7. CALENDARS

Suppose you are asked to find the day of the week on 6th NOV, 1983, or on what day you celebrated your birth day 10 years ago, it would be a tough job to find it if you do not know the method. The method of finding the day of the week lies in the number of "odd days".

Every 7th day will be the same day count wise, i.e. if today is Monday, then the 7th day counting from Tuesday onwards will once again be Monday. Odd days are the days remaining after completion of an exact number of weeks. Odd days are the reminder obtained on dividing the total number of days with seven.

Example*:* 54 days ÷ 7 = 5 odd days.
73 days ÷ 7 = 3 odd days

S.No.	Month	Days	Odd days
1.	January	31	3
2.	February	29/28	1/0
3.	March	31	3
4.	April	30	2
5.	May	31	3
6.	June	30	2
7.	July	31	3
8.	August	31	3
9.	September	30	2
10.	October	31	3
11.	November	30	2
12.	December	31	3
	Total	**366/365**	**2/1**

Leap and Non-leap Year:

A Non- leap year has 365 days whereas a leap year has 366 days (one extra day because of 29 days in the month of February). Every year which is divisible by 4 is called a leap year.

A non-leap year consists of 365 days
(52 complete weeks + 1 day). The extra one day is the odd day.

A Leap year consists of 366 days,
(52 complete weeks + 2 days), the extra two days are the odd days. So, a leap year has two odd days.

Example: Years 632, 856, 968, 1340, 1672, 1820, 1996, 2008… Are leap years as all these years divisible by 4.

Years 410, 530, 674, 893, 1015, 1346, 1626, 1854, 1998, 2006…. Are non leap years as all these years not divisible by 4.

Note: Every century, year which is a multiple of 400, is a leap year. A century year which is not divisible by 400 is a non-leap year.

Example: 400, 800, 1200, 1600 …. are leap years. 500, 700, 900, 1900 … are nonleap years.

Counting the number of Odd Days:

100 years consist of 24 leap years + 76 ordinary years. (100 years when divided by 4, we get 25. But the 100th year is not a leap year, hence only 24 leap years).
= 2 x 24 odd days + 1 x 76 odd days
= 124 days
= 17 weeks + 5 days
The extra 5 days are the odd days.
So, 100 years contain 5 odd days.
Similarly, for 200 years we have 10 extra days (1 week + 3 days).
∴ 200 years contains 3 odd days.
Similarly, 300 years contain 1 odd day and 400 years contain 0 odd days. This repeats from here for every 400 years.

500 years~100 years
600 years~200 years
700 years~300 years
800 years~400 years
1300 years~100 years
1800 years~200 years
2700 years~300 years

100 years	5 odd days
200 years	3 odd days
300 years	1 odd day
400 years	0 odd days

Counting of number of odd days, when only one date is given and no reference date is given:

Here we take 1st January 1 AD as the earlier date and we assume that this day is a Monday. We take its previous day, i.e. Sunday as the reference day. After this the above mentioned method is applied to count the number of odd days and find the day of the week for the given date.

Monday	1
Tuesday	2
Wednesday	3
Thursday	4
Friday	5
Saturday	6
Sunday	7~0

Counting number of odd days, when reference date is given to find the required date:

Here first we find the gap between reference date and required date. If the gap is in years, then we find the

number of odd days yearly wise. If the gap is only in months, then we calculate the odd days month wise. I f the gap is a combination of years and months we apply above two methods to find the number of odd days.

Any month which has 31 days has 3 odd days. ($\because$ 31 $\div$ 7 leaves 3 as remainder) and any month which has 30 days has 2 odd days (30 $\div$ 7 leaves 2 as remainder).

Then, the total number of odd days is calculated by adding the odd days for each month. The value so obtained is again divided by 7 to get the final number of odd days. The day of the week of the second date is obtained by adding the odd days to the day of the week of the earlier date.

Examples:

1. If today is Monday, then what will be the 17th day from today?

Sol: Number of odd days in 17 days = 17 $\div$ 7= 3
So, 17th day = Monday+3=Thursday

2. If today is Wednesday, then what was the day 29 days ago from today?

Sol: Number of odd days in 29 days = 29 $\div$ 7= 1
So, 29th day = Wednesday-1=Tuesday

3. Rakesh decided to visit the doctor once for every 100 days and if he visits on Sunday for the first time, then on what day he visits the doctor for 4th time?

