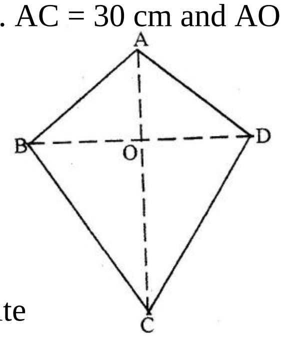
MATHEMATICS PAPER 121/1 K.C.S.E 2001
QUESTIONS
SECTION 1 (52 Marks)

Answer all the questions in this section

1. Find the reciprocal of 0.342. Hence evaluate:

$$\sqrt{\frac{0.0625}{0.342}}$$

2. The figure below represents a kite ABCD, AB = AD = 15 cm. The diagonals BD and AC intersect at O. AC = 30 cm and AO = 12 cm.

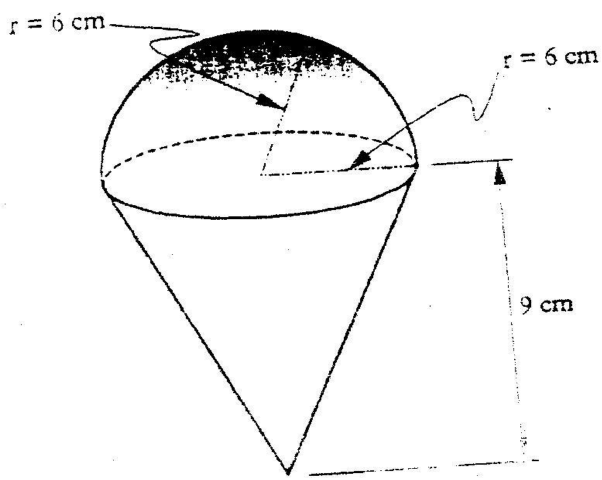


Find the area of the kite

3. Use logarithms to evaluate

$$(3.256 \times 0.0536)^{1/3}$$

4. The diagram below represents a solid made up of a hemisphere mounted on a cone. The radius of the hemisphere are each 6 cm and the height of the cone is 9 cm.



5. A line L_1 passes though point (1,2) and has a gradient of 5. Another line L_2, is perpendicular to L_1 and meets it at a point where x = 4. Find the equation for L_2 in the form of y = mx + c

6. Simplify the expression $\dfrac{3x^2 - 4xy - y^2}{9x^2 - y^2}$

7. The length of a room is 4 metres longer its width. Find the length of the room if its area is $32cm^2$

8. Use a ruler and compasses in this question. Draw a parallegram ABCD in which AB = 8 cm, BC = 6 cm and BAD = 75^0. By construction, determine the perpendicular distance between AB and CD.

9. A poultry farmer vaccinated 540 of his 720 chickens against a disease. Two months later, 5% of the vaccinated and 80% of the unvaccinated chicken, contracted the disease. Calculate the probability that a chicken chosen random contacted the disease.

10. Make x the subject of the formula

$$S = w\sqrt{a^2 - x^2}$$

11. A particle is projected from the origin. Its speed was recorded as shown in the table below

Time (sec)	0	5	10	15	20	25	39	35
Speed (m/s)	0	2.1	5.3	5.1	6.8	6.7	4.7	2.6

Use the trazezoidal rule to estimate the distance covered by the particle within the 35 seconds

12. Given that $\sin(x + 30)^0 = \cos 2x^0$ for 0^0, $0^0 \le x \le 90^0$ find the value of x. Hence find the value of $\cos^2 3x^0$.

13. Given that $P = \begin{pmatrix} 2 & 3 \\ 1 & 2 \end{pmatrix}$ and $Q = \begin{pmatrix} 2 & -3 \\ 1 & 2 \end{pmatrix}$,, find the matrix product PQ

Hence, solve simultaneous equations below:
$2x - 3y = 5$
$-x + 2y = -3$

14. The interior angles of the hexagon are $2x^0$, $\frac{1}{2}x^0 + 40^0$, 110^0, 130^0 and 160^0. Find the value of the smallest angle

15. A town N is 340 km due west of town G and town K is due west of town N. A helicopter Zebra left G for K at 9.00 am. Another helicopter Bufalo left N for K at 11.00 am. Helicopter Buffalo traveled at an average speed of 20 km/ h faster than Zebra. If both helicopters reached K at 12.30 pm find the sped of helicopter Buffalo.

