Practice Challenge - Objective

Subject: Mathematics

Topic : Quadratic Equations Exam Prep 1

Class: X

1. The number of common roots of the equations x^2 – 7x + 10 = 0 and x^2 – 10x + 16 = 0 is

- **A.** 0
- **B.** 1
- **C.** 2
- **D.** 3

Step 1:- For, x^2 – 7x + 10 = 0, roots are 2 and 5

Step 2:- For, x^2 – 10x + 16 = 0, roots are 2 and 8.

Step 3:- Thus common root is only one, i.e. is 2.

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2. Let $f(x) = ax^2 + bx + c$. Then, match the following.

a. Sum of roots of f(x) = 0	1.$-\frac{b}{a}$
b. Product of roots of f(x) = 0	2.$\frac{c}{a}$
c. Roots of f(x) = 0 are real and distinct	3.$b^2-4ac = 0$
d. Roots of f(x) = 0 are real and identical.	4.$b^2-4ac > 0$

✗ **A.** $a-2,\ b-1,\ c-3.\ d-4$

✓ **B.** $a-1,\ b-2,\ c-4,\ d-3$

✗ **C.** $a-3,\ c-4,\ b-2,\ d-1$

✗ **D.** $a-1,\ b-2,\ c-3,\ d-4$

For f(x) = $ax^2 + bx + c$,

a. Sum of roots of f(x) = 0 is equal to $\frac{-b}{a}$.

b. Product of roots of f(x) = 0 is equal to $\frac{c}{a}$

c. Roots of f(x) = 0 are real and distinct, if D= $b^2-4ac > 0$

d. Roots of f(x) = 0 are real and equal, if D= $b^2-4ac = 0$

3. Find the value of k for which $x^2-4x+k=0$ has coincident roots.

A. 0

B. -2

C. 4

D. -4

On comparing $x^2-4x+k=0$ with standard form $ax^2+bx+c=0$, we get

a = 1, b = -4 and c = k

Now, discriminant, D = b^2-4ac
$\Rightarrow D=(-4)^2-4(1)k=16-4k$

The roots of quadratic equation are co-incident only when $D=0$.

$\Rightarrow 16-4k=0$

$\Rightarrow k=4$

4. Shriya and Vidya solved a quadratic equation. In solving it, Shriya made a mistake in the constant term and obtained the roots as 5, – 3 while Vidya made a mistake in the coefficient of x and obtained the roots as 1, –3. The correct roots of the equation are

A. 1, 3

B. –1, 3

C. –1, –3

D. 1, –1

Shriya made a mistake in constant term only,
Thus, the sum of the roots was correct.
$Sum\ of\ roots = 2 = -\frac{b}{a}$
Vidya made a mistake only in coefficient of x
So the product of roots was correct.
Thus,
$Product\ of\ roots = -3 = \frac{c}{a}$
Hence, the correct quadratic equation is $x^2 - 2x - 3 = 0$
The roots of the correct quadratic equation are $-1, 3.$

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5. What will be the condition for $(a^2 - 9)x^2 + bx + c = 0$ to be a quadratic equation?

- **A.** $a \neq 0;\ a, b, c$ are real
- **B.** $a = -3;\ a, b, c$are real
- **C.** $a = 3;\ a, b, c$ are real
- **D.** $a \neq \pm 3;\ a, b, c$ are real

Standard form of a quadratic equation is $ax^2 + bx + c = 0$, with the conditions that a, b, c are real numbers and $a \neq 0$.

So considering the same here, $(a^2 - 9)$ should not be equal to zero.

$\Rightarrow a^2 - 9 \neq 0$

$\Rightarrow a^2 \neq 9$

$\Rightarrow a \neq \pm 3$

So, the condition for the given equation to be a quadratic equation is that $a, b, c$are real numbers and $a \neq \pm 3$.

6. Which of the following is not a quadratic equation?

A. $(x-2)^2$+ 1 = 2x -3

B. $(x+2)^3$=x^3-4

C. $x(x+1)+8=(x+2)(x-2)$

D. $x(2x+3)=(x^2+1)$

(a) $(x-2)^2$+ 1 = (2x – 3)

x^2 – 4x + 4 + 1 = 2x - 3

x^2 – 4x + 4 + 1 - 2x + 3 = 0

x^2 – 6x + 8 = 0

This is a quadratic equation.

(b) $(x+2)^3$= x^3 – 4

x^3 + 6x^2 + 12x + 8 = x^3 – 4

6x^2 + 12x + 12 = 0

This is a quadratic equation.

