

Linear and Quadratic Equations

Mathematics · Class 10 · Topic-wise Practice Worksheet

TIME 45 minutes	QUESTIONS 18	TOTAL MARKS 24	MAX. SCORE ____ / 24
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Name: _____ Class/Sec: _____ Date: _____

INSTRUCTIONS

- There are **18 questions** in this worksheet. All questions are compulsory.
- Each question has four options (A), (B), (C) and (D). Exactly **one** option is correct.
- Questions 1–15 carry **1 mark** each. Questions 16–18 (Achievers Section) carry **3 marks** each.
- There is no negative marking. Use of a calculator is **not** allowed.
- Rough work may be done on the blank space at the side of each page.

Section A — Mathematical Reasoning

Q1–Q8 · 1 mark each

1. A pair of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ has a **unique** solution when _____.

(A) $a_1 = a_2$

(B) $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

(C) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

(D) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

2. A pair of linear equations that has **no** solution is represented graphically by _____.

(A) Parallel lines

(B) Intersecting lines

(C) Coincident lines

(D) Perpendicular lines

3. The standard form of a quadratic equation is _____.

(A) $ax + b = 0$

(B) $ax^2 + bx + c = 0, a \neq 0$

(C) $ax^2 + bx + c = 0, a \neq 0$

(D) $ax^3 + bx^2 + c = 0$

4. The discriminant of the quadratic equation $ax^2 + bx + c = 0$ is _____.

(A) $\frac{-b}{2a}$

(B) $b^2 + 4ac$

(C) $\sqrt{b^2 - 4ac}$

(D) $b^2 - 4ac$

5. The roots of a quadratic equation are real and equal when _____.

(A) $D = 0$

(B) $D > 0$

(C) $D < 0$

(D) D is a perfect square

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

(A) 1 and 6

(B) -2 and -3

(C) 2 and 3

(D) -1 and 6

7. For the equation $ax^2 + bx + c = 0$, the sum of the roots is _____.

(A) $\frac{-c}{a}$

(B) $\frac{b}{a}$

(C) $\frac{c}{a}$

(D) $\frac{-b}{a}$

8. The equation $2x^2 - 4x + 3 = 0$ has _____.

(A) No real roots

(B) Two equal real roots

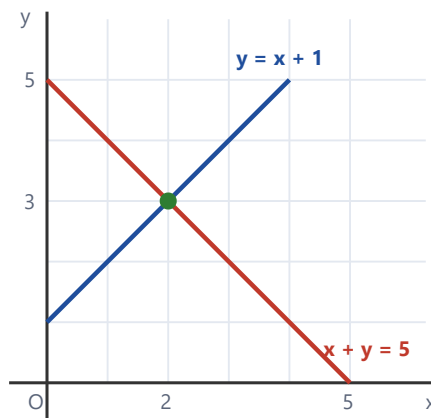
(C) Two distinct real roots

(D) Exactly one real root

Section B — Everyday Mathematics and Reasoning

Q9–Q15 · 1 mark each

9. The graphs of $x + y = 5$ and $y = x + 1$ are drawn below. The solution of this pair of equations is _____.



Graphs of $x + y = 5$ and $y = x + 1$

(A) $x = 3, y = 2$

(B) $x = 2, y = 3$

(C) $x = 1, y = 4$

(D) $x = 5, y = 0$

10. Solving $2x + y = 8$ and $x - y = 1$ gives _____.

(A) $x = 4, y = 0$

(B) $x = 2, y = 4$

(C) $x = 3, y = 2$

(D) $x = 1, y = 6$

11. The sum of two numbers is 27 and their difference is 3. The larger number is _____.

(A) 12

(B) 15

(C) 18

(D) 24

12. The product of two consecutive positive integers is 306. The smaller integer is _____.

(A) 16

(B) 17

(C) 18

(D) 19

13. The equation $kx^2 - 6x + 1 = 0$ has equal roots when $k =$ _____.

(A) 3

(B) 6

(C) 9

(D) 36

14. One row of the table below is **incorrectly** matched. Which row is it?

Row	Condition on the ratios	Graph and solutions
(A)	$a_1/a_2 \neq b_1/b_2$	Intersecting lines, one solution
(B)	$a_1/a_2 = b_1/b_2 \neq c_1/c_2$	Coincident lines, infinitely many solutions
(C)	$a_1/a_2 = b_1/b_2 = c_1/c_2$	Coincident lines, infinitely many solutions
(D)	Discriminant $D < 0$	Quadratic with no real roots

Table 2.1 — Conditions and what they mean

(A) (A)

(B) (B)

(C) (C)

(D) (D)

15. The cost of 2 pens and 3 notebooks is ₹110, while 1 pen and 1 notebook cost ₹45. The cost of one notebook is _____.
(A) ₹15 (B) ₹30
(C) ₹25 (D) ₹20

Achievers Section

Q16–Q18 · 3 marks each

16. If one root of $x^2 + kx + 12 = 0$ is 3, then the value of k and the other root are _____.
(A) $k = -7$, other root 4 (B) $k = 7$, other root 4
(C) $k = -7$, other root -4 (D) $k = -4$, other root 7
17. A train travels 360 km at a uniform speed. Had the speed been 5 km/h more, the journey would have taken 1 hour less. The original speed is _____.
(A) 30 km/h (B) 40 km/h
(C) 45 km/h (D) 60 km/h
18. Consider the three statements below.
(i) A quadratic equation with a negative discriminant has two real roots of opposite sign.
(ii) A pair of linear equations in two variables can have exactly two solutions.
(iii) If the graphs of two linear equations coincide, the pair has infinitely many solutions.
Which of them are **true**?
(A) (iii) only (B) (i) and (ii) only
(C) (ii) and (iii) only (D) All three