16. The position vectors for points P and Q are 4 I + 3 j + 6 j + 6 k respectively. Express vector PQ in terms of unit vectors I, j and k. Hence find the length of PQ, leaving your answer in simplified form.

SECTION II (48 Marks)
Answer any six questions in this section

17. The table shows income tax rates

Monthly taxable pay	Rate of tax Kshs in 1 K£
1 – 435	2
436 – 870	3
871-1305	4
1306 – 1740	5
Excess Over 1740	6

A company employee earn a monthly basic salary of Kshs 30,000 and is also given taxable allowances amounting to Kshs 10, 480.

(a) Calculate the total income tax

(b) The employee is entitled to a personal tax relief of Kshs 800 per month. Determine the net tax.

(c) If the employee received a 50% increase in his total income, calculate the corresponding percentage increase on the income tax.

18. The coordinates of the vertices of rectangle PQRS are P (1,1), Q (6,1), R (6,4) and S(1,4)

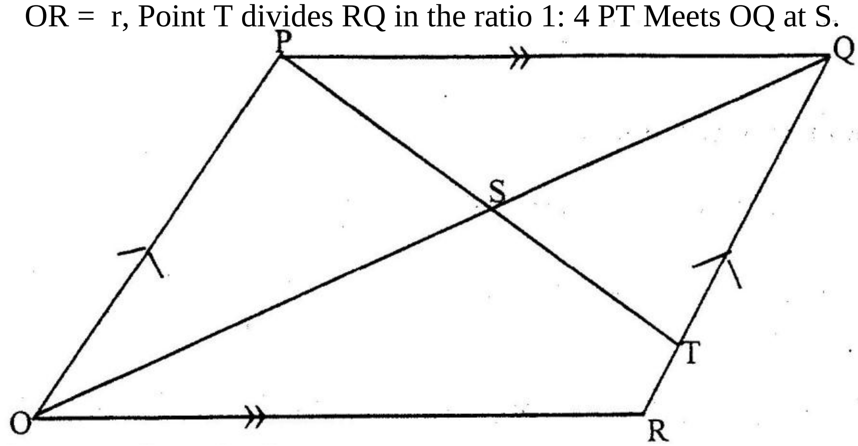
(a) (i) Find the coordinates of its image P"Q"R"S" of P'Q'R'S under the transformation given by the matrix $\begin{pmatrix} 1 & -2 \\ 0 & 1 \end{pmatrix}$

(ii) Draw the object and its image on the grade provide

(iii) On the same grid draw the image. P" Q"R" S" of P' Q' R' S' under the transformation given by $\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$

(b) Find a single matrix which will map P" Q" R" S" onto P'R'S'Q'

19. The figure below shows a parallelogram OPQR with O as the origin, OP = p and OR = r, Point T divides RQ in the ratio 1: 4 PT Meets OQ at S.



(a) Express in terms of p and r the vectors

(i) OQ

(ii) OT

(b) Vector OS can be expressed in tow ways: mOQ or OT + n TP, Where m and n are constants express OS in terms of