Sol: we need to find the 300th day from Sunday.
Number of odd days in 300 days = 300 $\div$ 7=6
So, 3rd time he visits on = Sunday+6=Saturday

4. On which day of the week does 11th June, 2001 fall?

Sol: 11th June 2001 $\Rightarrow$ (2000) years + 1st January to 4th June 2001.
We know that 2000 years have zero odd days. The number of odd days from 1st January to 11th June 2001.
Month : Jan + Feb + Mar + Apr + May + June
Odd day: 3 + 0 + 3 + 2 + 3 + 11

$\frac{22}{7}$ = 1 odd day.

Hence, 11th June 2001 was Monday.

5. What day of the week was 14th April 2301?

Sol: 14th April 2301 $\Rightarrow$ (2000 + 300) years + 1st January to 14th April 2301. 2000 years have – 0 odd days 300 years have – 1 odd day
The number of odd days from 1st January, 2301 to 14th April 2301 is (3 + 0 + 3 + 0) days
= 6 odd days
$\therefore$ Total number of odd days = 6 + 1 = 7 $\cong$ 0
Hence, 14th April 2301 is Sunday.

6. If you were born on 6thth November, 1983, which was a Sunday, then on which day of the week does your birthday fall in 1984?

Sol: 6th November 1983 to 6th November 1984 is a complete year, which has 366 days. Hence, the number of odd days $\cong$ 2. So, required day is Tuesday.

7. If 1st Jan, 1995 is a Tuesday then on which day of the week will 1st Jan, 1996 fall?

Sol: Though 1996 is a leap year, we are not considering the February here. So it is a non leap year gap.
There is 1 odd day.
Hence, 1st January 1996 is one day after Tuesday i.e., Wednesday.

8. If 1st April, 2003 was Monday, then which day of the week will 25th December of the same year be?

Sol: The number of days from 1st April to 25th December (29 + 31 + 30 + 31 + 31 + 30 + 31 + 30 + 25) days
= 268 days

$= \frac{268}{7}$ = 38 + 2 odddays

Hence, 25th December is two days after Monday, i.e., Wednesday.

9. Which year will have the same calendar as that of 2005?
(1) 2006 (2) 2007 (3) 2008
(4) 2011 (5) 2012

Sol: Year: 2005+2006+2007+2008+2009 +2010
Odd days: 1+ 1+ 1+ 2+ 1 + 1
Total number of odd days from 2005 to 2010 are 7 $\cong$ 0 odd days.
Hence, 2011 will have the same calendar as that of 2005.

Exercise

Directions for questions 1 to 32: Select the correct alternative from the given choices.

1. How many odd days are there in 422 days?
(1) 1 (2) 2 (3) 3 (4) 0

2. Which among the following years is a leap year?
(1) 3000 (2) 3100 (3) 3200 (4) 3300

3. If in a calendar year, there are 531 days and 9 days a week, then how many odd days will be there in that year?
(1) 1 (2) 2 (3) 3 (4) 0

4. In a year how many months have exactly 31 days?
(1) 5 (2) 6
(3) 7 (4) Depends on the year

5. How many odd days are there in the year 1786?
(1) 1 (2) 2
(3) 0 (4) None of these

6. If holidays are declared only on Saturdays and in a particular year 19th March is a Saturday, is 30th September in that year a holiday?
(1) Yes (2) No
(3) Yes, if it is a leap year.
(4) No, if it is a leap year.
(5) Cannot be determined

7. On which dates of October, 1994 did Wednesday fall?
(1) 4, 11, 18, 25 (2) 2, 9, 16, 23, 30
(3) 1, 8, 15, 22, 29 (4) 5, 12, 19, 26

