CLOCKS & CALENDERS

→ 12 hour spaces 30° each

→ The hands overlap about every 65 minutes

→ The hands coincide 22 times a day.

Non leap year
52 week + 1 odd day (extra)

Leap year
52 weeks + 2 odd days

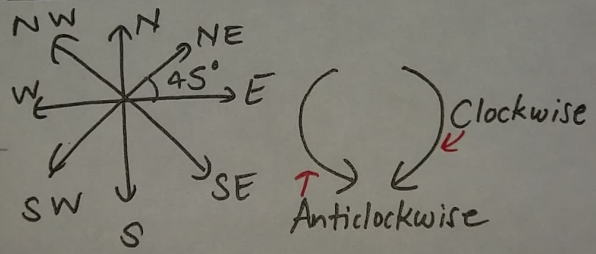
Years	No. of odd
Ordinary year	1
Leap year	2
100 years	5
200 "	3
300 "	1
400 "	0

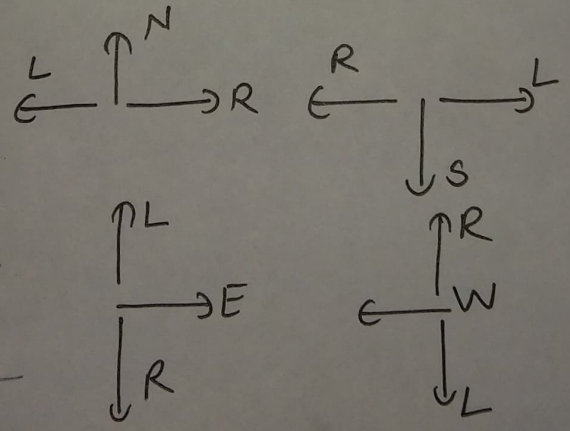
Month	J	F	M	A			J	A	S	O	N	D
No. of odd days	3	0/1	3	2	3	2	3	3	2	3	2	3

if leapyear

Code — Day
0 → Sunday
1 → Monday
2 → Tuesday
3 → Wednesday
4 → Thursday
5 → Friday
6 → Saturday

DIRECTION SENSE





Shadow:

Sunrise (till 12pm) — Towards West
Sunset (after 12pm) — Towards east
At 12 noon — no shadow ×

If a person faces,

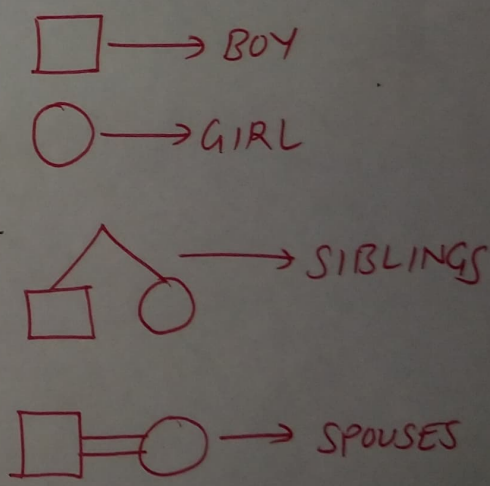
N

Before 12 pm
Shadow left
After 12 pm
Shadow right

S

Before 12 pm
Shadow right
After 12 pm
Shadow Left

BLOOD RELATION



PROFIT & LOSS

$P = SP - CP$ *

$L = CP - SP$ $\frac{\text{Error}}{\text{Total\_Error}} \times 100$

$\% P = \frac{P}{CP} \times 100$

$\% L = \frac{L}{CP} \times 100$

In case of Profit:

$SP = CP \times \frac{(100 + \text{gain}\%)}{100}$

In case of Loss:

$CP = SP \times \frac{(100 - \text{Loss}\%)}{100}$

TIME & WORK * same for pipes & cisterns

Work (Effort) = Manpower × Time

Efficiency $\propto \frac{1}{T}$ → Time

Efficiency $\propto W$ → Work

LCM (x) A → x → No. of days

LCM (y) B → y

LCM (z) C → z

LCM (x, y, z) → Total Work

↑ Efficiency

CHAIN RULE

Work Done = (No of men) × Days × Hrs / Days

$W = M \times D \times H$

$W_1 = M_1 \times D_1 \times H_1$

$W_2 = M_2 \times D_2 \times H_2$

$\frac{W_1}{W_2} = \frac{M_1 \times D_1 \times H_1}{M_2 \times D_2 \times H_2}$

TIME, SPEED & DISTANCE

$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$

Distance = Speed × Time

km/hr $\xrightarrow{\times 5/18}$ m/s

m/s $\xrightarrow{\times 18/5}$ km/hr

$S \propto D$

$D \propto T$

$S \propto \frac{1}{T}$

Relative speed = $x - y$ (same direction)

$= x + y$ (opposite direction)

