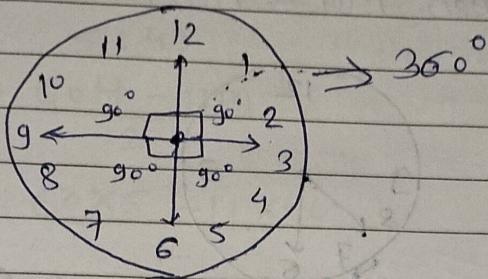


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24. CLOCK

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Types of angle:-

- 1) Angle
- 2) Time
- 3) Error

$$\boxed{\text{HH}} \quad 12 \text{ hr} \longrightarrow 360^\circ$$

$$\boxed{\text{MH}} \quad 1 \text{ hr} \longrightarrow 360^\circ$$

$$\boxed{\text{SH}} \quad 1 \text{ min} \longrightarrow 360^\circ$$

HH \rightarrow Hour Hand

MH \rightarrow Minute Hand

SH \rightarrow Second Hand

Imp

$$\textcircled{(1)} \quad \textcircled{Hour} \rightarrow \textcircled{360^\circ}$$

$$1 \text{ hr} \longrightarrow 30^\circ$$

$$60 \text{ min} \longrightarrow 30^\circ$$

$$1 \text{ min} \longrightarrow \frac{1}{2}^\circ$$

$$\boxed{\text{MH}} \Rightarrow$$

$$60 \text{ min} \longrightarrow 360^\circ$$

$$1 \text{ min} \longrightarrow 6^\circ$$

#Angle

1) Angle covered by HH $12:00 \longrightarrow 3:45$

\Rightarrow

3 hr 45 min

$$3 \times 30^\circ + 45 \times \frac{1}{2}^\circ$$

$$90 + 22.5$$

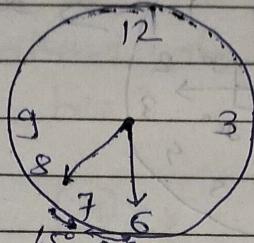
$$[112.5^\circ] \leq$$

$$\# \text{Angle} = \frac{60H - 11M}{2}$$

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2) Angle between MH & HH at 7:30

M1 \Rightarrow



$$30^\circ + 15^\circ = (45^\circ)$$

M2 \Rightarrow 7:30

$$\# \text{Angle} = \frac{60H - 11M}{2}$$

$$= \frac{60 \times 7 - 11 \times 30}{2}$$

$$= \frac{420 - 330}{2}$$

$$= \frac{90}{2}$$

$$= (45^\circ)$$

3) Angle between MH & HH at 5:10

5:10

$$\# \text{Angle} = \frac{60H - 11M}{2}$$

$$= \frac{60 \times 5 - 11 \times 10}{2}$$

$$= \frac{300 - 110}{2}$$

$$= \frac{190}{2}$$

$$= (95^\circ)$$

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① Angle between mH & HH at 5:40

5:40

$$\text{Angle} = \frac{60H - 11M}{2}$$

$$= \frac{60 \times 5 - 11 \times 40}{2}$$

$$= \frac{300 - 440}{2}$$

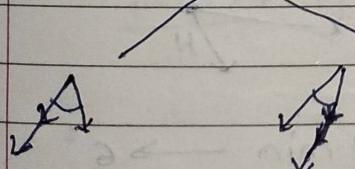
$$= \frac{140}{2}$$

$$= 70^\circ$$

① Angle $\Rightarrow \frac{60H - 11M}{2}$
 (MH & HH)

② Timing (Angle) $\Rightarrow \frac{2}{11}(A_1 \pm A_2)$

(2 times)



before coincide :-

$$\frac{2}{11}(A_1 - A_2) \quad H \downarrow m$$

$$\frac{2}{11}(A_1 - A_2)$$

Smaller no. $\times 30$ given angle

after coincide :-

$$\frac{2}{11}(A_1 + A_2) \quad m \nearrow H$$

behind \rightarrow before coincide

Ahead \rightarrow after coincide

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- 1) At what time between 3 & 4 o'clock is MH 4 minute (behind) the HH.

