# CLOCKS AND CALENDARS

# Clocks

## Important Formulas - Clock

1. Minute Spaces
   The face or dial of clock is a circle whose circumference is divided into 60 equal parts, named minute spaces

2. Hour hand and minute hand
   A clock has two hands. The smaller hand is called the hour hand or short hand and the larger one is called minute hand or long hand.

3. 55 min spaces are gained by minute hand (with respect to hour hand) in 60 min.
   (In 60 minutes, hour hand will move 5 min spaces while the minute hand will move 60 min spaces. In effect the space gain of minute hand with respect to hour hand will be
   60 - 5 = 55 minutes.)

4. Both the hands of a clock coincide once in every hour.

5. The hands of a clock are in the same straight line when they are coincident or opposite to each other.

6. When the two hands of a clock are at right angles, they are 15 minute spaces apart.

7. When the hands of a clock are in opposite directions, they are 30 minute spaces apart.

8. Angle traced by hour hand in 12 hrs = 360°

9. Angle traced by minute hand in 60 min. = 360°.

10. If a watch or a clock indicates 9.15, when the correct time is 9, it is said to be 15 minutes too fast.

11. If a watch or a clock indicates 8.45, when the correct time is 9, it is said to be 15 minutes too slow.

12. The hands of a clock will be in straight line but opposite in direction, 22 times in a day

13. The hands of a clock coincide 22 times in a day

14. The hands of a clock are straight 44 times in a day

15. The hands of a clock are at right angles 44 times in a day

16. The two hands of a clock will be together between H and (H+1) o' clock at $\left(\dfrac{60H}{11}\right)$ minutes past H o' clock.

17. The two hands of a clock will be in the same straight line but not together between H and (H + 1) o' clock at

$$(5H - 30)\frac{12}{11} \text{ minutes past H, when } H > 6$$

$$(5H + 30)\frac{12}{11} \text{ minutes past H, when } H < 6$$

18.

**Angle between Hands of a clock**

When the minute hand is behind the hour hand, the angle between the two hands at M minutes past H'o clock

$$= 30\left(H - \frac{M}{5}\right) + \frac{M}{2} \text{ degree}$$

When the minute hand is ahead of the hour hand, the angle between the two hands at M minutes past H'o clock

$$= 30\left(\frac{M}{5} - H\right) - \frac{M}{2} \text{ degree}$$

19. The two hands of the clock will be at right angles between H and $(H + 1)$ o' clock at

$$(5H \pm 15)\frac{12}{11}\text{minutes past H 'o clock}$$

20.

The minute hand of a clock overtakes the hour hand at intervals of M minutes of correct time. The clock gains or loses in a day by

$$= \left(\frac{720}{11} - M\right)\left(\frac{60 \times 24}{M}\right) \text{ minutes}$$

21. Between H and $(H + 1)$ o' clock, the two hands of a clock are M minutes apart at

$$(5H \pm M)\frac{12}{11}\text{minutes past H 'o clock}$$

**1.** An accurate clock shows 8 o'clock in the morning. Through how may degrees will the hour hand rotate when the clock shows 2 o'clock in the afternoon?
A. 144°        B. 150°        C. 168°        D. 180°
**Answer: Option D**
**Explanation:**

Angle traced by the hour hand in 6 hours $= \left(\frac{360}{12} \times 6\right)^{\circ} = 180^{\circ}$.

**2.** The reflex angle between the hands of a clock at 10.25 is:
A. 180°        B. 192.5°        C. 195°        D. 197.5°

**3.** A clock is started at noon. By 10 minutes past 5, the hour hand has turned through:
A. 145°        B. 150°        C. 155°        D. 160°

**4.** A watch which gains 5 seconds in 3 minutes was set right at 7 a.m. In the afternoon of the same day, when the watch indicated quarter past 4 o'clock, the true time is:

A.59$\frac{7}{}$min. past 3          B.4 p.m.          C.58$\frac{7}{12}$ min. past 3          D.2$\frac{3}{}$min. past 4

**5.** How much does a watch lose per day, if its hands coincide every 64 minutes

A.32$\frac{8}{11}$ min.          B.36$\frac{5}{11}$ min.          C. 90 min.          D. 96 min.

