01. (a) Mass of the cake before it was baked

$= \frac{100\%}{85\%} \times 2.1kg$

= 2.47kg

(b) (i) $\theta = \frac{2\pi}{6}$

$= \frac{\pi}{3}$ **rad**

(ii) volume of each piece of cake $= \frac{\pi(12)^5\ (5)}{6}$

$= 120\pi$ cm^3

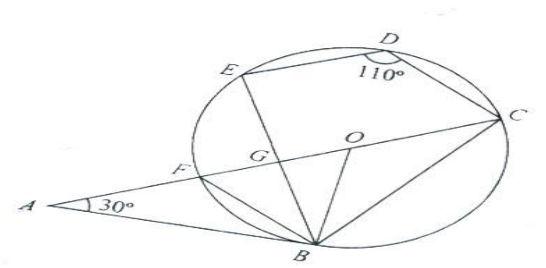
(iii) Total surface area of each piece of cake

$= [\frac{1}{2}(12)^2 \left(\frac{\pi}{3}\right) \times 2] + [(12)(5) \times 2] + [(12)\ \frac{\pi}{3} \times 5]$

$= 48\pi + 120 + 20\pi$

$= (68\pi + 120)$ cm^2

02.



(a) (i) $\angle ABO = 90^0$

$\angle AOB = 180^0 - 90^0 - 30^0$

$= 60^0$

(b) (ii) $\angle EBC = 180^0 - 110^0$

$= 70^0$

OB =OC(radii of a circle)

$\angle OBC = \frac{60^0}{2} = 30^0$

$\angle EBO = 70^0 - 30^0$

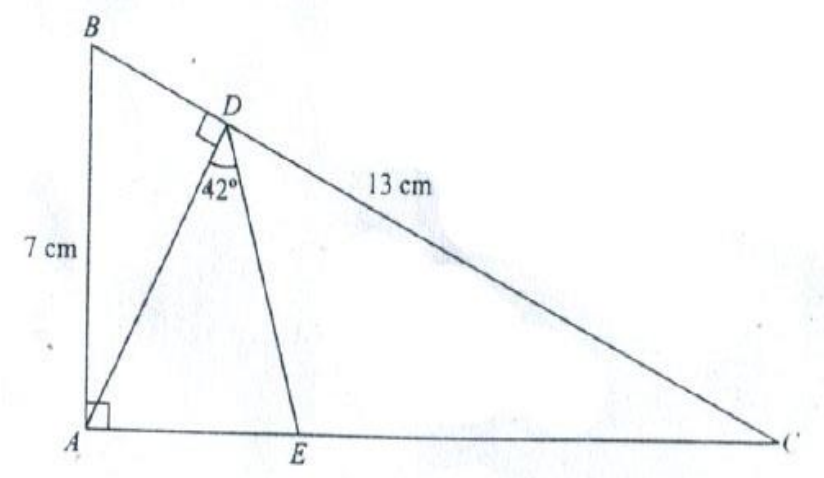
$= 40^0$

$\angle FBC = 90^0$

$\angle FCB = \angle OBC = 30^0$

Since $\angle FBC = \angle OBA$ and $\angle FCB = \angle OAB$, triangle ABO similar to triangle CBF

03.



(a By Pythagoras` Theorem,

AC = $\sqrt{13^2 - 7^2}$

= $\sqrt{120}$

= 11.0cm

(b) Using the area of triangle ABC,

$\frac{1}{2} \times AD \times 13 = \frac{1}{2} \times 7 \times \sqrt{120}$

$AD = \frac{7 \times \sqrt{120}}{13}$

= 5.90cm

(c) cos $\angle DAC = \frac{AD}{AC}$

$\angle DAC =$ cos $^{-1}$ $\left(\frac{7 \times \sqrt{120}}{13\sqrt{120}}\right)$

