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We are supposed to find the day of the week on a given date.

For this, we use the concept of *odd days.*

I. Odd Days: In a given period, the number of days more than the complete weeks are called *odd days.*

II. Leap Year:

  (*i*) Every year divisible by 4 is a leap year, if it is not a century.

  (*ii*) Every 4th century is a leap year and no other century is a leap year.

  Note : A leap year has 366 days.

  Examples:

  (*i*) Each of the years 1948, 2004, 1676 etc. is a leap year.

  (*ii*) Each of the years 400, 800, 1200, 1600, 2000 etc. is a leap year.

  (*iii*) None of the years 2001, 2002, 2003, 2005, 1800, 2100 is a leap year.

III. Ordinary Year:

  The year which is not a leap year is called an ordinary year. An ordinary year has 365 days.

IV. Counting of Odd Days:

  (*i*) 1 ordinary year = 365 days = (52 weeks + 1day).

    ∴ *1 ordinary year has 1 odd day.*

  (*ii*) 1 leap year = 366 days = (52 weeks + 2 days).

    ∴ *1 leap year has 2 odd days.*

  (*iii*) 100 years = 76 ordinary years + 24 leap years

          = (76 × 1 + 24 × 2) odd days = 124 odd days

          = (17 weeks + 5 days) ≡ 5 odd days.

∴ Number of odd days in 100 years = 5

  Number of odd days in 200 years = (5 × 2) ≡ 3 odd days

  Number of odd days in 300 years = (5 × 3) ≡ 1 odd day.

  Number of odd days in 400 years = (5 × 4 + 1) ≡ 0 odd day.

  Similarly, each one of 800 years, 1200 years, 1600 years, 2000 years, etc. has 0 odd days.

V. Day of the Week Related to Odd Days:

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

SOLVED EXAMPLES

Ex. 1. *What was the day of the week on 16th July, 1776?*

Sol. 16th July, 1776 = (1775 years + Period from 1.1.1776 to 16.7.1776)

  Counting of odd days:

  Number of odd days in 1600 years = 0

  Number of odd days in 100 years = 5

  75 years = 18 leap years + 57 ordinary years

          = (18 × 2 + 57 × 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)	= 198 days

198 days = (28 weeks + 2 days) ≡ 2 odd days.

∴   Total number of odd days = (0 + 2) = 2.

Hence, the required day is Tuesday.

Ex. 2. *What was the day of the week on 15th August, 1947?*

Sol. 15th August, 1947 = (1946 years + Period from 1.1.1947 to 15.8.1947)

Odd days in 1600 years = 0

Odd days in 300 years = (5 × 3) = 15 ≡ 1

46 years = (11 leap years + 35 ordinary years)

= (11 × 2 + 35 × 1) odd days = 57 odd days

= (8 weeks + 1 day) ≡ 1 odd day.

∴ Odd days in 1946 years = (0 + 1+ 1) = 2.

Jan.		Feb.		March		April		May		June		July		Aug	
(31	+	28		31	+	30	+	31	+	30	+	31	+	15)	= 227 days

227 days = (32 weeks + 3 days) ≡ 3 odd days.

Total number of odd days = (2 + 3) = 5.

Hence, the required day is Friday.

Ex. 3. *What was the day of the week on 4th June, 2002?*

Sol. 4th June, 2002 = (2001 years + Period from 1.1.2002 to 4.6.2002)

Odd days in 1600 years = 0

Odd days in 400 years = 0

Odd days in 1 ordinary year = 1

Odd days in 2001 years = (0 + 0 + 1) = 1

Jan.		Feb.		March		April		May		June	
(31	+	28	+	31	+	30	+	31	+	4)	= 155 days

= 22 weeks + 1 day ≡ 1 odd day

Total number of odd days = (1 + 1) = 2

∴ Required day is Tuesday.