(i) m, n and r

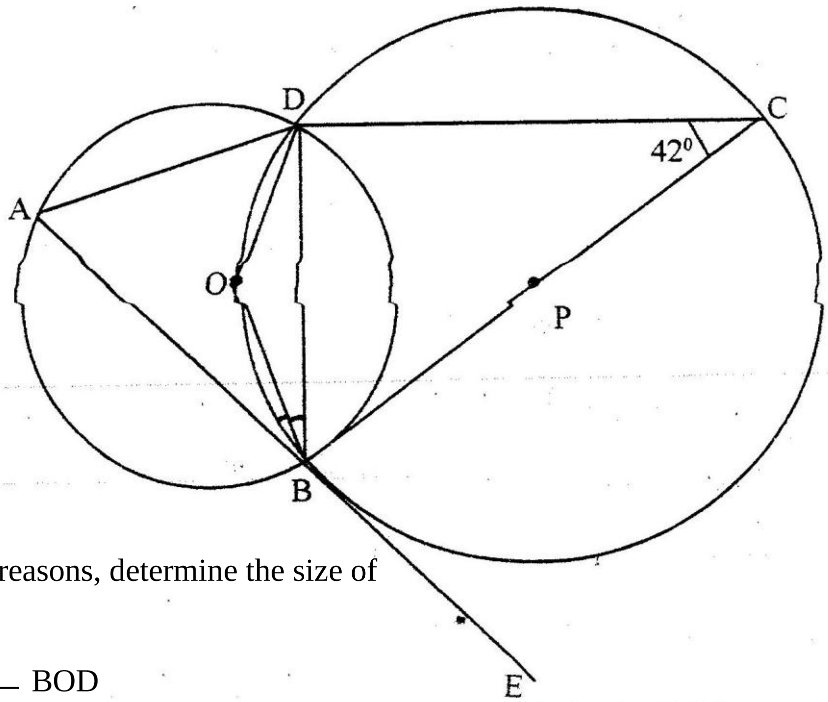
(ii) n, s and r

Hence find the:

(iii) Value on m

(iv) Ratio OS: SQ

20. In the figure below, points O and P are centers of intersecting circles ABD and BCD respectively. Line ABE is a tangent to circle BCD at B. Angle BCD = 42^0



(a) Stating reasons, determine the size of

(i) $\angle$GBD

(ii) Reflex $\angle$ BOD

(b) Show that Δ ABD is isosceles

21. (a) The gradient function of a curve is given by $\frac{dy}{dx} = 2x^2 - 5$

Find the equation of the curve, given that y = 3, when x = 2

(b) The velocity, vm/s of a moving particle after seconds is given: $v = 2t^3 + t^2 - 1$. Find the distance covered by the particle in the interval $1 \leq t \leq 3$

22. (a) Complete the following table for the equation $y = x^3 + 2x^3$

x	-3	-2.5	-2	-1.5	-1	-0.5	0	1	1.5
x^3	-27		-8	-3.375	-1	0.125	0	0.125	3.375
$2x^2$	18		8	4.5	2	0.5	0	0.5	4.5
y	-9		0	1.125	1	0.375	0	0.625	7.875

(b) On the grid provided draw the graph $y = x^3 + 2x^2$ for $-3 \leq x \leq 1.5$
Take the scale: 2cm for 1 unit on the X- axis and 1 cm for 1 unit on y – axis

(c) By drawing a suitable line on the same grid, Estimate the roots of the equation:
$X^3 + 2x^2 - x - 2 = 0$

23. The probability of three darts players Akinyi, Kamau, and Juma hitting the bulls eye are 0.2, 0.3 and 1.5 respectively.

(a) Draw a probability tree diagram to show the possible outcomes

(b) Find the probability that:
(i) All hit the bulls eye
(ii) Only one of them hit the bulls eye
(iii) at most one missed the bull's eye

24. A plane flying at 200 knots left an airport A (30^0S, 31^0E) and flew due North to an airport B (30^0 N, 31^0E)
(a) Calculate the distance covered by the plane, in nautical miles
(b) After a 15 minutes stop over at B, the plane flew west to an airport C (30^0N, 13^0E) at the same speed.
Calculate the total time to complete the journey from airport C, though airport B.

MATHEMATICS PAPER 121/2 K.C.S.E 2001
QUESTIONS

SECTION 1 (52 MARKS

Answer all the questions in this section.

1. Evaluate $^1/_3$ of $(2^3/_4 - 5^1/_2) \times 3\ ^6/_7 \div\ ^9/_4$

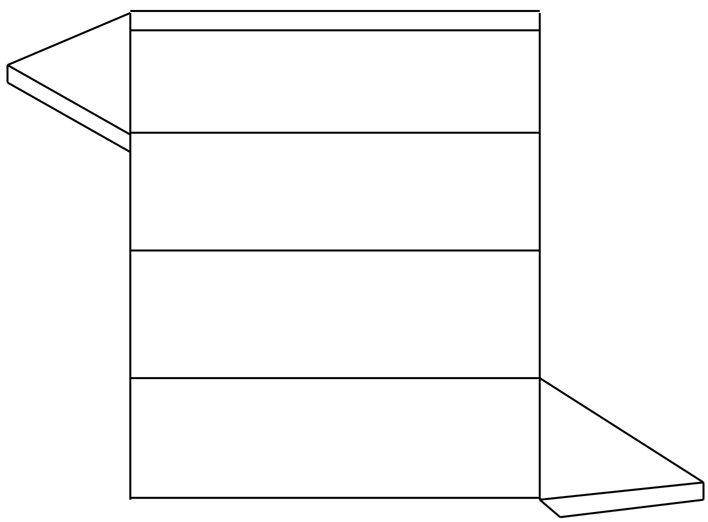
2. Solve for x in the equation $32^{(x-3)} \div 8^{(x-4)} = 64/\div 2^x$

