SHIKSHA CLASSES

Sub. : Maths. **Answer Paper** **Total Marks : 30**
Std. X (CBSE) **4 : Quadratic equations.**

Section : A (Each 1 Mark)

Multiple choice Questions (MCQs).

Q.1 : Every quadratic polynomial can have at most

Ans : c) two zeros

Q.2 : If $x^2 + 5px + 16$ has no real roots, then

Ans : b) $\frac{-8}{5} < p < \frac{8}{5}$

Q.3 : For $ax^2 + bx + c = 0$, which of the following statement is wrong?

Ans : d) If $b^2 = 4ac$, the roots are real and unequal.

Q.4 : Positive value of p for which equation $x^2 + px + 64 = 0$ and $x^2 - 8x + p = 0$ will both have real roots will be

Ans : c) $p = 16$

Q.5 : If equation $9x^2 + 6px + 4 = 0$ has equal roots, then both roots are equal to

Ans : a) $\pm\frac{2}{3}$

Q.6 : The equation $(x - 2)^2 + 1 = 2x - 3$ is a

Ans : b) quadratic equation

Q.7 : The quadratic equation whose one rational root is $3 + \sqrt{2}$ is

Ans : d) $x^2 - 6x + 7 = 0$

Q.8 : The equation $2x^2 + kx + 3 = 0$ has two equal roots, then the value of k is

Ans : d) $\pm 2\sqrt{6}$

Q.9 : The value of $\sqrt{6 + \sqrt{6 + \sqrt{6}.....}}$ is.

Ans : b) 3

For question number 10 to 11 two statements are given one labeled Assertion and other labeled Reason select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below

Q.10 : Assertion: If one root of the quadratic equation $6x^2 - x - k = 0$ is 2/3, then the value of k is 2.

Reason: The quadratic equation $ax^2 + bx + c = 0, a \neq 0$ has almost two roots.

Ans : b) If both Assertion and Reason are correct, but Reason is not the correct explanation of Assertion.

Q.11 : Assertion: The roots of the quadratic equation $x^2 + 2x + 2 = 0$ are imaginary

Reason: If discriminant $D = b^2 - 4ac < 0$ then the roots of quadratic equation $ax^2 + bx + c = 0$ are imaginary.

Ans : a) If both Assertion and Reason are correct and Reason is the correct explanation of Assertion.

Section : B (Each 2 Marks)

Q.12 : Solve the equation :

$$\frac{3}{x+2} - \frac{1}{2} = \frac{2}{3x-1}; x \neq -2, x \neq \frac{1}{3}$$ **for x.**

Ans. : $\frac{3}{x+2}-\frac{1}{2}=\frac{2}{3x-1}$

$\therefore \quad \frac{3}{x+2}-\frac{2}{3x-1}=\frac{1}{2}$

$\therefore \quad \frac{3(3x-1)-2(x+2)}{(x+2)(3x-1)}=\frac{1}{2}$

$\therefore \quad \frac{9x-3-2x-4}{x(3x-1)+2(3x-1)}=\frac{1}{2}$

$\therefore \quad \frac{7x-7}{3x^2-x+6x-2}=\frac{1}{2}$

$\therefore \quad \frac{7x-7}{3x^2+5x-2}=\frac{1}{2}$

$\therefore \quad 14x-14=3x^2+5x-2$

$\therefore \quad 3x^2-9x+12=0$

$\therefore \quad 3(x^2-3x+4)=0$

$\therefore \quad x^2-3x+4=0$

Here, $a=1, b=-3$ & $=4$

$b^2-4ac=(-3)^2-4(1)(4)$

$=9-16$

$\therefore \quad b^2-4ac=-7$

Here, $b^2-4ac<0$

$\therefore$ It has no real roots.

Q.13 : Solve : $\mathbf{x^2+\left(\frac{a}{a+b}+\frac{a+b}{a}\right)x+1=0}$

Ans : $x^2+\left(\frac{a}{a+b}+\frac{a+b}{a}\right)x+1=0$

$\Rightarrow x^2+\frac{a}{a+b}x+\frac{a+b}{a}x+1=0$

$\Rightarrow x\left(x+\frac{a}{a+b}\right)+\frac{a+b}{a}\left(x+\frac{1}{\left(\frac{a+b}{a}\right)}\right)=0$

$\Rightarrow x\left(x+\frac{a}{a+b}\right)+\frac{a+b}{a}\left(x+\frac{a}{a+b}\right)=0$

$\Rightarrow \left(x+\frac{a}{a+b}\right)\left(x+\frac{a+b}{a}\right)=0$

$\Rightarrow x+\frac{a}{a+b}=0 \text{ or } x+\frac{a+b}{a}=0$

$\Rightarrow x=-\frac{a}{a+b} \text{ or } x=-\frac{a+b}{a}$

OR

Solve the quadratic equation for $x: 2x^2+6\sqrt{3}x-60=0$.

