**RATIO, PROPORTION, VARIATION**

 If a : b : : c : d, then ad = bc

 If a : b : : c : d, then a + b : b : : c + d : d

 If a : b : : c : d, then a - b : b : : c - d : d

 If a : b : : c : d, then a + b : a - b : : c + d : c - d

 If a⁄b=c⁄d=e⁄f=....k,then k = a±c±e....⁄b±d±f...

**NUMBERS**

 a3 + b3 + c3– 3abc = (a + b + c) (a2+ b2 + c2 – ab – bc – ca)

 The product of n consecutive integers is always divisible by n! (n factorial)

 The sum of any number of even numbers is always even

 The sum of even number of odd numbers is always even

 The sum of odd number of odd numbers is always odd

 If N is a composite number such that N = ap. bq. cr.... where a, b, c are prime factors of N and p, q, r .... are positive integers, then

a) The number of factors of N is given by the expression (p + 1) (q + 1) (r + 1) ...

b) It can be expressed as the product of two factors in 1/2 {(p + 1) (q + 1) (r + 1).....} ways

c) If N is a perfect square, it can be expressed

  (i) as a product of two DIFFERENT factors in 1⁄2 {(p + 1) (q + 1) (r + 1) ... -1 } ways

http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage1.png  (ii)as a product of two factors in 1⁄2 {(p + 1) (q + 1) (r + 1) ... +1} ways

d) sum of all factors of N =

http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage2.pnge) the number of co-primes of N (< N), Φ(N) =

f) sum of the numbers in (e) = N⁄2.ΦN

g) it can be expressed as a product of two factors in 2n–1, where ‘n’ is the number of different prime factors of the given number N

**SIMPLE INTEREST AND COMPOUND INTEREST**

I = Interest, P is Principle, A = Amount, n = number of years, r is rate of interest

1. Interest under

  Simple interest, I = Pnr⁄100

  Compound interest, I = P ((1+r⁄100)n-1) 

2. Amount under

  Simple interest, A = P(1+nr⁄100)

  Compound interest, A = P (1+r⁄100)n

http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage2a.png  
3. Effective rate of interest when compounding is done k times a year re =

**MIXTURE AND ALLIGATION**

 If p1, p2 and p are the respective concentrations of the first mixture, second mixture and the final mixture respectively, and q1and q2 are the quantities of the first and the second mixtures respectively, then Weighted Average (p)

http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage3.png

 p =

http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage4.png If C is the concentration after a dilutions, V is the original volume and x is the volume of liquid. Replaced each

time then C =

**QUADRATIC EQUATION**

 If a, b and c are all rational and x +√y is an irrational root of ax2 + bx + c = 0, then x-√y is the other root

 If α and β are the roots of ax2 + bx + c = 0, then α + β =-b⁄a and αβ = c⁄a

http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage5.png

 When a > 0, ax² + bx + c has a minimum value equal to  , at x=-b⁄2a

http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage5.png

 When a < 0, ax² + bx + c has a maximum value equal to  , at x=-b⁄2a

**PROGRESSION**

Arithmetic Progression (A.P)

 a is the first term, d is the last term and n is the number of terms

   Tn = a + (n – 1)d

    Sn =1⁄2(first term+last term)X n = 1⁄2(2a+(n-1)d)× n

    Tn = Sn – Sn-1

    Sn = A.M × n

Geometric Progression (G.P)

 a is the first term, r is the common ratio and n is the number of terms

    Tn = arn-1

http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage6.png    Sn =

Harmonic Progression (H.P)

    H.M of a and b = 2ab⁄(a+b)

    A.M > G.M > H.M

    (G.M)2 = (A.M) (H.M)

http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage7.png    Sum of first n natural numbers Σn = n(n+1)⁄2

    Sum of squares of first n natural numbers Σn2 =

http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage8.png

    Sum of cubes of first n natural numbers Σn3 = =(Σn)2

**GEOMETRY**

 In a triangle ABC, if AD is the angular bisector, then AB⁄AC =BD⁄DC

 In a triangle ABC, if E and F are the points of AB and AC respectively and EF is parallel to BC, then AE⁄AB =AF⁄AC

 In a triangle ABC, if AD is the median, then AB2 + AC2 = 2(AD2 + BD2)

 In parallelogram, rectangle, rhombus and square, the diagonals bisect each other

 Sum of all the angles in a polygon is (2n – 4)90

 Exterior angle of a polygon is 360⁄n

 Interior angle of a polygon is 180-360⁄n

 Number of diagonals of a polygon is 1⁄2 n(n-3)

 The angle subtended by an arc at the center is double the angle subtended by the arc in the remaining part of the circle

 Angles in the same segment are equal

 The angle subtended by the diameter of the circle is 90°

**MENSURATION PLANE-FIGURE**

|  |  |  |  |
| --- | --- | --- | --- |
| **Figure** | **Perimeter** | **Area** | **Diagram** |
| Triangle | a+b+c | √s(s-a)(s-b)(s-c) | http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage9.png |
| (or) |
| 1⁄2bh |
| Right Angled Triangle | http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage19.pnga+b+ | ½ab | http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage10.png |
| Equilateral Triangle | 3a | √¾ a2 | http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage11.png |
| Isosceles Triangle | 2a+b | http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage20.png | http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage12.png |
| Circle | 2πr | πr2 | http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage13.png |
| Sector of a Circle | θ⁄360×2πr+2r | θ⁄360×πr2 | http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage14.png |
| Square | 4a | a2 | http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage15.png |
| Rectangle | 2(l+b) | l×b | http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage16.png |
| Trapezium | a+b+c+d | ½(a+b)h | http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage17.png |
| Parallelogram | 2(a+b) | bh or absinθ | http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage18.png |

