

## CSS 2023

Q6(a) A telephone company charges initially Rs 0.50 and then Rs 0.11 for every minute. Write an expression that gives the cost of a call that last  $N$  minutes.

Sol:-

A telephone company charges initially = Rs 0.50

Then charges for every minute = Rs 0.11

Cost of call for one minute

$$0.5 + 0.11 \times 1$$

Cost of call for two minutes

$$0.5 + 0.11 \times 2 \quad (\text{or } 0.5 + 0.11 + 0.11)$$

Cost of call for three minutes

$$0.5 + 0.11 \times 3$$

Cost of call for  $N$  minute

$$0.5 + 0.11N$$

(B) Series

(i) 1, 8, 4, 27, 9 ?

$$1^2, 2^3, 2^2, 3^3, 3^2, 4^3$$

64

(ii) 3, 6, 8, 16, 18, ?, 36

$\times 2$

$\times 2$

$\times 2$



$$i) 2, 8, 512, ?$$

$\begin{array}{ccc} \curvearrowright & \curvearrowright & \curvearrowright \\ 2^3 & 8^3 & 512^3 \end{array}$

$$2, 8, 512, 134, 217, 728$$

$$ii) 81, 9, 64, 8, ?, 12$$

$\begin{array}{ccc} \curvearrowright & \curvearrowright & \curvearrowright \\ 9^2 & 8^2 & 12^2 \end{array}$

$$81, 9, 64, 8, 144, 12$$

$$iii) 6, 11, 21, 36, 56, ?$$

$\begin{array}{ccccc} \curvearrowright & \curvearrowright & \curvearrowright & \curvearrowright & \curvearrowright \\ +5 & +10 & +15 & +20 & +25 \end{array}$

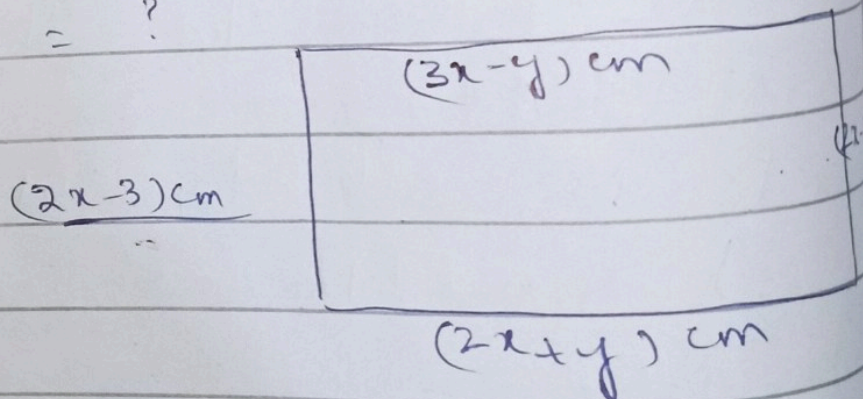
$$6, 11, 21, 36, 56 \rightarrow 81$$

(c) The Perimeter of the rectangle given below is 114 cm. Find area of rectangle.

Sol: -

$$\text{Perimeter} = 114 \text{ cm}$$

$$\text{Area} = ?$$



Opposite sides of rectangle are equal

$$\text{Perimeter} = \text{Sum of all sides}$$

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

$$114$$

$$= 9x - 6$$



$$9x = 114 + 6$$

$$9x = 120$$

$$\boxed{x = \frac{120}{9}} \Rightarrow x = 13.3 \text{ cm}$$

$y = ?$  opposites sides of Rect

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

$$3x = 2x + y + y$$

$$3x - 2x = 2y$$

$$x = 2y$$

$$\frac{x}{2} = y$$

By Putting value of  $x$

$$\frac{120/9}{2} = y \quad / \quad \frac{120}{9 \times 2} = y$$

$$\frac{120}{18} = y$$

$$\boxed{y = \frac{20}{3}}$$

$$\begin{aligned} \text{Length of rectangle} &= 2x + y \\ &= 2\left(\frac{120}{9}\right) + \frac{20}{3} \\ &= \frac{240 + 60}{9} \\ &= \frac{300}{9} = \frac{100}{3} \end{aligned}$$

$$\begin{aligned} \text{Width of Rect} &= 2x - 3 \\ &= 2\left(\frac{120}{9}\right) - 3 \\ &= \frac{240 - 27}{9} = \frac{213}{9} = \left(\frac{71}{3}\right) \end{aligned}$$



