Calendar

Introduction

In the Gregorian calendar, a normal year consists of 365 days. Because the actual length of a sidereal year (the time required for the Earth to revolve once about the Sun) is actually 365.2425 days, a "leap year" of 366 days is used once every four years to eliminate the error caused by three normal (but short) years.

Ordinary Year

An ordinary year is a year which has 365 days (52 weeks + 1 odd day).

- Such years are not divisible by 4, e.g. 2001, 2002, 2003, 2005, 2006, 2007, 2009, 2010 and 2011, etc.
- Ordinary years in the form of a century which are not exactly divisible by 400, e.g. 100, 200, 500, 600, 700 and 900 etc.

Properties of Ordinary Year

- In an ordinary year, the first and last days of the year are same e.g., In an ordinary year, if 1st January falls on Monday, then 31st December will also be on Monday.
- In any two consecutive ordinary years, date of the next year will be one day ahead of the same date of the previous year, e.g. If 2nd August, 2010 is Tuesday, then 2nd August, 2011 will be Wednesday.

Leap Year

A leap year is a year which has 366 days (52 weeks + 2 days).

- Such years are exactly divisible by 4, e.g. 2004, 2008, 2012, 2016, etc.
- Leap years in the form of a century are exactly divisible by 400, e.g. 400, 800, 1200, 1600, 2000, 2400, etc.

Properties of Leap Year

- Last day of a leap year is one day ahead of the first day, e.g. in a leap year, if 1st January, 2004 falls on Monday, then 31st December, 2004 will be on Tuesday.

Concept of Odd days

- Concept of odd days emerges from the concept of a week.
- Concept of a week - The day gets repeated after every seventh day.
- Ex - If today is Monday, then after 28 days there will also be a Monday as it a multiple of 7 (28/7 = 4, so four weeks). Ex - If today is Monday, then after 30 days = 28 + 2 (4 weeks and 2 days), i.e. 30/7 will give a remainder of 2. These two days are odd days. With starting day as Monday and two odd days, the day after 30 days will be Wednesday.

Months	Number of Odd days
Jan	3
Feb	0/1(leap year)
March	3
April	2
May	3
June	2
July	3
August	3
September	2
October	3
November	2
December	3

Number of odd days in an ordinary year

- Number of odd days in an ordinary year = Remainder (365/7} = 1 odd day
- Number of odd days in a leap year = Remainder {366/7} = 2 odd days
- Number of odd days in 100 years = 76 ordinary years + 24 leap years
  = 76 odd days of 76 ordinary years + (24 × 2) odd days of 24 leap years
  = 76 odd days + 48 odd days
  = 124 odd days = (7 × 17 + 5) odd days
  = 5 odd days
- Number of odd days in 200 years = (Odd days in 100 years) x 2 = 5 x 2 = 10 days = 1 week + 3 days = 3 odd days
- Number of Odd Days in 300 years = 100* 3 = 5*3 = 15 days and when it gets divided by 7, we will have remainder 1 and so. Odd days in 300 years = 1
- Now Odd days in 400 years = 5* 4 + 1 = 21 days which is a multiple of 7.
- Hence, odd days in 400 years = 0.

Zeller's Rule

The following formula is named Zeller's Rule after a Reverend Zeller.

- [x] means the greatest integer that is smaller than or equal to x. For positive numbers, you can find this number by just dropping everything after the decimal point. For example, [3.79] is 3.

Here's the formula:

f = k + [(13*m-1)/5] + D + [D/4] + [C/4] – 2*C.

- **k is the day of the month**. Let's use January 29th, 2064 as an example. For this date, k = 29.
- **m is the month number**.
- Months have to be counted specially for Zeller's Rule: March is 1, April is 2, and so on to February, which is 12.
- **D is the last two digits of the year**. Because in our example we are using January (see previous bullet) D = 63 (In Zeller's rule a year starts from March) even though we are using a date from 2064.
- **C stands for century**: it's the first two digits of the year. In our case, C = 20.

Now let's substitute our example numbers into the formula.

f = k + [(13*m-1)/5] + D + [D/4] + [C/4] – 2*C
= 29 + [(13*11-1)/5] + 63 + [63/4] + [20/4] – 2*20
= 29 + [28.4] + 63 + [15.75] + [5] – 40
= 29 + 28 + 63 + 15 + 5 – 40
= 100.

Once we have found f, we divide it by 7 and take the remainder.