**MENSURATION SOLIDS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| |  | | --- | | **Figure** | | **Lateral Surface Area** | **Total Surface Area** | **Volume** | **Diagram** |
| Cube | 4a2 | 6a2 | a3 | http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage39.png |
| Cuboid | 2h(l + b) | 2(lb + bh + lh) | lbh | http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage40.png |
| Cylinder | 2πrh | 2πr(r+h) | πr2h | http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage41.png |
| Cone | Πrl | πr(l+r) | ⅓πr2h | http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage42.png |
| Sphere | - | 4πr2 | 4⁄3πr3 | http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage43.png |
| Hemisphere | 2πr2 | 3πr2 | 2⁄3πr3 | http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage44.png |
| Equilateral Triangular Prism | 3ah | 3ah+ √3⁄2 a 2 | √3⁄4 a 2h | http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage45.png |
| Square prism | 4ah | 2a(2h+a) | a2h | http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage46.png |
| Hexagonal Prism | 6ah | 3a(√3⁄2 a+2h | ½×3 √3 a2 h | http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage47.png |
| Frustum of a cone | πl(R + r)where,l=√(R-r)2+h2 | π(R2 + r2 + Rl + rl) | ⅓πh(R2+Rr+r2) | http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage48.png |
| Frustum of a Pyramid | ½× perimeter of base × Slant Height | L.S.A + A1 + A2 | ½× h(A1+A2+√A1A2) | pyramid_frustum.png (268×192) |
| Torus | - | 4π2ra | 2π2r2a | http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage50.png |

**PERMUTAION AND COMBINATION / PROBABILITY**

 n (A ∪ B) = n (A) + n (B) – n (A ∩ B)

 If A and B are two tasks that must be performed such that A can be performed in 'p' ways and for each possible way of performing A, say there are 'q' ways of performing B, then the two tasks A and B can be performed in p × q ways

 The number of ways of dividing (p + q) items into two groups containing p and q items respectively is

http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage22.png

http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage23.png

 The number of ways of dividing 2p items into two equal groups of p each is   , when the two groups have distinct identity and http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage24.png, when the two groups do not have distinct identity

 nCr = nCn– r

http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage25.png The total number of ways in which a selection can be made by taking some or all out of (p + q + r + .....) items where p are alike of one kind, q alike of a second kind, r alike of a third kind and so on is {(p + 1) (q + 1) (r + 1) ....}−1

 P(Event) =   and 0 ≤ P(Event) ≤ 1

 P(A ∩ B) = P(A) × P(B), if A and B are independent events

 P(A ∪ B) = 1, if A and B are exhaustive events

 Expected Value = σ[Probability (Ei)]× [Monetary value associated with event Ei]

**STATISTIC, NUMBER SYSTEM, INEQUATIONS AND MODULUS AND SPECIAL EQUATIONS**

 G.M. = (x 1;.x2;...... .xn)1/n

http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage26.png

 H.M.=

 For any two positive numbers a, b    (i) A.M. ≥ G.M. ≥ H.M. (ii) (G.M.)2 = (A.M.) (H.M.)

 Range = Maximum value – Minimum value

 Q.D. = http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage27.png(i.e., one-half the range of quartiles)

 If a > b, then 1⁄a < 1⁄b, for any two positive numbers a and b

 |x + y| ≤ |x| + |y|, for any two real numbers x and y

 If for two positive values a and b; a + b = constant (k), then the maximum value of the product ab is obtained for a = b =k⁄2

 If for two positive values a and b; ab = constant (k), then the minimum value of the sum (a + b) is obtained for a = b = √k

**CO-ORDIANTE GEOMETRY, FUNCTIONS AND GRAPHS AND TRIGNOMETRY**

 If a point P(x, y) divides the line segment joining A(x1, y1) and B(x2, y2) in the ratio m : n, then x = http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage28.png and y = http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage29.png, positive sign for internal division and negative sign for external division

 The area of a triangle with the vertices at (0, 0), (x1, y1) and (x2, y2) is Δ = ½ |x1y2 -x2y1|

 The coordinates of the centroid C(x, y) of a triangle ABC formed by joining the points A(x1, y1); B(x2, y2) and C(x3, y3) are given byhttp://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage30.png

 The slope of line with points (x1, y1) and (x2, y2) lying on it is m = http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage31.png

 If m1 and m2 are the slopes of two lines L1 and L2 respectively, then the angle ‘θ’ between them is given by tanθ = http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage32.png

 The equation of the x-axis is y = 0 and that of y-axis is x = 0

 The equation of a line parallel to x-axis is of the form y = b and that of a line parallel to y-axis is of the form x = a (a and b are some constants)

 Point slope form of a line: y – y1 = m (x – x1)

 Two point form of a line: http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage33.png

 Slope intercept form of a line: y = mx + b

 Intercept form of a line : x⁄a+y⁄b=1

 Two lines a1x + b1y + c1 = 0 and a2x + b2y + c2 = 0 are  (i) parallel if http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage34.pngor m1= m2 (ii) perpendicular if a1 a2 + b1 b2 = 0 or m1m2 =−1

 The distance between two parallel lines of the form ax + by +c1 = 0 and ax + by + c2 = 0 is given by http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage35.png

 If ax + by + c = 0 is the equation of a line, then the perpendicular distance of a point (x1, y1) from the line is given byhttp://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage36.png

 sine rule : http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage37.png = 2R, where R is the circumradius of triangle ABC

 cosine rule : cosA = http://timeonlinecourses.com/timeworkflow/theme/gourmet/pix/formulae/fimage38.png, similarly cosB and cosC can be defined