Average speed = $\frac{\text{Total Distance}}{\text{Total Speed}}$

BOATS & STREAMS

u → speed of boat in still water

v → speed of stream

Speed downstream = $(u + v)$

Speed upstream = $(u - v)$

a → speed downstream

b → " upstream

Speed in still water = $\frac{1}{2}(a + b)$

Rate of stream = $\frac{1}{2}(a - b)$

ALLIGATION

(Find what ratio)

CP of cheaper quantity (x) — CP of costlier quantity (y) → Mean Price (m)

(y − m) : (m − x)

$$\frac{\text{Quantity of cheaper}}{\text{Quantity of costlier}} = \frac{y-m}{m-x}$$

PERCENTAGE

Expenditure = Price × Consumption

* same for value of a product

$P \propto \frac{1}{\text{Consumption}}$ (Exp = constant)

3/4 → 75%	5/4 → 125%
4/5 → 80%	3/2 → 150%
2/3 → 66.6%	1/16 → 6.25%
5/6 → 83.3%	3/8 → 37.5%
6/5 → 120%	1/3 → 33.3%

1/9 → 11%	1/13 → 7.69%
1/11 → 9.09%	1/14 → 7.14%
1/12 → 8.33%	1/15 → 6.66%

* NUMERICAL ON POPULATION

1) ↑ or ↓ rate = R%, P - current population

Population after n years $= P\left[1 \pm \frac{R}{100}\right]^n$

Population n years ago $= P \Big/ \left[1 \pm \frac{R}{100}\right]^n$

\+ if population ↑

\- if ⟶ ↓

INTEREST (SIMPLE)

$S.I = \frac{(P \times N \times R)}{100}$ (yearly)

if in months say M'

$SI = (P \times M/12 \times R)/100$

if in days

$SI = (P \times D/365 \times R)/100$

COMPOUND INTEREST

1) $DA = P\left[1 + \frac{R}{100}\right]^n$ .... (anually)

2) $A = P\left[1 + \frac{R/2}{100}\right]^n$ ... (half yearly)

3) $A = P\left[1 + \frac{R/4}{100}\right]^n$ ... (quaterly)

4) Rates different for n years then A =

$$A = P\left[1 + \frac{R_1}{100}\right]\left[1 + \frac{R_2}{100}\right] \cdots \left[1 + \frac{R_n}{100}\right]$$

5) $CI - SI = P\left(\frac{R}{100}\right)^2$ ... (2 years)

6) $CI - SI = P\left[\frac{R}{100}\right]^2 \times \left[\frac{R+300}{100}\right]$ ... (3 years)

7) Time for amount to double itself at R%

$$T = \frac{72}{R}$$

NUMBER SYSTEM

SUM OF

1) FIRST n natural nos $= \frac{n(n+1)}{2}$

2) sum of first n odd $= n^2$

3) sum of first n even $= n(n+1)$

4) Squares of first 'n' natural numbers $= \frac{n(n+1)(2n+1)}{6}$

5) sum of cubes of first 'n' natural numbers $= \left(\frac{n(n+1)}{2}\right)^2$

* To multiply by 9,99,999...

26324×999

26324000

$- \quad 26324$

26207766

HCF & LCM

1) Factorization

2) Difference method

* If two numbers a & b are divisible by n, thier difference is also divisible by n.

HCF & LCM

1) $a \times b = \text{gcd}(a,b) \times \text{lcm}(a,b)$

2) $a, b, c \div n$ to leave the same remainder r then least value of n,

$$n = (\text{LCM of } a,b,c) + r$$

3) HCF of co prime nos $= 1$

4) LCM (fraction) $= \frac{\text{LCM of num}}{\text{HCF of deno}}$

5) HCF (fraction) $= \frac{\text{HCF of num}}{\text{LCM of deno}}$

PROGRESSION : (AP)

sum of first 'n' terms

$$S_n = \frac{n}{2}[2a + (n-1)d]$$

(a : first term, d : common diff)

$$= \frac{n}{2}[a + l]$$

(l : last term)

last term $= a + (n-1)d$

PROGRESSION : (GP)

$a, ar, ar^2, ar^3 \ldots$

n^{th} term $= ar^{(n-1)}$

$$S_n = \frac{a(r^n - 1)}{(r-1)}$$

AVERAGE

New value = old avg + $(n \pm 1)$(diff)

+ if member added

− if member removed

RATIO & PROPORTION

$a : b = c : d$

1. $a \times d = b \times c$
2. $b/a = d/c$
3. $a/c = b/d$
4. $(a+b)/b = (c+d)/d$
5. $(a-b)/b = (c-d)/d$
6. $(a+b)/(a-b) = (c+d)/(c-d)$
7. $m : n = a : x$, $n : p = b : y$

$p : q = c : z$

then

$m : n : p : q = abc : xbc : xyc : xyz$