(before coincide)

(24°)

3 & 4 o'clock
Smaller

H A 4 min
M

before
coincide

$$\text{timing} = \frac{2}{11} (3 \times 30 - 24^\circ)$$

1 m $\rightarrow 6^\circ$

4 m $\rightarrow (24^\circ)$

$$= \frac{2}{11} (90^\circ - 24^\circ) \quad \boxed{\text{Smaller no.} \times 30}$$

$$= \frac{2}{11} \times 66$$

$$= 12 \text{ min}$$

$\boxed{3 : 12 \text{ min}}$

- 2) At what time between 3 & 4 o'clock is MH is 7 min ahead of HH.

(After coincide)

(42°)

3 & 4 o'clock

Smaller no.

7 min
H

1 min $\rightarrow 6^\circ$

7 min $\rightarrow (42^\circ)$

$$\text{timing} = \frac{2}{11} (A_1 + A_2)$$

$$= \frac{2}{11} (3 \times 30 + 42) \quad \boxed{\text{Smaller no.} \times 30}$$

$$= \frac{2}{11} (90 + 42)$$

$$= \frac{2}{11} \times 132$$

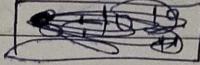
$$= 24 \rightarrow \boxed{3 : 24 \text{ min}}$$

① # most of Angle \rightarrow 1 hr \rightarrow 2 times

Some Angle \rightarrow 1 hr \rightarrow 1 times

$180^\circ \rightarrow$ 1 times.

$0^\circ/360^\circ \rightarrow$ 1 times \rightarrow 1



② At what time betn 8 & 9 O'clock both hands opposite to each other.

(180°)



$$A_1 = 8 \times 30 = 240 \rightarrow \text{Smaller No.} \times 30$$

$$A_2 = 180^\circ$$

$$\frac{2}{11}(A_1 - A_2)$$

$$\frac{2}{11}(A_1 + A_2)$$

$$\frac{2}{11}(240 - 180)$$

$$\frac{2}{11}(240 + 180)$$

$$\frac{2}{11} \times 60$$

$$\frac{2}{11} \times 420 \leftarrow \text{angle cannot be } 420$$

$$\frac{120}{11} = 10\frac{10}{11}$$

$$\frac{840}{11} \rightarrow 76\frac{4}{11}$$

$$8:10\frac{10}{11} \text{ min}$$

$$1 \text{ hr } 16\frac{4}{11} \text{ min}$$

Que asked angle betn
8 to 9 so

$$8:1 \text{ hr}:16\frac{4}{11} \text{ min}$$

$$9:16\frac{4}{11} \text{ min}$$

after 9

together $\rightarrow 0^\circ / 360^\circ$

Opposite $\rightarrow 180^\circ$

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Q) At what time betn 1 & 2 O'clock is both hands are together

smaller no.

(1) & 2 O'clock

$0^\circ / 360^\circ$

$0^\circ / 360^\circ$

$$A_1 = 1 \times 30 = 30 \rightarrow \text{smaller no.} \times 30$$

$$A_2 = 0^\circ \text{ or } 360^\circ$$

$$\frac{2}{11} (A_1 - A_2)$$

$$\frac{2}{11} (A_1 + A_2)$$

$$\frac{2}{11} (30 - 0)$$

$$\frac{2}{11} (30 + 0)$$

$$\frac{2}{11} \times 30$$

$$\frac{2}{11} \times 30$$

$$\frac{60}{11} \rightarrow 5\frac{5}{11}$$

$$\frac{60}{11} = 5\frac{5}{11}$$

$$1 : 5\frac{5}{11} \text{ min}$$

# timing	most of	<u>1 hr</u> \rightarrow 2 times
# times (ATR)	$180^\circ \text{ & } 0^\circ$	<u>1 hr</u> \rightarrow 1 times

Angle formed in one full day. (12 hrs / 24 hrs) :-

i) together $\rightarrow 0^\circ / 360^\circ$

ii) opposite $\rightarrow 180^\circ$

iii) straight line $\rightarrow 180^\circ \text{ or } 0^\circ$

iv) Right Angle $\rightarrow 90^\circ$

~~ACG~~

1) How many times in a day MH & HH will be

i) together (0°) :- 12:00

1 hr \rightarrow 1 times

12 hrs \rightarrow 11 times

24 hrs \rightarrow 22 times

(imp)

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ii) Opposite $\rightarrow (180^\circ) \Rightarrow [6:00]$

1 hr \rightarrow 1 times

12 hr \rightarrow 11 times

24 hr \rightarrow [22 times] ↗

iii) in straight Line $\Rightarrow (0^\circ \& 180^\circ)$

1 hr \rightarrow 2 times

12 hr \rightarrow 22 times

24 hr \rightarrow [44 times] ↗

iv) Right Angle (90°) $\Rightarrow [3:00] ; [9:00]$

1 hr \rightarrow 2 times

12 hr \rightarrow 22 times

24 hr \rightarrow [44 times] ↗



Error

① (Type -1) Slow/Fast

i) A clock which gains uniformly is 5 min slow on Sunday 8:00 am. If it is 7 min fast on Tuesday 8:00 am then when was it shown correct time.

