Mathematics

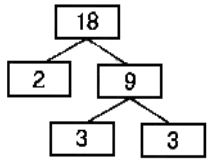
REVISION and MODEL QUESTIONS

55) There is a circular path around a sports field. Sonia takes 18 minutes to drive one round of the field, while Ravi takes 12 minutes for the same. Suppose they both start at the same point and at the same time, and go in the same direction. After how many minutes will they meet again at the starting point?

Soln: By taking LCM of time taken (in minutes) by Sonia and Ravi, we can get the actual number of minutes after which they meet again at the starting point after both start at some point and at the same time, and go in the same direction.

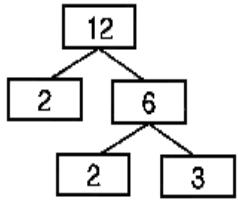
$18 = 2 \times 3 \times 3$

$= 2 \times 3^2$



$12 = 2 \times 2 \times 3$

$= 2^2 \times 3$

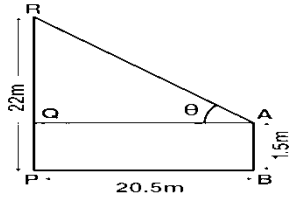


LCM (18, 12) = $2^2 \times 3^2 = 36$.

Therefore, both Sonia and Ravi will meet again at the starting point after 36 minutes

56) An observer 1.5 metres tall is 20.5 metres away from a tower 22 metres high. Determine the angle of elevation of the top of the tower from the eye of the observer.

Soln



From the above figure,

AB = PQ = 1.5 m

PB = QA = 20 m

PR = 22 m

QR = PR – PQ = 22 – 1.5 = 20.5 m

In the right triangle AQR,

$\tan\theta = QR/AQ$

$\tan\theta = 20.5/20.5 = 1$

$\Rightarrow \tan\theta = \tan 45°$

$\Rightarrow \theta = 45°$

Hence, the angle of elevation is 45°.

57) A coin is tossed two times. Find the probability of getting at most one head.

Soln:

When two coins are tossed, the total no of outcomes

$= 2^2 = 4$ i.e. (H, H) (H, T), (T, H), (T, T)

Where,

H represents head

T represents the tail

We need at most one head, which means we need one head only otherwise no head.

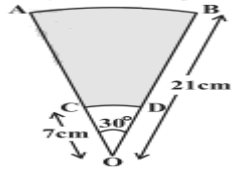
Possible outcomes = (H, T), (T, H), (T, T)

Number of possible outcomes = 3

Hence, the required probability = $\frac{3}{4}$

58) AB and CD are respectively arcs of two concentric circles of radii 21 cm and 7 cm and centre O (see Fig.). If ∠AOB = 30°, find the area of the shaded region.

Soln:-



Radius of the larger circle, R = 21 cm

Radius of the smaller circle, r = 7 cm

Angle made by sectors of both concentric circles = 30°

Area of the larger sector = $(30°/360°)\times\pi R^2$ cm^2

$= (1/12)\times(22/7)\times 21^2$ cm^2

$= 231/2$cm$^2 = 115.5$ cm^2

Area of the smaller circle = $(30°/360°)\times\pi r^2$ cm^2

$= 1/12\times 22/7\times 7^2$ cm^2

$= 77/6$ cm$^2 = 12.8334$ cm^2

Area of the shaded region = $(231/2) – (77/6)$ cm^2

$= 616/6$ cm$^2 = 308/3$cm^2

$= 102.667$ cm^2

59) if the quadratic equation $px^2 - 2\sqrt{5}px + 15 = 0$ has two equal roots, then find the value of *p*.

Soln: The given quadratic equation can be written as

$$px^2 - 2\sqrt{5}px + 15 = 0$$

$$a = p, \quad b = -2\sqrt{5}p, \quad c = 15$$

For equal roots, $D = 0$

$$D = b^2 - 4ac$$

$$0 = (-2\sqrt{5}p)^2 - 4\times p\times 15$$

$$0 = 4\times 5p^2 - 60p$$

$$0 = 20p^2 - 60p$$

$$\Rightarrow 20p^2 = 60p$$

$$p = \frac{60p}{20p} = 3$$

$$\therefore \quad \mathbf{p = 3}$$