ExamPath

CLASS 9 MATHEMATICS · FBISE · UNIT 4

Unit 4: Factorization and Algebraic Manipulation — Exam Ready

25 multiple-choice questions Suggested time: **25 minutes** 1 mark each

Name: _____ Date: _____ Score: / 25

Circle one answer for each question. The answer key with explanations is on the last pages, so try every question before you check. These are practice questions, not official FBISE papers.

1. Simplify $3/(x - 1) + 2/(x + 1)$.

(A) $5/x$
(B) $(5x - 1)/(x^2 - 1)$
(C) $(5x + 1)/(x^2 - 1)$
(D) $5/(x^2 - 1)$

2. If the HCF of polynomials P and Q is $x^2 + 2x$, what is the HCF of 5P and Q?

(A) $x^2 + 2x$
(B) $5(x^2 + 2x)$
(C) x
(D) 5

3. Find the square root of $4a^2 + 12ab + 9b^2$.

(A) $\pm(2a + 3b)$
(B) $2a + 3b$ only
(C) $\pm(4a + 9b)$
(D) $\pm(2a - 3b)$

4. Why can $x^3 + 3/x - 1/x^3 - 3x$ be written as $(x - 1/x)^3$?

(A) It is a difference of squares
(B) It matches the expansion of $(a - b)^3$ with $a = x$ and $b = 1/x$
(C) It matches the expansion of $(a + b)^3$ with $a = x$ and $b = 1/x$
(D) It is a sum of two cubes

5. An algebraic fraction P/Q requires that:

(A) $P \neq 0$
(B) $Q = 1$
(C) $Q \neq 0$
(D) $P = Q$

6. Which expression is a difference of two squares?

(A) $x^2 + 16$
(B) $x^3 - 16$
(C) $x^2 - 16$
(D) $x^2 - 8x + 16$

7. In $4x^2 + 12x + 9 = (2x + 3)^2$, the middle term 12x is:

(A) the sum of $4x^2$ and 9
(B) the product of 2x and 3
(C) twice the product of 2x and 3
(D) the square of 3x

8. Find the LCM of $6x^2y$ and $9xy^3$.

(A) $18x^2y^3$
(B) $18xy$
(C) $54x^3y^4$
(D) $3xy$

9. Which expression equals $(a + b)^3 - 3ab(a + b)$?

(A) $(a + b)^3$
(B) $a^3 + b^3$
(C) $a^3 + 3b^3$
(D) $a^3 - b^3$

10. $(a + b)^3$ equals:

(A) $a^3 + b^3$
(B) $a^3 + 3ab + b^3$
(C) $a^3 + 3a^2b + 3ab^2 + b^3$
(D) $a^3 - 3a^2b + 3ab^2 - b^3$

11. The square root of an algebraic expression is defined as one of its:

(A) coefficients
(B) equal factors
(C) degrees
(D) terms

12. The factors of $a^2 + 2ab + b^2 - c^2$ are:

(A) $(a + b + c)(a + b - c)$
(B) $(a + b + c)(a - b - c)$
(C) $(a - b + c)(a - b - c)$
(D) $(a + b)^2 - c$

13. For $x^2 - 7x + 12$, why are both numbers in the pair negative?

(A) Their sum is positive
(B) They must be even
(C) Their product is negative
(D) Their product is positive and their sum is negative

14. If $P = a^2 - b^2$ and $Q = (a - b)^2$, what is their HCF?

(A) $a^2 - b^2$
(B) $a - b$
(C) $a + b$
(D) $(a - b)^2$

15. Factorize $3x^2 + 11x + 6$.

(A) $(3x + 1)(x + 6)$
(B) $(3x + 3)(x + 2)$
(C) $(x + 2)(3x - 3)$
(D) $(3x + 2)(x + 3)$

