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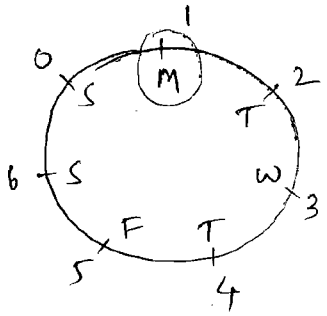
# Pure Apptitude

## ⇒ Calender :-

→ Gregorian Calender ; In which 1st Jan 001 was assumed as Monday




### Odd days :

→ It is defined as remainder when no. of days is divided by seven.

$$\text{Remainder} = \left(\frac{\text{Total days}}{7}\right)$$

| Month | No. of odd days |
|---|---|
| Jan → | 3 |
| Feb → | 0 |
| Mar → | 3 |
| Apl → | 2 |
| May → | 3 |
| June → | 2 |
| July → | 3 |
| Aug → | 3 |
| Sep → | 2 |
| Oct → | 3 |
| Nov → | 2 |
| Dec → | 3 |

→ In one-Non leap year ⇒ No. of odd days = $\frac{365}{7}$ ≈ Remainder : 1

→ In Leap-year ⇒ No. of odd days = $\frac{366}{7}$ ≈ Remainder = 2

→ Leap year :- When year is completely divisible by 4.

$$\frac{\text{Year}}{4} \approx \text{Remainder} = 0$$

But above concept is not applicable in case of Century years (i.e, 100, 200, 300, 400, ...)

→ Hence Century year will be a Leap year only when it is divisible by 400.

$$\text{i.e, } \frac{\text{Century year}}{400} \approx \text{Rem. is } 0.$$

Ex:-

1996 ≈ Leap year (∵ It is divisible by 4).

$1900 \approx \frac{1900}{400} \neq$ Leap year (∵ Not divisible by 400)

$2000 \approx \frac{2000}{400} =$ Leap year (∵ Divisible by 400).

→ No. of odd days in 100 years = $\frac{76 \text{ years \& } 24 \text{ Leap years}}{7}$

$$= \frac{76 \times 1 + 24 \times 2}{7}$$

$$= \frac{124}{7} \approx \text{Rem. is } \underline{5} \text{ (learn)}$$

→ No. of odd days in 200 years = $\frac{2 \times 5}{7} = \frac{10}{7} \approx$ Rem. is 3 (learn)

→ No. of odd days in 300 years = $\frac{3 \times 5}{7} = \frac{15}{7} \approx$ Rem. is 1 (learn)

→ No. of odd days in 400 years = $\frac{4 \times 5 + 1}{7} = \frac{21}{7} \approx$ Rem. is 0

→ No. of odd days in 1600 years = 0

→ No. of odd days in 2000 years = 0.

Note:-

) In one Non-leap year No. of odd days = 1

$\therefore \frac{365}{7} =$ Rem. is 1.

$\therefore$ 1 Jan $\approx$ 1 $\approx$ M

$\therefore$ 31st Dec $\approx$ 1 $\approx$ M.

→ Hence, 1st and last day of any Non-leap year is always same

→ Hence (1st Jan 001, 1st Jan 401, 1st Jan 801, 1st Jan 1201, 1st Jan 1601, 1st Jan 2001) are all "Mondays".

Q: the Calender for 2007 will be same for the calender of the year?

a) 2015 b) 2016 c) 2017 d) 2018

Sol:

| 2007 | 2008 | 2009 | 2010 | 2011 | 2012 (?) | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 2 | 1 | |
| odd days → 1 | 2 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | | | |

$\frac{14}{7} \approx$ Rem. 0

Q: Last day of the century years cannot be ——?

Sol: 100 ⟶ odd days = 5 (Fri)

200 ⟶ odd days = 3 (Wed)

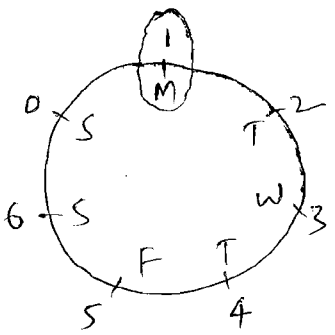
300 ⟶ odd days = 1 (Mon)

400 ⟶ odd days = 0 (Sun)

∴ Hence Last day of the century years can't be Tue, Thur, Sat.