Ans. : $2x^2+6\sqrt{3}x-60=0$

$\therefore \quad 2x^2+10\sqrt{3}x-4\sqrt{3}x-60=0$

$\therefore \quad 2x^2+10\sqrt{3}x-4\sqrt{3}x-20\sqrt{3}\times\sqrt{3}=0$

$\therefore \quad 2x(x+5\sqrt{3})-4\sqrt{3}(x+5\sqrt{3})=0$

$\therefore \quad (x+5\sqrt{3})(2x-4\sqrt{3})=0$

$\therefore \quad x+5\sqrt{3}=0 \quad \text{or} \quad 2x-4\sqrt{3}=0$

$\therefore \quad x=-5\sqrt{3} \quad \text{or} \quad 2x=4\sqrt{3}$

$\therefore$

$x=-5\sqrt{3} \quad \text{or} \quad x=\frac{4\sqrt{3}}{2}=2\sqrt{3}$

Section : C (Each 3 Marks)

Q.14 : Seven years ago Varun's age was five times the square of Swati's age. Three years hence. Swati's age will be two fifth of Varun's age find their present ages.

Ans : seven years ago, let Swati's age be x years then, seven years ago Varun's age was $5x^2$ years.

$\therefore$ Swati's present age $= (x + 7)$ years

Varun's present age $= (5x^2 + 7)$ years

Three years hence, we have

Swati's age $= x + 7 + 3 = (x + 10)$ years

Varun's age $= 5x^2 + 7 + 3 = (5x^2 + 10)$ years.

According to the question.

$$x+10=\frac{2}{5}(5x^2+10)$$

$\Rightarrow \quad x+10=2x^2+4$

$\Rightarrow \quad 2x^2-x-6=0$

$\Rightarrow \quad 2x^2-4x+3x-6=0$

$\Rightarrow \quad 2x(x-2)+3(x-2)=0$

$\Rightarrow \quad (x-2)(2x+3)=0$

$\Rightarrow \quad x-2=0$

$[\because 2x+3\neq 0$ as $x>0$

$\Rightarrow \quad x=2\cdot$

Hence Swati's present age = 2 + 7 = 9 years varun's present age = $5(2)^2 + 7$ = 27 years.

Q.15 : Solve :

$9x^2 - 9(a+b)x + (2a^2 + 5ab + 2b^2) = 0.$

Ans. : $9x^2 - 9(a+b)x + (2a^2 + 5ab + 2b^2) = 0$

Here $2a^2 + 5ab + 2b^2$

$= 2a^2 + 4ab + ab + 2b^2$

$= 2a(a + 2b) + b(a + 2b)$

$= (2a + b)(a + 2b).$

$\therefore$

$9x^2-9(a+b)x+2a^2+5ab+2b^2=0$

$\Rightarrow$

$9x^2-9(a+b)x+(a+2b)(2a+b)=0$

$\Rightarrow$

$9x^2-3(3a+3b)x+(a+2b)(2a+b)=0$

$\Rightarrow$

$9x^2-3\{2a+b+a+2b\}x+(a+2b)$

$(2a+b)=0$

$\Rightarrow \quad 9x^2-3(2a+b)x-3(a+2b)\,x$

$+(a+2b)(2a+b)=0$

$\Rightarrow \quad 3x(3x-(2a+b))-$

$(a+2b)(3x-(2a+b))=0$

$\Rightarrow \quad (3x-(2a+b))(3x-(a+2b)=0$

$\Rightarrow \quad 3x-(2a+b)=0$ **or** $3x-(a+2b)=0$

$\Rightarrow \quad x=\frac{2a+b}{3}$, **or** $x=\frac{a+2b}{3}$.

OR

Find the value of k for which the quadratic equation $(k+1)x^2-6(k+1)x+3(k+9)=0$, $k\neq -1$ has equal roots. Hence find the roots of the equation.

Ans. : $(k+1)x^2-6(k+1)x+3(k+9)=0$

Compare given equation with

$ax^2+bx+c=0$

$\therefore$ $a=k+1$, $b=-6(k+1)$

and $c=3(k+9)$

For equal roots, $b^2-4ac=0$

$[-6(k+1)]^2-4(k+1)\,3(k+9)=0$

$\therefore \quad 36(k+1)^2-12(k+1)(k+9)=0$

$\therefore \quad 36(k+1)^2=12(k+1)(k+9)$

$\therefore \quad 3(k+1)^2=(k+1)(k+9)$

$\therefore \quad \frac{3(k+1)^2}{k+1}=k+9$

$\therefore \quad 3(k+1)=k+9$

$\therefore \quad 3k+3=k+9$

$\therefore \quad 3k-k=9-3$

$\therefore \quad 2k=6$

$\therefore \quad k=3\cdot$

Put k = 3 in

given quadratic equation

$\therefore \quad 4x^2-24x+36=0$

$\therefore \quad 4(x^2-6x+9)=0$

$\therefore \quad x^2-6x+9=0$

$\therefore \quad x^2-3x-3x+9=0$

$\therefore \quad x(x-3)-3(x-3)=0$

$\therefore \quad (x-3)=0 \quad$ or $\quad (x-3)=0$

$\therefore \quad x=3 \quad$ or $\quad x=3\cdot$

Section - D(Each 5 Marks)

Q.16 : Sum of the areas of two squares is 640 m². If the difference of their perimeters is 64 m find the sides of the two squares.