= cos $^{-1}$ $\frac{7}{13}$

= 57.4^0

(d) By sine rule,

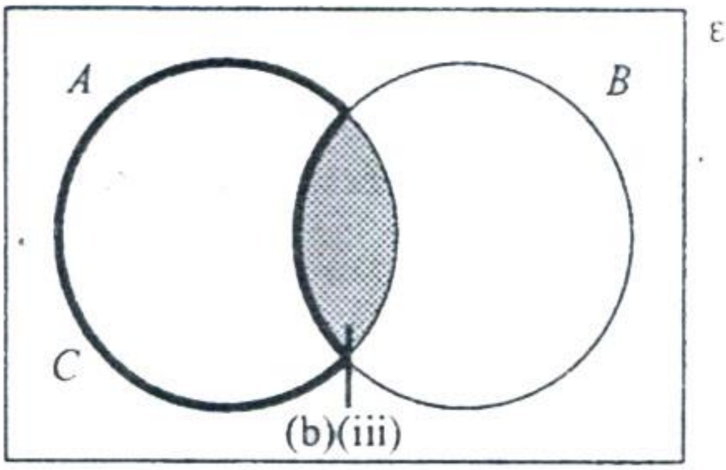
$$\frac{AE}{\sin\angle ADE} = \frac{AD}{\sin\angle AED}$$

$$\frac{AE}{\sin 42^0} = \frac{7 \times \sqrt{120}}{13\sin(180^0 - 42^0 - cos^{-1} - \frac{7}{13}}$$

$$\text{AE} = \sin 42^0 \times \frac{7 \times \sqrt{120}}{13\sin(180^0 - 42^0 - cos^{-1}\frac{7}{13}}$$

AE = 4.00cm

04. (a)



(b) (i) The elements of set A ∩ B are all positive integers less than 50 that are multiples of 15

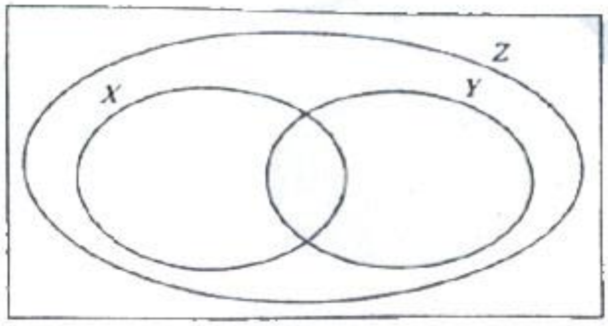
$A \cap B = \{15, 30, 45\}$

$n(A \cap B) = 3$

(ii) C could represent the set of all positive integers less than 50 and are multiples of 3 excluding numbers 15,30 and 45.

C ={ 3,6,9,12,18,21,24,27,33,36,39,42,48}

(c)



05. (a) $OA = \begin{pmatrix} a \\ 2 \end{pmatrix}$, $OB = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$ and $OC = \begin{pmatrix} -2 \\ -3 \end{pmatrix}$

(i) $\frac{1}{4}BC + OB$

$= \frac{1}{4}(OC - OB) + OB$

$= \frac{1}{4}OC - \frac{1}{4}OB + OB$

$= \frac{1}{4}OC + \frac{3}{4}OB$

$= \frac{1}{4}\begin{pmatrix} -2 \\ -3 \end{pmatrix} + \frac{3}{4}\begin{pmatrix} 2 \\ 4 \end{pmatrix}$

$= \begin{pmatrix} 1 \\ \frac{9}{4} \end{pmatrix}$

(ii) OA = $\sqrt{5a}$

$\begin{pmatrix} a \\ 2 \end{pmatrix} = \sqrt{5a}$

$\sqrt{a^2} + 4 = \sqrt{5a}$

$a^2 + 4 = 5a$

$a^2 - 5a + 4 = 0$

$(a-1)(a-4) = 0$

$a = 1 \; or \; a = 4$

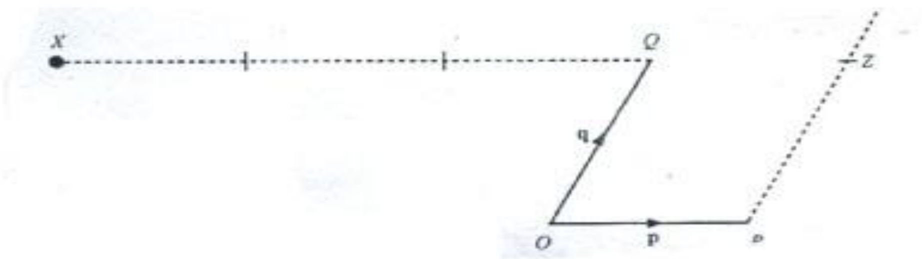
$a = 1$

(b) (i) OX = **q** – 3**p**

(ii) OY = **p** + $\frac{3}{2}$**q**

(iii) OZ = **p** =**q**

(c) Figure OQZO is a parallelogram.



