

EXERCISE 3.2

Calendar — Odd Days Method / Applied Mathematics-XI

Quick Reference

Weekday codes: 0=Sunday, 1=Monday, 2=Tuesday, 3=Wednesday, 4=Thursday, 5=Friday, 6=Saturday

Century odd days (repeats every 400 yrs): $100 \rightarrow 5$, $200 \rightarrow 3$, $300 \rightarrow 1$, $400 \rightarrow 0$

Days before each month (non-leap): Jan-0, Feb-31, Mar-59, Apr-90, May-120, Jun-151, Jul-181, Aug-212, Sep-243, Oct-273, Nov-304, Dec-334 (add 1 from March onward in a leap year)

Method for 'find the day': Odd days of (year-1) + Odd days of ordinary/leap years remaining + Odd days of the date within its year $\rightarrow$ total mod 7 $\rightarrow$ weekday code

Q1. Find the day of the week

(i) 4th January 2002

Year - 1 = 2001. Break as 2000 (multiple of 400 $\rightarrow$ 0 odd days) + 1 ordinary year (1 odd day) = $0 + 1 = 1$

Days from 1 Jan to 4 Jan = 4 $\rightarrow$ 4 odd days

Total = $1 + 4 = 5$

Answer: Friday

(ii) 13th August 1975

Year - 1 = 1974 = 1600 (0 odd days) + 300 yrs [1601–1900] (1 odd day) + 74 yrs [1901–1974]

In 74 yrs: leap years = 18 (1904 to 1972), ordinary = 56 $\rightarrow$ odd days = $56 \times 1 + 18 \times 2 = 92 \rightarrow 92 \bmod 7 = 1$

Total up to 1974 = $0 + 1 + 1 = 2$

Days from 1 Jan to 13 Aug 1975 (not leap) = $212 + 13 = 225 \rightarrow 225 \bmod 7 = 1$

Total = $2 + 1 = 3$

Answer: Wednesday

(iii) 28th December 1998

Year - 1 = 1997 = 1900 (1 odd day, as above) + 97 yrs [1901–1997]

In 97 yrs: leap years = 24 (1904 to 1996), ordinary = 73 $\rightarrow$ odd days = $73 + 48 = 121 \rightarrow 121 \bmod 7 = 2$

Total up to 1997 = $1 + 2 = 3$

Days from 1 Jan to 28 Dec 1998 (not leap) = $334 + 28 = 362 \rightarrow 362 \bmod 7 = 5$

Total = $3 + 5 = 8 \rightarrow 8 \bmod 7 = 1$

Answer: Monday

Q2. Find the day of the week

(i) 22nd November 2025

Year - 1 = 2024 = 2000 (0 odd days) + 24 yrs [2001–2024]

In 24 yrs: leap years = 6 (2004 to 2024), ordinary = 18 $\rightarrow$ odd days = $18 + 12 = 30 \rightarrow 30 \bmod 7 = 2$

Total up to 2024 = $0 + 2 = 2$

Days from 1 Jan to 22 Nov 2025 (not leap) = $304 + 22 = 326 \rightarrow 326 \bmod 7 = 4$

Total = $2 + 4 = 6$

Answer: Saturday

(ii) 21st September 2080

Year - 1 = 2079 = 2000 (0 odd days) + 79 yrs [2001–2079]

In 79 yrs: leap years = 19 (2004 to 2076), ordinary = 60 $\rightarrow$ odd days = $60 + 38 = 98 \rightarrow 98 \bmod 7 = 0$

Total up to 2079 = $0 + 0 = 0$

2080 is a leap year $\rightarrow$ days from 1 Jan to 21 Sep 2080 = $244 + 21 = 265 \rightarrow 265 \bmod 7 = 6$

Total = $0 + 6 = 6$

Answer: Saturday

(iii) 18th October 2100

Year - 1 = 2099 = 2000 (0 odd days) + 99 yrs [2001–2099]

In 99 yrs: leap years = 24 (2004 to 2096), ordinary = 75 → odd days = 75 + 48 = 123 → $123 \bmod 7 = 4$

Total up to 2099 = 0 + 4 = 4

2100 is NOT a leap year (divisible by 100, not 400) → days from 1 Jan to 18 Oct 2100 = 273 + 18 = 291 → $291 \bmod 7 = 4$

Total = 4 + 4 = 8 → $8 \bmod 7 = 1$

Answer: Monday

Q3. Today is Tuesday. Find the day on the 7706th day.