**6.** At what time between 7 and 8 o'clock will the hands of a clock be in the same straight line but, not together?

A.5 min. past 7          B.5$\frac{2}{\backslash 11}$ min. past 7          C.5$\frac{3}{11}$min. past 7          D.5$\frac{5}{11}$ min. past 7

**7.** At what time between 5.30 and 6 will the hands of a clock be at right angles?

A. 43$\frac{5}{\text{I}1}$ min. past 5     B. 43$\frac{7}{11}$ min. past 5     C. 40 min. past 5     D. 45 min. past 5

**8.** The angle between the minute hand and the hour hand of a clock when the time is 4.20, is:

A. 0º          B. 10º          C. 5º          D.     20º

**9.** At what angle the hands of a clock are inclined at 15 minutes past 5?

A.58.5º          B. 64º          C.67.5º          D. 72.5º

**10.** At 3:40, the hour hand and the minute hand of a clock form an angle of:

A. 120°          B. 125°          C.130°          D.135°

**11.** How many times are the hands of a clock at right angle in a day?
A. 22          B. 24          C. 44          D. 48

**12.** The angle between the minute hand and the hour hand of a clock when the time is 8.30, is:
A. 80°          B. 75°          C. 60°          D. 105°

**13.** At what time between 9 and 10 o'clock will the hands of a watch be together?
A. 45 min. past 9          B. 50 min. past 9
C. $49\frac{1}{11}$ min. past 9          D. $48\frac{2}{11}$ min. past 9

**14.** At what time, in minutes, between 3 o'clock and 4 o'clock, both the needles will coincide each other?
A. $5\frac{1}{11}$"          B. $12\frac{4}{11}$"          C. $13\frac{4}{11}$"          D. $16\frac{4}{11}$"

**15.** How many times do the hands of a clock coincide in a day?
A. 20          B. 21          C. 22          D. 24

**16.** How many times in a day, the hands of a clock are straight?
A. 22          B. 24          C. 44          D. 48

**17.** A watch which gains uniformly is 2 minutes low at noon on Monday and is 4 min. 48 sec fast at 2 p.m. on the following Monday. When was it correct?
A. 2 p.m. on Tuesday          B. 2 p.m. on Wednesday
C. 3 p.m. on Thursday          D. 1 p.m. on Friday

**18.** At what time between 4 and 5 o'clock will the hands of a watch point in opposite directions?
A. 45 min. past 4          B. 40 min. past 4
C. $50\frac{4}{11}$ min. past 4          D. $54\frac{6}{11}$ min. past 4

# Calendar

## Leap Year:

(1) = A particular year divisible by 4 is called leap year, also it should not be century year
Eg. 1976, 1840 are leap year as they are divisible by 4

(2) = Each fourth century is a leap year
Eg. 400, 800, 1200, 1600, 2000, 2400 are leap years, but 700, 1300, 1900 are not leap years

**Odd Days:** For a given number of days, number of days more than complete week are called odd days.
Eg. in 10 days, there is one week and 3 odd days.

## Counting of weeks and days in year:

(a) 1 ordinary year has 365 days = 52 weeks + 1 odd day
(b) 1 leap year has 366 days = 52 weeks + 2 odd days
(c) 100 years = 76 ordinary years + 24 leap years = 76*1 + 24*2 = 124 odd days
        = 17 weeks + 5 odd days
(d) Since in 100 years, number of odd days are 5
(e) In 200 years, number of odd days are 5*2= 10 = 1 week + 3 odd days, 3 odd days
(f) Similarly in 300 years 5*3 = 15 = 2 weeks + 1 odd day
(g) Similarly for 400 years number of odd days 5*4 + 1 = 0 odd days, from this we conclude that for 800, 1200, 1600 , 2000, 2400 years odd days will be zero

| Day | Sun | Mon | Tues | Wed | Thurs | Fri | Sat |
|---|---|---|---|---|---|---|---|
| Odd day no. | 0 | 1 | 2 | 3 | 4 | 5 | 6 |

**Ex.** What was the day of the week on 20 may, 1985?

**Ex.** Prove that calendar for the year 2009 will serve for the year 2015.
**Solution:** for this sum of odd days from 2009 to 2014 should be zero.

**Ex.** On what date of Feb. 2007 did Saturday fall?

**Ex.** Today is Tuesday. After 72 days, it will be?

Most of the students are having difficulties in solving the Calendar problems.
Already many logics are there to solve these kinds of problems, but all these logics are difficult to understand. So here is the simple way to solve calendar problems.