06. (a) Metered distance

= 16.4 -1

= 15.4Km

= $\frac{10km}{380m} \times \$0.20 + \frac{5.4km}{300m} \times \$\ 0.15$

= $\frac{10000m}{380m} \times \$\ 0.20 + \frac{5400m}{300m} \times \$\ 0.15$

= $ 7.96

Peak period premium

= $\frac{35}{100} \times \$\ 7.96$

=$0.35 \times \$0.76$

= $ 2.79

Waiting time fee

= $\frac{10min}{45s} \times \$0.20$

= $\frac{10 \times 60s}{45s} \times \$0.20$

$\approx \$2.667$

Taxi fare for whole jouney = Flag down + metered fare + booking fee + Waiting time fee + Peak period premium

= $\$2.80 + \$7.96 + \$\ 3.20$ +$ $2.667 + \$2.79$

=$19.417

=$19.40

(b) (i) Hire purchase price

= $\left(\frac{15}{100} \times \$2799\right) + (12 \times \$250)$

= $\$419.85 + \$\ 3000$

= $3419.85

(ii) Simple interest = $\frac{\left(\frac{85}{100} \times \$2799\right) \times R \times 1}{100}$

= $\$23.7915R$

Monthly instalment = $\frac{\left(\frac{85}{100} \times \$2799\right) + \$23.7915R}{12}$

$\$250 = \left(\frac{85}{100} \times \$2799\right) + \$23.7915R$

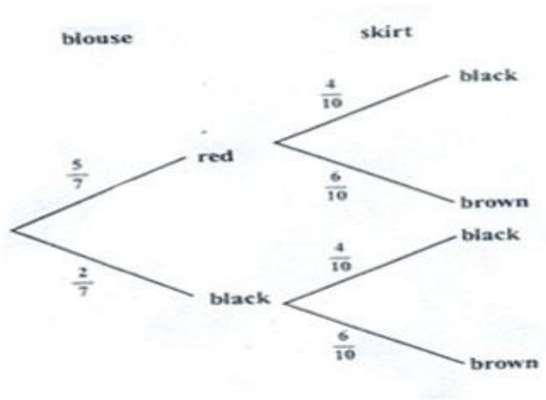
$\$3000 = \$2379.15 + \$23.7915R$

$\$23.7915R = \$620.85$

$R = 26.1$

Therefore, percentage interest = 26.1%

07. (a)



(b) P(same colour)

= P (black blouse and black skirt)

$= \frac{2}{7} \times \frac{4}{10}$

$= \frac{4}{35}$

(c) P(different colour)

= 1 –P (same colour)

$= 1 - \frac{4}{35}$

$= \frac{31}{35}$

(d) P(red blouse and brown skirt)

$= \frac{5}{7} \times \frac{6}{10}$

$= \frac{3}{7}$

(e) Let the number of red blouses that sally needs to buy be X

$\frac{2}{7+x} \times \frac{6}{10} \times \frac{8}{100}$

$\frac{12}{7+x} = \frac{4}{5}$

60 = 28 +4x

4x =32

x = 8

Therefore sally needs to buy 8 more red blouses.

08. (a) Interior angle

$$= \frac{(6-2) \times 180^0}{6}$$

$= \frac{720^0}{6}$

$=120^0$

(b) (i) Volume of the pyramid

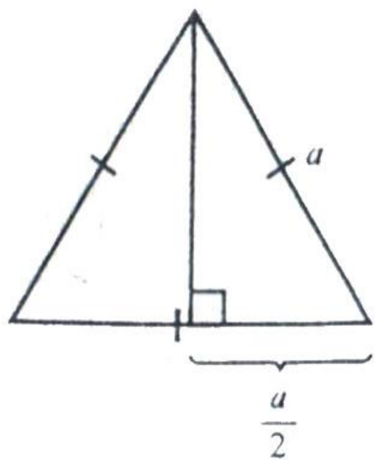
$= \frac{1}{3} \times base\ area\ \times height$

$$45\sqrt{3} = \frac{1}{3} \times 54\sqrt{3} \times height$$

$$height = \frac{45\sqrt{3}}{54\sqrt{3}} \times 3$$

Height of pyramid = 2.5cm

(ii) Divide the hexagonal base into six equal triangles. Each triangle is an equilateral triangle.