Ex. 4. *On what dates of March 2005 did Friday fall?*

Sol. First we find the day on 1.3.2005

1.3.2005 = (2004 years + Period from 1.1.2005 to 1.3.2005)

Odd days in 1600 years = 0 Odd days in 400 years = 0

4 years = (1 leap year + 3 ordinary years)

= (1 × 2 + 3 × 1) odd days = 5 odd days

Jan.		Feb.		March	
(31	+	28	+	11)	

= 60 days = (8 weeks + 4 days) ≡ 4 odd days.

Total number of odd days = (0 + 0 + 5 + 4) = 9 ≡ 2 odd days

∴ 1.3.2005 was Tuesday. So, Friday lies on 4.3.2005

Hence, Friday lies on 4th, 11th, 18th and 25th of March, 2005.

Ex. 5. *Prove that the calendar for the year 2003 will serve for the year 2014.*

Sol.   We must have same day on 1.1.2003 and 1.1.2014.

So, number of odd days between 31.12.2002 and 31.12.2013 must be 0.

This period has 3 leap years and 8 ordinary years.

Number of odd days = (3 × 2 + 8 × 1) = 14 ≡ 0 odd day

∴ Calendar for the year 2003 will serve for the year 2014.

EXERCISE

(OBJECTIVE TYPE QUESTIONS)

Directions: *Mark (√) against the correct answer in each of the following:*

1. January 1, 2007 was Monday. What day of the week lies on Jan. 1, 2008?
(*a*) Monday (*b*) Tuesday
(*c*) Wednesday (*d*) Sunday

2. January 1, 2008 is Tuesday. What day of the week lies on Jan. 1, 2009?
(*a*) Monday (*b*) Wednesday
(*c*) Thursday (*d*) Sunday

3. 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

4. On 6th March, 2005 Monday falls. What was the day of the week on 6th March, 2004?
(*a*) Sunday (*b*) Saturday
(*c*) Tuesday (*d*) Wednesday

5. The calendar for the year 2007 will be the same for the year:
(*a*) 2014 (*b*) 2016
(*c*) 2017 (*d*) 2018

6. 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

7. What was the day of the week on 17th June, 1998?
(*a*) Monday (*b*) Tuesday
(*c*) Wednesday (*d*) Thursday

8. What was the day of the week on 28th May, 2006?
(*a*) Thursday (*b*) Friday
(*c*) Saturday (*d*) Sunday

9. What will be the day of the week on 15th August, 2010?
(*a*) Sunday (*b*) Monday
(*c*) Tuesday (*d*) Friday

10. Today is Monday. After 61 days, it will be
(*a*) Wednesday (*b*) Saturday
(*c*) Tuesday (*d*) Thursday

11. The last day of a century cannot be
(*a*) Monday (*b*) Wednesday
(*c*) Tuesday (*d*) Friday

12. Which of the following is not a leap year?
(a) 700 (*b*) 800
(*c*) 1200 (*d*) 2000

13. How many days are there in x weeks x days?
(a) $7x^2$ (*b*) $8x$
(*c*) $14x$ (*d*) 7

14. It was Sunday on Jan 1, 2006. What was the day of the week on Jan 1, 2010?
(a) Sunday (*b*) Saturday
(*c*) Friday (*d*) Wednesday

15. 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

16. For a certain month, the dates of three of the Sundays are even numbers. Then, the 15th of the that month falls on a **[SSC—CGL (Tier I) Exam, 2012]**
(*a*) Thursday (*b*) Friday
(*c*) Saturday (*d*) Sunday

17. What was the day of the week on 15 August, 1947?
[DMRC— Customer Relationship Assistant (CRA) Exam, 2016]
(*a*) Saturday (*b*) Friday
(*c*) Thursday (*d*) Wednesday

18. The calendar for the year 2009 will be the same as that of the year
[DMRC— Customer Relationship Assistant (CRA) Exam, 2016]
(*a*) 2013 (*b*) 2014
(*c*) 2015 (*d*) 2014