3. Three people Odawa,Mliwa and Amina contributed money to purchase a flour mill.Odawa contributed of the total amount,Mliwa contributed of the remaining amount and Amina contributed the rest of the money. The difference in contribution between Mliwa and Amina was shs.40,000.

   Calculate the price of the flour mill.

4. Two valuables A and B are such that A varies partly as the square of B. Given that A 30,when B =9, and A= 16 when 4=14, Find A and B = 36.

5. The figure below shows a anet of a prism whose cross – section is an equilateral triangle.



   a) Sketch the prism
   b) State the number of planes of symmetry of the prism.

6. A telephone bill includes Ksh.4,320 for local calls,Ksh.3,260 for trunk calls and a rental charge of Kshs.2,080.A value added tax (V.A.T.) is then charge at 15%.

7. A translation maps a point P (3,2) onto P’ (95,5)
   a) Determine the translation vector.

8. Solve the equation log (x+24) – 2log3 =log (9-2x)

9. The table below shows the number of bags of sugar sold per week and their moving averages.

No. of bag as per week	340	330	x	342	350	345
Moving averages		331	332	Y	346	

a) State the order of moving average

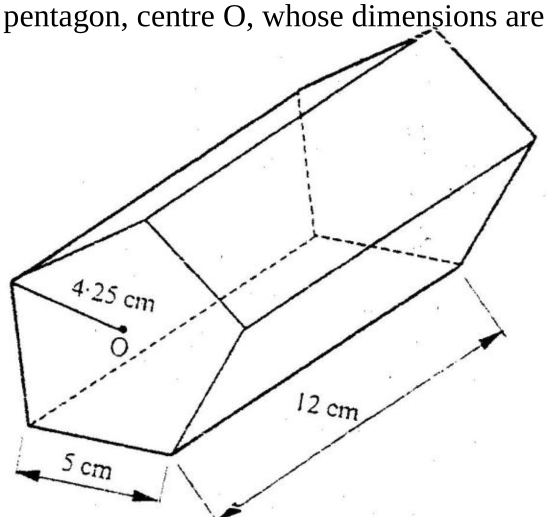
b) Find the value of and y

10. Expand $(2 + x)^5$ in ascending powers of x up to the term in x3
Hence, approximate the value of $(2.03)^5$ to 4s.f.

11. A curve is given by the equation: $u = 5x^3 - 7x^2 + 3x + 2$

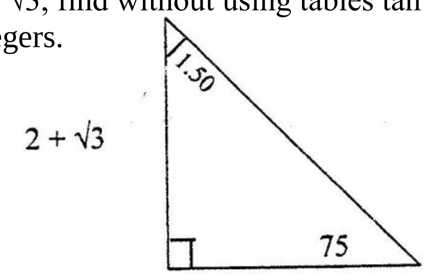
a) Gradient of the curve at x = 1

12. The figure represents a pentagon prism of length 12cm. The cross – section is a regular pentagon, centre O, whose dimensions are shown.

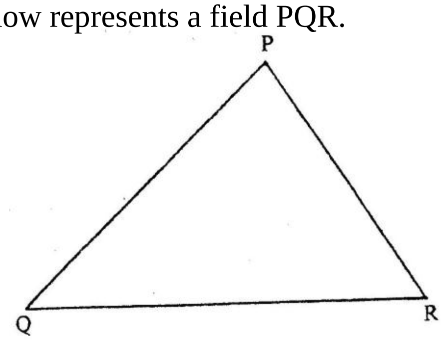


Find the total surface area of the prism.

