



Clocks

Angle between Hours and Hands

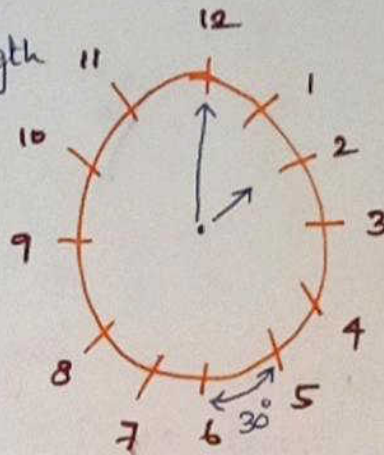
Angle?

• Hour Hand - SL

• Minute Hand - LL

Smaller in length

longer in length



Total Angle = 360

↓
divided into 12 Parts
↓
each part is 30°

Note 1

• Every gap is 30°

Hour hand Moves 200 - 300
60 mins - Minute hand - Complete Rotation

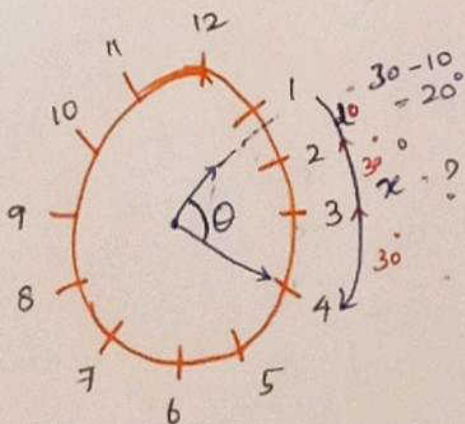
HH 30° - Hour hand - 30°

$$1 \text{ mins} = \frac{1}{2}^\circ (0.5^\circ) \frac{30}{60} = \frac{1}{2}$$

$$20 \text{ Mins} = 10^\circ \left(\frac{20}{2}\right)$$

$$45 \text{ Mins} = 22.5^\circ \left(\frac{45}{2}\right)$$

Q1 What is the angle between minute hand and hour hand at 1:20?



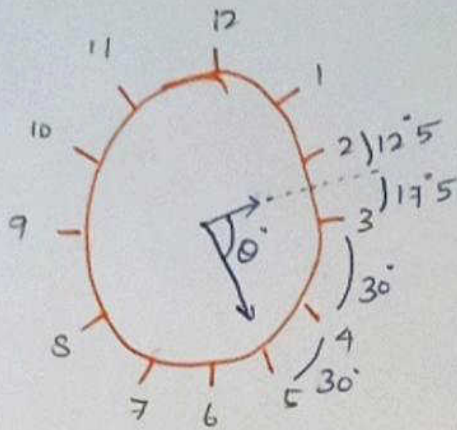
$$30^\circ + 30^\circ + \left(\frac{20}{2}\right)^\circ (30^\circ - 10^\circ) = 80^\circ$$

$$\frac{20}{2} \cdot 10^\circ$$

3

1 20

Q2 What is the angle between Minutes hand and hour hand at 2:25?



$$30^\circ + 30^\circ + 17.5^\circ = 77.5^\circ$$

$$\begin{array}{r} 2 \times 30 \\ \underline{12} \\ 25 \\ \underline{2} \\ 12 \\ 30 - 12.5 \end{array}$$

Q3 What is the angle between minutes hand and hour hand at 1:35?

$$5 \times 30^\circ = 150^\circ$$

$$150^\circ + 12.5^\circ = 162.5^\circ$$

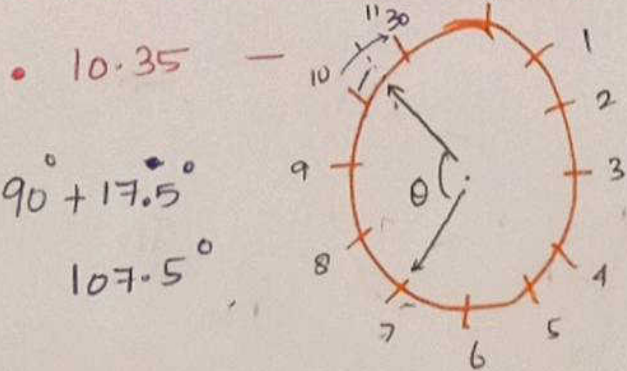
$$\begin{array}{r} 5 \times 30 \\ 150 \end{array}$$

