RBSE Class 10th Maths Question Paper With Solution 2015

QUESTION PAPER CODE S-09-Mathematics

PART - A

Question 1: Write the common difference of the A.P. 7, 5, 3, $1, -1, -3, \dots$

Solution:

The given AP: 7, 5, 3, 1, -1, -3, The first term a = 7Common difference $[d] = a_2 - a_1$ = 5 - 7= -2Hence, the common difference is -2.

Question 2: Write the distance of the point (-5, 4) from the x-axis.

Solution:

The distance of the point (-5, 4) from x-axis means the distance of the point (-5, 4) from (-5, 0).

Therefore, the required distance is given by distance formula

 $= \sqrt{(\mathbf{x}_2 - \mathbf{x}_1)^2 + (\mathbf{y}_2 - \mathbf{y}_1)^2}$ = $\sqrt{(-5 + 5)^2 + (4 - 0)^2}$ = $\sqrt{0 + 16}$ = $\sqrt{4^2}$ = 4

Question 3: Write the solution of the pair of linear equations 4x + 2y = 5 and x - 2y = 0.

4x + 2y = 5 - (1) x - 2y = 0 x = 2y - (2)Put equation (2) in (1), 4 * (2y) + 2y = 5 10y = 5 y = 5 / 10 y = 1 / 2Putting the value of y in (2), x = 2y x = 2 (1 / 2)x = 1

Question 4: Find the HCF of 96 and 404 by the Prime Factorisation Method.

Solution:

2	96		
2	48	2	404
2	24	2	202
2	12	101	101
2	6		1
3	3		
	1		

 $96 = 2 \times 2 \times 2 \times 2 \times 2 \times 3$ $404 = 2 \times 2 \times 101$ HCF of 96 and 404 = Product of common prime factors $= 2 \times 2$ = 4

Question 5: One card is drawn from a well-shuffled deck of 52 cards. Calculate the probability that the card will not be an ace.

The total number of favourable outcomes n (S) = 52. Probability of getting an ace card = 4. P (getting an ace card) = n(A) / n(S)= 4 / 52 = 1 / 13 P (not getting an ace card) = 1 - P (getting an ace card) = 1 - (1 / 13) = 12 / 13

Question 6: If K (5, 4) is the midpoint of the line segment PQ and coordinates of Q are (2, 3), then find the coordinates of point P.

Solution:

Given that, PQ is a line segment with K its mid-point Let, $P \equiv (x_1, y_1)$ and $Q \equiv (x_2, y_2)$ The coordinates of Q are (2, 3) and that of mid-point K are (5, 4) By the definition of midpoint, x coordinates of midpoint = $[x_1 + x_2] / [2]$ y coordinates of midpoint = $[y_1 + y_2] / [2]$ $5 = [x_1 + 2] / [2]$ $10 = [x_1 + 2]$ $10 - 2 = x_1$ $x_1 = 8$ $4 = [y_1 + 3] / [2]$ $8 = [y_1 + 3]$ $8 - 3 = y_1$ $y_1 = 5$ Hence, the coordinates of point P are (8, 5).

Question 7: If tangents RA and RB from a point R to a circle with centre O are inclined to each other at an angle of θ and $\angle AOB = 40^{\circ}$ then find the value of θ .



 $\angle OAR = 90^{\circ}$ $\angle OBR = 90^{\circ}$ In the quadrilateral OARB, the sum of the angles of a quadrilateral is 360°. $\angle OAR + \angle OBR + \angle ARB + \angle AOB = 360^{\circ}$ $90^{\circ} + 90^{\circ} + \theta + 40^{\circ} = 360^{\circ}$ $220^{\circ} + \theta = 360^{\circ}$ $\theta = 360^{\circ} - 220^{\circ}$ $\theta = 140^{\circ}$

Question 8: How many tangents can be constructed to any point on the circle of radius 4 cm?

Solution:

One tangent passes through a given point irrespective of its radius. At a point on the circle, only one tangent can be drawn as it is perpendicular to the normal at the point.

Question 9: Find the circumference of a circle whose diameter is 14 cm.

Solution:

The radius will be half of the diameter. The diameter of the circle = 14 cm Radius of the circle = 14 / 2 = 7 cm Circumference = $2\Pi r$ = $2 * \Pi * 7$ = 2 * (22 / 7) * 7= 43.98 cm Question 10: Write the length of an arc of a sector of a circle with radius r and angle with degree measure θ .

Solution:

Circumference of a circle of radius r is equal to $2\pi r$ The angle subtended by circumference at the centre in radians is 360°. Hence, length of arc subtending an angle θ° is $l = [\theta / 360] \times 2\pi r$ $l = [\pi \theta r] / 180$

PART - B

Question 11: Show that $\sin 28^{\circ} \cos 62^{\circ} + \cos 28^{\circ} \sin 62^{\circ} = 1$.

