

CLASS - 3

Mathematics

Simple Equation

1. The journey from A to B is 240 km. A train leaves A at 10 A.M. travelling at 80 km/h for B. Another train leaves B at noon travelling at 100 km/h for A. When do they meet?
2. A train does a journey of 400 km partly at 80 km/h and partly at 60km/h. If the whole journey takes 5 hours, 45 minutes, how long does the train travel at 80km/h?
3. A and B are two ports 466 miles apart. Ship x leaves A for B steaming at 8knts. Two hours later ship y leaves A steaming at 20 knots and on arriving at B, waits for 20 hours before starting back along the same track. How far will they be from B when they meet?
4. A man starts a from a town at 1 p.m and walks at 5 km/h. At 5 p.m. a cyclist leaves to follow him travelling at 20 km/h. At what time will the cyclist catch the walker?
5. Two trains start off on a journey at the same time. The first travels at 80 km/h and its total stopping time on the way is 1 hour. The second travels at 120 km/h, stops on the way for 1.1/2 hours and will arrives 2 hours before the first. How long is the journey?
6. Four equally spaced buoys A, B, C and D are in line and 5 miles apart. A vessel steamed from A to B at full speed and from B to C at $\frac{3}{4}$ of full speed and from C to D at $\frac{2}{3}$ of full speed. If the average speed from A to D was 9 knots find full speed.

Problem leading to Simultaneous Equation

1. A boat travels 80 miles downstream and 15 miles upstream in $5\frac{1}{2}$ Hours. If it travels 15 miles downstream and 30 miles upstream $6\frac{1}{2}$ hours, what is the speed of the stream?
2. If both numerator and denominator of a fraction are each decreased by 1 the fraction becomes $\frac{2}{3}$. If they are increased by 1 the fraction becomes $\frac{4}{3}$. Find the fraction.
3. A boat goes upstream 40 miles and downstream 36 miles in 8 hours. If it goes upstream 24 miles and down the same distance in 5 hours, what is the boat's speed?
4. One litre of fresh water weighs 1000 gms and one litre of a certain spirit weighs 800 gms. If six litres of a mixture of the spirit and water weigh 5.3 kilograms, find the number of litres of each there are in the mixture.

5. The sum of the digits of a certain number less than 100 is 11, and if the digits are reversed the number is diminished by 9. Find the number.
6. A and B each have sums of money. If A gives $\frac{1}{6}$ of his money to B, B will then have $\frac{3}{4}$ as much as A. If originally B loses £25, he will have $\frac{1}{4}$ of what A had originally. How much had A at first?

Problem leading to Quadratic Equation

1. If the general quadratic equation $ax^2 + bx + c = 0$ where a, b, c are constants; then prove that

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

2. A man leaves at 10 a.m. to run from A to B, and another leaves B at 11 a.m. to walk to A. They meet at 4 p.m. To do the full distance from A to B which is 100 km, the walker would take $2\frac{1}{2}$ hours longer than the runner. What are the speeds of the two men?
3. A rectangle has a perimeter of 13 m. If the length is increased by 50cm and the breadth decreased by 25 cm the area of the new rectangle is 9.5 sq. meters Find the dimension of the original rectangle.
4. A 10 cm long steel bar is of square section and its surface area is equal to the surface area of a sphere 7 cm radius. Find the dimension of the bar.
5. A man rows downstream 6 miles at a certain speed and upstream the same distance at 1 knot less. If there is no current and he takes 3.5 hours over the whole journey, what was his first speed?
6. A rectangle has a perimeter of 14 cm. If the length is decreased by 1 cm. and the breadth increased by 1 cm, the area of the new rectangle is 12 sq.cm. Find the original dimensions.

Graph

1. Draw the triangle whose angular points are (0,0), (0,8) and (-1, 5) and find its area (a) by counting squares (b) by calculation.
2. Draw a figure whose angular points are (10, 12), (-2, -4) and (2, -8) and find its area. How long is its perimeter?
3. Plot the points (-3, 6), (3, -9), (6, 9) and find the area of the triangle formed if each unit represents one mile.

Ratio & Proportion

1. If $x : y = 2 : 5$ find the value of $\frac{3xy-x^2}{2xy+y^2}$
2. Find the ratio $x : y$ if $\frac{2x+5y}{3x+9y} = \frac{3}{5}$
3. Find the ratio $x : y$ if $\frac{5}{7} = \frac{3x-5y}{6y-x}$
4. If $x : y = -1 : 2$ find the value of $\frac{6x^2-3xy}{4xy+5y^2}$
5. If $\frac{a}{b} = \frac{c}{d}$ prove that $\frac{a^2-b^2}{c^2-d^2} = \frac{a^2}{c^2}$
6. If $4(2x-y) = 6x-y$ find the value of

