Conceptual Multiple Choice Questions: Systems of Quadratic Equations (Exercise 4.9)

Class 11 Mathematics (Chapter 4)

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MCQs

1. The solution set for $2x^2 = 6 + 3y^2$, $3x^2 - 5y^2 = 7$ is:

(a) $\{(3, 2), (-3, 2), (3, -2), (-3, -2)\}$
(b) $\{(2, 3), (-2, 3), (2, -3), (-2, -3)\}$
(c) $\{(3, 1), (-3, 1), (3, -1), (-3, -1)\}$
(d) $\{(1, 2), (-1, 2), (1, -2), (-1, -2)\}$

2. The number of real solutions for $8x^2 = y^2$, $x^2 + 2y^2 = 19$ is:

(a) 4
(b) 2
(c) 1
(d) 0

3. For $x^2 - 5xy + 6y^2 = 0$, $x^2 + y^2 = 45$, one solution is:

(a) $(6, 3)$
(b) $(3, 6)$
(c) $(2, 3)$
(d) $(3, 2)$

4. The solution set for $12x^2 - 25xy + 12y^2 = 0$, $4x^2 + 7y^2 = 148$ includes:

(a) $(3, 4)$
(b) $(4, 3)$
(c) $(3, -3)$
(d) $(4, -4)$

5. For $12x^2 - 11xy + 2y^2 = 0$, $2x^2 + 7xy = 60$, one solution is:

(a) $(\sqrt{2}, 4\sqrt{2})$
(b) $(2, 4)$
(c) $(1, 2)$
(d) $(4, \sqrt{2})$

6. The solution set for $x^2 - y^2 = 16$, $xy = 15$ includes:

(a) $(5, 3)$

(b) $(3, 5)$

(c) $(5, -5)$

(d) $(3, -3)$

7. The solution set for $x^2 + xy = 9$, $x^2 - y^2 = 2$ is:

(a) $\left\{\left(\frac{9}{4}, \frac{7}{4}\right), \left(-\frac{9}{4}, -\frac{7}{4}\right)\right\}$

(b) $\left\{\left(\frac{7}{4}, \frac{9}{4}\right), \left(-\frac{7}{4}, -\frac{9}{4}\right)\right\}$

(c) $\left\{\left(\frac{9}{4}, -\frac{7}{4}\right), \left(-\frac{9}{4}, \frac{7}{4}\right)\right\}$

(d) $\left\{\left(2, \frac{1}{2}\right), \left(-2, -\frac{1}{2}\right)\right\}$

8. The solution set for $y^2 - 2xy = 7$, $2x^2 + 3 = xy$ is:

(a) $\{(3, 7), (-3, -7)\}$

(b) $\{(7, 3), (-7, -3)\}$

(c) $\{(3, -7), (-3, 7)\}$

(d) $\{(7, -3), (-7, 3)\}$

9. The solution set for $x^2 + y^2 = 5$, $xy = 2$ is:

(a) $\{(2, 1), (-2, -1), (1, 2), (-1, -2)\}$

(b) $\{(2, -1), (-2, 1), (1, -2), (-1, 2)\}$

(c) $\{(2, 2), (-2, -2), (1, 1), (-1, -1)\}$

(d) $\{(1, 1), (-1, -1), (2, 2), (-2, -2)\}$

10. The equation obtained after eliminating y^2 in $2x^2 = 6 + 3y^2$, $3x^2 - 5y^2 = 7$ is:

(a) $x^2 = 9$

(b) $y^2 = 4$

(c) $x^2 = 4$

(d) $y^2 = 9$

11. The homogeneous equation for $x^2 - 5xy + 6y^2 = 0$ factors as:

(a) $(x - 2y)(x - 3y) = 0$

(b) $(x - y)(x - 6y) = 0$

(c) $(x - 2y)(x - 4y) = 0$

(d) $(x - y)(x - 5y) = 0$

12. The quadratic equation for $x^2 + y^2 = 5$, $xy = 2$ after substitution is:

(a) $x^4 - 5x^2 + 4 = 0$

(b) $x^4 + 5x^2 - 4 = 0$

(c) $x^4 - 4x^2 + 5 = 0$

(d) $x^4 + 4x^2 - 5 = 0$

13. The number of real solutions for $x^2 + xy = 9$, $x^2 - y^2 = 2$ is:

(a) 2
(b) 4
(c) 1
(d) 0

14. The homogeneous equation obtained from $y^2 - 2xy = 7$, $2x^2 + 3 = xy$ is:

(a) $14x^2 - 13xy + 3y^2 = 0$
(b) $14x^2 + 13xy - 3y^2 = 0$
(c) $7x^2 - 13xy + 2y^2 = 0$
(d) $7x^2 + 13xy - 2y^2 = 0$

15. For $12x^2 - 25xy + 12y^2 = 0$, the linear factors are:

(a) $(3x - 4y)(4x - 3y) = 0$
(b) $(3x - y)(4x - y) = 0$
(c) $(2x - 3y)(6x - 4y) = 0$
(d) $(x - 4y)(12x - 3y) = 0$

16. The value of y^2 when $x = \sqrt{2}$ in $12x^2 - 11xy + 2y^2 = 0$, $2x^2 + 7xy = 60$ is:

(a) 16
(b) 8
(c) 4
(d) 2

17. The sum of the x-coordinates of the real solutions to $x^2 + y^2 = 5$, $xy = 2$ is:

(a) 0
(b) 2
(c) -2
(d) 4

18. For $x^2 - y^2 = 16$, $xy = 15$, the quadratic equation in x^2 is:

(a) $x^4 - 16x^2 - 225 = 0$
(b) $x^4 - 16x^2 + 225 = 0$
(c) $x^4 + 16x^2 - 225 = 0$
(d) $x^4 - 225x^2 + 16 = 0$