Solution:

LHS = $\sin 28^{\circ} \cos 62^{\circ} + \cos 28^{\circ} \sin 62^{\circ}$ = $\sin 28^{\circ} \cos (90^{\circ} - 28^{\circ}) + \cos 28^{\circ} \sin (90^{\circ} - 28^{\circ})$ = $\sin 28^{\circ} \sin 28^{\circ} + \cos (90^{\circ} - 68^{\circ}) \sin 68^{\circ}$ = $\sin^2 28^{\circ} + \cos^2 28^{\circ}$ = 1

Question 12: Find the value of tan 67° / cot 23°.

Solution:

 $\tan 67^{\circ} / \cot 23^{\circ}$ = cot (90° - 67°) / cot 23° = cot 23° / cot 23° = 1

Question 13: If 3 cot A = 4, then evaluate $[1 - \tan^2 A] / [1 + \tan^2 A]$.

Solution:

cot A = 4/3B / P = 4/3Let B = 4k and P = 3kSo in a right angle triangle with angle, $P^{2} + B^{2} = H^{2}$ H = 5kNow tan A = 1 / cot A = 3 / 4 cos A = B / H = 4 / 5 sin A = P / H = 3 / 5 tan A = sin A / cos A = [3 / 5] / [4 / 5] = 3 / 4 Let us take the LHS [1 - tan²A] / [1 + tan²A] = [1 - (3 / 4)²] / [1 + (3 / 4)²] = 7 / 25

Question 14: A vessel is in the form of a hollow hemisphere mounted by a hollow cylinder. The radius of the hemisphere is 7 cm and the total height of the vessel is 13 cm. Find the inner surface area of the vessel.

Solution:



Let H be the height of the material, R be the radius of hemisphere & cylinder and D be the diameter

H = 13 cm D = 14 cm R = 14 / 2 = 7cm Curved surface area of hemisphere = $2\pi r^2$ = 2 × [22 / 7] × 7 × 7 = 44 × 7 = 308 cm² R = 7 cm H = 13 cm Height of cylinder = H - R = 6 cm Curved surface area of cylinder = $2\pi rh$

$$= 2 \times [22 / 7] \times 7 \times 6$$

= 44 × 6
= 264cm²
Surface area of the vessel = (308 + 264) cm²
= 572cm²

Question 15: In the figure, \triangle OPR ~ \triangle OSK , \angle POS = 125° and \angle PRO = 70°. Find the values of \angle OKS and \angle ROP.



Solution:

Given that,

 $\Delta \text{ OPR} \sim \Delta \text{ OSK}, \angle \text{POS} = 125^{\circ} \text{ and } \angle \text{PRO} = 70^{\circ}$ Sum of the supplementary angles = 180° $\angle \text{POS} + \angle \text{POR} = 180^{\circ}$ $125^{\circ} + \angle \text{ROP} = 180^{\circ}$ $\angle \text{ROP} = 180^{\circ} - 125^{\circ}$ $\angle \text{ROP} = 55^{\circ}$ $\angle \text{OKS} = \angle \text{PRO}$ [Since triangle $\Delta \text{ OPR} \sim \Delta \text{ OSK}$] $\angle \text{OKS} = 70^{\circ}$

PART - C

Question 16: Prove that $\{[1 - \tan A] / [1 + \cot A]\}^2 = \tan^2 A$.

Solution:

 $(1 - \tan A / 1 - \cot A)^2$ = $(1 + \tan^2 A - 2 \tan A) / (1 + \cot^2 A - 2 \cot A)$

$$= (\sec^{2} A - 2 \tan A) / (\csc^{2} A - 2 \cos A / \sin A)$$

= (sec² A - 2 * sin A / cos A) / (cosec² A - 2 cos A / sin A)
= (1 / cos² A - 2 sin A / cos A) / (1 / sin² A - 2 cos A / sin A)
= [(1 - 2 sin A cos A) / cos² A] / [(1 - 2 cos A sin A) sin² A]
= (1 - 2 sin A cos A) / cos² A * sin² A / (1 - 2 sin A cos A)
= sin² A / cos² A
= tan² A

Question 17: Divide $3x^3 + x^2 + 2x + 5$ by $1 + 2x + x^2$.

Solution:

Quotient

$$3x - 5$$
Quotient

$$x^{2} + 2x + 1$$

$$3x^{3} + x^{2} + 2x + 5$$

$$3x^{3} + 6x^{2} + 3x$$
(-) (-) (-)

$$-5x^{2} - x + 5$$

$$-5x^{2} - 10x - 5$$
(+) (+) (+)

$$9x + 10$$
Remainder

Quotient: 3x - 5 Remainder: 9x + 10

Question 18: Prove that $\sqrt{2}$ is an irrational number.