⇒ Questions based on Type-I : (when reference point is given) :-

In such situations we follow Gregorian calender



Q:- Which days of the week will fall on —?

a) 15 Aug 1947 b) 15 Sep 1995 c) 5 May 2007

Sol:-

a) In 1600 yrs → No. of odd days = (0)

In 300 yrs → No. of odd days = (1)

In 46 yrs → No. of odd days = $\frac{11 \text{ Lp.Yrs} + 35 \text{ yrs}}{7}$

$= \frac{11 \times 2 + 35 \times 1}{7} = \frac{57}{7} \approx$ Rem. is (1).

In, Jan No. of odd days = 3

Feb ----------→ = 0

Mar ----------→ = 3

Apl ----------→ = 2

May ----------→ = 3

June ----------→ = 2

July ----------→ = 3

Remaining, Aug ----------→ $\frac{15}{7} \approx$ Rem. is (1)

∴ Total odd days = $\frac{19}{7} \approx$ Rem. is (5) ⇒ Friday.

b) In 1900 yrs → No. of odd days = 1

In 94 yrs → No. of odd days = $\frac{23 \text{ Lp. years} + 71 \text{ yrs}}{7}$

$= \frac{23 \times 2 + 71 \times 1}{7}$

= Rem. is 5 ⇒

In Jan No. of odd days = 3

Feb ----------→ = 0

⋮

July ----------→ = 3

Aug ----------> 3

Remaining, Sep ----------> $\frac{15}{7}$ ≈ Rem. is (1)

∴ Total odd days = $\frac{26}{7}$ ≈ Rem. is (5) ⇒ Friday

c) In 2000 yrs → No. of odd days = (0)

In 6 yrs → No. of odd days = $\frac{1 \text{ Lp yr} + 5 \text{ yr}}{7}$

$= \frac{2+5}{7}$ ≈ Rem. is (0)

In, Jan No. of odd days = 3

Feb ----------> = 0

Mar ----------> = 3

Apl ----------> = 2

Remaining, May ----------> = (5)

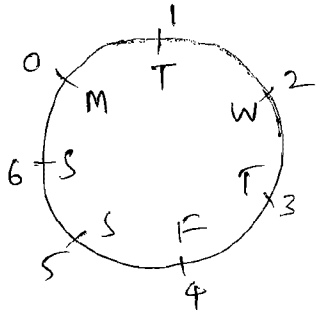
∴ Total odd days = $\frac{13}{7}$ ≈ Rem. is (6) ⇒ Saturday.

⇒ Questions based on Type-II :- (When reference point is given) :-

(Don't follow Gregorian Calender).

Q:- if 10th April 2007 was Tuesday, then what day of the week will fall on 25th December 2010?.

Sol:- Let us assume that, 10th April 2007 ≈ 1st day ≈ (1 ≈ Tuesday)




→ From 10th April 2007 to 9th April 2010, No. of yrs = (3)

So, no. of odd day = 1 Lp yr + 2 yrs = (4)

In, Remaining, April No. of odd days = $\frac{21}{7}$ = Remainder is (0)

May ----------→ 3

June ----------→ 2

July ----------→ 3

Aug ----------→ 3

Sep ----------→ 2

Oct ----------→ 3

Nov ----------→ 2

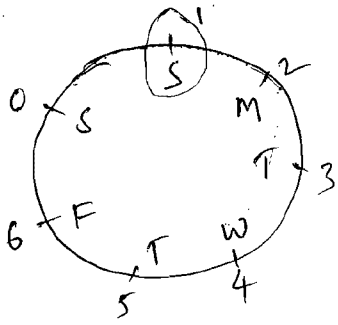
Remaining, Dec ----------→ $\frac{25}{7}$ ≈ Rem. is (4)

∴ Total odd days = $\frac{26}{7}$ ≈ Rem. is (5) ⇒ Saturday.

Q:- If CAT is always held on 3rd Sunday of November and in the year 2007 it was held on 18th Nov. then on which date will it be held in 2009?

Sol:- (This is Type-II question).

Let us assume that, 18th Nov. 2007 as I st day ≈ 1 ≈ Sunday




∴ from 18th Nov. 2007 to 17th Nov. 2009, No. of yrs = 2

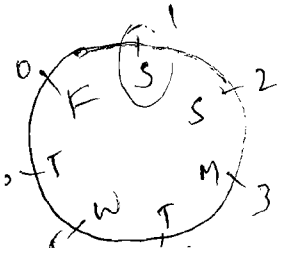
→ No. of odd days = 1 p yr + 1 yr = 2+1 = 3 ≈ Tuesday

i.e, 17th Nov. 2009 is Tuesday

i.e, 15th Nov ⟶ 3rd Sunday

Q:- If 12th Jan. year 1450 is saturday, then which day of the week is 27th Jan year 1750?