\Rightarrow

Sun 8 am \rightarrow 5 min slow
 $48 \text{ hr} \swarrow$ Tues 8 am \rightarrow 7 min fast

SUN 8 AM
24 ↘
Mon 8 AM
24 ↘
Tue 8 AM
48 hr ↗

12 min $\xrightarrow{4}$ 48 hr

5 min $\xrightarrow{4}$ 20 hr

5 min $\xrightarrow{2}$ 12 min

Sun 8 am $\xrightarrow{+20 \text{ hr}}$ Mon 4 AM

Correct time show

(Imp)

$$\text{Correct time} = \frac{\text{slow/fast}}{\text{Slow+Fast}} \times \text{Total time}$$

$$= \frac{5}{5+7} \times 48$$

$$= \frac{5}{12} \times 48$$

$$= 5 \times 4 = 20 \text{ hr}$$

$$\text{sum 8 AM} \xrightarrow{+20 \text{ hr}} \text{mon 4 AM}$$

- 2) A clock which gains uniformly is 10 min fast on Sunday 9 AM. If it is 2 min slow on Wednesday 9 AM then when was it show correct time.



$$\begin{array}{l} \text{Sun 9 AM} \rightarrow 10 \text{ min fast} \\ \swarrow 72 \text{ hr} \\ \text{wed 9 AM} \rightarrow 2 \text{ min slow} \end{array} \quad \begin{array}{l} \text{Sun 9 AM} \\ 24 \leftarrow \\ 24 \leftarrow \\ 24 \leftarrow \\ 24 \leftarrow \\ 72 \text{ hr} \end{array}$$

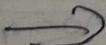
$$\text{Correct time} = \frac{\text{S/F}}{\text{S+F}} \times \text{Total Time}$$

$$= \frac{10}{72} \times 72$$

$$= 60 \text{ hr}$$

$$\text{wed 9 AM} \xrightarrow{-12 \text{ hr}} \text{Tue 9:PM}$$

- 3) A clock which gains uniformly is 9 min slow on Sunday 11 AM. If it is 6 min fast on Tue 11 PM then when was it show correct time.



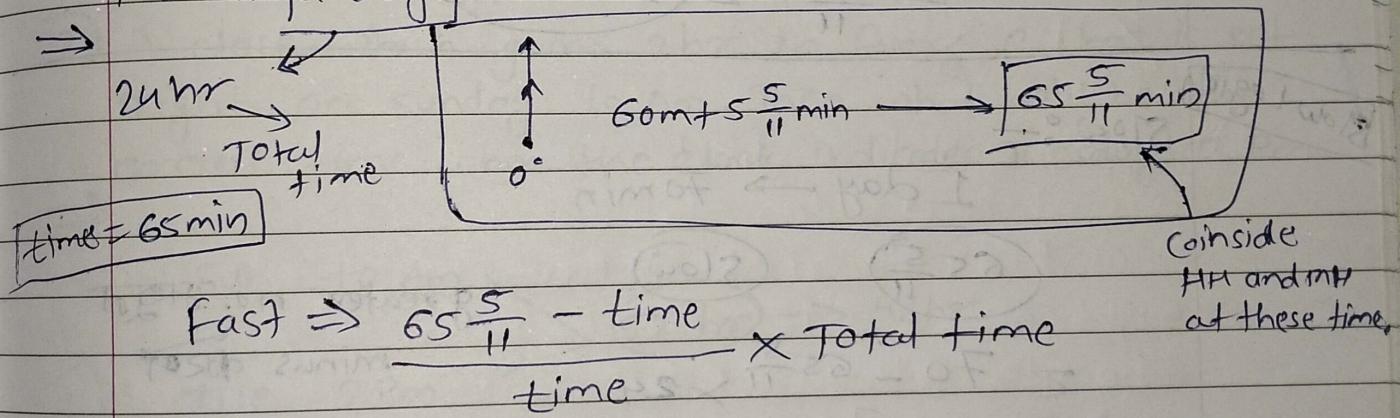
$$\begin{array}{l} \text{Sun 11 AM} \rightarrow 9 \text{ min slow} \\ \swarrow 60 \text{ hr} \\ \text{Tue 11 PM} \rightarrow 6 \text{ min fast} \end{array} \quad \begin{array}{l} \text{Sun 11 AM} \\ 24 \leftarrow \\ 24 \leftarrow \\ 24 \leftarrow \\ 60 \text{ hr} \end{array}$$

