27. CALENDAR

IMPORTANT FACTS AND FOAMULAE

Under this heading we mainly deal with finding the day of the week on a particular given date the process of finding it lies on obtaining the number of odd days.

Odd Days : Number of days more than the complete number of weeks in a given

Period ., is the number of odd days during that period.

LeapYear: Every year which is divisible by 4 is called a leap year.

Thus each one of the years 1992, 1996, 2004, 2008, 2012, etc. is a leap year. Every 4th century is a leap year but no other century is a leap year.thus each one of 400, 800, 1200,' 1600, 2000, etc. is a leap year.
None of 1900, 2010, 2020, 2100, etc. is a leap year.

An year which is not a leap year is called an ordinary year.

(I)An ordinary year has 365 days. (II) A leap year has 366 days.

Counting of Odd Days:

i)1 ordinary year = 365 days = (52 weeks + 1 day).
:. An ordinary year has 1 odd day.
ii)1 leap year = 366 days = (52 weeks + 2 days).
:. A leap year has 2 odd days.
iii)100 years = 76 ordinary years + 24 leap years
= [(76 x 52) weeks + 76 days) + [(24 x 52) weeks + 48 days]
= 5200 weeks + 124 days = (5217 weeks + 5 days).
:. 100 years contain 5 odd days.
200 years contain 10 and therefore 3 odd days.
300 years contain 15 and therefore 1 odd day.
400 years contain (20 + 1) and therefore 0 odd day.
Similarly, each one of 800, 1200, 1600, 2000, etc. contains 0 odd days.
Remark: (7n + m) odd days, where m < 7 is equivalent to m odd days.
Thus, 8 odd days ≡ 1 odd day etc.

No of odd days	0	1	2	3	4	5	6
Day	Sun.	Mon.	Tues.	Wed.	Thur.	Fri.	Sat.

SOLVED EXAMPLES

Ex: 1.Wbat was the day of the week on, 16th July, 1776?

Sol: 16th July, 1776 = (1775 years + Period from 1st Jan., 1776 to 16th July, 1776)
Counting of odd days :
1600 years have 0 odd day. 100 years have 5 odd days.
75 years = (18 leap years + 57 ordinary years)
= [(18 x 2) + (57 x 1)] odd days = 93 odd days
= (13 weeks + 2 days) = 2 odd days.

.. 1775 years have (0 + 5 + 2) odd days = 7 odd days = 0 odd day.
Jan. Feb. March April May June July
31 + 29 + 31 + 30 + 31 + 30 +16 = 198days
= (28 weeks + 2 days) =2days
:. . Total number of odd days = (0 + 2) = 2. Required day was 'Tuesday'.

Ex. 2. What was the day of the week on 16th August, 1947?

Sol. 15th August, 1947 = (1946 years + Period from 1st Jan., 1947 to 15th
Counting of odd days:
1600 years have 0 odd day. 300 years have 1 odd day.
47 years = (11 leap years + 36 ordinary years)
= [(11 x 2) + (36 x 1») odd days = 58 odd days = 2 odd days.
Jan. Feb. March April May June July Aug.
31 + 28 + 31 + 30 + 31 + 30 + 31 + 15
= 227 days = (32 weeks + 3 days) = 3,
Total number of odd days = (0 + 1 + 2 + 3) odd days = 6 odd days.
Hence, the required day was 'Saturday'.

Ex. 3. What was the day of the week on 16th April, 2000 ?

Sol. 16th April, 2000 = (1999 years + Period from 1st Jan., 2000 to 16thA'
Counting of odd days:
1600 years have 0 odd day. 300 years have 1 odd day.
99 years = (24 leap years + 75 ordinary years)
= [(24 x 2) + (75 x 1)] odd days = 123 odd days
= (17 weeks + 4 days) = 4 odd days.
Jan. Feb. March April
31 + 29 + 31 + 16 = 107 days = (15 weeks + 2 days) = 2 odd,
Total number of odd days = (0 + 1 + 4 + 2) odd days = 7 odd days = 0 odd day. Hence, the required day was 'Sunday'.

Ex. 4. On what dates of Jull.2004 did Monday fall?

Sol . Let us find the day on 1st July, 2004.
2000 years have 0 odd day. 3 ordinary years have 3 odd days.
Jan. Feb. March April May June July
31 + 29 + 31 + 30 + 31 + 30 + 1
= 183 days = (26 weeks + 1 day) = 1 t .
Total number of odd days = (0 + 3 + 1) odd days = 4 odd days.'
:. 1st July 2004 was 'Thursday',-,-
Thus, 1st Monday in July 2004 _as on 5th July.
Hence, during July 2004, Monday fell on 5th, 12th, 19th and 26th. .

Ex. 5. Prove that the calendar for the year 2008 will serve for the year 20ll

Sol. In order that the calendar for the year 2003 and 2014 be the same, 1st January of both the years must be on the same day of the week.
For this, the number of odd days between 31st Dec., 2002 and 31st Dec.,2013 must be the same.
We know that an ordinary year has 1 odd day and a leap year has 2 odd During this period, there are 3 leap years, namely 2004, 2008 and 2012 and 8 ordinary years.
Total number of odd days = (6 + 8) days = 0 odd day.
Hence, the calendar for 2003 will serve for the year 2014.

Ex. 6. Prove that any date in March of a year is the same day of the week corresponding date in November that year.

We will show that the number of odd days between last day of February and last day of October is zero. .

March April May June July Aug. Sept. Oct.

31 + 30 + 31 + 30 + 31 + 31 + 30 + 31

= 241 days = 35 weeks = 0 odd day. ,Number of odd days during this period = O.

Thus, 1st March of an year will be the same day as 1st November of that year. Hence, the result follows.