Note that **if the result for f is negative**, care must be taken in calculating the proper remainder. Suppose f = -17. When we divide by 7, we have to follow the same rules as for the greatest integer function; namely we find the greatest multiple of 7 *less* than 17-, so the remainder will be positive (or zero). 21- is the greatest multiple of 7 less than 17-, so the remainder is 4 since 17- = 4 + 21-. Alternatively, we can say that 7- goes into 17- twice, making 14- and leaving a remainder of 3-, then add 7 since the remainder is negative, so 7 + 3- is again a remainder of 4.

A remainder of 0 corresponds to Sunday, 1 means Monday, etc. For our example, 100 / 7 = 14*7 + 2 so, remainder 2, and therefore, January 29th, 2064 will be a Tuesday.

Solved MCQs

Q 1. The year next to 1990 will have the same calendar as that of the year 1990.

(a) 1995

(b) 1997

(c) 2001

(d) 1992

Answer: c

The year 1990 has 365 days. i.e. 1 odd day,
the year 1991 has 365 days, i.e. 1 odd day,
the year 1992 has 366 days i.e. 2 odd days.
The likewise year 1993, 1994, 1995 have 1 odd day each,

1996 – 2 Odd days

1997 – 1 Odd day

1998 – 1 Odd day

1999 – 1 Odd day

2000 – 2 Odd day
Total – 14 Odd days (Multiple of 7)
The sum of odd days, so calculated from years 1990 - 2000
Hence, the year 2001 will have the same calendar as that of the year 1990.

Q 2. If 26th January 2011 was Wednesday, then what day of the week was it on 26th January 2012?

(a) Monday

(b) Wednesday

(c) Tuesday

(d) Thursday

Answer: d

26th January 2011 to 26th January 2012 will be considered as an ordinary year because 26th January in 2012 (a leap year) comes before 29th February.
Hence, the period of this one year will have only 1 odd day.
Since 26th January 2011 = Wednesday
∴26th January 2012 = Wednesday + 1 odd day = Thursday

Q 3. If Ramesh was born on 28th January 1988, which was a Sunday, on what day of the week will Ramesh's birthday fall in 1989?

(a) Monday
(b) Tuesday
(c) Sunday
(d) None of the above

Solution: b

Since, 1988 is a leap year and as Ramesh birthday is before 29 February, Ramesh's birthday in the next year will be two days aft er Sunday.
since a leap year will have two odd days, which is Tuesday.

Q 4. How many leap years does first 100 years have?

(a) 23
(b) 24
(c) 25
(d) 26

Answer: b

Given number of years is divided by 4, and the quotient gives the number of leap years.
Here, 100 ÷ 4 = 25.
But, as 100 is not a leap year => 25 - 1= 24 leap years.

Q 5. What was the day of the week on 28th May, 2006?

(a) Thursday
(b) Friday
(c) Saturday
(d) Sunday

Answer: d

28 May, 2006 = (2005 years + Period from 1.1.2006 to 28.5.2006)
Odd days in 1600 years = 0
Odd days in 400 years = 0
5 years = (4 ordinary years + 1 leap year) = (4 x 1 + 1 x2) 6 odd days
Jan. Feb. March April May
(31 + 28 + 31 + 30 + 28) = 148 days
148 days = (21 weeks + 1 day) = 1 odd day.
Total number of odd days = (0 + 0 + 6 + 1) = 7 = 0 odd day. Given day is Sunday.

Q 6. What was the day of the week on 21st June, 1999?

(a) Monday
(b) Tuesday
(c) Wednesday
(d) Thursday

Solution: a

Zeller's Rule
F=k+ [(13*m-1)/5] +D+ [D/4] +[C/4]-2*C where,
k is the day of the month = 21
m is the month number = 4 (March = 1, and so on….)
D is the last two digits of the year = 99
C is the first two digits of the year = 19
Putting this value in the equation, we will get:
F = 120, dividing it by 7, we will get 1
Hence, using date code, the day will be Monday.

Q 7. On 15th August 2015, what will be day?

(a) Sunday
(b) Monday
(c) Saturday
(d) Friday

Answer: **c**

Zeller's Rule

F=k+ [(13*m-1)/5] +D+ [D/4] +[C/4]-2*C where,k is the day of the month = 15 m is the month number = 6 (March = 1, and so on….)
D is the last two digits of the year = 15
C is the first two digits of the year = 20
Putting the value, we will get = 15 + [(13*2 -1)/5] + 15 + [15/4] + [20/4] – 2*20
F = 13; and will result in remainder 6 when divided by 7
Date Code – Sun = 0, Mon = 1, Tuesday = 2……., Saturday = 6.
Hence, Saturday will be the answer.

