Quadratic Equations

Standard difficulty · 20 questions · 40 marks · Time: 36 minutes

Name: _____ Date: _____ Score: ____ / 40

Show your working for Sections B and C. Answers are on the last page — try every question first!

Section A — Choose the correct answer — 8 × 1 = 8 marks

1. The roots of $x^2 + 5x - 6 = 0$ are:

(a) −6 and −1 **(b)** −1 and 6 **(c)** −6 and −5 **(d)** −6 and 1

2. The discriminant of $5x^2 + 5x + 5 = 0$ is:

(a) 125 **(b)** 75 **(c)** −75 **(d)** −95

3. The roots of $x^2 - 5x + 9 = 0$ are:

(a) real and equal **(b)** always zero

(c) real and distinct **(d)** not real (no real roots)

4. Which of these is a quadratic equation?

(a) $4x^2 + x - 3 = 0$ **(b)** $(x + 1)^2 = x^2 - 3$

(c) $x^3 + x - 3 = 0$ **(d)** $x - 3 = 0$

5. The standard form of a quadratic equation is:

(a) $ax + b = 0$ **(b)** $ax^2 + bx + c = 0$, with $a \neq 0$

(c) $ax^2 + bx + c = 0$, with $a = 0$ **(d)** $ax^3 + bx^2 + c = 0$

6. For what values of k does $x^2 + kx + 49 = 0$ have equal roots?

(a) $k = \pm 49$ **(b)** $k = \pm 7$ **(c)** k = 14 only **(d)** $k = \pm 14$

7. One root of $x^2 - 14x + 45 = 0$ is 9. The other root is:

(a) 5 **(b)** 14 **(c)** 45 **(d)** −5

8. Assertion (A): $x^2 + x + 3 = 0$ has two distinct real roots.
Reason (R): A quadratic equation has two distinct real roots when $b^2 - 4ac > 0$.

(a) Both A and R are true, and R is the correct explanation of A.

(b) Both A and R are true, but R is not the correct explanation of A.

(c) A is true, but R is false.

(d) A is false, but R is true.

Section B — Short answer — 8 × 2 = 16 marks

9. Solve by factorisation: $2x^2 + 9x + 10 = 0$

10. Solve using the quadratic formula: $2x^2 + 8x + 3 = 0$

11. Find the discriminant of $6x^2 - 3x + 7 = 0$ and say what kind of roots it has.

12. Find k so that $x^2 + 14x + k = 0$ has two equal roots.

13. Solve: $x + 18/x = 9$ $(x \neq 0)$

14. Form the quadratic equation whose roots are 4 and −3.

15. Solve: $(x + 5)(x - 10) = -56$

16. For what values of k does $x^2 + kx + 9 = 0$ have no real roots?

Section C — Word problems — 4 × 4 = 16 marks

17. The product of two consecutive positive integers is 306. Find them.

18. The length of a rectangular plot is 11 m more than its breadth. Its area is 900 m^2. Find its length and breadth.

19. The hypotenuse of a right-angled triangle is 159 cm. One of the other sides is 51 cm longer than the third. Find the two sides.

20. A train travels 400 km at a uniform speed. If the speed were 20 km/h more, the journey would take 1 hour less. Find the speed of the train.

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Answer key

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Q	Answer	Working
1	**(d) −6 and 1**	$(x + 6)(x - 1) = 0$
2	**(c) −75**	$b^2 - 4ac = 25 - 4 \times 5 \times 5 = -75$
3	**(d) not real (no real roots)**	$b^2 - 4ac = -11 < 0$
4	**(a) $4x^2 + x - 3 = 0$**	the highest power of x is 2, and the x^2 term does not cancel
5	**(b) $ax^2 + bx + c = 0$, with $a \neq 0$**	—
6	**(d) k = ±14**	equal roots: $k^2 - 4 \times 49 = 0$, so $k^2 = 196$
7	**(a) 5**	product of roots = 45, so the other is 45 ÷ 9 = 5
8	**(d) A is false, but R is true.**	A is false: $b^2 - 4ac = -11$. R is true.
9	**x = −5/2 or x = −2**	$(x + 2)(2x + 5) = 0$
10	**$x = (-4 \pm \sqrt{10})/2$**	$b^2 - 4ac = 40$; $x = (-8 \pm \sqrt{40})/4$
11	**−159; no real roots**	$b^2 - 4ac = 9 - 168 = -159$
12	**k = 49**	$(14)^2 - 4k = 0$, so k = 49
13	**x = 3 or x = 6**	multiply by x: $x^2 - 9x + 18 = 0$, so $(x - 6)(x - 3) = 0$
14	**$x^2 - x - 12 = 0$**	$x^2 - (\text{sum})x + \text{product} = 0$: sum 1, product −12
15	**x = 2 or x = 3**	$x^2 - 5x - 50 = -56$, so $x^2 - 5x + 6 = 0$
16	**$-6 < k < 6$**	$k^2 - 36 < 0$, so $k^2 < 36$
17	**17 and 18**	$x(x + 1) = 306$; $x^2 + x - 306 = 0$; x = 17
18	**length 36 m, breadth 25 m**	$x(x + 11) = 900$; x = 25
19	**84 cm and 135 cm**	$x^2 + (x + 51)^2 = 25281$; x = 84
20	**80 km/h**	$400/x - 400/(x + 20) = 1$; $x^2 + 20x - 8000 = 0$; x = 80

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