

Polynomials and Algebraic Identities

Mathematics · Class 9 · 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

- The degree of the polynomial $5x^3 - 4x^2 + 7x - 2$ is _____.
 (A) 1 (B) 2
 (C) 3 (D) 5
- Which of the following is **not** a polynomial in x ?
 (A) $3x^2 - 5x + 2$ (B) $\sqrt{5}x + 7$
 (C) $x^3 - 1$ (D) $\sqrt{x} + 3$
- If $p(x) = x^2 - 3x + 2$, then $p(2) =$ _____.
 (A) 0 (B) 2
 (C) 4 (D) 12
- The remainder when $x^3 + 3x^2 + 3x + 1$ is divided by $(x + 1)$ is _____.
 (A) 8 (B) 0
 (C) -1 (D) 1
- The factorisation of $x^2 - 5x + 6$ is _____.
 (A) $(x - 2)(x + 3)$ (B) $(x + 2)(x + 3)$
 (C) $(x - 1)(x - 6)$ (D) $(x - 2)(x - 3)$
- The zero of the polynomial $2x + 5$ is _____.
 (A) $\frac{-5}{2}$ (B) $\frac{5}{2}$
 (C) -5 (D) $\frac{-2}{5}$
- The degree of a non-zero constant polynomial, such as $p(x) = 7$, is _____.
 (A) 0 (B) 1
 (C) 7 (D) Not defined

8. Using an identity, $(x + 7)(x - 7)$ equals _____.

(A) $x^2 + 49$

(B) $x^2 - 49$

(C) $x^2 - 14x + 49$

(D) $x^2 - 14x - 49$

Section B — Everyday Mathematics and Reasoning

Q9–Q15 · 1 mark each

9. If $(x - 2)$ is a factor of $x^3 - 3x^2 + kx - 4$, then the value of k is _____.

(A) 2

(B) -4

(C) 4

(D) 6

10. Expanded using an identity, $(2x - 3y)^2$ equals _____.

(A) $4x^2 + 9y^2$

(B) $4x^2 - 6xy + 9y^2$

(C) $2x^2 - 12xy + 3y^2$

(D) $4x^2 - 12xy + 9y^2$

11. A shopkeeper works out 104×96 mentally using an identity. The product is _____.

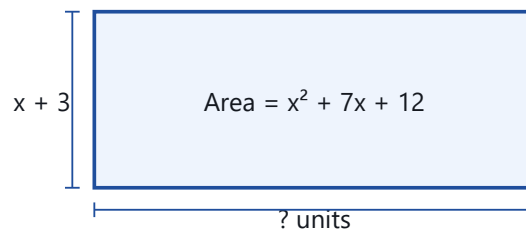
(A) 9984

(B) 9996

(C) 10004

(D) 9984.5

12. The rectangle below has an area of $(x^2 + 7x + 12)$ square units and one side of length $(x + 3)$ units. Its other side is _____.



A rectangle of area $x^2 + 7x + 12$ with one side $x + 3$

(A) $x + 12$

(B) $x + 4$

(C) $x - 4$

(D) $x + 7$

13. If $x + \frac{1}{x} = 5$, then $x^2 + \frac{1}{x^2}$ equals _____.

(A) 25

(B) 23

(C) 27

(D) 10

14. The volume of a cuboidal water tank is $(2x^3 - 5x^2 - 3x)$ cubic units. Which of the following can be its three dimensions?

(A) $2x$, $(x + 1)$, $(x - 3)$

(B) x , $(2x - 1)$, $(x + 3)$

(C) x , $(2x + 1)$, $(x - 3)$

(D) x , $(2x + 3)$, $(x - 1)$

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

Row	Polynomial	Degree and type
(A)	$4x - 9$	Degree 1, linear
(B)	$x^2 + 2x + 1$	Degree 2, quadratic
(C)	-11	Degree 0, constant
(D)	$7x^3 - x$	Degree 2, quadratic

Table 2.1 — Polynomials, their degrees and types

(A) (A)

(B) (B)

(C) (C)

(D) (D)

Achievers Section

Q16–Q18 · 3 marks each

16. The polynomial $p(x) = x^3 + ax^2 + bx + 6$ has $(x - 2)$ as a factor and leaves a remainder 3 when divided by $(x - 3)$. The values of a and b are _____.

(A) $a = 3, b = -1$

(B) $a = -1, b = -3$

(C) $a = -3, b = 1$

(D) $a = -3, b = -1$

17. The complete factorisation of $x^3 - 6x^2 + 11x - 6$ is _____.

(A) $(x - 1)(x - 2)(x - 3)$

(B) $(x + 1)(x + 2)(x + 3)$

(C) $(x - 1)(x - 2)(x + 3)$

(D) $(x - 1)(x^2 - 5x + 6)^2$

18. If $a + b + c = 0$, then $a^3 + b^3 + c^3 = 3abc$. Using this, the value of $(-5)^3 + 2^3 + 3^3$ is _____.

(A) 90

(B) -90

(C) -30

(D) 0

Answer Key

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

Solutions

1. Answer: (C) 3

The degree is the highest power of the variable that appears with a non-zero coefficient. Here the powers are 3, 2, 1 and 0, so the degree is **3**. (5 is the leading coefficient, not the degree.)

2. Answer: (D) $\sqrt{x} + 3$

In a polynomial every exponent of the variable must be a whole number. In $\sqrt{x} + 3$ the term $\sqrt{x}$ is $x^{1/2}$, whose exponent is not a whole number, so it is **not a polynomial**. An irrational *coefficient* such as $\sqrt{5}$ is perfectly allowed.