Solution:

Let $\sqrt{2}$ be a rational number.

Therefore, $\sqrt{2} = p / q$ [p and q are in their lowest terms i.e., HCF of (p, q) = 1 and q $\neq 0$.

On squaring both sides,

 $p^2 = 2q^2 \dots (1)$

Clearly, 2 is a factor of $2q^2$.

 \Rightarrow 2 is a factor of p² [since 2q² = p²]

⇒ 2 is a factor of p. Let p = 2 m for all m (where m is a positive integer) Squaring both sides, $p^2 = 4$ m² ... (2) From (1) and (2), $2q^2 = 4m^2$ ⇒ $q^2 = 2m^2$ Clearly, 2 is a factor of $2m^2$. ⇒ 2 is a factor of q^2 [since $q^2 = 2m^2$] ⇒ 2 is a factor of q. Thus, both p and q have common factor 2 which is a contradiction that H.C.F. of (p, q) = 1. Therefore, our supposition is wrong.

Hence $\sqrt{2}$ is not a rational number but an irrational number.

Question 19: How many terms of the A.P. 17, 15, 13, must be taken, so that their sum is 81?

Solution:

a = 17 d = - 2

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\begin{split} S_n &= 81 \\ &=> [n \ / \ 2] \ [2a + (n - 1) \ d] = 81 \\ &=> n \ [2 \ ^* \ 17 + (n - 1) \ (-2)] = 162 \\ &=> n \ (34 - 2n + 2) = 162 \\ &=> n \ (36 - 2n) = 162 \\ &=> 36n - 2n^2 - 162 = 0 \\ &=> 2n^2 - 36n + 162 = 0 \\ &=> n^2 - 18n + 81 = 0 \\ &=> n^2 - 9n - 9n + 81 = 0 \\ &=> n \ (n - 9) - 9 \ (n - 9) = 0 \\ &=> (n - 9) \ (n - 9) = 0 \end{split}
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=> $(n - 9)^2 = 0$ => n - 9 = 0=> n = 9Number of terms = 9

Question 20: From a point on a bridge across a river the angles of depression of the banks on opposite sides of the river are 30° and 45° respectively. If the bridge is at a height of 4 m from the banks, find the width of the river.

Solution:



AB = 4cm = CD = EF \angle FAE = 30° $\angle DAC = 45^{\circ}$ $\tan \theta = \text{perpendicular} / \text{base}$ $tan (\angle FAE) = FE / FA$ $\tan 30^{\circ} = 4 / FA$ $1 / \sqrt{3} = 4 / FA$ $FA = 4\sqrt{3} m$ Similarly, tan (\angle DAC) = CD / DA $\tan 45^{\circ} = 4 / DA$ DA = 4mWidth of river = W = EC = FD= FA + AD $= 4\sqrt{3} + 4$ $= 4 (\sqrt{3} + 1)m$

Question 21: In the given figure, O is the centre of a circle and two tangents KR, KS are drawn on the circle from a point K lying outside the circle. Prove that KR = KS.



Question 22: Construct a triangle of sides 4 cm, 5 cm and 6 cm and then a triangle similar to it whose sides are 3 / 5 time of the corresponding sides of the given triangle.



Question 23: Find the area of the corresponding major sector of a circle with radius 7 cm and angle 120°.

Solution:

Area of a sector of a circle of radius r subtending an angle θ° at the centre is given by A = $\pi r^2 \theta / 360$. A = $(120^{\circ}) * 7^2 * \pi / 360$ = $5880\pi / 360$ = 18472.6 / 360= 51.313 cm^2

Question 24: A copper rod of radius 1 cm and length 2 cm is drawn into a wire of length 18 m of uniform thickness. Find the thickness of the wire.

Solution:

The radius of the copper rod, $r_1 = 1$ cm.

The length of the copper rod $l_1 = 2$ cm.

Length of the wire $= l_2 = 18m$

To find the thickness of the wire (l_2)

Both the rod and wire are in the form of cylinder and volume of the cylinder = $\pi r^2 l$. The volume of the copper rod is equal to the volume of wire as density and mass of the material does not change. $V_{1} = V_{2}$ $\pi r_{1}^{2} l_{1} = \pi r_{2}^{2} l_{2}$ $r_{2} = \sqrt{r_{1}^{2} l_{1} / l_{2}}$ $= \sqrt{1^{2} * 2 / 18 * 100}$ = 1 / 30 cmThickness of the wire is equal to the diameter which is twice the radius. $t_{2} = 2r_{2}$ = 2 * (1 / 30)= 1 / 15 cm

Question 25: Neeraj and Dheeraj are friends. Find the probability of their birthdays when

- (i) birthdays are different.
- (ii) birthdays are the same.

