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Quadratic Equation

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1. The roots of the equation x^2-7x+12=, are
   $a)\ 4,-3$ $b)4,3$ $c)\ -4,3$ $d)\ -4,-3$
2. The roots of the equation $4x^2-2(a^2+b^2)x+a^2b^2=0, are$
   $a)\ \frac{a^2}{b},\frac{b^2}{a}$ $b)\ \frac{a^2}{2},\frac{b^2}{2}$ $c)\ \frac{a^2}{b^2},\frac{a}{b}$ $d)\ ab,a^2b^2$
3. Which of the following equation is not quadratic?
   $a)\ 2x^2-x+3=0$ $b)\ 3x^2+x-2=0$ $c)\ x^2+2\sqrt{x}+1=0$ $d)\ -4x^2+2x-1=0$
4. If one root of $kx^2-2x+3=0$ is 2, then the value of k is
   $a)\ \frac{1}{2}$ $b)\frac{1}{4}$ $c)\frac{1}{3}$ $d)\frac{1}{5}$
5. Find the sum and product of the root of the equation $\frac{2}{x^2}-\frac{5}{x}+2=0$
   $a)\ \frac{3}{4},2$ $b)\ \frac{1}{4},-2$ $c)\ \frac{5}{2},1$ $d)\frac{2}{3},-1$
6. If $6+\sqrt{5}$ is the root of the equation $x^2+mx+m=0\ where\ m\ and\ n\ are\ real$, then (m,n) is
   $a)\ 12,31$ $b)-12,31$ $c)\ 12,-31$ $d)-12,-31$
7. Find the quadratic equation whose roots are $2+\sqrt{3},2-\sqrt{3}$
   $a)\ 2x^2-4x+3=0$ $b)\ x^2-5x+1=0$ $c)\ x^2-4x+1=0$ $d)\ x^2+4x=0$
8. Find the value of k so that the roots of $kx^2+5x-2=0$ are reciprocal to each other?
   $a)-1$ $b)-2$ $c)\ 2$ $d)\ 1$
9. Find the discriminate of $\sqrt{3}x^2-2\sqrt{2}x-2\sqrt{3}=0$
   $a)\ 28$ $b)\ 32$ $c)\ 16$ $d)\ 36$
10. The roots of $x^2+5x+5=0$ are
    a) Real and equal b) real, unequal and rational
    c) real, unequal and irrational d) imaginary
11. If the roots of the equation $(a^2+b^2)x^2-2(ac+bd)x+(c^2+d^2)=0$ are equal then
    a) ac=bd b)ad=bc c) $a^2b=b^2c$ d) $ab^2=ac^2$
12. Find the maximum value of the quadratic expression $15+4x-3x^2$
    a) 61/3 b) 52/3 c)49/3 d)73/3
13. Find the minimum value of the quadratic expression x^2-x+7
    a) 27/4 b) 23/4 c) 29/4 d) 21/4
14. Find the 2 consecutive positive even integer, the sum of whose square is 884?
    a) 22,24 b) 16,18 c) 20,22 d) 18,20
15. If the sum of positive number and its square is 240. Find the number.
    a) 12 b) 16 c) 14 d) 15
16. Find the negative number which when increased by 17 is equal to 60 times the reciprocal of the number.
    a) -17 b) -18 c) -20 d) -25
17. The ratio of the mother's age to her daughter's age is 7:3. The product of their ages is 756. The ratio of their ages 10 years ago was
    a) 3:1 b) 4:1 c) 5:2 d) 6:1
18. The area of a rectangle is 460m^2. If the length is 15% more than the breadth. What is the breadth of the rectangular field?
    a) 20m b) 25m c) 23m d) 27m
19. Divide 45 into 2 parts so that the sum of the square is 1157
    a) 14,31 b) 16,29 c) 15,30 d) 18,27

20. Determine 2 consecutive positive multiple of 3, whose product is 3780?

a) 63,66 b) 66,69 c) 60,63 d) 57,60

Answers with Solutions

1. Solution: (b)

$$x^2 - 7x + 12 = 0$$
$$x^2 - 4x - 3x + 12 = 0$$
$$x(x-4) - 3(x-4) = 0$$
$$(x-4)(x-3) = 0$$
$$\therefore x = 4 \; or \; 3$$

2. Solution: (b)

$$4x^2 - 2(a^2 + b^2)x + a^2b^2 = 0$$
$$(4x^2 - 2a^2x) - (2b^2x - a^2b^2) = 0$$
$$2x(2x - a^2) - b^2(2x - a^2) = 0$$
$$(2x - a^2)(2x - b^2) = 0$$
$$2x - a^2 = 0 \; or \; 2x - b^2 = 0$$
$$\rightarrow x = \frac{a^2}{2} \; or \; x = \frac{b^2}{2}$$

