Clock Problems

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Clock Formula:

1. 60-minute space = 360° = 1 hour
2. 1-minute space = 6° = 1 minute
3. 5-minute space = 6° x 5 = 30° = 5 minutes
4. Right Angle or Perpendicular = 15-minute spaces apart
5. Right Angle or Perpendicular = 22 times in 12 hours or 44 times in 24 hours (1 day)
6. Straight Angle or Straight Line or 180° = 30-minute space apart
7. Straight Angle = 11 times in 12 hours or 22 times in 24 hours (1 day)
8. Angle traced by hour hand in 12 hrs = 360°
9. Angle traced by minute hand in 60 min. = 360°
10. Speed of hour hand = 0.5 dpm (degree per minute)
11. Speed of minute hand = 6 dpm
12. Angle of the hour hand from vertical at N o'clock = 30N

Too Fast And Too Slow :
If a watch or clock indicated 8.15, when the correct time is 8, it is said to be 15 minutes too fast.

On the other hand, if it indicates 7.45, when the correct time is 8, it is said to be 15 minutes too slow

Illustrations:

Q) Find the angle between the minute hand and hour hand of a clock when the time is 7.20?

Ans: 100deg.

Sol:

● Angle traced by the hour hand in 12 hours = 360 degrees.

• Angle traced by it in 7 hrs. 20 min i.e. 22/3 hrs. = [(360/12) * (22/3)] = 220 degrees

• Angle traced by minute hand in 60 min = 360 deg.

• Angle traced by it in 20 min = [(360/20) * 60] = 120 deg.

• Therefore, required angle = (220 - 120) = 100deg.

Q) At what time between 2 and 3 O' clock will the hands of a clock together?

Ans: 10 10/11 min. past 2.

Sol:• At 2 O' clock, the hour hand is at 2 and the minute hand is at 12, i.e. they are 10 min space apart. To be together, the minute hand must gain 10 minutes over the other hand. Now, 55 minutes are gained by it in 60 min.

• Therefore, 10 min will be gained in [(60/55) * 10] min = 10 10/11 min.

• Therefore, the hands will coincide at 10 10/11 min. past 2.

Q) The minute hand of a clock overtakes the hours hand at intervals of 65 min of the correct time. How much of the day does the clock gain or lose?

Ans: the clock gains 10 10/43 minutes

Sol:

● In a correct clock, the minute hand gains 55 min. spaces over the hour hand in 60 minutes. To be together again, the minute hand must gain 60 minutes over the hour hand.

• 55 minutes are gained in 60 min.

• 60 min. are gained in [(60/55) * 60] min = 65 5/11 min.

• But they are together after 65 min.

• Therefore, gain in 65 minutes = (65 5/11 - 65) = 5/11 min.

• Gain in 24 hours = [(5/11) * (60*24)/65] = 10 10/43 min.

• Therefore, the clock gains 10 10/43 minutes in 24 hours.

Q) A clock is set right at 8 a.m. The clock gains 10 minutes in 24 hours. What will be the true time when the clock indicates 1 p.m. on the following day?

Ans. 48 min. past 12.

Sol:

• Time from 8 a.m. on a day to 1 p.m. on the following day = 29 hours.

• 24 hours 10 min. of this clock = 24 hours of the correct clock.

• 145/6 hrs of this clock = 24 hours of the correct clock.

• 29 hours of this clock = [24 * (6/145) * 29] hrs of the correct clock

• = 28 hrs 48 min of the correct clock.

• Therefore, the correct time is 28 hrs 48 min. after 8 a.m.

• This is 48 min. past 12.

Practice Problems

Q.1. When the time is 5:40, then what is the angle b/w the hour hand & the minute hand of a clock?

A. 70°

B. 60°

C. 74°

D. 80°

Q.2. At what time between 2 and 3 o'clock will the hands of a clock be together?

A. 10(10/11)min. past 2

B. 10 min. past 2

C. 20(10/11)min. past 2

D. 12 min. past 2

Q.3. What when the time is 6:32, then what is the angle b/w the hour hand & the minute hand of a clock?

