

Calendars

"Today is 15 August 1995". And you are asked to find the day of the week on 15 August 2001.

If you don't know the method, it will prove a tough job for you. This type of question is sometimes asked in competitive exams. The process of finding it lies in obtaining the number of odd days. So, we should be familiar with odd days.

The number of days more than the complete number of weeks in a given period, are called odd days. For example :

- (1) In an ordinary year (of 365 days) there are 52 weeks and one odd day.
- (2) In a leap year (of 366 days) there are 52 weeks and two odd days.

What is the Leap and Ordinary year ?

Every year which is exactly divisible by 4 such as 1988, 1992, 1996 et. is called a leap year.

Also every 4th century is a leap year. The other centuries, although divisible by 4, are not leap years. Thus, for a century to be a leap year, it should be exactly divisible by 400. For example :

- (1) 400, 800, 1200, etc are leap years since they are exactly divisible by 400.
- (2) 700, 600, 500 etc are not leap years since they are not exactly divisible by 400.

How to find number of odd days : An ordinary year has 365 days. If we divide 365 by 7, we get, 52 as quotient and 1 as remainder. Thus, we may say that an ordinary year of 365 days has 52 weeks and 1 day. Since, the remainder day is left odd-out we call it odd day.

Therefore, an ordinary year has 1 odd day.

A leap year has 366 days, i.e. 52 weeks and 2 days.

Therefore, a leap year has 2 odd days.

A century, ie, 100 years has :

76 ordinary years and 24 leap years.

$$= [(76 \times 1 \text{ day}) + [(24 \times 2 \text{ days})]$$

$$= 124 \text{ days}$$

if we divide 124 with 7 there are 17 full weeks and 5 odd days remains.

Therefore, 100 years contain 5 odd days.

Now, (i) 200 years contain 10 odd days, ie, 3 odd days.

(ii) 300 years contain 8 odd days, ie, 1 odd day.

(iii) 400 years contain $6 + 1 = 7$, ie, no odd day.

(Note: 400th year is a leap year therefore, one additional day is added, So number of odd days in year 301 to 400 = 6 instead of 5)

Similarly, 800, 1200 etc contain no odd day.

Practice Problems

1. January 1, 1992 was a Wednesday. What day of the week will it be on January 1, 1993

Ans: 1992 being a leap year, it has 2 odd days. So, the first day of the year 1993 will be two days beyond Wednesday. ie it will be Friday

2. On January 12, 1980, it was Saturday. The day of the week on January 12, 1979 was :

Ans: The year 1979 being an ordinary year, it has 1 odd day. So, the day on 12th January 1980 is one day beyond the day on 12th January, 1979. But, January 12, 1980 being Saturday. January 12, 1979 was Friday

3. On July 2, 1985, it was Wednesday. The day of the week on July 2, 1984 was :

Ans: Let us calculate the number of odd days between these two dates. July month of 1984 has 29 days left. So odd days are 1. Now August 1984 to June 1985 we have $3 + 2 + 3 + 2 + 3 + 2 + 0 + 3 + 2 + 3 + 2$. Now July, 1985 till 2nd July contains 2 odd days. Total 29 odd days. or 1 odd day. So July 2, 1984 is 1 day before Wednesday. It is Tuesday.

(2nd July 1985 is in fact Tuesday, and 2nd July 1984 is Monday)

4. Monday falls on 4th April, 1988. What was the day on 3rd November, 1987 ?

Ans: Counting the number of days after 3rd November, 1987 we have :

	Nov	Dec	Jan	Feb	March	April
days	27	+ 31	+ 31	+ 29	+ 3	+ 4

= 153 days containing 6 odd days

i.e., $(7-6) = 1$ day beyond the day on 4th April, 1988. So, the day was Tuesday.

5. Today is 1st August. The day of the week is Monday. This is a leap year. The day of the week on this day after 3 years will be :

Ans: This being a leap year none of the next 3 years is a leap year. So, the day of the week will be 3 days beyond Monday ie, it will be Thursday.

6. January 16, 1997 was a Thursday. What day of the week will it be on January 4, 2000 ?

Ans: First we look for the leap years during this period.

1997, 1998, 1999 are not leap years.