13. Given that tan 75o = 2 + √3, find without using tables tan 150 in the form p+q√m, where p,q and m are integers.



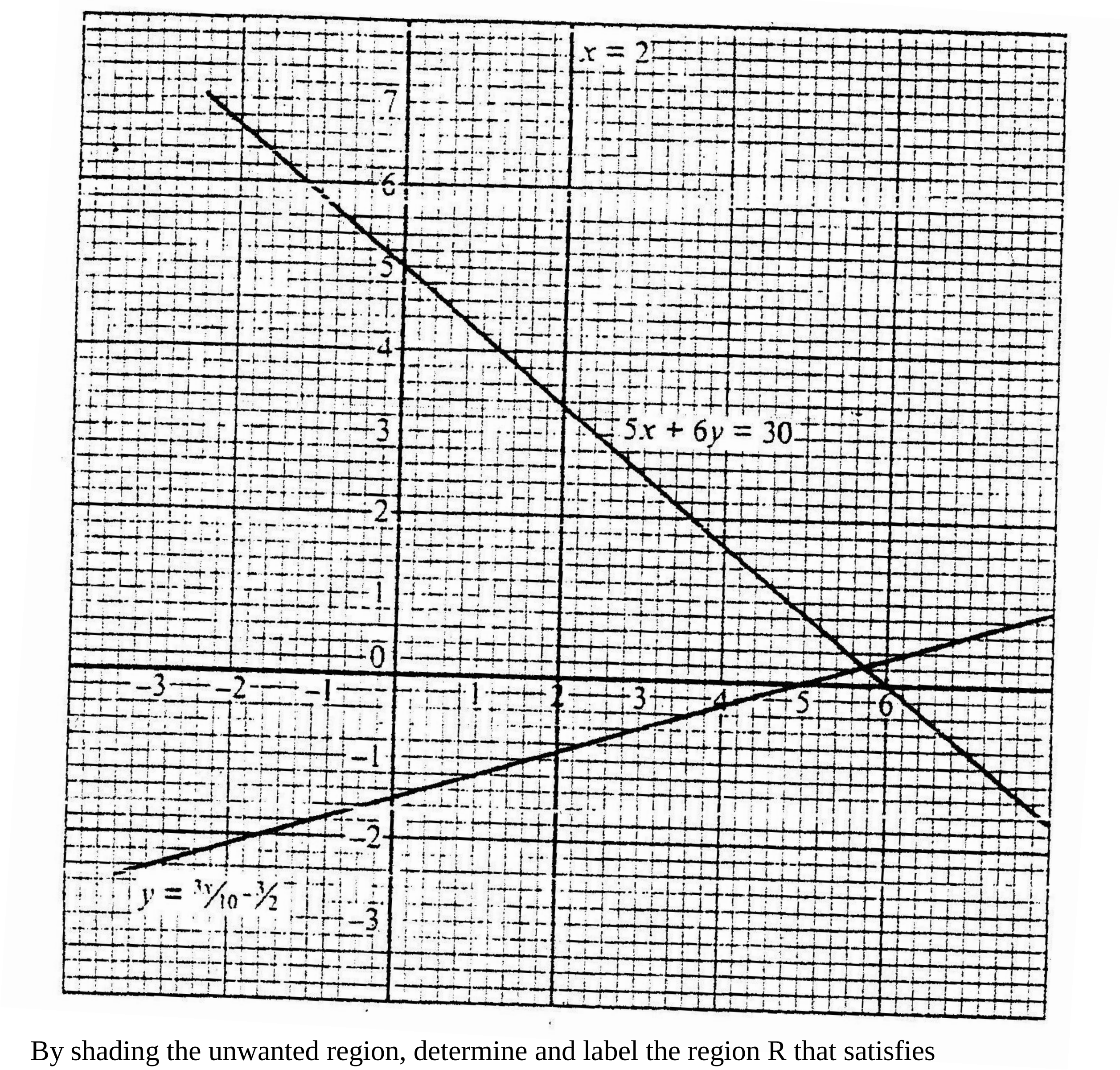
14. The diagram below represents a field PQR.



a) Draw the locus of points equidistant from sides PQ and PR.
b) Draw the locus of points equidistant from points P and R.
c) a coin is lost within a region which is nearest to point P than to R and closer to side Pr than to side P,q, shade the region where the coin can be located.

15. Solve the equation $4 \sin^2 \Theta + 4 \cos \Theta = 5$
For $0^o \leq \Theta \geq 360^o$ give the answer in degrees

16. The diagram below shows the graph of:
$Y \geq {}^3/_{10x} - {}^3/_2$, $5x + 6y = 30$ and $x = 2$



By shading the unwanted region, determine and label the region R that satisfies the three inequalities.