Sol:- Let us assume that, 12th Jan 1450 ≈ I st day ≈ (1 = Sat)




from 12th Jan 1450 to 11th Jan 1750 → No. of yrs = 300 yrs

No. of odd day in these 300 yrs = 1 + (1) → (for yr 1600)

= 2

→ Remaining, Jan.... → No. of odd day = $\frac{16}{7}$ ≈ Rem. is (2)

∴ Total odd days = (4) ⇒ Tuesday.

Q:- If 10th April 2007 was Tuesday, then which day of the week would be 2nd oct 2002?

Sol:- Instead of going back we should move forward to maintain safe strategy.

10th April 2007 Tuesday, 2nd oct 2002?

let us assume that 2nd oct 2002 as 1st days = (1 = ?)

→ from 2nd oct 2002 to 1st Oct 2006, No. of yrs = 4

∴ No. of odd days = $\frac{1 \text{ Lp. yr} + 3 \text{ yrs}}{7} \approx \frac{1\times2 + 3\times1}{7} \approx$ Rem. is (5)

→ Remaining; Oct → No. of odd days = $\frac{30}{7} \approx$ Rem. is (2)

Nov ----------→ = (2)

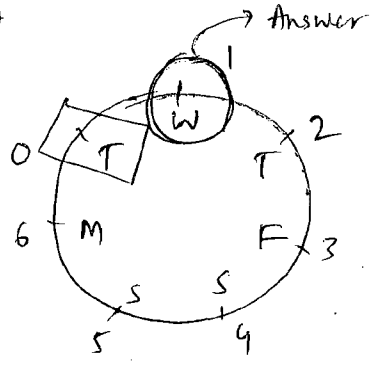
Dec ----------→ = (3)

Jan ----------→ = (3)

Feb ----------→ = (0)

Mar ----------→ = (3)

Remaining, April ----------→ = $\frac{10}{7} \approx$ Rem. is (3)




∴ Total odd days = $\frac{21}{7} \approx$ Rem. is (0) ≃ Tuesday (given)

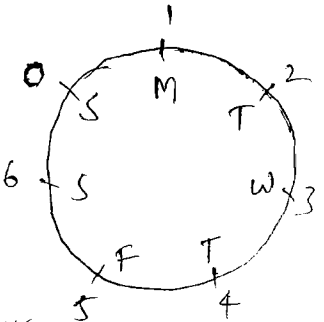
Q:- A workman starts his work on Monday & work for 8 days & takes 9th day as his holiday, then his twelth (12th) holiday will fall on?

Sol:- Workman works 8 days & 9th day is Holiday, then his cycle is of 9 days

for 12th Holiday he should complete 12 cycles.

∴ Total days = 12×9 = 108 days

i.e, 108th day is his 12th Holiday




∴ Total odd day = $\frac{108}{7} \approx$ Rem. is (3) ⇒ Wednesday

# 2. Circular Motion

→ Time taken to meet/catch = $\frac{\text{Track length}}{\text{Relative speed } (S_1 \pm S_2)}$

Note :-

→ if they are moving in a same direction, relative speed = $S_1 - S_2$

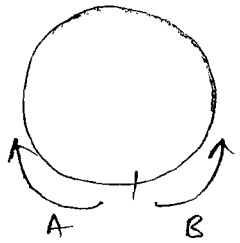
" " " " opposite direction, relative speed = $S_1 + S_2$

Case(i) :-

→ if they are moving in opposite direction :-

On meeting for the first time they have together run one complete track length

i.e, Sum of the distances run by them till their first meeting = 1 track length




Case(ii) :-

→ if they are moving in same direction :-

On meeting for the first time faster Athlete has to run one complete track length more than the slower one.

i.e, Difference of the distances run by them so far = One complete track length

Ex: Three Athletes A, B & C are running on a circular track of length 1200m with speeds 30, 50 & 80 m/sec. A is running clockwise, B & C are running in Anti-clockwise direction?

i) Find the time after which A & B meet for 1st time?

Sol:- A & B meet for 1st time,

$$\text{Time} = \frac{\text{Track length}}{\text{Relative speed}} = \frac{1200}{30+50} = 15 \text{ sec}$$