$7706 \div 7 = 1100$ weeks + 6 odd days

Tuesday + 6 days → Wed, Thu, Fri, Sat, Sun, Mon

Answer: Monday

Q4. 22 April 1970 was Wednesday. Find the day on 31 May 1999.

Days remaining in 1970 after 22 April (not leap) = $365 - (90 + 22) = 365 - 112 = 253$ → $253 \bmod 7 = 1$

Full years 1971–1998 = 28 yrs: leap = 7 (1972–1996), ordinary = 21 → odd days = 21 + 14 = 35 → $35 \bmod 7 = 0$

Days from 1 Jan to 31 May 1999 (not leap) = $120 + 31 = 151$ → $151 \bmod 7 = 4$

Total shift = 1 + 0 + 4 = 5

Wednesday + 5 days → Thu, Fri, Sat, Sun, Mon

Answer: Monday

Q5. 10 June 1948 was Thursday. Find the day on 16 November 1969.

1948 is a leap year. Days remaining after 10 June = $366 - (152 + 10) = 366 - 162 = 204$ → $204 \bmod 7 = 1$

Full years 1949–1968 = 20 yrs: leap = 5 (1952–1968), ordinary = 15 → odd days = 15 + 10 = 25 → $25 \bmod 7 = 4$

Days from 1 Jan to 16 Nov 1969 (not leap) = $304 + 16 = 320$ → $320 \bmod 7 = 5$

Total shift = 1 + 4 + 5 = 10 → $10 \bmod 7 = 3$

Thursday + 3 days → Fri, Sat, Sun

Answer: Sunday

Q6. 8 March 1996 was Friday. Find the day on 8 March 1993.

Going year by year from March 8, 1993 to March 8, 1996, each step adds 1 day (ordinary year ahead) or 2 days (if the year ahead is a leap year, since Feb 29 falls in between):

1993 → 1994: 1994 not leap → +1

1994 → 1995: 1995 not leap → +1

1995 → 1996: 1996 leap → +2

Total forward shift = 1 + 1 + 2 = 4

So March 8, 1993 = March 8, 1996 - 4 days = Friday - 4 days = Monday

Answer: Monday

Q7. On which dates of April 2007 did Thursday fall?

Year - 1 = 2006 = 2000 (0 odd days) + 6 yrs [2001–2006]: leap = 1 (2004), ordinary = 5 → odd days = 5 + 2 = 7 → $7 \bmod 7 = 0$. Total = 0

Days from 1 Jan to 1 Apr 2007 (not leap) = $90 + 1 = 91$ → $91 \bmod 7 = 0$

Total = 0 + 0 = 0 → 1st April 2007 is Sunday

Sunday + 4 days = Thursday → first Thursday is 5th April; then every 7 days

Answer: 5, 12, 19, 26 April 2007

Q8. On which dates of May 1999 did Saturday fall?

Year - 1 = 1998 = 1900 (1 odd day) + 98 yrs [1901–1998]: leap = 24 (1904–1996), ordinary = 74 → odd days = $74 + 24 = 98 \rightarrow 98 \bmod 7 = 0$. Total = 1 + 0 = 1

Days from 1 Jan to 1 May 1999 (not leap) = 120 + 1 = 121 → $121 \bmod 7 = 2$

Total = 1 + 2 = 3 → 1st May 1999 is itself Saturday

Answer: 1, 8, 15, 22, 29 May 1999

Q9. Rahul's birthday is Saturday, 5th June. Radhika was born 13th September (same year). Find Radhika's birthday's weekday.

Days between 5 June and 13 Sept = (days before Sept +13) - (days before June +5) = (243+13) - (151+5) = 256 - 156 = 100

$100 \bmod 7 = 2$

Saturday + 2 days → Sunday, Monday

Answer: Monday

Q10. Covid-19 Lockdown: 25 March 2020 (midnight) to 3 May 2020 (midnight)

(i) Total number of days the lockdown lasted

25 March → 25 April = 31 days (6 remaining days of March + 25 days of April)

25 April → 3 May = 8 days

Total = 31 + 8 = 39 days

Answer: 39 days

(ii) If 25 March 2020 is Wednesday, find the day on 3 May 2020

Duration = 39 days → $39 \bmod 7 = 4$ (since $35 = 7 \times 5$, $39 - 35 = 4$)

Wednesday + 4 days → Thu, Fri, Sat, Sun

Answer: Sunday