3. Solution: (c)

$$From\ option\ B\ we\ have\ x^2 + 2\sqrt{x} + 1 = 0$$
$$\rightarrow x^2 + 2x^{\frac{1}{2}} + 1 = 0$$

$is\ not\ a\ quadratic\ equation\ because\ it\ contains\ a\ term\ involving\ x^{\frac{1}{2}}, where \frac{1}{2} is\ not\ an\ integer.$

4. Solution: (b)

$$clearly\ x = 2\ satisfies\ kx^2 - 2x + 3 = 0$$
$$K(2)^2 - 2(2) + 3 = 0$$
$$4k - 1 = 0 \rightarrow k = \frac{1}{4}$$

5. Solution: (c)

$$Given, \frac{2}{x^2} - \frac{5}{x} + 2 = 0$$
$$2x^2 - 5x + 2 = 0$$
$$Here, a = 2, b = -5\ and\ c = 2$$
$$Sum\ of\ the\ roots = -\frac{b}{a} = -\frac{-5}{2} = \frac{5}{2}$$
$$\therefore Product\ of\ the\ roots = \frac{c}{a} = \frac{2}{2} = 1$$

6. Solution: (b)

$$If\ \left(6 + \sqrt{5}\right) is\ one\ root\ then\ the\ other\ root\ is\ \left(6 - \sqrt{5}\right)$$
$$m\ and\ n\ are\ real.$$
$$Sum\ of\ the\ roots = \left(6 + \sqrt{5}\right) + \left(6 - \sqrt{5}\right) = 12$$
$$Product\ of\ the\ roots = \left(6 + \sqrt{5}\right)\left(6 - \sqrt{5}\right) = 31$$
$$Thus, the\ required\ equation\ is\ x^2 - 12x + 31 = 0 \rightarrow m = -12, n = 31$$

7. Solution: (c)

$$Sum\ of\ the\ roots = \left(2+\sqrt{3}\right)+\left(2-\sqrt{3}\right) = 4$$
$$Product\ of\ the\ roots = \left(2+\sqrt{3}\right)\left(2-\sqrt{3}\right) = 1$$
$$Thus, the\ required\ equation\ is\ x^2 - 4x + 1 = 0$$

8. Solution: (b)

$$If\ the\ roots\ of\ the\ equation\ reciprocates\ with\ each\ other,$$
$$then\ the\ product\ of\ the\ root\ should\ be = a = k, b = 5\ and\ c = -2$$
$$The\ product\ of\ the\ roots = \frac{c}{a} = -\frac{2}{k} = 1 \rightarrow k = -2$$

9. Solution: (b)

$$Here, a = \sqrt{3}, b = -2\sqrt{2}\ and\ c = -2\sqrt{3}$$
$$Discriminant = b^2 - 4ac = \left(-2\sqrt{2}\right)^2 - 4\left(\sqrt{3}\left(-2\sqrt{3}\right)\right)$$
$$8 + 24 = 32$$

10. Solution: (c)

$$Given, x^2 + 5x + 5 = 0$$
$$Here, a = 1, b = 5\ and\ c = 5$$
$$b^2 - 4ac = 5^2 - 4(1 \times 5) = 5$$
$$As\ 5 > 0\ and\ not\ a\ perfect\ square, the\ roots\ are\ real, irrational\ and\ unequal.$$

11. Solution: (b)

$$Here, a = (a^2 + b^2), b = -2(ac + bd) and\ c = (c^2 + d^2)$$
$$As\ the\ equation\ has\ equal\ roots\ b^2 - 4ac = 0$$
$$[-2(ac + bd)]^2 - 4(a^2 + b^2)(c^2 + d^2) = 0$$
$$4(ac + bd)^2 - 4(a^2c^2 + a^2d^2 + b^2c^2 + b^2d^2)$$
$$(ac + bd)^2 - (a^2c^2 + a^2d^2 + b^2c^2 + b^2d^2) = 0$$
$$a^2c^2 + b^2d^2 + 2abcd - a^2c^2 - a^2d^2 - b^2c^2 - b^2d^2 = 0$$
$$2abcd - a^2d^2 - b^2c^2 = 0$$
$$a^2d^2 + b^2c^2 - 2abcd = 0 \rightarrow (ad - bc)^2 = 0 \rightarrow ad - bc) = 0 \rightarrow ad - bc$$

