

CLOCKS

Angular Speed

Longer Hand = 360° / hour

Small Hand = 30° / hour

#1) When is angle b/w hands 100° ?

6:51 \Rightarrow 6:51

Long hand moved

$$\left(\frac{51}{60}\right) \times 360^\circ = 306^\circ \text{ from } 12 \text{ o'clock}$$

Small hand moved

$$\left(\frac{51}{60}\right) \times 30^\circ = 25.5^\circ \text{ from } 6 \text{ o'clock}$$

$$25.5^\circ + 180^\circ = 205^\circ \text{ from } 12 \text{ o'clock}$$

Angle from Small to Long hand

$$306^\circ - 205^\circ = 101^\circ$$

$\approx 100^\circ$

#2> At what time b/w 7 and 8, will both the hands of clock coincide?

$$1 \text{ min} = 360/60 = 6^\circ \quad (60 \text{ divisions made for 1 min})$$

Big hand covers 360° in 12 hrs $\rightarrow 12 \times 60 \text{ mins}$
In 1 minute it covers $\rightarrow \frac{360}{12 \times 60} = \frac{1}{2}^\circ$

At 7 o'clock, small hand of clock covered
 $7 \times 30^\circ = 210^\circ$

Big hand is at 0°

Let at the time they both meet, the displacement of small hand of the clock be x .

Displacement of big hand = $210 + x$

$$\therefore (210 + x)/6 = x/(1/2) = 2x$$

$$\Rightarrow x = (210/11)^\circ$$

Time taken by small hand

$$= \left(\frac{210}{11} \right) / \left(\frac{1}{2} \right) \text{ minutes}$$

$$= 38 \frac{2}{11} \text{ minutes}$$

Hence they will meet at 7 hr $38 \frac{2}{11}$ mins

#3) If seconds hand covered 3960, how many degrees does hour hand move in same time?

$$\left(\frac{3960}{360} \right) \times (0.5) = 5.5^\circ$$

#4) What is angle b/w hands at 3:50?

Formula: $(30 \times H) - (11/2 \times M)$

Here, $H = 3$ & $M = 50$

$$(30 \times 3) - (11/2 \times 50)$$

$$= -185 \text{ degree}$$

OR

$$360 - 185$$

$$= 175 \text{ degree}$$

#5) Mirror shows 10 hr 23 mins. Actual time?

$$12 - 10 \text{ hr } 23 \text{ min}$$

$$= \underline{1 \text{ hr } 37 \text{ min}}$$

#6) A clock loses 5 mins fast at 4pm on a Friday. Subsequent Sunday at 8am the watch was 3 mins slow. When did it show the correct time?

No of mins lost = 8

Total time from 4 Friday to 8 Sun = 40 hours

It lost 8 mins in 40 hrs.

$$\text{Time taken to lose 5 mins} = \frac{40 \times 5}{8} = 25 \text{ hrs}$$

Whenever it loses the first 5 mins, the clock will show the right time — hence after 25 hrs at 5pm on Saturday

#7) At what time b/w 4 & 5 hands will be at right angle?

$$30H - \left(\frac{11}{2}\right)M = 90$$

$$\Rightarrow 30(4) - \left(\frac{11}{2}\right)M = 90$$

$$\Rightarrow 120 - \frac{11}{2}M = 90$$

$$\Rightarrow M = 38 \frac{2}{11} \text{ mins past 4}$$

#8) How many degrees does the hour hand lag behind when compared to min hand in a span of 8 mins?

For every minute, the hour hand lags by $5\frac{1}{2}^\circ$

So for 8 minutes it lags by

$$8 \times 5\frac{1}{2} = 44^\circ$$

#9) Angle covered by hour hand in 48 mins?

Hour hand covers $(\frac{1}{2})^\circ$ in 1 minute

$$\frac{1}{2} \times 48 = \underline{\underline{24^\circ}} \text{ in 48 mins.}$$

#10) How many times Min Hand will be opposite to Hour Hand from 3pm on Friday to 11am Sunday?

3pm Fri - 3pm Sat (1 day) = 22 times (Exception of 60' clock)

3pm Sat - 3am Sun ($\frac{1}{2}$ day) = 11 times

3am Sun - 11am Sun (8 hrs) = 7 times

$$(22 + 11 + 7) = \underline{\underline{40 \text{ times}}}$$

#11) C1 C2 C3 Shows current time at 3 am.

C1 loses 4.5 mins in an hour.

C2 loses 1.5 min in an hour.

C3 gains 2.5 mins in hour

At 11 am how much will they differ?

3 am to 11 am \rightarrow 8 hours

C1 loses $4.5 \times 8 = 36$ mins in 8 hours
 \rightarrow 10:24

C2 loses $1.5 \times 8 = 12$ min
 \rightarrow 10:48

C3 gains $2.5 \times 8 = 20$ min
 \rightarrow 11:20 am

C1 \leftrightarrow C2 \sim 24
C2 \sim C3 \rightarrow 32
C1 \sim C3 \rightarrow 56

Ans.

#12) Angle covered by min hand in 27 mins?

6° in 1 minute

covered by min hand.

$$27 \times 6^\circ = \underline{162^\circ}$$

in 27 mins it covers