Ans. : Let the side of a square = x m

then perimeter of this square = 4x

Given, Difference of perimeter of 2 squares = 64m

Thus, perimeter of other square = (64 + 4x)m

And each side of this second square

$= \frac{64+4x}{4} = (16+x)m$

According to the question, sum of the areas of two squares is 640 m²

$\therefore \quad x^2 + (16+x)^2 = 640$

$\Rightarrow \quad x^2 + 256 + x^2 + 32x = 640$

$\Rightarrow \quad 2x^2 + 32x - 384 = 0$

$\Rightarrow \quad x^2 + 16x - 192 = 0$

$\Rightarrow \quad x^2 + 24x - 8x - 192 = 0$

$\Rightarrow \quad (x+24)(x-8) = 0$

$\Rightarrow \quad x = 8 \qquad x = -24$ [$\because$ side cannot be negative

$\Rightarrow \quad x = 8$ m

Thus side of one square = 8 m

side of second square = 16 + 8 = 24 m.

OR

A shopkeeper buys a number of books for ₹ 80 If he had bought 4 more books for the same amount, each book would have cost ₹ 1 less. How many books did he buy?

Ans. : Let number of books bought be x then cost of x books = ₹ 80

$\Rightarrow$ Cost of one book = ₹ $\frac{80}{x}$

If number of books bought is x + 4, then

cost of one book = ₹ $\frac{80}{x+4}$

Therefore, According to the question

$$\frac{80}{x} - \frac{80}{x+4} = 1$$

$$\Rightarrow \quad 80\left(\frac{1}{x} - \frac{1}{x+4}\right) = 1$$

$$\Rightarrow \quad 80\left(\frac{x+4-x}{x(x+4)}\right) = 1$$

$$\Rightarrow \quad \frac{320}{x^2+4x} = 1$$

$$\Rightarrow \quad x^2 + 4x - 320 = 0$$

$$\Rightarrow \quad x^2 + 20x - 16x - 320 = 0$$

$$\Rightarrow \quad x(x+20) - 16(x+20) = 0$$

$$\Rightarrow \quad (x+20)(x-16) = 0$$

$\Rightarrow \quad x = -20$ or $x = 16$ [$\because$ x cannot be negative]

Section : E

Q.17 : Case Study :

Distance and Speed : A passenger is waiting for his flight at an airport. But due to bad weather conditions, his flight got delayed by 40 minutes. In order to reach the destination on time, which is 1600 km away, an aeroplane has to increase its speed by 400 km/h from its usual speed. (Let usual speed be x km/h).

i) Find the expression for the time taken by the plane to cover 1600 km with its increased speed. 1

Ans. : Increased speed = (x + 400) km/h

Time taken by the plane = $\frac{\text{Distance}}{\text{Speed}}$

$= \frac{1600}{x+400}$ h

ii) Find the usual speed of the plane. **2**

Ans. : Let the usual speed of plane = x km/h

So, according to given question.

$$\frac{1600}{x} - \frac{1600}{x+400} = \frac{2}{3}$$

$$\Rightarrow \quad 1600\left[\frac{x+400-x}{x(x+400)}\right] = \frac{2}{3}$$

$$\Rightarrow \quad 2400 \times 400 = x^2 + 400\,x$$

$$\Rightarrow \quad x^2 + 400\,x - 960000 = 0$$

$$\Rightarrow \quad x^2 + 1200\,x - 800\,x - 960000 = 0$$

$$\Rightarrow \quad x(x + 1200) - 800(x + 1200) = 0$$

$$\Rightarrow \quad (x + 1200)\,(x - 800)$$

Therefore $x = 800 \quad x = -1200$

Hence. Usual speed of plane = 800 km/h.

OR

Manoj when increases his speed from 24 km/h to 30 km/h he takes 1 hour less than the usual time to cover a certain distance. What is the distance usually covered by Manoj?

Ans. : Let distance be x

Then according to the question

$$\frac{x}{24} - \frac{x}{30} = 1$$

$$\Rightarrow \quad x\left[\frac{5-4}{120}\right] = 1$$

$$\Rightarrow \quad \frac{x}{120} = 1$$

$$\Rightarrow \quad x = 120$$

So, Distance = 120 km.

iii) If the usual speed of the plane is 750 km/h, then find the time taken by the plane to cover 2250 km distance. 1

Ans. : $\therefore \quad \text{Time} = \frac{\text{Distance}}{\text{Speed}}$

So, The time taken by the plane $= \frac{2250}{750}$

= 3 hours.

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