Q 8. If today is Sunday, then after 75 days, it will be:

(a) Wednesday
(b) Saturday
(c) Tuesday
(d) Friday

Answer: d

There is a repetition after 7 days. Hence, by dividing 75 with 7 days, we will get 5 odd days.
Hence, 5 days after Sunday and that is Friday.

Q 9. If first, third and fifth Saturday and all Sundays are holidays in a 31 days month beginning on Saturday, then how many working days are there in that month?

(a) 21
(b) 23
(c) 25
(d) 24

Answer: b

Explanation: The 1st day of the month is Saturday, so 2nd, 9th, 16th, 23rd, 30th days will be Sundays.
Saturdays will be on – 1st, 8th, 15th, 22nd and 29th.
Hence, no. of working days = 31 – 8 =23.

Q 10. The calendar of the year 2024 can be used again in the year?

(a) 2052
(b) 2036
(c) 2040
(d) 2048

Answer: a

Repetition of leap year: Add +28 to the Given Year.
Repetition of non leap year
Step 1 : Add +6 to the Given Year. If Result is a leap year, then Go to step 2.
Step 2: Add +11 to the Given Year
2024 is a leap year. Hence, we should add 28 to the 2024, which comes out to be 2052.

Practice MCQs

Q 11. 1. If Thursday is on March 17th,1994 then, what will be the day on Feb 24th,1995?

(a) Sunday
(b) Monday
(c) Tuesday
(d) Friday

Q 12. What are the dates in July 2004 which are Monday, if 5th July 2003 is Saturday.

(a) 6th,10th,21st ,30th
(b) 1st, 7th, 14th, 21st
(c) 5th, 12th, 19th and 26th
(d) 6th, 13th, 20th, 27th

Q 13. Find out the number of leap years in first 300 years.

(a) 71
(b) 72
(c) 73
(d) 74

Q 14. On which date in July was Ramesh born?

1. Ramesh's mother remembers that Ramesh was born before nineteenth but after fifteenth.
2. Ramesh's brother remembers that Ramesh was born before seventeenth but after twelfth.

(a) Only statement I is sufficient to answer the question
(b) Only statement II is sufficient to answer the question
(c) Both the statements are necessary to answer the question
(d) None of statement is sufficient to answer the question

Q 15. The last Saturday of April, 2006 fell on which date?

1. The first Saturday of that month fell on 4th.
2. The last day of that month fell on Thursday.

(a) Only statement I is sufficient to answer the question
(b) Only statement II is sufficient to answer the question
(c) Either of the statements is sufficient to answer the question
(d) None of statement is sufficient to answer the question

Q 16. If Friday falls on 12th July 2013, what will be the day on 3rd January 2014?

(a) Sunday
(b) Saturday
(c) Friday
(d) Tuesday

Q 17. Mrs. Susheela celebrated her wedding anniversary on Tuesday 30th September 1997. What will she celebrate her next wedding anniversary on same day (Tuesday)?

(a) 30 Sept 2003
(b) 30 Sept 2004
(c) 30 Sept 2002
(d) 30 October 2003

Q 18. The last day of a century will not be –

(a) Tuesday
(b) Saturday
(c) Thursday
(d) All of the above

Q 19. Republic Day of India was celebrated on Thursday in 2017. On which day it was celebrated in 2021?

(a) Tuesday
(b) Wednesday
(c) Thursday
(d) Friday

Q 20. If the fourth day of a month is Wednesday, then which day will come on the third day after the 19th day of the same month?

(a) Tuesday
(b) Saturday
(c) Sunday
(d) Friday

Q 21. Mohini went to the movies nine days ago. She goes to the movies only on Thursday. What day of the week is today?

(a) Thursday
(b) Tuesday
(c) Saturday
(d) Friday

Q 22. Today is Saturday. After 59 days, it will be:

(a) Sunday
(b) Monday
(c) Tuesday
(d) Saturday

Q 23. I. 1998 and 1987 will have the same calendars.

II. 2025 and 2031 will have same calendars.
III. 2020 and 2030 will have same calendars.

(a) Only one statement is correct.
(b) Only two statements are correct.
(c) All the statements are correct.
(d) None of the statements is correct.

Q 24. Ramesh birthday falls on the date which is equal to the number of prime numbers in that month.

i. There are four possibilities for the date of birthday of Ramesh.
ii. There are three possibilities for the date of birthday of Ramesh.
iii. Ramesh birthday can never be a date which is also a prime number.
iv. Ramesh's birthday can never be a date divisible by 3.

(a) Only one statement is correct.
(b) Only two statements are correct.
(c) Only three statements are correct.
(d) All the statements are correct.

Q 25. What will be the date on which Dinesh birthday falls?

i. The date can be written as a product of three consecutive prime numbers.
ii. The date can be written in the form of $X^x + X$ where X is a prime number.

