



# Clock & Calendar

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# Clock and Calendar

## **Clocks**

### **Important formula and equations:**

A clock has two hands, hour hand and minute hand – the hour hand is the smaller one and the minute hand is the larger one.

A clock is a complete circle having  $360^\circ$ . It is divided into twelve equal parts that is each part is  $\frac{360}{12} = 30^\circ$ .

A minute hand takes one hour to complete a round and it covers  $360^\circ$  in 60 min. So, in 1 min. it covers  $\frac{360}{60} = 6^\circ$  / min.

After every one hour both the hands coincide once. In 12 hours, both the hands coincide 11 times since between 12 and 1, they coincide only once i.e., at 12 o'clock.

When the two hands are at right angle, they are 15 mins spaces apart. The hands are in the same straight line when they are coincident or opposite to each other.

In 1 hour, they will form two right angles and in 12 hours they will form 22 right angles.

The angle formed by both the minute and hour hand at 3 o'clock and 9 o'clock.

When the hands are in opposite directions, they are 30 min spaces apart.

If a clock indicates 7.15, when the correct time is 7, it is said to be 15 mins too fast.

Also, if a clock indicates 6.45, when the correct time is 7, it is said to be 15 mins too slow.

The minute hand gains 55 mins over hour hand per hour.

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

22 times in a day, the hands of a clock coincide.

44 times in a day, the hands of a clock will be straight.

44 times in a day, the hands of a clock are at right angles.

Some common type of questions asked in the exam,

1. To find the angle between the two hands (i.e., minute hand and hour hand) at a given time.

2. To find the time when the angle between the two hands is given.

3. Questions on losing or gaining the time.

Below we are going to share the types of questions with examples to explain it,

1. What is the angle between the two hands of a clock when the time shown by the clock is 8 p.m.? (in degrees).

A. 120

B. 150

C. 60

D. 50

Ans. A

Sol –

60 minutes made by minute hand complete the one round of  $360^\circ$ .

So, 1 minute by minute hand makes  $= 360/60 = 6^\circ$ .

At 08:00 PM, minute hand will makes 0 angle.

Now, 12 hours made by hour hand makes the one round of  $360^\circ$ .

So, 1 hour made by hour hand makes  $= 360/12 = 30^\circ$ .

Now, the degree makes by hour hand at 8 will be  $= 30 \times 8 = 240^\circ$ .

So, at 08:00 PM there will be two angles between minute and hour hand which are obtuse angle ( $240^\circ$ ) and acute angle ( $120^\circ$ ).

So, the correct option is (A).

2. Find the angle between the minute hand and the hour hand of a clock when the time is 5.10?

- A.  $65^{\circ}$
- B.  $45^{\circ}$
- C.  $75^{\circ}$
- D.  $95^{\circ}$

Ans. D

Sol-

So, Angle by hour hand in 5.10 hrs.  $= \frac{360}{12} \times (5 + \frac{10}{60}) = 30 \times (\frac{31}{6}) = 155$

Angle by minute hand in 10 min  $= \frac{360}{60} \times 10 = 60$

Hence, angle between the minute hand and the hour hand of a clock when the time is; 5.10  $= 155 - 60 = 95$ .

So, the correct option is (D).

3. A clock is started at noon. By 40 minutes past 4, the hour hand has turned through the angle is?

- A.  $140^{\circ}$
- B.  $145^{\circ}$
- C.  $175^{\circ}$
- D.  $155^{\circ}$

Ans. A

Sol-

Angle made by hour hand in 12 hours  $= 360^{\circ}$

Therefore, Angle made by hour hand in 4 hours 40 minutes i.e 4 and  $\frac{2}{3}$  hours

$= 360/12 \times 14/3$

$= 30 \times 14/3$

$= 10 \times 14 = 140^{\circ}$

So, the correct option is (A).

### **Calendar**

#### **Important formula and equations:**

As we know that a Calendar measure a day, a week, a month and a year. In an ordinary year, there are 365 days. The year which is not a leap year is an ordinary years.

Leap year: a year which is divisible by 4, if it is not a century year.

Odd days: In a given period, the number of days more than the complete weeks.

Counting of odd days -In an ordinary year, there are 365 days and in that there are (52 weeks + 1 day). This additional day is called as an odd day.

