Number Systems and Algebra: Practice Questions with Answers

Class 10 Maths · Units I and II · Important board-style questions

Name: _____ Class / Section: _____ Date: _____

HOW TO USE THIS SHEET
Try each question on your own first, then check the answer. Marks shown follow the CBSE paper pattern. **Topics covered:** Real Numbers, Polynomials, Pair of Linear Equations, Quadratic Equations, Arithmetic Progressions.

Q1 **Find the HCF and LCM of 12 and 18 by the prime factorisation method, and verify that HCF × LCM = product of the two numbers.** **[2 marks]**

ANSWER
$12 = 2^2 \times 3$ and $18 = 2 \times 3^2$
HCF = product of the smallest powers of common primes = $2 \times 3 = 6$
LCM = product of the greatest powers of all primes = $2^2 \times 3^2 = 36$
Verification: HCF × LCM = $6 \times 36 = 216$ and $12 \times 18 = 216$. Hence verified.
Final Answer: HCF = 6, LCM = 36.

Q2 **Prove that $3 + 2\sqrt{5}$ is an irrational number.** **[3 marks]**

ANSWER
Let us assume that $3 + 2\sqrt{5}$ is rational. Then $3 + 2\sqrt{5} = a/b$, where a and b are integers and $b \neq 0$.
$2\sqrt{5} = a/b - 3 = (a - 3b)/b$
$\sqrt{5} = (a - 3b)/(2b)$
Since a and b are integers, $(a - 3b)/(2b)$ is a rational number. So $\sqrt{5}$ would be rational.
But $\sqrt{5}$ is irrational. This contradiction means our assumption was wrong.
Final Answer: Hence, $3 + 2\sqrt{5}$ is irrational.

Q3 **Find the zeroes of the polynomial $x^2 - 3x - 10$ and verify the relationship between the zeroes and the coefficients.** **[3 marks]**

ANSWER
$x^2 - 3x - 10 = x^2 - 5x + 2x - 10 = x(x - 5) + 2(x - 5) = (x - 5)(x + 2)$
So the zeroes are $x = 5$ and $x = -2$.
Here $a = 1$, $b = -3$, $c = -10$.
Sum of zeroes = $5 + (-2) = 3$ and $-b/a = -(-3)/1 = 3$ ✓
Product of zeroes = $5 \times (-2) = -10$ and $c/a = -10/1 = -10$ ✓
Final Answer: Zeroes are 5 and −2; both relationships are verified.

Q4 **Solve the following pair of linear equations by the substitution method:** **[3 marks]**

$x + 2y = 8$ and $2x - y = 6$

ANSWER

From $2x - y = 6$, we get $y = 2x - 6$.

Substituting in $x + 2y = 8$: $x + 2(2x - 6) = 8$

$x + 4x - 12 = 8$, so $5x = 20$ and $x = 4$.

Then $y = 2(4) - 6 = 2$.

Check: $4 + 2(2) = 8$ ✓ and $2(4) - 2 = 6$ ✓

Final Answer: $x = 4$, $y = 2$.

Q5 **Solve the quadratic equation $2x^2 - 7x + 3 = 0$ by factorisation.** **[3 marks]**

ANSWER

Product $a \times c = 2 \times 3 = 6$. We need two numbers with product 6 and sum -7, which are -6 and -1.

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

$2x(x - 3) - 1(x - 3) = 0$

$(2x - 1)(x - 3) = 0$

So $2x - 1 = 0$ or $x - 3 = 0$.

Final Answer: $x = 1/2$ or $x = 3$.

Q6 **Find the values of k for which the quadratic equation $2x^2 + kx + 3 = 0$ has two equal real roots.** **[3 marks]**

ANSWER

For equal roots, the discriminant must be zero: $D = b^2 - 4ac = 0$.

Here $a = 2$, $b = k$, $c = 3$.

$k^2 - 4 \times 2 \times 3 = 0$, so $k^2 = 24$.

$k = \pm\sqrt{24} = \pm 2\sqrt{6}$

Final Answer: $k = 2\sqrt{6}$ or $k = -2\sqrt{6}$.

Q7 **Which term of the arithmetic progression 3, 8, 13, 18, … is 78?** **[3 marks]**

ANSWER

Here $a = 3$ and $d = 8 - 3 = 5$. Let $a_n = 78$.

$a_n = a + (n - 1)d$

$78 = 3 + (n - 1) \times 5$

$75 = (n - 1) \times 5$, so $n - 1 = 15$ and $n = 16$.

Final Answer: 78 is the 16th term.

Q8 **Find the sum of the first 20 terms of the arithmetic progression 1, 4, 7, 10, …** **[3 marks]**

ANSWER

Here a = 1, d = 4 − 1 = 3 and n = 20.

$S_n = n/2\,[2a + (n - 1)d]$

$S_{20} = 20/2\,[2 \times 1 + 19 \times 3] = 10 \times [2 + 57] = 10 \times 59 = 590$

Final Answer: The sum of the first 20 terms is 590.

BEFORE YOU CLOSE THIS SHEET

Write the formula first, then substitute the values, then show every step. In board exams, steps carry marks, not just the final answer.