19. For $2x^2 = 6 + 3y^2$, $3x^2 - 5y^2 = 7$, the discriminant of the quadratic in x^2 (if solved) is:

(a) 0

(b) 16

(c) 64

(d) 36

20. The product of the y-coordinates of the real solutions to $x^2 + y^2 = 5$, $xy = 2$ is:

(a) 4

(b) -4

(c) 2

(d) -2

Answers and Explanations

1. **Answer: a**
Explanation: Multiply first by 3, second by 2, subtract: $y^2 = 4 \implies y = \pm 2$. Substitute: $x^2 = 9 \implies x = \pm 3$. Solution set: $\{(3, 2), (-3, 2), (3, -2), (-3, -2)\}$. Option (a) is correct; others do not match.

2. **Answer: a**
Explanation: From $8x^2 = y^2$, substitute into $x^2 + 2y^2 = 19$: $17x^2 = 19 \implies x = \pm\sqrt{\frac{19}{17}}$. Then, $y = \pm 2\sqrt{\frac{38}{17}}$. Four solutions. Option (a) is correct; others are incorrect.

3. **Answer: a**
Explanation: Factorize: $(x - 2y)(x - 3y) = 0$. For $x = 2y$, substitute: $5y^2 = 45 \implies y = \pm 3 \implies (6, 3)$. Option (a) is correct; others are not solutions.

4. **Answer: a**
Explanation: Factorize: $(3x - 4y)(4x - 3y) = 0$. For $4x - 3y = 0$, substitute: $y = \pm 4 \implies x = \pm 3$. Includes $(3, 4)$. Option (a) is correct; others are not solutions.

5. **Answer: a**
Explanation: Factorize: $(3x - 2y)(4x - y) = 0$. For $4x - y = 0$, substitute: $x = \pm\sqrt{2} \implies y = \pm 4\sqrt{2}$. Includes $(\sqrt{2}, 4\sqrt{2})$. Option (a) is correct; others are not solutions.

6. **Answer: a**
Explanation: Substitute $y = \frac{15}{x}$ into $x^2 - y^2 = 16$: $x^4 - 16x^2 - 225 = 0 \implies x = \pm 5$. Then, $y = \pm 3$. Includes $(5, 3)$. Option (a) is correct; others are not real solutions.

7. **Answer: a**
Explanation: Eliminate constants: $(7x - 9y)(x + y) = 0$. For $7x - 9y = 0$, substitute: $y = \pm\frac{7}{4} \implies x = \pm\frac{9}{4}$. Solution set: $\left\{\left(\frac{9}{4}, \frac{7}{4}\right), \left(-\frac{9}{4}, -\frac{7}{4}\right)\right\}$. Option (a) is correct; others are incorrect.

8. **Answer: a**
Explanation: Eliminate constants: $(2x - y)(7x - 3y) = 0$. For $7x - 3y = 0$, substitute: $y = \pm 7 \implies x = \pm 3$. Solution set: $\{(3, 7), (-3, -7)\}$. Option (a) is correct; others do not match.

9. **Answer: a**
Explanation: Substitute $y = \frac{2}{x}$ into $x^2 + y^2 = 5$: $x^4 - 5x^2 + 4 = 0 \implies x = \pm 2, \pm 1$. Then, $y = \pm 1, \pm 2$. Solution set: $\{(2, 1), (-2, -1), (1, 2), (-1, -2)\}$. Option (a) is correct; others are incorrect.

10. **Answer: b**
Explanation: Multiply and subtract: $y^2 = 4$. Option (b) is correct; others are incorrect results of elimination.

11. **Answer: a**
Explanation: Factorize: $x^2 - 5xy + 6y^2 = (x - 2y)(x - 3y) = 0$. Option (a) is correct; others do not factor correctly.

12. **Answer: a**
Explanation: Substitute $y = \frac{2}{x}$: $x^4 - 5x^2 + 4 = 0$. Option (a) is correct; others are incorrect.

13. **Answer: a**
Explanation: For $7x - 9y = 0$, two solutions. For $x + y = 0$, no solution. Two real solutions. Option (a) is correct; others do not match.

14. **Answer: a**
Explanation: Multiply first by 3, second by 7, add: $14x^2 - 13xy + 3y^2 = 0$. Option (a) is correct; others are incorrect.

15. **Answer: a**
Explanation: Factorize: $(3x - 4y)(4x - 3y) = 0$. Option (a) is correct; others do not factor correctly.

16. **Answer: a**
Explanation: For $4x - y = 0$, $y = 4x$. Substitute $x = \sqrt{2}$: $y = 4\sqrt{2} \implies y^2 = 16$. Option (a) is correct; others are incorrect.

17. **Answer: a**
Explanation: Solutions: $x = 2, -2, 1, -1$. Sum: $2 + (-2) + 1 + (-1) = 0$. Option (a) is correct; others are incorrect.

18. **Answer: a**
Explanation: Substitute $y = \frac{15}{x}$: $x^4 - 16x^2 - 225 = 0$. Option (a) is correct; others are incorrect.

19. **Answer: a**
Explanation: Eliminate x^2: $y^2 = 4$. Discriminant of quadratic in x^2 is zero (perfect square). Option (a) is correct; others are incorrect.

20. **Answer: a**
Explanation: Solutions: $y = 1, -1, 2, -2$. Product: $1 \cdot (-1) \cdot 2 \cdot (-2) = 4$. Option (a) is correct; others are incorrect.