$$\begin{aligned}\text{Correct time} &= \frac{S/F}{S+F} \times \text{Total time} \\ &= \frac{9}{15} \times 60 \\ &= 36 \text{ hr}\end{aligned}$$

Sum 11 Am $\xrightarrow{24+12 \text{ hr}} [\text{mid} 11 \text{ PM}]$

② (Type - 2)

1) If in a clock MH overtakes the HH in 65 min of correct time. then How much does the clock gain or loss in a day.



$$\text{fast} \Rightarrow \frac{65 \frac{5}{11} - \text{time}}{\text{time}} \times \text{Total time}$$

$$= \frac{65 \frac{5}{11} - 65}{65} \times 24$$

$$= \frac{5}{11 \times 65} \times 24$$

$$= \boxed{\frac{24}{143} \text{ hr fast}}$$

$65\frac{5}{11} > \text{min} \rightarrow \text{fast}$

$65\frac{5}{11} < \text{max} \rightarrow \text{slow}$

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- 2) If a clock both hands overtakes every 60 min in a 22 hr. then how much slow/fast the clock.
- Total time = 22 hr
Time = 60 min ~~fast~~

$$\text{fast} = \frac{65\frac{5}{11} - 60}{60} \times 22$$

$$= \frac{5\frac{5}{11}}{60} \times 22$$

$$= \frac{60}{11 \times 60} \times 22$$

$$= \frac{22}{11} = 2 \text{ hr fast}$$

$$\boxed{\frac{55}{11} = (11 \times 5) + 5 = 60}$$

~~Slow logic~~

Slow % -

1 day \rightarrow 70 min

$65\frac{5}{11}$

slow

greater no. ~~more~~

minus ~~more~~

$$\leftarrow 70 - \frac{65\frac{5}{11}}{70} \times 24$$

$$= \frac{5\frac{5}{11}}{70} \times 24$$

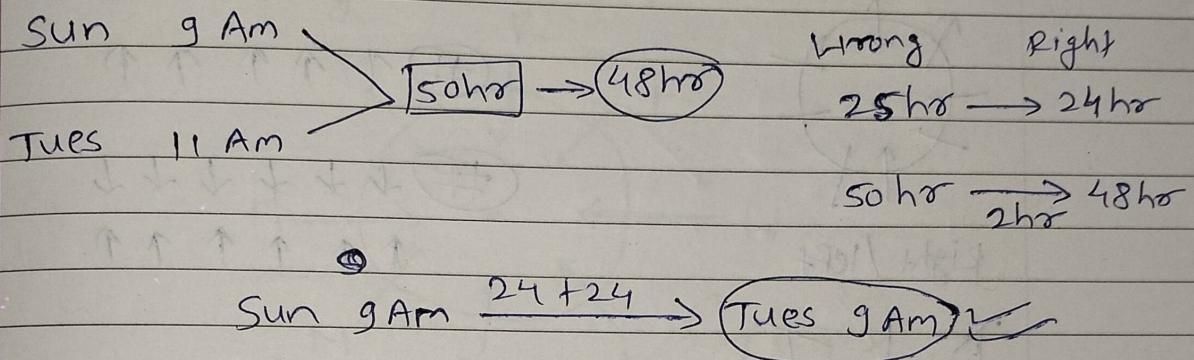
$$= \frac{60\frac{6}{7}}{11 \times 70} \times 24$$

$$\frac{2\frac{24}{7}}{110}$$

$$= \boxed{\frac{140}{77} \text{ hr slow}}$$

TYPE-3

- 1) A clock which gains 1 hr in Every 24 hr is set Right on Sunday 9 Am. Then what will be the correct time when the clock indicates Tuesday 11 Am.



- 2) A clock which gains 2 hr in Every 24 hr is set right on Sunday 10 Am. Then what will be the correct time when the clock indicates Tuesday 2 Pm.