8. What will be next leap year after 4096?
(1) 4100 (2) 4101 (3) 4104 (4) 4108

9. What is the next leap year after 2396?
(1) 2402 (2) 2408 (3) 2404 (4) 2400

10. Which day of the week was 25th December, 1999?
(1) Sunday (2) Saturday
(3) Tuesday (4) Wednesday

11. Which day of the week was 27th August 2176?
(1) Sunday (2) Wednesday
(3) Thursday (4) Tuesday

12. Which day of the week was 2001, Jan 19?
(1) Friday (2) Tuesday
(3) Wednesday (4) Thursday

13. The first Republic day was celebrated on 26th Jan 1950. It was a
(1) Monday (2) Friday
(3) Thursday (4) Tuesday

14. Which day of the week is 21st April 2013?
(1) Sunday (2) Wednesday
(3) Thursday (4) Monday

15. Which day of the week was 31-01-2000?
(1) Friday (2) Tuesday
(3) Wednesday (4) Monday

16. Which day of the week was 31-12-1990?
(1) Friday (2) Tuesday
(3) Monday (4) Thursday

17. Which day of the week was 28-12-2000?
(1) Friday (2) Tuesday
(3) Wednesday (4) Thursday

18. If 8th January 1998 was a Wednesday, then 8th January 1997 was on which day?
(1) Wednesday (2) Thursday
(3) Tuesday (4) Monday

19. If 17th September 1993 was a Sunday, then which day of the week was 30th June 1989?
(1) Wednesday (2) Thursday
(3) Friday (4) Sunday

20. If 11th August 2005 was a Sunday, that which day of the week was 15th August 2006?
(1) Tuesday (2) Monday
(3) Thursday (4) Friday

21. If 1st January 2011 is a Sunday, then which day of the week will the New Year be celebrated in 2015?
(1) Friday (2) Sunday
(3) Wednesday (4) Saturday

22. If 1st April 1983 was a Sunday, then which day of the week will 1st August 1979 be?
(1) Friday (2) Monday
(3) Tuesday (4) Thursday

23. If 23rd March 2006 is a Friday, then 23rd March 2106 will be a
(1) Wednesday (2) Thursday
(3) Friday (4) Saturday

24. If the first day of the years 2016 and 2027 are Tuesday, which day of the week will the last days of years be respectively?
(1) Tuesday, Monday
(2) Wednesday, Tuesday
(3) Monday, Tuesday
(4) Sunday, Monday

25. If 15th April 2006 is a Monday, then 15th April 2706 is a
(1) Sunday (2) Friday
(3) Tuesday (4) Monday

26. In a year, if 6th November is a Friday then 12th January in that year is on which day of the week?
(1) Monday (2) Wednesday
(3) Sunday (4) cannot be determined

27. In a leap year, which month will have the same calendar as that of January in that year?
(1) April (2) July
(3) October (4) Both (1)and (2)

28. Which year will have same calendar as 1984?
(1) 2020 (2) 2008
(3) 2012 (4) 2004 (5) 1988

29. The last day of a century cannot be
(1) Friday (2) Wednesday
(3) Monday (4) Tuesday

30. Which of the following has the same calendar as 2005?
(1) 2010 (2) 2008
(3) 2012 (4) 2011

31. If 3rd Tuesday of April is on 18th, then which day will occur 5 times in that month?
(1) Saturday (2) Wednesday
(3) Sunday (4) both (1) and (3)

32. The birthdays of two friends Agna and Jigna are on 15th January and 15th June respectively. In 2012, Agna and Jigna celebrated their birthdays on Tuesday and Sunday respectively. In 2013, on which day will Agna celebrate her birthday?
(1) Tuesday (2) Friday
(3) Thursday (4) Wednesday

33. In question 32, In 2013, on which day will Jigna celebrate her birthday?
(1) Monday (2) Tuesday
(3) Friday (4) Sunday

34. In question 32, In 2011, on which day will Agna celebrate her birthday?
(1) Sunday (2) Monday
(3) Wednesday (4) Thursday

35. In question 32, In 2011, on which day will Jigna celebrate her birthday?
(1) Monday (2) Friday
(3) Sunday (4) Wednesday

Calendars													
1	2	**6**	2	**11**	4	**16**	3	**21**	1	**26**	4	**31**	4
2	3	**7**	4	**12**	1	**17**	4	**22**	1	**27**	4	**32**	3
3	4	**8**	3	**13**	3	**18**	3	**23**	1	**28**	3	**33**	1
4	3	**9**	4	**14**	1	**19**	4	**24**	2	**29**	4	**34**	2
5	1	**10**	2	**15**	4	**20**	4	**25**	3	**30**	4	**35**	2