Q4 What is the angle between minute hand and hour hand at 4:45?

$$\text{Sol: } - 120^\circ + 7.5^\circ = 127.5^\circ$$

$$\begin{array}{r} 35 \times 3 \\ \underline{2} \\ 300 \\ 175 \\ \underline{125} \end{array}$$

Q5 What is the angle between Minutes hand & hour hand to the following numbers



• 10:35

$$90^\circ + 17.5^\circ = 107.5^\circ$$

$$\frac{35}{2} = 17.5$$

• 11:45

$$60^\circ + 22.5^\circ = 82.5^\circ$$



Formula Method

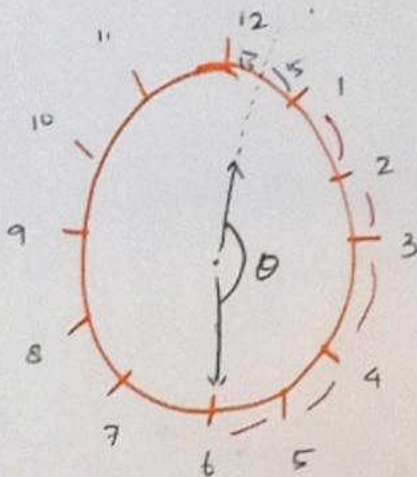
• 1.20

$$\left| 30H - \frac{11}{2} M \right|$$

$$= \left| 30(1) - \frac{11}{2}(20) \right|$$

$$= |30 - 110| = |-80^\circ| = 80^\circ$$

• 12.30



150° + 15°
= 165°

$$= \left| 30H - \frac{11}{2} M \right|$$

$$= \left| 30(12) - \frac{11}{2}(30) \right|$$

$$= |360 - 165|$$

$$= |195^\circ|$$

$$= 195^\circ$$

$$360^\circ - 195^\circ = 165^\circ$$

clk have two angle

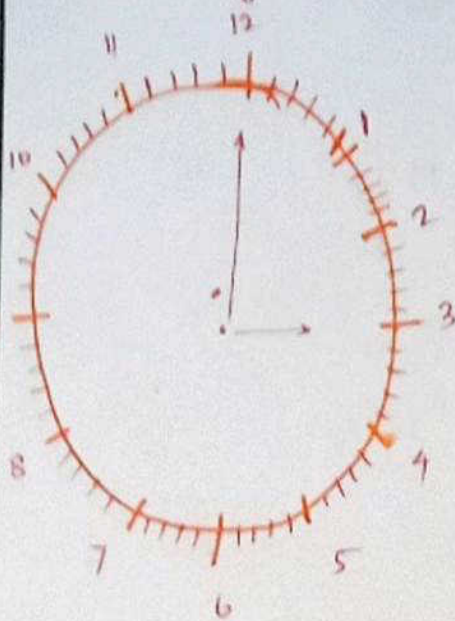
Got Ans - More than

180° - Reflex angle

< 180° - hour hand & Minute hand

• Reflex angle

Hands together (Overlap)



Both the hands together / Angle is 0°
overlap each other

Note 1

55 min ^{small} spaces are gained by minute hand in 60 minutes

60 spaces \approx 5 space

3:00 to 4:00

1 Hr

1 Hr

(HH) 60 spaces \approx 5 spaces (HH)

Minute Hand gains $\frac{55 \text{ spaces}}{1 \text{ min}}$

Note 2 Answer

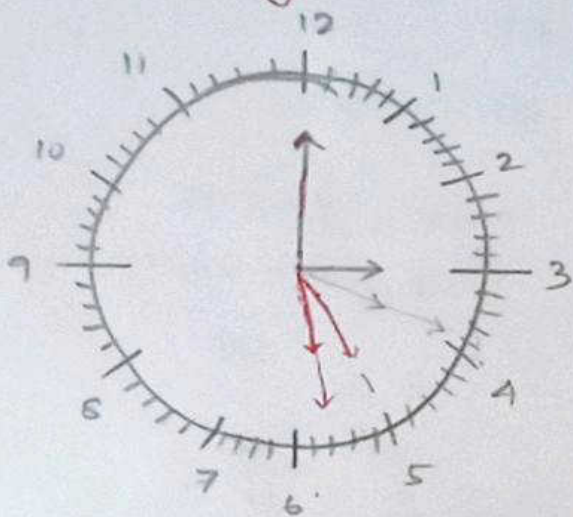
Eg $\frac{300}{11}$ - based on the option \rightarrow solve it

decimal or Fraction

$$\begin{array}{r}
 27 \quad 27 \\
 11 \overline{) 300} \\
 \underline{22} \\
 80 \\
 \underline{77} \\
 3
 \end{array}$$

27 mins $\frac{3}{11}$ seconds

Q₁ At what time between 3' o'clk and 4' o'clk, will hands of a clock be together?