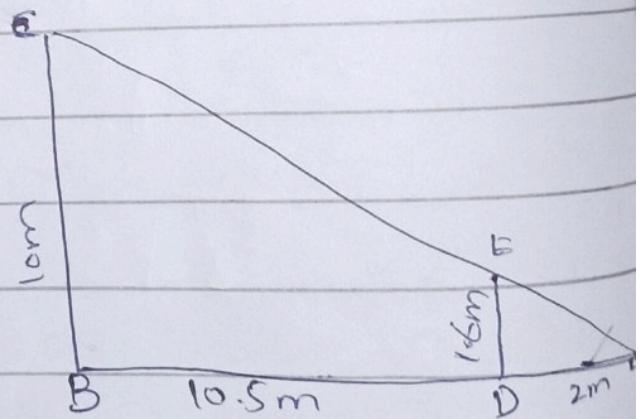
$$\text{Area of Rectangle} = L \times w$$

$$= \frac{100}{3} \times \frac{71}{3}$$

$$\boxed{\text{Area of Rec} = \frac{7100}{9}}$$

(d) Ahmed stands at Point D, 2m in front of a spotlight at point A. He is 1.6m tall and is facing the wall of a building which is 10.5m away from him. How tall (BC) is his shadow on the wall of the building.

Sol:-



$$B \quad 10.5m \quad 2m \quad A$$

$$= 12.5m$$

There are two equiangular triangle namely  $\triangle ABC$  and  $\triangle ADE$



Note = For two equiangular triangle  
the ratio of any two corresponding  
sides is always same.

$$\frac{BC}{12.5} = \frac{1.6}{2}$$

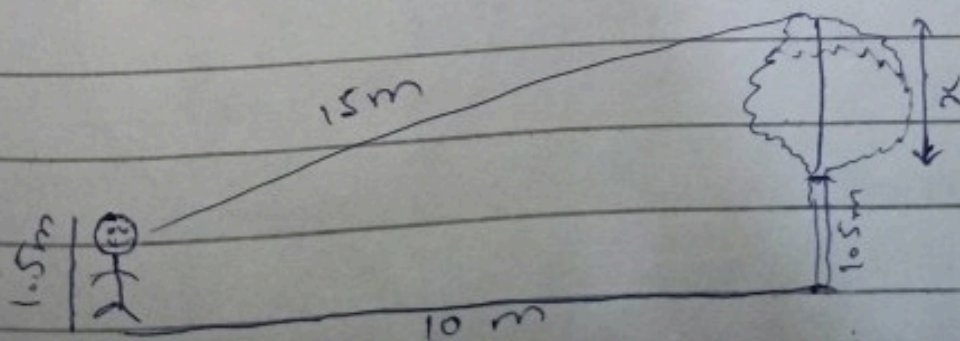
$$BC = \frac{1.6 \times 12.5}{2}$$

$$BC = \frac{2 \times 1.6 \times 12.5}{2 \times 2} = 10$$

$$BC = 10m$$

Q7(a) Ali is standing 10 meters away  
from a tree. The distance of his eyes  
from his feet is 1.5 meter. Given that  
the distance from his eyes to the  
top of a tree is 15 meters. Find  
the height of the tree.

Sol: -





$$\text{Height of tree} = 10.5\text{m} + x \quad \text{--- (i)}$$

By using pathagoras theorem

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

$$(H^2 = B^2 + P^2)$$

$$15^2 = 10^2 + x^2$$

$$225 = 100 + x^2$$

$$x^2 = 225 - 100$$

$$x^2 = 125$$

$$\sqrt{x^2} = 5\sqrt{25} \quad \text{--- (2)}$$

$$x = 5\sqrt{5}$$

Put value of  $x$  in equ (i)

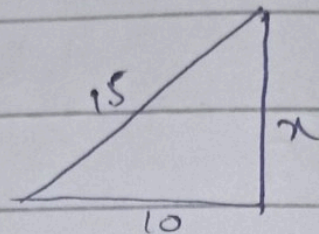
$$\text{Height of tree} = 10.5\text{m} + 5\sqrt{5}$$

$$= \frac{15^3}{10^2} \text{m} + 5\sqrt{5}$$

$$= \frac{3}{2} + 5\sqrt{5}$$

$$= \frac{3 + 15\sqrt{5}}{2} \text{m}$$

$$= 12.68$$





b) Jumbled words

LNUGEF

ENGULF

CKANS

SNACK

CIREFE

FIRECE

EERANMOGTP

POMEGRANATE

MINIKPPU

PUMPKIN

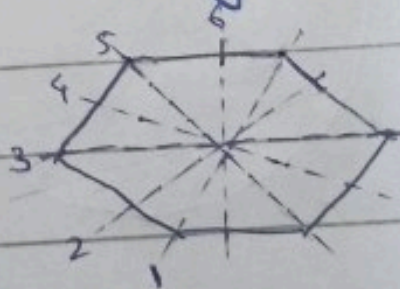
(c) Draw and write total number of lines of symmetry in a regular hexagon and octagon. How many lines of symmetry are there in a circle

Sol: -

Lines of symmetry: It is a line that divides a shape into two equal and

Note: Any regular polygon with "n" number of sides will have in "lines of symmetry."