In order to solve these type of problems you must know some codes.
- Year Code
- Month Code
- Day Code

*Year Code:-*

| 1600-1699 | 6 |
|-----------|---|
| 1700-1799 | 4 |
| 1800-1899 | 2 |
| 1900-1999 | 0 |
| 2000-2099 | 6 |

*Month Code:-*

| Jan | Feb | Mar | April | May | June | July | Aug | Sep | Oct | Nov | Dec |
|-----|-----|-----|-------|-----|------|------|-----|-----|-----|-----|-----|
| 0 | 3 | 3 | 6 | 1 | 4 | 6 | 2 | 5 | 0 | 3 | 5 |

*Day Code:-*

| Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
|--------|--------|---------|-----------|----------|--------|----------|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 |

*Steps to solve:-*
Step 1: Add the day digit to last two digit of the year.
Step 2: Divide the last two digits of the year by four.
Step 3: Add the Quotient value in step 3 to result obtain in **step 1**.
Step 4: Add Month Code and year codes to the result obtain in **step3**.
Step 5: Divide the result of **step 4** by seven.
Step 6: Obtain the remainder and match with the day code.

**Example:-**

what was the day on **23.04.1990?**

step : 1 (add day + last two digit of the year)

$$(+)\begin{array}{r}23\\90\\\hline 113\\\hline\end{array}$$

step : 2 (divide last two digit of the year by 4)

$$\begin{array}{r}22\\4\overline{)\ 90}\\88\\\hline 2\\\hline\end{array}$$

step : 3 (add quotient value to step 1)

$$\begin{array}{r}113\\22\\6 — \text{Month Code}\\0 — \text{Year Code}\\\hline 141\\\hline\end{array}$$

step : 4 (Divide result of step 3 by 7)

$$\begin{array}{r}20\\7\overline{)\ 141}\\140\\\hline 1\end{array}$$

step : 5 (match the remainder to day code)

1  -->  Monday

**19.** It was Sunday on Jan 1, 2006. What was the day of the week Jan 1, 2010?
A. Sunday      B. Saturday      C. Friday      D. Wednesday

**20.** What was the day of the week on 28th May, 2006?
A. Thursday      B. Friday      C. Saturday      D. Sunday

**21.** What will be the day of the week 15th August, 2010?
A. Sunday      B. Monday      C. Tuesday      D. Friday

**22.** Today is Monday. After 61 days, it will be:
A. Wednesday    B. Saturday      C. Tuesday      D. Thursday

**23.** If 6th March, 2005 is Monday, what was the day of the week on 6th March, 2004?
A. Sunday      B. Saturday      C. Tuesday      D. Wednesday

**24.** On what dates of April, 2001 did Wednesday fall?
A. 1st, 8th, 15th, 22nd, 29th          B. 2nd, 9th, 16th, 23rd, 30th
C. 3rd, 10th, 17th, 24th             D. 4th, 11th, 18th, 25th

**25.** How many days are there in x weeks x days?
A. $7x^2$      B. 8x      C. 14x      D. 7

**26.** The last day of a century cannot be
A. Monday      B. Wednesday      C. Tuesday      D. Friday

**27.** On 8th Feb, 2005 it was Tuesday. What was the day of the week on 8th Feb, 2004?
A. Tuesday      B. Monday      C. Sunday      D. Wednesday\

**28.** The calendar for the year 2007 will be the same for the year:
A. 2014      B. 2016      C. 2017      D. 2018

**29.** Which of the following is not a leap year?
A. 700      B. 800      C. 1200      D. 2000

**30.** On 8th Dec, 2007 Saturday falls. What day of the week was it on 8th Dec, 2006?
A. Sunday      B. Thursday      C. Tuesday      D. Friday

**31.** January 1, 2008 is Tuesday. What day of the week lies on Jan 1, 2009?
A. Monday      B. Wednesday      C. Thursday      D. Sunday

**32.** January 1, 2007 was Monday. What day of the week lies on Jan. 1, 2008?
A. Monday      B. Tuesday      C. Wednesday      D. Sunday

**33.** What was the day of the week on 17th June, 1998?
A. Monday      B. Tuesday      C. Wednesday      D. Thursday