A. 2°

B. 4°

C. 8°

D. 12°

Q.4. How many times do the hands of a clock coincide in a day?

A. 20

B. 21

C. 22

D. 24

Q.5. At what time between 1 and 2 o’ clock will the hands of a watch makes an angle of 180°

A. 35(5/11) min. past 1

B. 40 min. past 1

C. 50(4/11) min. past

D. 38(2/11) min. past 1

Q.6. At what time between 6 and 7 are the hands of a clock 8 minutes apart?

A. 24 min past 6

B. 21 min past 6

C. 18min past 6

D. 20 min past 6

Q.7. A clock is set right at 1 pm. If it gains one minute an hour, what is the true time when the clock indicates 6 pm the same day?

A. 5(7/61) min past 5

B. 55(8/61) min past 5

C. 55(8/61) min past 5

D. 56(5/61) min past 5

Q8. The minute hand of a clock overtakes the hour hand at intervals of 64 minutes of correct time. How much does the clock gain or lose in 12 hours?

A. 16(5/11) min

B. 16(4/11) min

C. 16(6/11) min

D. 16(7/11) min

Q9. Find the time between 3 and 4 will the hands of a watch point in the opposite direction?

A. 49(1/11) min past 3

B. 49(3/11) min past 3

C. 49(2/11) min past 3

D. 49(4/11) min past 3

Q10. At what time between 5 and 6 pm will the hands of a clock be coincident?

A. 21(8/11) min past 4

B. 32(8/11) min past 5

C. 21(5/11) min past 4

D. 21(4/11) min past 4

Solutions

1) Sol : Option A

Formula used= $\theta=(11/2)M - 30H$ where, H= hours, M= minutes

H= 5 , M= 40

Required angle, $\theta=(11/2)40 - 30\times5 = 70°$

2) Sol : Option A

At 2 o' clock, the hour hand is at 2 and the minute hand is at 12. So, they are 10 min. spaces apart. To be together, the minute hand must gain 10 minutes over the hour hand.

Now, 55 minutes are gained by it in 60 min. So, 10 minutes will be gained in $(60/55)\times10$ min.

$= 10(10/11)$ min

The hands will coincide at 10(10/11) min. past 2.

3)Sol : Option B

Formula used = $\theta = 30H - (11/2)M$ where, H= hours, M= minutes

H= 6 , M= 32

Required angle, $\theta = 30\times6 - (11/2)32 = 4°$

4)Sol : Option C

The hands of a clock coincide 11 times in every 12 hours (since between 11 and 1, they coincide only once, i.e. at 12 o' clock). The hands coincide 22 times in a day.

5)Sol : Option D

6)Sol : Option A

Between x and (x + 1) O'clock, the 2 hands will be t min apart at $(5x \pm t)(12/11)$ min past x. Between 6 and 7 O'clock, the 2 hands will be 8 min. apart at $(5\ 6 - 8)(12/11) = 264/11 = 24$ min past 6.

7)Sol : Option B

Clock gains one minute an hour. In 61 min, it shows 1 min less. In 5 hrs (300 min) it will show 300/61 min less actual time will be $6 - (300/61)$ i.e. 55(5/61) min past 5 pm.

8)Sol : Option B

60 min are gained in (60/55)×60 = 65(5/11) min. But they are together after 64 min. Gain in 65 min.= 65(5/11) -64 = (16/11)m Gain in 12 hrs = (16/11) × (12×60/64) = 180/11 =16(4/11) min.

9)Sol : Option A

Between x and (x + 1) O'clock, the 2 hands are in opposite directions at (5x + 30)(12/11) min past x.

So, between 3 and 4, 2 hands will be in opposite directions at (5 3 + 30)(12/11)

= (45)(12/11) = 540/11 = 49(1/11) min past 3.

10)Sol : Option B

Between 5 and 6 pm, hands of a clock will be together at 5 6 (12/11) min past 5 i.e. 360/11 = 32(8/11) min past 5.