Answer Key

1	D	2	A	3	C	4	D	5	A
6	C	7	D	8	A	9	B	10	C
11	B	12	B	13	C	14	B	15	D
16	A	17	B	18	A				

Solutions

1. **Answer: (D)** $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

When the coefficient ratios of x and y differ, the two lines have different slopes and must cross at exactly one point, giving a **unique solution**. Equal ratios throughout give coincident lines, and equal coefficient ratios with a different constant ratio give parallel lines.

2. **Answer: (A)** Parallel lines

Parallel lines never meet, so no ordered pair satisfies both equations — such a pair is called inconsistent. Coincident lines share every point and give infinitely many solutions.

3. **Answer: (C)** $ax^2 + bx + c = 0$, $a \neq 0$

A quadratic equation is **$ax^2 + bx + c = 0$ with $a \neq 0$** . If a were 0 the x^2 term would vanish and the equation would be linear.

4. **Answer: (D)** $b^2 - 4ac$

The discriminant is $D = b^2 - 4ac$, the quantity under the root sign in the quadratic formula. Its sign decides the nature of the roots.

5. **Answer: (A)** $D = 0$

When **$D = 0$** the formula gives $x = \frac{-b}{2a}$ twice, so the two roots coincide. A positive D gives two distinct real roots and a negative D no real roots at all.

6. **Answer: (C)** 2 and 3

Splitting the middle term, $x^2 - 5x + 6 = (x - 2)(x - 3)$, so the roots are **2 and 3**. Their sum 5 and product 6 match the coefficients.

7. **Answer: (D)** $\frac{-b}{a}$

Adding the two roots given by the quadratic formula, the square-root parts cancel and the sum is $\frac{-b}{a}$. Their product is

$$\frac{c}{a}$$

8. **Answer: (A)** No real roots

Here $D = (-4)^2 - 4(2)(3) = 16 - 24 = -8$, which is negative, so the equation has **no real roots**. Its graph is a parabola lying entirely above the x -axis.

9. **Answer: (B)** $x = 2$, $y = 3$

The solution of a pair of linear equations is the point where the graphs meet, which the figure shows at (2, 3). So **$x = 2$ and $y = 3$** . Checking: $2 + 3 = 5$ and $3 = 2 + 1$.

10. **Answer: (C)** $x = 3$, $y = 2$

Adding the two equations eliminates y : $3x = 9$, so $x = 3$. Substituting into $x - y = 1$ gives $y = 2$. Hence **$x = 3$ and $y = 2$** , which satisfies $2(3) + 2 = 8$.

11. **Answer: (B)** 15

If the numbers are x and y with $x + y = 27$ and $x - y = 3$, adding gives $2x = 30$, so the larger is $x = 15$ and the smaller $y = 12$.

12. **Answer: (B)** 17

Let the integers be x and $x + 1$, so $x^2 + x - 306 = 0$, which factorises as $(x - 17)(x + 18) = 0$. Since the integers are positive, $x = 17$ and the pair is 17 and 18.

13. **Answer: (C)** 9

Equal roots need $D = 0$, so $(-6)^2 - 4(k)(1) = 0$, that is $36 - 4k = 0$ and $k = 9$. The equation then becomes $9x^2 - 6x + 1 = (3x - 1)^2 = 0$.

14. Answer: (B) (B)

Equal coefficient ratios with a *different* constant ratio give **parallel** lines and no solution at all, not coincident lines. So row **(B)** is wrong; the other three descriptions are correct.

15. Answer: (D) ₹20

Let a pen cost x and a notebook y . Then $2x + 3y = 110$ and $x + y = 45$, so $x = 45 - y$. Substituting, $2(45 - y) + 3y = 110$ gives $90 + y = 110$ and $y = \text{₹}20$, with a pen costing ₹25.

16. Answer: (A) $k = -7$, other root 4

Substituting $x = 3$: $9 + 3k + 12 = 0$, so $3k = -21$ and $k = -7$. The product of the roots is $\frac{12}{1} = 12$, so the other root is $12 \div 3 = 4$. Hence **$k = -7$ and the other root is 4**, and their sum 7 matches $-k$.

17. Answer: (B) 40 km/h

Let the speed be x km/h. Then $\frac{360}{x} - \frac{360}{x+5} = 1$, which clears to $360(x+5) - 360x = x(x+5)$, that is $x^2 + 5x - 1800 = 0$.

Factorising, $(x - 40)(x + 45) = 0$, and speed cannot be negative, so $x = \text{40 km/h}$. Checking: $360 \div 40 = 9$ hours against $360 \div 45 = 8$ hours.

18. Answer: (A) (iii) only

Statement (i) is false: a negative discriminant means there are *no* real roots. Statement (ii) is false too — two straight lines meet in exactly one point, in none, or in infinitely many, never in exactly two. Statement (iii) is true, since coincident lines share every one of their points. So **only (iii)** holds.