55 Min space ^{gain} — 60 Minute hand

$$55 \text{ spaces} = 60$$

$$15 = x$$

$$55x = 60 \times 15$$

$$x = \frac{60 \times 15}{55}$$

$$x = \frac{180}{11} = 16 \frac{4}{11} \text{ past } 3$$

Both the hands meet

Past 3 16 Minutes $\frac{4}{11}$ seconds, meet

together

$$16 \frac{4}{11}$$

Q₂ At what time between 5' o'clk and 6' o'clk, will the hands of a clock be together?

$$55 = 60$$

$$25 = x$$

$$55x = 60 \times 25$$

$$55x = 1500$$

$$x = \frac{1500}{55} = 27 \frac{3}{11}$$

$$x = \frac{300}{11} = 27 \frac{3}{11} \text{ Past } 5$$

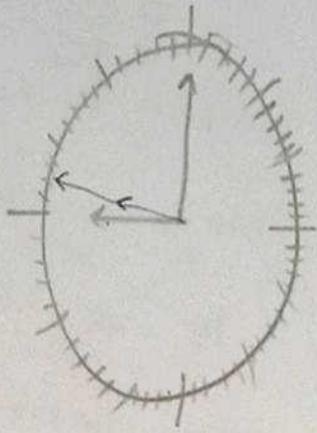
5 Hour 27 Mins $\frac{3}{11}$ seconds, both hands

meet together

$$27 \frac{3}{11}$$



Q3 At what time between 9^o clk and 10^o clk, will hands of a clock together?



$$55 = 60$$

$$45 = x$$

$$55x = 60 \times 45$$

$$x = \frac{60 \times 45}{55}$$

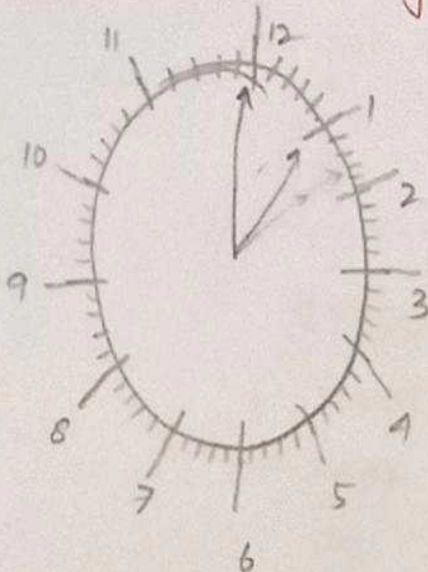
$$= \frac{540}{11}$$

At 9^o clk 49 min $\frac{1}{11}$ seconds, both the hands will meet together.

49 $\frac{1}{11}$ Past 9

$$\begin{array}{r} 49 \\ 11 \overline{) 540} \\ \underline{44} \\ 100 \\ \underline{99} \\ 1 \end{array}$$

Q4 At what time between 1^o clk and 2^o clk, will the hands of a clock be together?



$$55 = 60$$

$$5 = x$$

$$55x = 60 \times 5$$

$$x = \frac{60 \times 5}{55} = \frac{60}{11} = 5 \frac{5}{11}$$

= 5 $\frac{5}{11}$ Past 1



⊙ hands of the clock in opposite direction

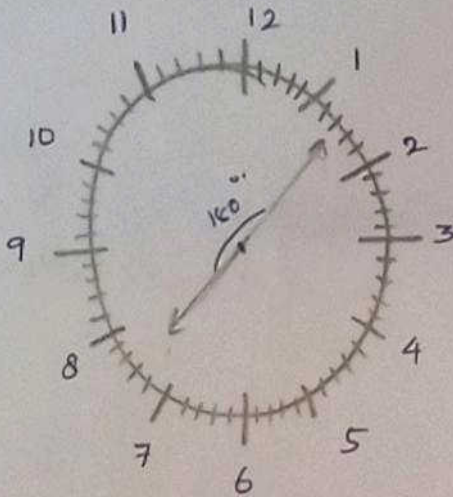
at line but not together

↓
angle is 180°

apply the same logic

"55 Min spaces are gained by minutes hand in 60 Min"

Q1 At what time between 7'o clk and 8'o clk the hands of the clock be in opposite direction?