3. Answer: (A) 0

Substitute $x = 2$: $p(2) = 2^2 - 3(2) + 2 = 4 - 6 + 2 = \mathbf{0}$. So 2 is a zero of this polynomial, which means $(x - 2)$ is one of its factors.

4. Answer: (B) 0

By the Remainder Theorem the remainder on division by $(x + 1)$ is $p(-1) = (-1)^3 + 3(-1)^2 + 3(-1) + 1 = -1 + 3 - 3 + 1 = \mathbf{0}$. A zero remainder means $(x + 1)$ is a factor — indeed the polynomial is $(x + 1)^3$.

5. Answer: (D) $(x - 2)(x - 3)$

Split the middle term using two numbers whose product is +6 and whose sum is -5: these are -2 and -3. So $x^2 - 5x + 6 = \mathbf{(x - 2)(x - 3)}$. Expanding back confirms it.

6. Answer: (A) $-\frac{5}{2}$

A zero is a value of x making the polynomial 0. Solving $2x + 5 = 0$ gives $2x = -5$, so $x = \mathbf{-\frac{5}{2}}$. Substituting checks out: $2 \times (-2.5) + 5 = 0$.

7. Answer: (A) 0

A non-zero constant can be written as $7x^0$, so its degree is **0**. (Only the zero polynomial $p(x) = 0$ has an undefined degree.)

8. Answer: (B) $x^2 - 49$

This is the difference-of-squares identity $(a + b)(a - b) = a^2 - b^2$ with $a = x$ and $b = 7$, giving **$x^2 - 49$** . The middle terms $-7x$ and $+7x$ cancel, so no x term survives.

9. Answer: (C) 4

By the Factor Theorem, $(x - 2)$ is a factor exactly when $p(2) = 0$. So $2^3 - 3(2^2) + 2k - 4 = 8 - 12 + 2k - 4 = 2k - 8 = 0$, giving $k = \mathbf{4}$.

10. Answer: (D) $4x^2 - 12xy + 9y^2$

Use $(a - b)^2 = a^2 - 2ab + b^2$ with $a = 2x$ and $b = 3y$: $a^2 = 4x^2$, $b^2 = 9y^2$ and $2ab = 2 \times 2x \times 3y = 12xy$. So the expansion is **$4x^2 - 12xy + 9y^2$** .

11. Answer: (A) 9984

Write the product as $(100 + 4)(100 - 4)$ and use $a^2 - b^2$: $100^2 - 4^2 = 10000 - 16 = \mathbf{9984}$. Spotting the equal distance of both numbers from 100 is what makes this a one-step mental calculation.

12. Answer: (B) $x + 4$

Area $\div$ known side gives the other side, so factorise the area: the two numbers with product 12 and sum 7 are 3 and 4, so $x^2 + 7x + 12 = (x + 3)(x + 4)$. Dividing by $(x + 3)$ leaves **$x + 4$** units.

13. Answer: (B) 23

Square both sides: $(x + \frac{1}{x})^2 = x^2 + 2 \times x \times \frac{1}{x} + \frac{1}{x^2} = x^2 + \frac{1}{x^2} + 2$. So $25 = x^2 + \frac{1}{x^2} + 2$, giving $x^2 + \frac{1}{x^2} = \mathbf{23}$.

14. Answer: (C) x , $(2x + 1)$, $(x - 3)$

Volume = length $\times$ breadth $\times$ height, so factorise. Taking x common: $2x^3 - 5x^2 - 3x = x(2x^2 - 5x - 3)$. Splitting the middle term with -6 and +1 gives $2x^2 - 6x + x - 3 = (2x + 1)(x - 3)$. So the dimensions are **x , $(2x + 1)$ and $(x - 3)$** .

15. Answer: (D) (D)

In $7x^3 - x$ the highest power is 3, so it is a cubic polynomial of degree 3, not a quadratic — row **(D)** is wrong. The missing x^2 term does not lower the degree. The other three rows are correctly described.

16. Answer: (D) $a = -3$, $b = -1$

Factor Theorem: $p(2) = 8 + 4a + 2b + 6 = 0$, so $4a + 2b = -14$, that is $2a + b = -7$. Remainder Theorem: $p(3) = 27 + 9a + 3b + 6 = 3$, so $9a + 3b = -30$, that is $3a + b = -10$. Subtracting the first relation from the second gives $a = -3$, and then $b = -7 - 2(-3) = -1$. So **$a = -3$ and $b = -1$** .

17. Answer: (A) $(x - 1)(x - 2)(x - 3)$

Try the factors of the constant term 6. $p(1) = 1 - 6 + 11 - 6 = 0$, so $(x - 1)$ is a factor. Dividing gives $x^2 - 5x + 6$, which factorises as $(x - 2)(x - 3)$. Hence the polynomial is **$(x - 1)(x - 2)(x - 3)$** ; multiplying the roots $1 \times 2 \times 3 = 6$ matches the constant term.

18. Answer: (B) -90

Here $a = -5$, $b = 2$ and $c = 3$, and $a + b + c = -5 + 2 + 3 = 0$, so the identity applies: the sum of cubes is $3abc = 3 \times (-5) \times 2 \times 3 = \mathbf{-90}$. Direct calculation agrees: $-125 + 8 + 27 = -90$.