So, in 1 Leap year there are 366 days which means (52 weeks + 2 days) this shows that there are 2 odd days in 1 leap year.

In 100 years  $= 76$  ordinary years (non- leap years) + 24 leap years

$$= 76 \times 1 + 24 \times 2 = 124 \text{ odd days.}$$

Since, 7 odd days make a week, so by dividing 124 by 7 we get the number of odd days in 100 years that will be 5 (which is the remainder).

Thus, calculating as above; the number of odd days in 200 years is  $5 \times 2 = 10 - 7$  (1 week)  $= 3$  odd days.

The number of odd days in 300 years is  $5 \times 3 = 15 - 14$  (2 weeks)  $= 1$  odd day.

The number of odd days in 400 years is  $\{5 \times 4 + 1 \text{ (leap century)} - 21\} = 0$  odd days.

Likewise, each one of 800 years, 1200 years, 1600 years, 2000 years and so on has 0 odd days.

Given below is the table showing day of the week related to odd days.

| No. of days | Days      |
|-------------|-----------|
| 0 or 7      | Sunday    |
| 1           | Monday    |
| 2           | Tuesday   |
| 3           | Wednesday |
| 4           | Thursday  |
| 5           | Friday    |
| 6           | Saturday  |

Given below is the table showing months and its code.

| Month | Code |
|-------|------|
| Jan   | 1    |
| Feb   | 4    |
| Mar   | 4    |
| Apr   | 0    |
| May   | 2    |
| Jun   | 5    |
| Jul   | 0    |
| Aug   | 3    |
| Sep   | 6    |
| Oct   | 1    |
| Nov   | 4    |
| Dec   | 6    |

In a simple year, months those have same first day; Jan– Oct, Feb – Mar- Nov, Apr- Jul.

In a leap year months those have same first day; Jan-Apr-Jul, Feb-Aug, Mar-Nov.

1<sup>st</sup> and the last day of a simple year remain same as First Jan is on Monday. Thus, the 31<sup>st</sup> Dec of that year will be on Monday as well.

Below we are going to share the types of questions with examples to explain it,

1. Mahatma Gandhi died on 30th January 1948. What was the day on which he died?

- A. Monday
- B. Thursday
- C. Saturday
- D. Friday

Ans. D

Sol-

Up to 1600 AD we have 0 odd days; up to 1900 AD we have 1 odd day.

Now in 47 years we have, 11 leap years and 36 normal years.

Odd days from 1901 to 1947 =  $(11 \times 2 + 36 \times 1) = (22 + 36) = 58$  odd days = 8 weeks + 2 odd days.

Total odd days up to 31st December 1947 is  $(1 + 2) = 3$  odd days.

30 days of January contain only 4 weeks + 2 odd days.

So, 30th January 1948 has total 5 odd days.

Day on 30th January 1948 = Friday.

So, the correct option is (D).

2. Aniruddh's birthday is on Sunday 2nd April. On what day of the week will be Priyansh's Birthday in the same year if Priyansh was born on 28th October?

- A. Saturday
- B. Wednesday
- C. Thursday
- D. Friday

Ans. A

Sol-

| Month     | Number of days |
|-----------|----------------|
| April     | 30             |
| May       | 31             |
| June      | 30             |
| July      | 31             |
| August    | 31             |
| September | 30             |

Days left in April =  $30 - 2 = 28$

Days in October to count = 28

Thus total number of days from Aniruddh's birthday to Priyansh's birthday =  $28 + 31 + 30 + 31 + 31 + 30 + 28 = 209$

Thus number of odd days =  $\frac{209}{7} = 6$

As, Aniruddh's birthday is on Sunday, Priyansh's birthday will on Sunday + 6 days = Saturday.

So, the correct option is (A).

3. If 23 January 2005 was a Thursday, then what day was 22 January 2000?

- A. Wednesday
- B. Thursday
- C. Friday
- D. Sunday

Ans. A

Sol-

Number of days between 22 January 2000 & 23 January 2005

$365 \times 3 + 366 \times 2 - 22 + 23 = 1828$

261 weeks and 1 day.

Since 23 January 2005 was given to be Thursday.

22 January 2000 will be Thursday - 1 = Wednesday.

So, the correct option is (A).