Conceptual Multiple Choice Questions: Quadratic Equations

Exercise 4.1 (Class 11 Mathematics, Chapter 4)

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MCQs

1. A quadratic equation $ax^2 + bx + c = 0$ has real coefficients and:

(a) $a = 0$
(b) $b = 0$
(c) $c = 0$
(d) $a \neq 0$

2. The factorization of $x^2 + 5x + 6 = 0$ yields:

(a) $(x + 2)(x + 3) = 0$
(b) $(x - 2)(x - 3) = 0$
(c) $(x + 1)(x + 6) = 0$
(d) $(x - 1)(x - 6) = 0$

3. For $6x^2 - x - 2 = 0$, the correct factorization is:

(a) $(2x - 1)(3x + 2) = 0$
(b) $(3x - 1)(2x + 2) = 0$
(c) $(6x - 1)(x + 2) = 0$
(d) $(2x + 1)(3x - 2) = 0$

4. Solving $x^2 - 16 = 0$ by factorization gives the solution set:

(a) $\{4, -4\}$
(b) $\{2, -2\}$
(c) $\{16, -16\}$
(d) $\{0, 16\}$

5. To solve $x^2 - 6x - 7 = 0$ by completing the square, the first step is:

(a) $x^2 - 6x = 7$
(b) $x^2 - 6x + 9 = -7$
(c) $x^2 - 6x = -9$
(d) $x^2 - 6x + 36 = 7$

6. Completing the square $(x - 2)^2 = 25$ yields:

- $\{2, -2\}$

- $\{7, -3\}$
- $\{5, 2\}$
- $\{3, -7\}$

7. The quadratic formula is:

$$\begin{aligned} &\text{(a) } x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \\ &\text{(b) } x = \frac{-b \pm \sqrt{a^2 - 4bc}}{2a} \\ &\text{(c) } x = \frac{-b \pm \sqrt{b^2 - 4ac}}{4a} \\ &\text{(d) } x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \end{aligned} \tag{1}$$

8. The discriminant of $4x^2 + 3x - 2 = 0$ is:

- 41
- 25
- 9
- -23

9. For $9x^2 + 6x + 1 = 0$, the discriminant indicates:

- Two distinct real roots
- One real root (repeated)
- No real roots
- Two complex roots

10. The solution to $2x^2 + 5x - 3 = 0$ using the quadratic formula is:

- $\left\{\frac{1}{2}, -3\right\}$
- $\left\{-\frac{1}{2}, 3\right\}$
- $\left\{3, -\frac{1}{2}\right\}$
- $\left\{-3, \frac{1}{2}\right\}$

11. Solving $\frac{1}{x-1} + \frac{1}{x-2} = \frac{3}{2}$ by eliminating fractions yields:

- $\{4, 0\}$
- $\left\{\frac{7}{3}, \frac{5}{3}\right\}$
- $\{3, 1\}$
- $\{2, -1\}$

12. The equation $\frac{2}{x+1} + \frac{3}{x+2} = \frac{7}{x+3}$ simplifies to a quadratic equation with solution set:

- $\{1, -3\}$

- $\left\{-\frac{5}{2}, 1\right\}$
- $\{0, -2\}$
- $\left\{\frac{3}{2}, -1\right\}$

13. For the equation $x(x+3) = (x-1)(x+2)$, the solution set is:

- $\{1, -1\}$
- $\{2, -2\}$
- $\{0, 3\}$
- $\{-3, 0\}$

14. Solving $x^2 + 4x - 221 = 0$ by completing the square gives:

- $\{13, -17\}$
- $\{17, -13\}$
- $\{11, -15\}$
- $\{15, -11\}$

15. The quadratic formula applied to $3x^2 - 2x - 5 = 0$ yields:

- $\left\{\frac{5}{3}, -1\right\}$
- $\left\{1, -\frac{5}{3}\right\}$
- $\left\{\frac{3}{2}, -1\right\}$
- $\left\{-\frac{3}{2}, 1\right\}$

16. For $2x^2 + kx + 2 = 0$, the equation has equal roots if k is:

- ± 4
- ± 2
- $\pm\sqrt{8}$
- ± 8

17. The equation $(x-1)(x-2) + (x-2)(x-3) + (x-3)(x-1) = 0$ simplifies to:

- $3x^2 - 12x + 11 = 0$
- $2x^2 - 12x + 11 = 0$
- $3x^2 - 6x + 6 = 0$
- $x^2 - 6x + 6 = 0$