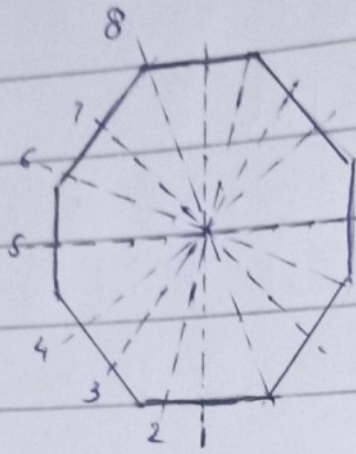
Regular Hexagon: 6 sides



A regular hexagon has 6 lines of symmetry

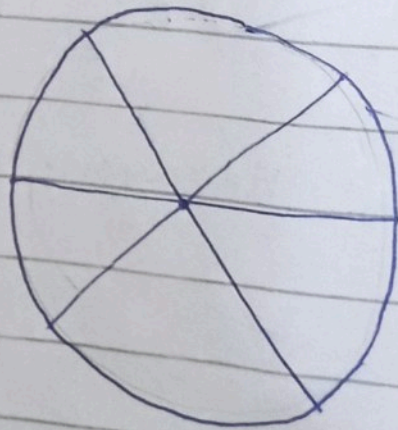


Regular octagon: 8 sides



A regular octagon has 8 lines of symmetry.

Circle Every line passing through centre of circle is a line of symmetry. So, a circle has infinite number of lines of symmetry.



(d) The height of Egyptian pyramid is 146.6 meters and base length is 230.6 meters. Find volume of that



pyramid.

Sol:-

volume of pyramid

$$V = \frac{Lwh}{3}$$

Given that

$$h = 146.6\text{m}$$

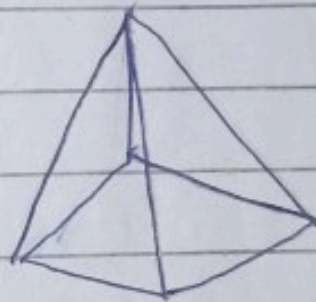
$$L = 230.6\text{m}$$

Note: The Egyptian pyramid has a square base

then

$$L = W$$

$$W = 230.6\text{m}$$



$$V = \frac{230.6 \times 230.6 \times 146.6}{3}$$

$$V = \frac{7795654.38\text{m}^3}{3}$$

$$V = 2,598,551.46\text{m}^3$$

volume of pyramid of Egypt  
is  $2,598,551.46\text{m}^3$



(ii) Even Number

$$N(A) = 2, 4, 6, 8, 10, 12 \rightarrow N(A) = 6$$

$$N(S) = 12$$

$$P(A) = \frac{N(A)}{N(S)}$$

(Even Number)

$$P(A) = \frac{6}{12}$$

$$P(A) = \frac{1}{2}$$

(iii) Perfect square

$$n(A) = 1, 4, 9$$

$$n(S) = 12$$

$$P(A) = \frac{N(A)}{N(S)}$$

(Perfect square)

$$P(A) = \frac{3}{12}$$

$$P(A) = \frac{1}{4}$$

(iv) A Negative Number

There is no negative number  
in sample space

$$N(A) = 0$$



$$N(S) = 12$$

$$P(A) = \frac{P \cdot N(A)}{N(S)}$$

(Negative N)

$$P(A) = \frac{0}{12}$$

$$P(A) = 0$$

(v) Number less than 13

$$N(A) = 12$$

$$N(S) = 12$$

$$P(A) = \frac{N(A)}{N(S)}$$

(Number less than 13)