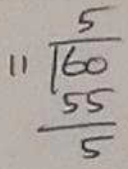
$$55 = 60$$

$$\text{(Minutes hand)} = x$$

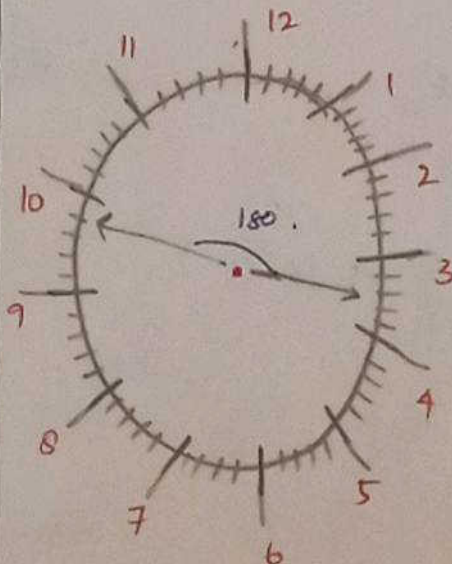
$$55x = 60 \times 5$$

$$x = \frac{60 \times 5}{55}$$

5 $\frac{5}{11}$ Past 7



Q2 What time between 3'o clk and 4'o clk the hands of the clock be in opposite directions?



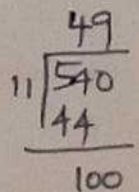
$$55 = 60$$

$$45 = x$$

$$55x = 60 \times 45$$

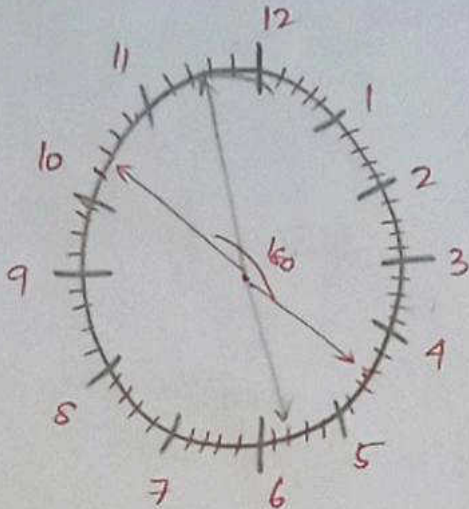
$$x = \frac{60 \times 45}{55}$$

$$= \frac{540}{11}$$





Q3 At what time between 4'o clock and 5'o clock the hands of the clock be in opposite direction



$$55 = 60$$

$$50 = x$$

$$55x = 60 \times 50$$

$$x = \frac{60 \times 50}{55}$$

$$= \frac{600}{11}$$

$$\begin{array}{r} 54 \\ 11 \overline{) 600} \\ \underline{55} \\ 50 \\ \underline{44} \\ 6 \end{array}$$

$$= 54 \frac{6}{11} \text{ past 4}$$

Q4 At what time between 11'o clk and 12'o clk the hands of the clock be in opposite direction?