Solution:

- (i) P (both having different birthdays)
- = P (both will not have same birthday)
- = 1 P (both will have the same birthday)
- = 1 (1 / 365)
- = 364 / 365

(ii) Number of days in a year = 365
Number of days when the birthday is possible = 1
P (both have same birthday) = 1 / 365

PART - D

Question 26: The cost of 5 apples and 3 oranges is Rs. 35 and the cost of 2 apples and 4 oranges is Rs. 28. Formulate the problem algebraically and solve it graphically.

Solution:

Let the cost of 1 apple be x and the cost of 1 orange be y.

According to question 5x + 3y = 35 - - - - (i)2x + 4y = 28 - - - - (ii)Multiply by 2 in equation (i) and by 5 in equation (ii) Now, => 10x + 6y = 70 - - - (i)=> 10x + 20y = 140 - - - (ii)By subtraction equation (i) from (ii) => 14y = 70=> y = 10 / 14=> y = 5 Putting the value of y in equation (i) => 5x + (3 * 5) = 35=> 5x = 35 - 15 => x = 20 / 5=> x = 4

Hence, the cost of an apple = $\mathbf{E}4$ and the cost of an orange = $\mathbf{E}5$.



Question 27: The speed of a boat in still water is 18 km / h. It takes 1 / 2 an hour extra to go 12 km upstream instead of going the same distance downstream. Find the speed of the stream.

Solution:

Speed of a boat in still water = 18 km / h

Distance = 12 km Now, Let speed of stream = x km / h Let up stream = 18 + x km / hDownstream = 18 - x km / hTime is downstream – the time is upstream = (1 / 2)h12 / [18 - x] - 12 / [18 + x] = 1 / 2Multiply by (18 - x) (18 + x) $216 + 12x - 216 + 12x = (1 / 2) (18^2 - x^2)$ $24x = (1 / 2) (324 - x^2)$ $x^2 + 48x - 324 = 0$ x = 6x = -54

Hence, the speed of stream = 6 km / h.

Question 28: O is any point inside the rectangle ABCD. Prove that $OB^2 + OD^2 = OA^2 + OC^2$.



We draw PQ AB CD as shown in the figure. ABCD is a rectangle, it means ABPQ and PQDC are also rectangles For, ABPQ, AP = BQ [opposite sides are equal] For, PQDC PD = QC [opposite sides are equal] Now, for $\triangle OPD$, OD² = OP² + PD² -----(1) For, $\triangle OQB$, OB² = OQ² + BQ² ------(2) Add equations (1) and (2), OB² + OD² = (OP² + PD²)+ (OQ² + BQ²) = (OP² + CQ²) + (OQ² + AP²) $\triangle OPA$ and $\triangle OQC$ are also right-angled triangles For, $\triangle OCQ \Rightarrow OQ^2 + CQ^2 = OC^2$ For, $\triangle OPA \Rightarrow OP^2 + AP^2 = OA^2$, OB² + OD² = OC² + OA²

Question 29: In the given figure, PK / KS = PT / TR and \angle PKT = \angle PRS. Prove that \triangle PSR is an isosceles triangle.



Since two angles of $\triangle PSR$ are equal, it is an isosceles triangle.

Question 30: In the following distribution calculate mean from the assumed mean:

CI	10 - 25	25 - 40	40 - 55	55 - 70	70 - 85	85 - 100
Frequency	2	3	7	5	6	7

OR

Find the mode of the following distribution :

CI	0 - 20	20 - 40	40 - 60	60 - 80	80 - 100	100 - 120
Frequency	10	35	52	61	38	20

Solution:

CI	10 - 25	25 - 40	40 - 55	55 - 70	70 - 85	85 - 100
Frequency	2	3	7	5	6	7
Mid value	17.5	32.5	47.5	62.5	77.5	92.5
$d_i = x_i - A / h$	-2	-1	0	1	2	3
f _i d _i	-4	-3	0	5	12	21

$$mean(\bar{x}) = A + \left\{ h \times \frac{\sum (f_i \times u_i)}{\sum f_i} \right\}$$

= 47.5 + 15 * {[31 / 30]
= 47.5 + 15.5
= 63

Here the maximum frequency is 61, and the class corresponding to this frequency is 60 - 80. So the modal class is 60 - 80. Therefore, 1 = 60, h = 20, $f_1 = 61$, $f_0 = 52$, $f_2 = 38$ Mode = $1 + [(f_1 - f_0) / (2f_1 - f_0 - f_2)] \times h$ = $60 + [(61 - 52) / (2 \times 61 - 52 - 38)] \times 20$ = 60 + [9 / 32] * 20= 60 + [5.625]= 65.625Hence, the mode of the data is 65.625.

OR