$$P(A) = \frac{12}{12}$$

$$P(A) = 1$$

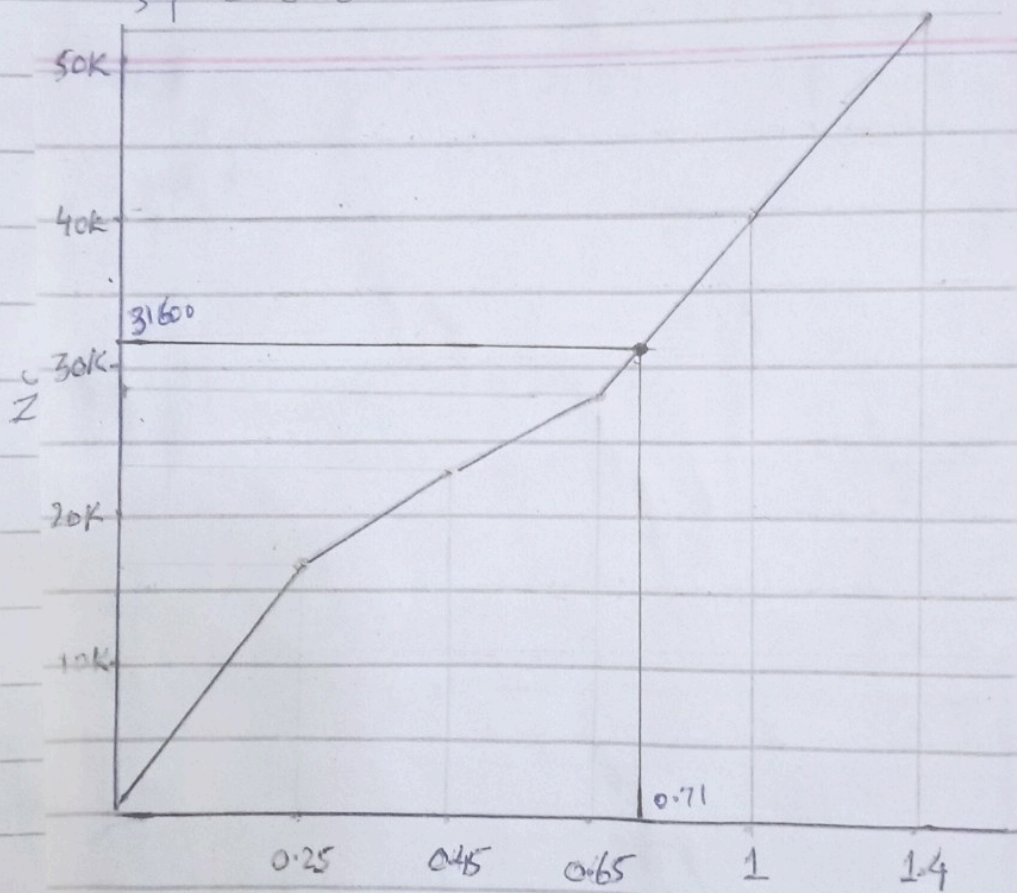
c) The scintillation nuclear radiation detector detects the alpha rays per second. When the energy of the alpha rays ( $E_\alpha$ ) in MeV increases, the number of counts ( $N_c$ ) on the detector also increases linearly as shown in the table below.



$E_\alpha$ (MeV)	0.25	0.45	0.65	1	1.4
$N_c$	17500	23500	29500	40000	52000

Sol:-

Draw a graph of  $N_c$  as a function  $E_\alpha$  (MeV) and find the energy of unknown alpha ray if the number of counts are 31600



$$\frac{0.35}{30000} = 0.000035$$

$$1 \rightarrow 0.000035$$

$$1600 \rightarrow 1600 \times 0.000035$$

$$\rightarrow 0.056$$

$$0.706 \rightarrow 0.71$$



(d) The  $Y$  is directly proportional to  $x^2$  and  $y=m$  for a particular value of  $x$ . Find an expression for  $y$  in terms of  $m$ , when the value of  $x$  is doubled.

Sol:-

$$Y \propto x^2$$
$$Y = Cx^2 \quad (1) \quad (C = \text{constant})$$

$y = m$  For a particular value  
Let suppose  $x = a$

$$m = Ca^2$$
$$\boxed{C = \frac{m}{a^2}}$$

If particular value <sup>of  $x$</sup>  is doubled

$$x = a$$

$$x = 2a$$

$$y = Cx^2$$

$$y = \frac{m}{a^2} \times (2a)^2$$

$$y = \frac{m \times 4a^2}{a^2}$$

$$y = 4m \quad \text{Require Expression}$$



or

• As  $y$  is directly proportion to square of  $x$ , that is

$$y \propto x^2 \quad \text{or} \quad \boxed{y = kx^2}$$

( $k$  is constant of proportionality)

• For particular value  $x$ ,  $y = m$ , we have  $m = kx^2$  or  $\boxed{k = \frac{m}{x^2}}$

• When  $x$  is doubled ( $y = kx^2$ )

$$Y = k(2x)^2$$

$$Y = \frac{m}{x^2}(4x^2)$$

By putting value of  $k$

$$Y = 4m$$