$$55 = 60$$

$$25 = x$$

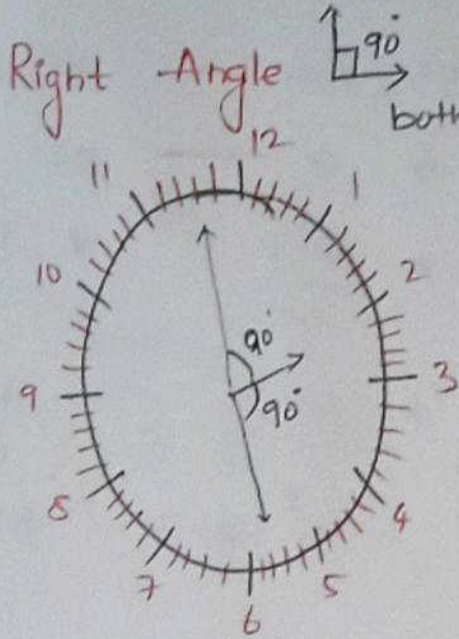
$$55x = 60 \times 25$$

$$x = \frac{60 \times 25}{55}$$

$$x = \frac{300}{11}$$

$$= 27 \frac{3}{11} \text{ Past 11}$$

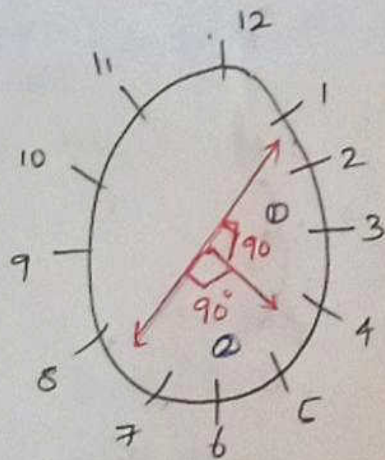
$$\begin{array}{r} 27 \\ 11 \overline{) 300} \\ \underline{22} \\ 80 \\ \underline{77} \\ 3 \end{array}$$



- two Answers Possible between 2' o'clk to 5' o'clk

- Draw a hour hand
- Draw a Perpendicular line (Minutes)
- Find both - Answer (2)

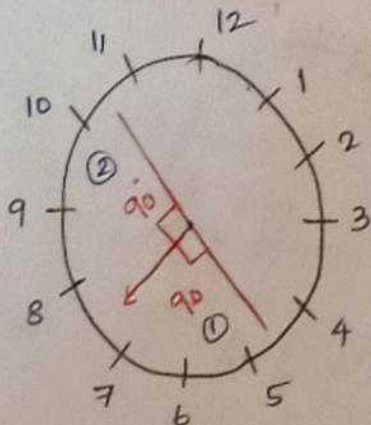
Q1. At what time between 40' o'clk and 50' o'clk, will the both hands of a clk be at right angle



Possible

| | |
|--|-------------------------------|
| $55 = 60$ | $55 = 60$ |
| $5 = x$ | $35 = x$ |
| $55x = 60 \times 5$ | $55x = 60 \times 35$ |
| $x = \frac{60 \times 5}{55}$ | $x = \frac{60 \times 35}{55}$ |
| $= \frac{60}{5} = 5 \frac{5}{11}$ Past 4 | $= \frac{420}{11}$ |

Q2. At what time between 70' o'clk and 80' o'clk, will both hands of a clock be at right angle



$55 = 60$

$20 = x$

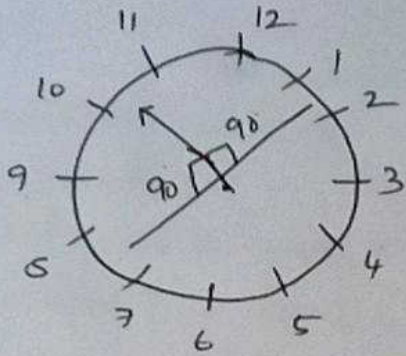
$x = 21 \frac{9}{11}$ Past 7

$55 = 60$

$50 = x$

$x = 54 \frac{6}{11}$ Past 7

Q3 between 10' o'clk and 11' o' clk



$$55 = 60$$

$$5 = x$$

$$x = \frac{60 \times 5}{55}$$

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

$$= 5 \frac{5}{11} \text{ past } 10$$

$$55 = 60$$

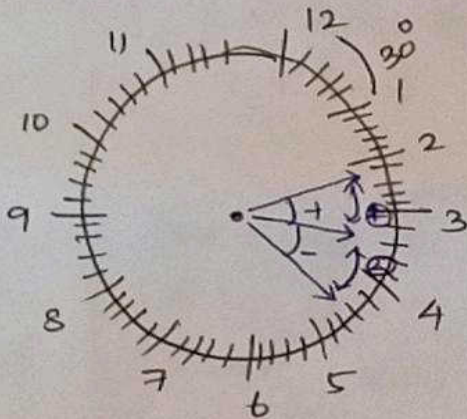
$$35 = x$$

$$x = \frac{60 \times 35}{55}$$

$$x = \frac{420}{11}$$

$$38 \frac{2}{11} \text{ past } 10$$

(X) Apart - ? Formula Method



$$\theta = \left| 30H - \frac{11}{2}M \right|$$

60 Mins = 1 Complete rotation
360°

$$1 \text{ Min} = \frac{360}{60} = 6^\circ$$

3-4 o'clk 4 Mins apart ?