$Y \geq {}^3/_{10}x - {}^3/_2$, $+ 6y \geq 30$ and $x \geq 2$

SECTION II (48 Marks)

Answer any six questions in this section.

17. A helicopter is stationed at an airport H on a bearing 060^{o} and 800km from another airport P.A third airport is J is on bearing of 140^{0} and 1,200km from H.

a) Determine:

i) Value of P

ii) The bearing of P from J

18. The marks obtained by 10 pupils in an English test were 15,14,13,12,P,16,11,13,12 and 17.The sum of the squares of the marks, ∑x21,794

a) Calculate the:

i) Value of P

ii) Standard deviation.

b) If each mark is increased by 3, write down the:

i) New mean

ii) New standard deviation

19. The nth term of a sequence is given by 2n+3

a) Write the first four items of the sequence.

b) Find S50, the sum of the first terms of the sequence.

c) Show that the sum of the first terms of the sequence is given by.

$$Sn = n^{2} +4n$$

Hence or otherwise find the first largest integral value of n such that.

$$Sn < 725$$

20. a) Distance from A and B

b) bearing B from A

21. a) Complete the table given below in the blank spaces.

X	0o	15^{0}	30^{0}	45^{0}	60^{0}	75^{0}	90^{0}	105^{0}	120^{0}	135^{0}	150^{0}	165^{0}	180^{0}
3 cos 2x	3	2.598	1.5	0	1.5	--3	-2.598	-1.5	0	2.598	3		
2 sin (2x +30o)	1		2	2-732	1	0		-1	-1.732	-2	-2.732	-2	1

b) On the grid provided draw, on the same axis, the graph of y = 3cos 2x and y = $\sin(2x +30^{0})$ for $0^{o} \leq x \geq 180^{0.}$ Take the scale: 1cm for 150 on the axis and 2cm for 1 unit on the y-axis.

c) Use your graph to estimate the range of value of x for which $3 \cos 2x \leq 2\sin (2x+30^{o})$.

Give your answer to the nearest degree.

22. The displacement x metres a particle after seconds given by.

$X = t3-2t2 +6t>0.$

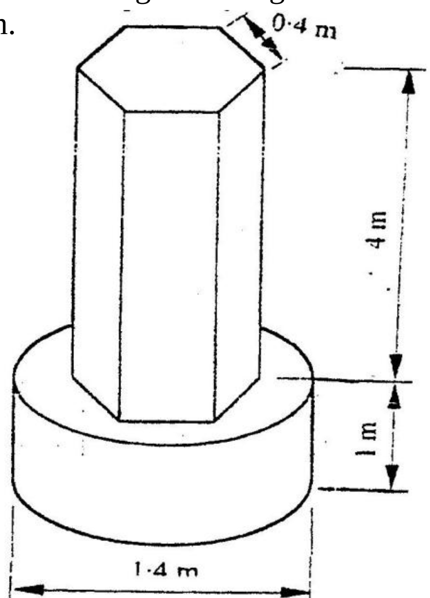
a) Calculate the velocity of the particle in m/s when t = 2 seconds.\

b) When the velocity of the particle is zero, calculate its:-

i) Displacement

ii) Acceleration.

23. The diagram below represents a pillar made of cylindrical and regular hexagonal parts. The diameter and height of the cylindrical part are 1.4m and 1m respectively. The side of the regular hexagonal face is o.4m and height of hexagonal part is 4m.



a) Calculate the volume of the :

i) Cylindrical part

ii) Hexagonal part

b) An identical pillar is to be built but with a hollow centre cross – section area of0.25m2. The density of the material to be used to make the pillar is 2.4g/cm3.Calculate the mass of the new pillar.

24. Bot juice Company has two types of machines, A and B, for juice production. Type A machine can produce 800 litres per day while type B Machine produces1,600 litres per day.
Type A machine needs 4 operators and type B machine needs 7 operators.

At least 8,000litres must be produced daily and the total number of Operators should not exceed 41. There should be 2 more machines of each type.

Let x be the number of machines of type A and Y the number of machines for type B,

a) Form all inequalities in x and y to represent the above information.

b) On the grid provided below, draw the inequalities to shade the unwanted regions.