ANSWERS

1. (*b*)	**2.** (*c*)	**3.** (*d*)	**4.** (*b*)	**5.** (*d*)	**6.** (*d*)	**7.** (*c*)	**8.** (*d*)	**9.** (*a*)	**10.** (*b*)
11. (*c*)	**12.** (*a*)	**13.** (*b*)	**14.** (*c*)	**15.** (*c*)	**16.** (*c*)	**17.** (*b*)	**18.** (*c*)		

SOLUTIONS

1. The year 2007 is an ordinary year. So, it has 1 odd day.

1st day of the year 2007 was Monday.

1st day of the year 2008 will be 1 day beyond Monday.

Hence, it will be Tuesday.

2. The year 2008 is a leap year. So, it has 2 odd days.

1st day of the year 2008 is Tuesday (Given)

So, 1st day of the year 2009 is 2 days beyond Tuesday.

Hence, it will be Thursday.

3. The year 2006 is an ordinary year. So, it has 1 odd day.

So, the day on 8th Dec, 2007 will be 1 day beyond the day on 8th Dec, 2006.

But, 8th Dec, 2007 is Saturday.

∴ 8th Dec, 2006 is Friday.

4. The year 2004 is a leap year. So, it has 2 odd days.

∴ The day on 6th March, 2005 will be 2 days beyond the day on 6th March, 2004.

But, 6th March, 2005 is Monday.

∴ 6th March, 2004 is Saturday.

5. Count the number of odd days from the year 2007 onwards to get the sum equal to 0 odd day.

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Odd day	1	2	1	1	1	2	1	1	1	2	1

Sum = 14 odd days ≡ 0 odd day.

∴ Calendar for the year 2018 will be the same as for the year 2007.

6. We shall find the day on 1st April, 2001.

1st April, 2001 = (2000 years + Period from 1.1.2001 to 1.4.2001)

Odd days in 1600 years = 0

Odd days in 400 years = 0

Jan.   Feb.   March   April
(31 + 28 + 31 + 1) = 91 days ≡ 0 odd days.

16. The dates of three of the Sundays are even number is 2, 9, 16, 23, 30.

So, on 16th of that month = Sunday, 15th of that month falls on a Saturday

17. 15 August, 1947 means 1946 complete years + first 7 months upto July 1947 + 15 days of August 1947

1600 years have 0 odd day.

300 years have 1 odd day

46 years have 11 leap years and 35 ordinary years

$$= (11 \times 2) + (35 \times 1)$$
$$= 22 + 35 = 57 \text{ odd days}$$
$$= 8 \times 7 + 1 \text{ odd days}$$
$$= 8 \text{ weeks} + 1 \text{ odd day}$$

Up to 1946 there are 1 + 1 = 2 odd days

January 1947 ⇒ 3 odd days

February 1947 ⇒ 0 odd days

(1947 is a normal year)

March 1947 ⇒ 3 odd days

April 1947 ⇒ 2 odd days

May 1947 ⇒ 3 odd days

June 1947 ⇒ 2 odd days

July 1947 ⇒ 3 odd days

Up to 15 August ⇒ 15 odd days

Total number of odd days up to 15 August 1947

= 2 + 3 + 0 + 3 + 2 + 3 + 2 + 3 + 15 = 33 odd days.

Hence, 15th August, 1947 was Friday.

18. 2008 was a leap year.

A leap year has two odd days.

Suppose year 2008 starts with a Monday.

Then the first day of 2009 was Wednesday.

Now,

First day of 2010 ⇒ Thursday

First day of 2011 ⇒ Friday

First day of 2012 ⇒ Saturday

Because 2012 was a leap year

First day of 2013 ⇒ Monday

First day of 2014 ⇒ Tuesday

First day of 2015 ⇒ Wednesday

Thus, the calendar for the year 2009 was the same as that of the year 2015.