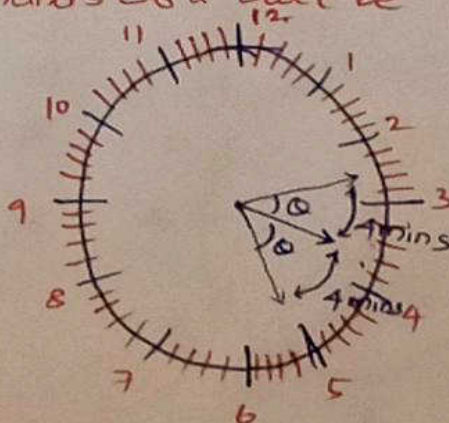
ahead (+) behind (-)

Step 1

- Find Angle
- sub to Value in formula
- calculate Value -

2 Answer.

Q1 At what time between 3' o'clk and 4 o'clk will both hands of a clock be 4 Min apart ?





Step 1:

$$1 \text{ Mins} = 6^\circ$$

$$4 \text{ Mins apart} = 6^\circ \times 4 = 24^\circ$$

$$\text{Angle } \theta = \pm 24^\circ$$

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

$$+24 = \left[30(3) - \frac{11}{2}M \right]$$

$$\frac{11}{2}M = 90 - 24$$

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

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

$$M = 12 \text{ Min past } 3$$

$$-24 = \left[30(3) - \frac{11}{2}M \right]$$

$$-24 = 90 - \frac{11}{2}M$$

$$\frac{11}{2}M = 90 + 24$$

$$M = \frac{114 \times 2}{11}$$

$$M = \frac{228}{11} = 20 \frac{8}{11} \text{ past } 3$$

Q2. At what time between 5 o'clock and 6 o'clock will both the hands of a clock be mins apart?

$$1 \text{ Mins} = 6^\circ$$

$$3 \text{ Mins apart} = 6^\circ \times 3 = 18^\circ$$

$$\text{Angle } \theta = 18^\circ$$

$$\theta = 30H - \frac{11}{2}M$$

$$+18 = 30(5) - \frac{11}{2}M$$

$$\frac{11}{2}M = 150 - 18$$

$$-18 = 30(5) - \frac{11}{2}M$$

$$\frac{11}{2}M = 150 + 18$$

$$M = \frac{168 \times 2}{11}$$

$$M = \frac{336}{11} = 30 \frac{6}{11} \text{ past } 5$$

Q3 between 4'o & 5'o clk, 10 Mins apart

Q = ?

1 Min = 6°

10 Mins apart = $6^\circ \times 10$
 $= 60^\circ$

$+60 = 30(A) - \frac{11}{2}(M)$

$\frac{11}{2}M = 120 - 60$

$M = \frac{60 \times 2}{11} = \frac{120}{11}$

$M = 10 \frac{10}{11}$ Past 4

$-60 = 30(A) - \frac{11}{2}(M)$

$\frac{11}{2}M = 120 + 60$

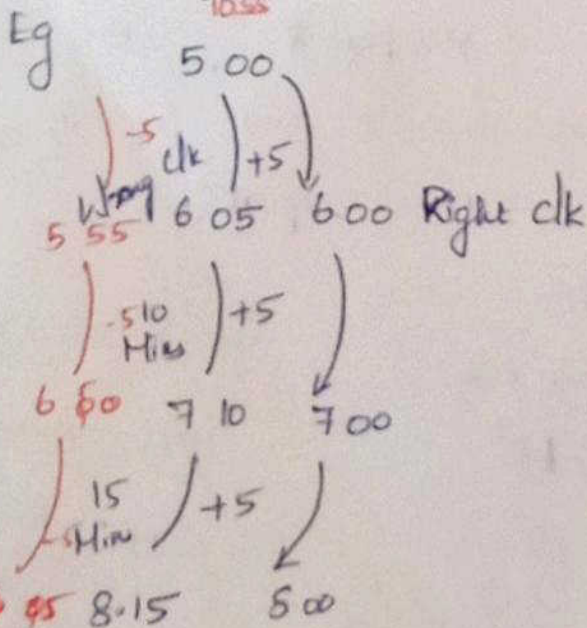
$M = \frac{180 \times 2}{11} = \frac{360}{11}$