Let each side of the triangle be a cm.By Pythagoras's theorem,

Height of triangle = $\sqrt{a^2 - \frac{a^2}{4}}$

$= \sqrt{\frac{3a^2}{4}}$

$= \frac{a}{2}\sqrt{3}$

Area of each triangle $= \frac{54\sqrt{3}}{6}$

$$\frac{1}{2} \times \frac{a}{2}\sqrt{3} \times a = 9\sqrt{3}$$

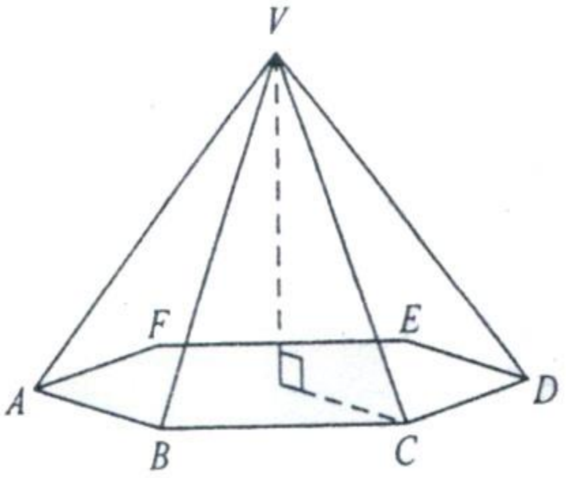
$$\frac{a^2}{4} = 9$$

$$a^2 = 36$$

$$a = 6\ or\ a = -6$$

Therefore the length of each side of the hexagonal base is 6cm.

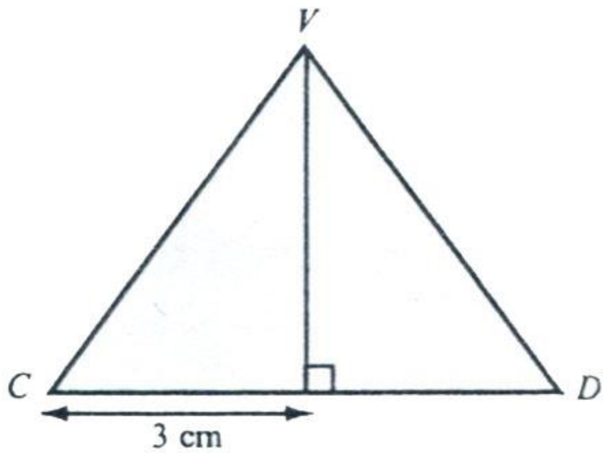
(iii)



All the 6 triangle faces are equal in area. So we only need to consider one triangular face, say triangle VCD,

By Pythagoras Theorem,

VC = $\sqrt{2.5^2 + 6^2}$



By Pythagoras Theorem,

Height of triangle VCD = $\sqrt{42.25 - 9}$

=$\sqrt{33.25}$cm^2

Total surface area of pyramid

= $54\sqrt{3} + (6 \times 3\sqrt{33.25})$

=197.324cm^2

09.

(b) Median $=Q_2 \approx 39.5$

Interquartile range $= Q_3 - Q_1 \approx 46.2 - 32 = 14.5$

(c) Fraction of the total number of people spending 44 hours or more

$\approx \frac{51-34}{51}$

$= \frac{17}{51}$

$= \frac{1}{3}$

10. (i) Minimum point is (0.7, - 2.2)

(ii) Gradient of the cure at x =2

$= \frac{3-(-2.2)}{4-1}$

= 1.73

(iii) $x < 0.1 \; or \; x > 3.4$

(iv) $2x + \frac{1}{x} = 5$

$2x + \frac{1}{x} - 5 = 0$

The solutions of $2x + \frac{1}{x} = 5$ are given by the x – intercepts of the graph , that is x = 0.20 and x = 2.30.

(v) $3x + \frac{1}{x} - 6 = 0$

$2x + \frac{1}{x} - 5 = -x + 1$

Hence draw the graph of y = -x +1 on the same graph.

Form the graph, x = 0.15 and x =1.80