(c) x(x + 1) + 8 = (x + 2) (x – 2)

x^2 + x + 8 = x^2 – 4

x+12 = 0

This is not a Quadratic equation.

(d) x(2x + 3) = x^2 + 1

2x^2 + 3x = x^2+1

x^2 +3x -1 = 0

This is a quadratic equation.

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7. Write x^2 +10x+16 =0 in the form x^2 +px+qx+16 =0 such that p x q = 16

- **A.** p = 8, q = 2
- **B.** p = -8, q = -2
- **C.** p = 2, q = 6
- **D.** p = -2, q = -8

Comparing x^2 +10x+16 =0 to ax^2 + bx+ c = 0, we have a=1 , b=10 and c=16

Now, we need to find two numbers whose product is 16 and whose sum is 10

Pairs of numbers whose product is 16

1,16

-1,-16

2,8

-2,-8

4,4

-4,-4

Of these pairs , the pair that gives the sum 10 is the third pair

Identifying the pair, we rewrite the given quadratic equation as

x^2 +10x+16= x^2 +2x+8x+16

x^2 +2x+8x+16=0

8. The altitude of a right triangle is 7 cm less than its base. If the hypotenuse is 13 cm, find the other two sides (in cm).

- ✗ **A.** 2,5
- ✗ **B.** 5,3
- ✗ **C.** 7,2
- ✓ **D.** 12,5

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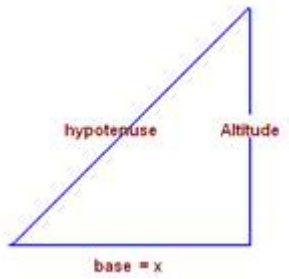

Let the base = x cm

Given that the altitude of a right triangle is 7 cm less than its base

Altitude is = x - 7 cm

Given that hypotenuse = 13cm

Applying Pythagoras theorem,

$base^2 + altitude^2 = hypotenuse^2$

Substituting the values, we get

$\Rightarrow \quad x^2 + (x-7)^2 = 13^2$

$\Rightarrow \quad x^2 + x^2 + 49 - 14x = 169$

$\Rightarrow \quad 2x^2 - 14x + 49 - 169 = 0$

$\Rightarrow \quad 2x^2 - 14x - 120 = 0$

Dividing with 2 on both sides the above equation simplifies to

$\Rightarrow \quad x^2 - 7x - 60 = 0$

$\Rightarrow \quad x^2 - 12x + 5x - 60 = 0$

$\Rightarrow \quad x(x - 12) + 5(x - 12) = 0$

$\Rightarrow \quad (x - 12)(x + 5) = 0$

$\Rightarrow \quad x - 12 = 0 \text{ or } x + 5 = 0$

$\Rightarrow \quad x = 12 \text{ or } x = -5$

Length cannot be negative so x cannot be equal to – 5

base x = 12cm; altitude = 12 – 7 = 5cm

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9. What are the roots of the quadratic equation $(x+2)^2$-16 = 0?

- **A.** x = 2 or -6
- **B.** x = -2 or 6
- **C.** x = 2 or 6
- **D.** x = -2 or -6

$(x+2)^2 - 16 = 0$

$(x+2)^2 = 16$

$(x+2) = \sqrt{16}$

$(x+2) = +4 \; or \; (x+2) = -4$

x = 2 or x = - 6

10. During a practice match, a softball pitcher throws a ball whose height can be modeled by the equation $h = -16t^2 + 24t + 1$, where h = height in feet and t = time in seconds. How long does it take for the ball to reach a height of 6 feet?

- ✗ **A.** 2.2 and 3.8 secs
- ✗ **B.** 5.4 and 6.2 secs
- ✓ **C.** 0.25 and 1.25 secs
- ✗ **D.** 7 and 5 secs

Given Height = 6

$\Rightarrow -16t^2 + 24t + 1 = 6$

$\Rightarrow 16t^2 - 24t + 5 = 0$

$\Rightarrow 16t^2 - 4t - 20t + 5 = 0$

$\Rightarrow 16t^2 - 4t - 20t + 5 = 0$

$\Rightarrow 4t(4t - 1) - 5(4t - 1) = 0$

$\Rightarrow (4t - 1)(4t - 5) = 0$

$t = \frac{1}{4}, \frac{5}{4} or\ 0.25,\ 1.25$

So, at time 0.25 secs and 1.25 secs, the ball will be at a height of 6 feet.