$M = 32 \frac{8}{11}$ Past 4

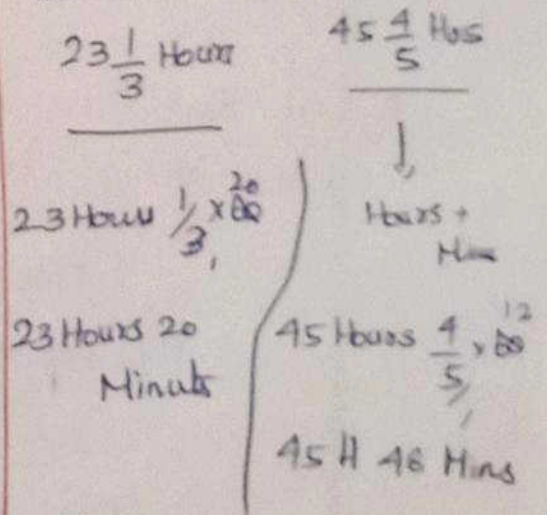
clk (Loss/gain)

note 1

clock gain 5 mins every hour



note 2





- Q1 Akash saw the clock when it was set right at 8 am. The clk gains 5 Minutes in an hour. what time will it shows at 8 PM at the same day?

Initial 8 00 am — 9 00 am — 10 00 am
 ↘ ↘
 +5 +5
 +5 +5
Between 8 00 am to 8 00 pm

Total difference = 12 Hrs

1 hour = 5 Mins gain

12 hour = 12×5

= 60 Mins

The clk shows = 8 pm + 1 Hr (60 Mins)

= 9 pm

- Q2 If a clk gains 5 Minutes every hour and it set correctly at 5 am then at what time will it shows at 10 am at the same day

5 am ~ 10 am = 5 Hours

1 Hour = 5 Minutes gain

5 Hours = 5×5

= 25 Mins

∴ The time is 10:25 am



Q3. Raju observed that a watch loses 5 ~~minutes~~ seconds ^{PM} every hour which was set right at 7 am. what time will it show at 2 pm on the same day?

$$7 \text{ am} - 2 \text{ pm} = 7 \text{ Hours}$$

$$1 \text{ Hour} = 5 \text{ seconds}$$

$$7 \text{ Hour} = 7 \times 5 \\ = 35 \text{ seconds}$$

$$\therefore \text{Time} = 1 \text{ hr } 59 \text{ Minutes } 25 \text{ seconds} \\ (60 - 35)$$

Q4. A clk is set correctly at 1 PM. but it loses 3 minutes every hour, what time will the clk show when the correct time is 10 am the next day

$$1 \text{ pm} = 10 \text{ am} \text{ (Next day)} = 21 \text{ Hrs}$$

$$1 \text{ pm} = 1 \text{ am} = 12 \text{ Hrs}$$

$$1 \text{ am} = 10 \text{ am} = 9 \text{ Hrs}$$



$$1 \text{ hr} - \text{loses } 3 \text{ Minutes}$$

$$21 \text{ Hr} = 21 \times 3$$

$$= 63 \text{ Minutes} = 1 \text{ Hr } 3 \text{ Minutes}$$

$$\text{Time} = 8 \text{ o'clock } 57 \text{ Minutes}$$

$$(8 \text{ } 57 \text{ am})$$

Q5 A watch losses 5 seconds every hour. The watch was set correctly on Wednesday at 6:30am. What time did it show at 6:30am in the next Wednesday?

Gap = 7 days

6:30am $\xrightarrow{\quad}$ 6:30am

1 Hr = 5 seconds

24 Hr = 24×5

1 day = 120 seconds = 2 Mins

7 day = 2×7 Mins

= 14 Mins

Time : 6:16am

$$\begin{array}{r} 270 - \\ 14 \\ \hline 16 \end{array}$$

Q6 A watch gains 5 seconds in 3 minutes was set right at 6:00am. What time will it show at 8:00pm on the same day?

6:00am - 8:00pm = 14 Hours

3 Mins gain 5 seconds

$\times 20$

60 Mins = 100 seconds

1 Hr = 1 Mins 40 seconds (100 seconds)

14 Hrs = 1400 seconds gain

Time =

$\overline{60}$

~~23 Hours~~ $\frac{2}{6}$ ~~seconds~~
Minute