$$\frac{(3x-2y)(2x+y)}{(x-3y)(4x-3y)}$$

Logarithms & Further Logarithms

1. Given that $A = P \left(1 + \frac{r}{100}\right)^n$ Find P when $A = 185.65$, $n=5$, $r=2.75$.
2. $\sqrt[3]{\frac{0.056 \times 0.0078}{0.089}} + 0.004$
3. $\frac{\sqrt[3]{0.0076 \times 31.683}}{\frac{3}{4}(408.72)}$
4. In expression $P(V)^{1.2} = 72.8$. If $v = 10.52$ find p .
5. Given $\log 3 = 0.47712$ and $\log 2 = 0.30103$. Find $\log (0.00036)^{\frac{1}{3}}$
6. Find the values of x and y to satisfy the equation: -

$$4^x \cdot 5^y = 200$$

$$5^x \cdot 4^y = 40$$

(Take $\log 4$ as 0.6, $\log 5$ as 0.7 and $\log 2$ as 0.3)

Relation Between Ratio

1. Show that $\cos A (1 + \cot A) + \sin A (1 + \tan A) = \operatorname{cosec} A + \sec A$

2. Prove the following relation:

$$\frac{\tan^2 \theta (\cos \theta + 1)}{\sec \theta (\sin \theta + \tan \theta)} = \sin \theta$$

3. if $\operatorname{hav}(\theta) = \frac{1}{8}$, find without reference to tables the $\sin \theta$, $\cos \theta$ and $\operatorname{versine}(\theta)$.

4. Find the values of A in the equation

$$\cos^2 A - 2 = \sin^2 A - 5 \cos A$$

5. Solve the following equation and find values for θ in the 1st quadrant

$$\frac{\sin \theta}{\cos \theta} = 2 - \frac{\cos \theta}{\sin \theta}$$

6. Solve the following equation and find values of θ

$$\sec^2 \theta + \tan^2 \theta = 3 \tan \theta$$

Heights and distance

1. A vertical tower 100 m high stands on a horizontal plane. From a point in the plane the angle of elevation of the top of the tower is 60° . how far is the point of observation from the foot of the tower?

2. A man standing on the bank of a straight river observes the angle subtended by a tree on the opposite bank to be 60° . On walking 100 m along the river he finds the tree subtends an angle of 30° . Find the width of the river.

Spherical triangles

1. In spherical triangle PQR, angle R = 90° , PR = $110^\circ 15'$, QR = $70^\circ 49' 14''$. Find angle Q.

2. In Spherical Triangle ABC, angle A = 90° , AB = $46^\circ 18' 30''$, B = $34^\circ 27' 30''$. Find BC, AC and C.

3. In Spherical Triangle PXZ, angle P = 90° , ZX = $85^\circ 17'$, PX = $102^\circ 26' 15''$; Find Z, X and PZ.

4. In Spherical Triangle ABC, $BC = 90^\circ$, $C = 60^\circ 20'$, $A = 115^\circ 40'$. Find AB.
5. In Spherical Triangle PXZ, angle $ZX = 90^\circ$, $Z = 80^\circ 10'$, $X = 50^\circ 02'$; Find P, PX and PZ.
6. In Spherical Triangle ABC, $a = 99^\circ 40' 48''$, $b = 64^\circ 23' 15''$, $A = 95^\circ 38' 4''$; Find B.
7. In spherical Triangle XYZ, $XY=90^\circ$, $X = 121^\circ 20'$, $Y = 42^\circ 01'$, Find YZ and Z.
8. In spherical Triangle ABC, $c = 90^\circ$, $a = 110^\circ 11'$, $B = 14^\circ 20'$, Find angle C.
9. In spherical Triangle ABC, $AB = 50^\circ 10'$, $AC = 64^\circ 17'$, $BC = 27^\circ 37'$. Find the three angles.
10. In spherical Triangle ABC, Given $AB = 50^\circ 10'$, $BC = 27^\circ 37'$, $A = 28^\circ 29'$. Find C.

Mensuration

1. Find the area of lifeboat's lugsail of the following dimension, head 3m, foot 3.5m, luff 2.6m, leach 5m and the diagonal throat to clew 4.4m.
2. The length of a room is three times its breadth and its area is 108 m^2 . Find its length and breadth.
3. Find the area of a boat lugsail of the following dimensions, head 2 m, foot 2.5 m, luff 1.5 m. leach 3.5 m, and the diagonal throat to clew 3 m.
4. A rectangle has a height of 1 metre. A triangle on the same base has an area equal to $\frac{2}{3}$ that of the rectangle. Find the height of the triangle.
5. Find the area of a triangle whose sides are 44cm and 40cm and the angle included is 40° .
6. The perimeter of a rectangle is 240 metres. The length to breadth ratio is 5 : 3. Find the area of the rectangle.

Vectors

1. Find the resultant of two velocities of 7 m/s and 9 m/s, if the velocities are at an angle of 120° to each other.
2. Find the resultant of four forces 5, 6, 8, and 11 units acting N. 30° E., S. 60° E., S. 45° W. and N. 60° W.