1998 and 1999 together have net 2 odd days.

No. of days remaining in 1997 = $365 - 16 = 349$ days = 49 weeks 6 odd days.

Total no. of odd days = $2 + 6 + 4 = 12$ days = 7 days (1 week) + 5 odd days

Hence, January 4, 2000 will be 5 days beyond Thursday ie it will be on Tuesday.

7. February 20, 1999 was Saturday. What day of the week was on December 30, 1997 ?

Ans: The year during this interval was 1998 and it was not a leap year. Now, we calculate the no. of odd days in 1999 up to February 19 :

January 1999 gives 3 odd days

19 February 1999 gives 5 odd days

1998, being ordinary year, gives 1 odd day

In 1997, December 30 and 31 give 2 odd days

Total no. of odd days = $3 + 5 + 1 + 2 = 11$ days = 4 odd days

Therefore, December 30, 1997 will fall 4 days before Saturday ie on Tuesday.

8. March 5, 1999 was on Friday, what day of the week will be on March 5, 2000 ?

Ans: Year 2000 is a leap year

No. of remaining days in 1999 = $365 - [31 \text{ days in January} + 28 \text{ days in February} + 5 \text{ days in March}] = 301$ days = 43 weeks ie 0 odd day. No. of days passed in 2000 = January (31 days) gives 3 odd days.

February (29 days, being a leap year) gives 1 odd day March (5 days) gives 5 odd days

Total no. of odd days = $0 + 3 + 1 + 5 = 9$ days ie 2 odd days.

Therefore, March 5, 2000 will be two days beyond Friday, ie on Sunday.

9. On which week day August 15, 1947 falls?

Ans: We know that odd days upto 1600 years are zero.

For the years 1601 to 1700 there exist 5 odd days, 1701 to 1800 there exist 5 odd days, 1801 to 1900 there are another 5 odd days. So upto 1900 there are 15 odd days or 1 odd day

Now from 1901 to 1946 there are 11 leap and 36 non leap years. So number of odd days for these 46 years will be $11 \times 2 + 36 \times 1 = 58$. After dividing this with 7 we get 2 odd days.

Now we entered into year 1947. January contains 3 odd days, february 2, march 3, april 2, may 3, june 2, july 3, august 15 = $3 + 0 + 3 + 2 + 3 + 2 + 3 + 15 = 31 = 3$ odd days

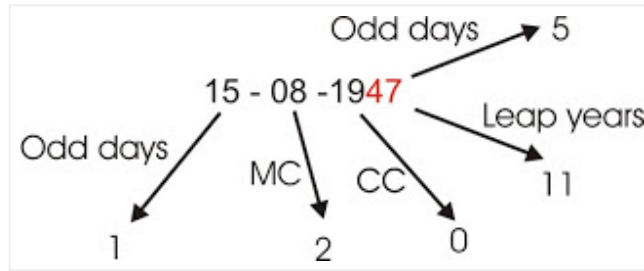
So total odd days = $1 + 2 + 3 = 6$

If odd days are 0 then it is sunday, 1 monday,..... so It is friday

Short Cut:

Remember this shortcut technique: **Month Code:** 033 614 625 035 **Century Code:** 6420

15 - 08 - 1947



Century code explanation: We must consider every 400 years as a set, and of these if the given years fall in between first 100 years then CC = 6, 101 to 200 then CC = 4... So on. For 1947 we should take 1601 to 2000 as a 400 year set. Of these 1947 fall in the last century

Total odd days = $1 + 2 + 0 + 11 + 5 = 19 = 5$

5 odd days means Friday.

10. When do we use same calendar of the year 1968?

Ans: To solve this problem we need to calculate the odd days for consecutive years upto the odd days become 0.

This is a tedious job.

Shortcut:

If the given year is a leap year then add 28

If the given year is an year next to a leap year then add 6

For other years add 11.

Here 1968 is a leap year so add 28 to it. So we can use the same calendar for year 1996

Finding the weekday of a date when a reference date is given

To find on which weekday the given day falls is a bit tricky to calculate by using odd day method. We have to find the number of odd days between the given two days and add to the given reference weekday. To find the odd days we need to divide the number of days between the given days by 7. But by using a simple technique we can solve this problem easily.