z=16.

i) Write down an equation connecting y, x, and z.

$$Y \propto \frac{x^2}{\sqrt{z}}$$

$$y = \frac{K x^2}{\sqrt{z}}$$ M_1

$$225 = \frac{k(3)^2}{\sqrt{16}}$$

$$\frac{900}{9} = \frac{9K}{9}$$ A_1

$$K = 100$$

$$y = \frac{100x^2}{\sqrt{z}} \text{ is the equation}$$ B_1 *For equation stated*

ii) Find the possible values of x when y=80 and z=25.

$$8\emptyset = \frac{100\emptyset x^2}{\sqrt{25}}$$ M_1

$$40 = 10x^2$$

$$\sqrt{4} = \sqrt{x^2}$$ A_1

$$X = \pm 2$$

b) Nnalongo shared money to her children in the ratio 4:5:3 to Jovan, Jovia and Jonah. If Jovan got shs 320,000.

i)   How much did Nnalongo have?

Jovan: Jovia : Jonah

   4   : 5 : 3

Total ratio = 12 B_1

$^4/_{12}$ Of Total amount = 320,000

$^4/_{12}$ X m = 320,000 M_1

  M   = 960,000 A_1

ii)   How much more money did Jovia get than Jonah?

Jovia got $= ^5/_7 \times 960,000$ B_1

       = 400,000

Johanah got $= ^3/_{12} \times 960,000$ B_1
                                                     M_1
       = 240,000

Then 400,000-240,000

       = 160,000 A_1

15. In a given science-oriented school, it was found out that, of the 108 students in S.5. The number of students who offer none of Biology (B) Chemistry (C) and Physics (P) is equal to those offering all the three subjects.
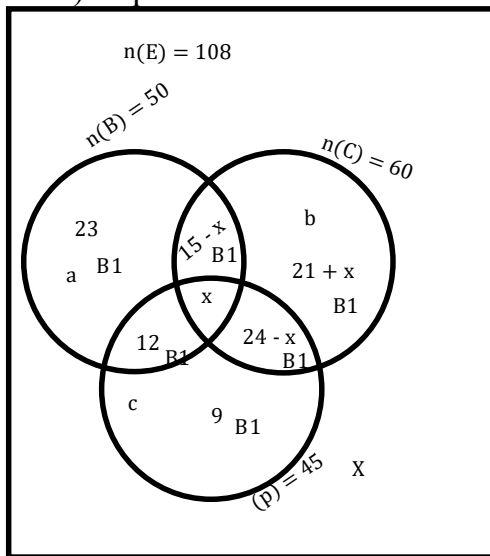Given that 50 offer Biology,
60 offer Chemistry and 45 offer physics,
12 students offer only Biology and physics,
15 students offer Biology and chemistry,

8

24 students offer Chemistry and Physics.
a) Represent the information in a venn diagram.

n(E) = 108

n(B) = 50

n(C) = 60

23
a B1

15 -x B1

b
21 + x
B1

x

12 B1

24 - x
B1

c

9 B1

(p) = 45 X

b) How many students offered Biology and physics.
   Bilogogy only
   a+12+x+15-x=50
                 a =23
   chemistry only
   b+15-x+x+24-x =60
         b+39-x =60
                 b =21+x
   physics only
   c+12+x+24-x=45
         c+36 =45
           c =9
   23+12+x+15-x+21+X+24-x M_1
         9+x =108
       104+x =108
           X=4 A_1
   biology and physics B_1
       12+4 =16
c) Find the number of students who offered PCB.
   PCB =4 B_1

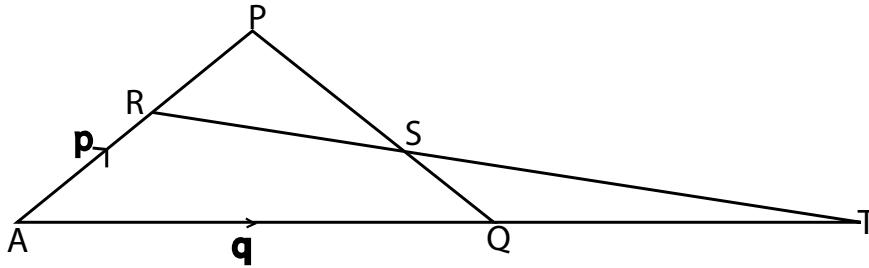d) What is the probability of picking students who offered at least two subjects.
   atleast two
   $= \frac{12+(15-4)+(24-4)+4}{108}$ M_1

   $= \frac{47}{108}$ A_1

16. In the figure below AP=**p**, AQ=**q**, 2AP=5AR and 4PQ=5PS. When RS and AQ are produced, they meet at T.

a) Express in terms of **p** and **q** the vectors.

i) AR

using 2Ap = 5AR

and Ap=P

$$\frac{2P}{5} = \frac{5}{5}AR$$

AR $= \frac{2}{5}\,P$

ii) AS

AS =AP+PS

= P+PS

But Ps=??

4PQ=5PS

$\frac{4}{5}$ PQ =PS

And PQ=-p+q

$\frac{4}{5}(-p + q)$=ps

∴AS $=\tilde{P}+\frac{4}{5}(-p + q)$

$=\frac{5\tilde{P}+4\tilde{P}+4q}{5}$

$=\frac{1}{5}$(P+4q)

iii) RS

RS = RP + PS

Since AR $= \frac{2}{5}\,\tilde{P}$ then RP $= \frac{3}{5}\,\tilde{P}$

$= \frac{3}{5}\,\tilde{P} + \frac{4}{5}$(-P + q)

$=\frac{3p-4p+4q}{5}$

$=\frac{1}{5}$(-P + 4q)

b) Given that AT=nAQ and RT=mRS, find the vectors of m and n.

AT $=$ nAQ

AT $=$ nq – eqn 1 B_1

RT $=$ MRS

RT $= \frac{M}{5}(4q - P)B_1$

But AT $=$ AR+RT

AT $= \frac{2}{5}$P $+= \frac{M}{5}$(4q-p)M

And

AT=nq

Nq$== \frac{2}{5}$n $+ = \frac{M}{5}$(4p-3)M

N$= \frac{4}{5}$m

5n=4m __eqn (ii)

0$= \frac{2}{5}$-$\frac{M}{5}$

M=2

n$== \frac{8}{5}$

17a). The price of Otim's car was increased by 10% to shs 8800,000.

 i) What was the original price.

$\frac{110}{100}$ $of\ price = 8,800,000$ $\qquad$ $M_1 A_1 M_1$

Original price $= 8,000,000$ $\qquad$ A_1

ii) If Opio bought this car at this increased price and sold it a year later at 20% discount .
 Express Opio's selling price as a percentage of original price.

opio,s sellingbprice

$\frac{100-20}{100} \times 8800000$ $\qquad$ M_1

$= \frac{80}{100} \times 8,800,000$ $\qquad$ $A_1\ M_1$

$= 7,040,000$ $\qquad$ A_1

$\frac{7,040,000}{8,000,000} \times 100\%$ $\qquad$ M_1

$=88\%$ $\qquad$ A_1

b) Mariam's taxable income is shs 750,00. She earns a tax-free allowance of shs 150,000 and
 pays a tax of shs 125,000. Calculate her net income.

Net income =Gross-income-income tax

$\qquad$ (750,000+150,000)-125,000 $\qquad$ M_1

$\qquad$ $= 775,000$ $\qquad$ A_1

END