12. Solution: (c)

$$a = -3, b = 4\ and\ c = 15$$
$$a < 0, the\ maximum\ value\ occure\ and\ is\ given\ by\ \frac{4ac - b^2}{4a}$$
$$= \frac{4 \times -3 \times 15 - 4 \times 4}{4 \times -3} = \frac{-180 - 16}{-12} = \frac{196}{12} = \frac{49}{3}$$

13. Solution: (a)

$$a = 1, b = -1\ and\ c = 7$$
$$a > 0, the\ minimum\ value\ occurs\ and\ is\ given\ by\ \frac{4ac - b^2}{4a}$$
$$= \frac{4 \times 1 \times 7 - (-1)^2}{4 \times 1} = \frac{28 - 1}{4} = \frac{27}{4}$$

14. Solution: (c)

$$Let\ the\ 2\ consecutive\ even\ integers\ be\ 2n\ and\ 2n+2.$$
$$Then, (2n)^2 + (2n+2)^2 = 884$$
$$4n^2 + 4n^2 + 8n + 4 = 884$$
$$8n^2 + 8n - 880 = 0$$
$$n^2 + n - 110 = 0$$
$$n^2 + 11n - 10n - 110 = 0$$
$$n(n+11) - 10(n+11) = 0$$
$$(n+11)(n-10) = 0$$
$$n = -11\ or\ 10 \rightarrow n = 10\ [\because n\ cannot\ be\ negative]$$
$$Then, the\ required\ numbers\ are\ 2n\ and\ (2n+20\ ie, 20\ and\ 22.$$

15. Solution: (d)

$$x + x^2 = 240$$
$$x^2 + x - 240 = 0$$
$$x^2 + 16x - 15s - 240 = 0$$
$$x(x+16) - 15(x+16) = 0$$
$$(x+16)(x-15) = 0$$
$$x = -16\ or\ 15 \rightarrow x = 15$$
$$\therefore x\ cannot\ \ be\ negative$$

16. Solution: (c)

$$Let\ the\ number\ be\ x.$$
$$x + 17 = 60 \times \frac{1}{x} \rightarrow x^2 + 17x - 60 = 0$$
$$x^2 + 20x - 3x - 60 = 0$$
$$x(x+20) - 3(x+20) = 0$$
$$(x+20)(x-3) = 0$$
$$x = -20\ or\ 3 \rightarrow x = -20\ [\ as\ x\ cannot\ be\ positive]$$

17. Solution: (b)

$$Let, \quad mother's age\ be\ 7x\ years\ and\ daughter's\ age\ be\ 3x\ years.$$
$$then, 7x \times 3x = 756 \rightarrow 21x^2 = 756 \rightarrow x^2 = 36$$
$$x^2 - 36 = 0 \rightarrow (x+6)(x-6) = 0 \rightarrow x = -6\ or\ 6 \rightarrow x = 6\ [\ x\ cannot\ be\ negative]$$
$$So, mother's\ current\ age = 7x = 42\ and\ 10\ years\ ago = 42 - 10 = 32$$
$$daughter's\ age = 3x = 18$$

18. Solution: (a)

$$Let\ the\ breadth\ of\ the\ rectangular\ field = x\ m$$
$$Then, the\ length\ of\ the\ rectangular\ field = \frac{115x}{100}\ m$$
$$Area = Length \times Breadth$$
$$460 = x \times \frac{115x}{100} = \frac{115x^2}{100} = 480$$
$$x^2 = \frac{460 \times 400}{115} = 400 \rightarrow x^2 - 400 = 0$$
$$(x+20)(x-20) = 0 \rightarrow x = 20\ or\ -20 \rightarrow x = 20[\ x\ cannot\ be\ negative]$$

19. Solution: (a)

$$Let\ the\ 2\ parts\ be\ x\ and\ 45-x$$
$$Then, x^2+(45-x)^2=1157$$
$$2x^2-90x+868=0$$
$$x^2-45x+434=0$$
$$x^2-31x-40x+434=0$$
$$(x-31)(x-14)=0\rightarrow x=31\ or\ 14$$
$$If\ x=31,(45-x)=14\ and\ if\ x=14,(45-x)=31$$
$$So, the\ 2\ parts\ are\ 14\ and\ 31$$

20. Solution: (c)

$$Let\ the\ required\ numbers\ be\ 3x\ and\ 3x+3$$
$$Then, 3x(3x+3)=3780$$
$$9x^2+9x-3780=0\rightarrow x^2+x-420=0$$
$$x^2+21x-20x-420=0$$
$$(x+21)(x-20)=0\rightarrow x=-21\ or\ 20\rightarrow x=20[As\ x\ cannot\ be\ negative]$$
$$So, the\ required\ numbers\ are\ 3x=60\ and\ 3x+3=63\ respectively.$$