18. For $6x^2 + ax - a^2 = 0$, the roots are:

- $\left\{\frac{a}{2}, -\frac{a}{3}\right\}$
- $\left\{\frac{a}{3}, -\frac{a}{2}\right\}$
- $\left\{-\frac{a}{3}, \frac{a}{2}\right\}$
- $\left\{-\frac{a}{2}, \frac{a}{3}\right\}$

19. Solving $\frac{a}{ax-1} + \frac{b}{bx-1} = a + b$, $x \neq \frac{1}{a}, \frac{1}{b}$, gives roots:

- $\left\{\frac{a+b}{ab}, \frac{2}{a+b}\right\}$
- $\left\{\frac{ab}{a+b}, \frac{2}{ab}\right\}$
- $\left\{\frac{a+b}{ab}, \frac{a+b}{2}\right\}$
- $\left\{\frac{2}{a+b}, \frac{ab}{a+b}\right\}$

20. For $(a + b)x^2 + (2a + b + c)x + (a + c) = 0$, one root is:

- -1
- $\frac{a+c}{a+b}$
- $\frac{a+b}{a+c}$
- -2

Answers and Explanations

1. **Answer: d**
   A quadratic equation requires $a \neq 0$ to be second-degree (PDF p.205).

2. **Answer: a**
   $x^2 + 5x + 6 = (x + 2)(x + 3)$, as $2 \cdot 3 = 6$ and $2 + 3 = 5$. Others are incorrect.

3. **Answer: a**
   $6x^2 - x - 2 = (2x - 1)(3x + 2)$, as $2 \cdot 3 = 6$, and cross terms yield $-x$. Others do not factor correctly.

4. **Answer: a**
   $x^2 - 16 = (x - 4)(x + 4) = 0 \implies x = \pm 4$. Others are incorrect.

5. **Answer: a**
   Move the constant: $x^2 - 6x = 7$. Next, add $\left(\frac{-6}{2}\right)^2 = 9$ to both sides.

6. **Answer: b**
   $(x - 2)^2 = 25 \implies x - 2 = \pm 5 \implies x = 7, -3$. Others do not satisfy.

7. **Answer: d**
   The quadratic formula is $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$. Others are incorrect (PDF p.212).

8. **Answer: a**
   $\Delta = 3^2 - 4 \cdot 4 \cdot (-2) = 9 + 32 = 41$. Others are incorrect.

9. **Answer: b**
   $\Delta = 6^2 - 4 \cdot 9 \cdot 1 = 36 - 36 = 0 \implies$ one repeated root. Others do not match.

10. **Answer: d**
    $\Delta = 5^2 - 4 \cdot 2 \cdot (-3) = 49$, $x = \frac{-5 \pm 7}{4} \implies x = \frac{1}{2}, -3$. Others are incorrect.

11. **Answer: b**
Combine: $\frac{2x-3}{(x-1)(x-2)} = \frac{3}{2} \implies 2x^2 - 7x + 5 = 0 \implies x = \frac{7}{3}, \frac{5}{3}$. Others do not satisfy.

12. **Answer: b**
Simplify: $5x^2 + 17x + 14 = 0 \implies (5x + 7)(x + 2) = 0 \implies x = -\frac{7}{5}, -2$. Others are incorrect.

13. **Answer: b**
Expand: $x^2 + 3x = x^2 + x - 2 \implies x^2 - 4 = 0 \implies x = \pm 2$. Others do not match.

14. **Answer: a**
$x^2 + 4x = 221 \implies (x + 2)^2 = 225 \implies x + 2 = \pm 15 \implies x = 13, -17$. Others are incorrect.

15. **Answer: b**
$\Delta = (-2)^2 - 4 \cdot 3 \cdot (-5) = 64$, $x = \frac{2 \pm 8}{6} \implies x = 1, -\frac{5}{3}$. Others do not satisfy.

16. **Answer: a**
Equal roots: $\Delta = k^2 - 4 \cdot 2 \cdot 2 = k^2 - 16 = 0 \implies k = \pm 4$. Others are incorrect.

17. **Answer: a**
Simplify: $3x^2 - 12x + 11 = 0$. Others do not match the expansion.

18. **Answer: d**
$\Delta = a^2 + 4 \cdot 6 \cdot a^2 = 25a^2$, $x = \frac{-a \pm 5a}{12} \implies x = -\frac{a}{2}, \frac{a}{3}$. Others are incorrect.

19. **Answer: a**
Simplify: $(a + b - abx)(ax + bx - 2) = 0 \implies x = \frac{a+b}{ab}, \frac{2}{a+b}$. Others do not match (PDF p.209).

20. **Answer: a**
$\Delta = (2a + b + c)^2 - 4(a + b)(a + c) = (b - c)^2$, $x = -1, -\frac{a+c}{a+b}$. Others are incorrect.