(a) Only I is sufficient to answer the question.

(b) Only II is sufficient to answer the question.

(c) Both the statements are necessary to answer the question.

(d) Both the statements are insufficient to answer the question.

Solution

Q 1. Answer: d

Here, we will be counting Odd days:
March – 14 - 0
April – 30 - 2
May – 31 - 3
June – 30 - 2
July – 31 - 3
August – 31 - 3
September – 30 - 2
October – 31 - 3
November – 30 - 2
December – 31 - 3
January – 31 - 3
February – 24 – 3
Hence 29 odd days, implies – 1 odd day, Hence, 24 February 1995 will be Friday.

Q 2. Answer: c

Explanation:

Number of odd days after 5th July 2003 till 5th July 2004 is 2 odd days. (Since, one year having February of Leap Year 2004 will consists of 366 days)
Hence, 5th July 2004 is two days after Saturday i.e Monday.

Q 3. Answer: b

Divide the year by 4 and the quotient will give the number of leap years.
Here, 300%4 = 75.
But, as 100,200 and 300 are not leap years.
Hence, 75 - 3= 72 leap years.

Q 4. Answer: c

From I, we conclude that Ramesh was born on any one of the dates among 16th, 17th and 18th. From II, we conclude that Ramesh was born on any one of the dates among 13th, 14th, 15th and 16th. Thus, from both I and II, we conclude that Ramesh was born on 16th August.

Q 5. Answer: c

From I, we conclude that 4th, 11th, 18th and 25th of April, 2006 were Saturday. So, the last Saturday fell on 25th. From II, we conclude that 30th April, 2006 was Thursday. Thus, 25th March, 2006 was the last Saturday of the month.

Q 6. Answer: c

Month	Jul	Aug	Sep	Oct	Nov	Dec	Jan
Days	19	31	30	31	30	31	3
Odd Days	5	3	2	3	2	3	3

Therefore, No. of Odd Days = 5 + 3 + 2 + 3 + 2 + 3 + 3 = 21 = 0 odd days
So, given day Friday + 0 = Friday is the required result.

Q 7. Answer: a

We have to find the year which has same calendar as same as that of 1997. 1997 is an ordinary year and so calendar will repeat after 6years. Therefore, 30th September 2003 will be Tuesday.

Q 8. Ans – d

Solution-100 years contain 5 odd days. (so, the last day of the 1st century is Friday.) 200 years contain (5 × 2) = 3 odd days. (so, the last day of the 2nd century is Wednesday.) 300 years contain (5 × 3) = 15 = 1 odd day (so, Last day of 3rd century is Monday.) 400 years contain 0 odd days. (Last day of the 4th century is Sunday.)
This cycle is repeated. Therefore, the last day of a century cannot be Tuesday or Thursday, or Saturday.

Q 9. Answer: a

We know that in 365 days we have 1 odd day.
26 January 2017 = Thursday
26 January 2018 = Friday
26 January 2019 = Saturday
26 January 2020 = Sunday.
2020 is a leap year so February has 29 days.
26 January 2021 = Sunday + 2 = Tuesday (+2 because of leap year, In 366 days we have 2 odd days)

Q 10. Answer: C

Solution- The fourth day of the month is Wednesday so, the first day of the month = Sunday
The third day after the 19th day of the month = the 22nd day of the month
1st day of the month = 8th day of the month = 15th day of the month = 22nd day of the month = Sunday.

Q 11. Answer: c

Dividing 9 with 7 we get 2 as remainder. Hence, Today will be Saturday.

Q 12. Answer: c

Dividing 59 with 7 we get 3 as remainder. Hence, three days after Saturday is Tuesday.

Q 13. Answer: b

Explanation: Calendar of an ordinary year and leap year repeat after 6 or 11 and 28 years respectively.
Hence, 1987 and 1998 will have same calendar and 2031 and 2025 will have same calendar.

Q 14. Answer: a

There can be 28, 29, 30, 31 days in a month.
Hence, number of prime dates in 28, 29, 30, 31 days will be 9, 10, 10, 11 respectively.
Thus, Ramesh birthday may fall on these days: 9^{th}, 10^{th} or 11^{th}.

Q 15. Answer: a

Prime numbers are: 2, 3, 5, 7, 11…..so on.
Statement I: Product of three consecutive prime numbers which will give result less than 31 such primes are 2, 3 and 5.
Hence, Dinesh birthday falls on 30^{th}.
From statement II. The values can be $2^2 + 2$, 3^3+3 which is 6 and 30 respectively. Hence, Here we have two outcomes.