16. Which expression has the square root $\pm(x + 2)$?

(A) $x^2 - 4$
(B) $x^2 + 4$
(C) $x^2 + 2x + 4$
(D) $x^2 + 4x + 4$

17. Which rule is used to simplify an expression with more than one operation?

(A) The rule of three
(B) DMAS
(C) The factor theorem
(D) The power rule

18. A fraction with an algebraic expression in its numerator, its denominator or both is called a:

(A) unit fraction
(B) complex fraction
(C) proper fraction
(D) whole fraction

19. What is the factored form of $a^2 + 2ab + b^2$?

(A) $a(a + 2b) + b$
(B) $(a - b)^2$
(C) $(a + b)^2$
(D) $(a + b)(a - b)$

20. Factorize $(x^2 + 3x - 4)(x^2 + 3x + 5) + 8$, putting $x^2 + 3x = a$.

(A) $(x^2 + 3x + 4)(x^2 + 3x - 3)$
(B) $(x^2 + 3x + 1)(x^2 + 3x - 1)$
(C) $(x^2 + 3x - 4)(x^2 + 3x + 5)$
(D) $(x^2 + 3x - 4)^2$

21. Why is $x^2 + 9$ not equal to $(x + 3)^2$?

(A) The sign is negative
(B) x^2 is not a square
(C) 9 is not a perfect square
(D) $(x + 3)^2$ has the middle term 6x

22. $x^3 - 8 = (x - 2)(x^2 + 2x + 4)$. What does this show?

(A) The two factors are equal
(B) The expression is a perfect square
(C) Cubes cannot be factorized
(D) A difference of two cubes has one linear and one quadratic factor

23. Which expression is a common factor of $x^2 - 4$ and $x^2 - 4x + 4$?

(A) x
(B) $x + 2$
(C) $x - 4$
(D) $x - 2$

24. Why can $x + 1$ be cancelled from $(x + 1)(x - 2) \div ((x + 1)(x + 5))$, but x cannot be cancelled from $(x + 2)/(x + 5)$?

(A) $x + 1$ is a factor of the whole numerator and denominator; x is only a term
(B) Because 1 is smaller than 2
(C) Because $x + 5$ is prime
(D) Both can be cancelled

25. To add or subtract algebraic fractions with unlike denominators, we first:

(A) find the LCM of the denominators
(B) square the fractions
(C) multiply the numerators
(D) add the denominators

Answer key

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1 C	**2** A	**3** A	**4** B	**5** C
6 C	**7** C	**8** A	**9** B	**10** C
11 B	**12** A	**13** D	**14** B	**15** D
16 D	**17** B	**18** B	**19** C	**20** A
21 D	**22** D	**23** D	**24** A	**25** A

Explanations

1. C. $(5x + 1)/(x^2 - 1)$
The LCM of the denominators is $x^2 - 1$. So the sum is $(3(x + 1) + 2(x - 1))/(x^2 - 1) = (5x + 1)/(x^2 - 1)$.

2. A. $x^2 + 2x$
Multiplying one polynomial by a non-zero constant does not change the HCF.

3. A. $\pm(2a + 3b)$
$4a^2 + 12ab + 9b^2 = (2a + 3b)^2$, so the square roots are $+(2a + 3b)$ and $-(2a + 3b)$.

4. B. It matches the expansion of $(a - b)^3$ with $a = x$ and $b = 1/x$
$(x - 1/x)^3 = x^3 - 3x + 3/x - 1/x^3$, which is the same expression written in a different order.

5. C. $Q \neq 0$
The denominator of a fraction can never be zero.

6. C. $x^2 - 16$
$x^2 - 16 = x^2 - 4^2$. The other choices are a sum, a trinomial and a cube term.

7. C. twice the product of 2x and 3
$2 \times (2x) \times 3 = 12x$, which is the condition for a perfect square.

8. A. $18x^2y^3$
The LCM of 6 and 9 is 18. The highest powers are x^2 and y^3.

9. B. $a^3 + b^3$
$(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$. Taking away $3a^2b + 3ab^2$ leaves $a^3 + b^3$.

10. C. $a^3 + 3a^2b + 3ab^2 + b^3$
The cube of a sum expands to $a^3 + 3a^2b + 3ab^2 + b^3$.

11. B. equal factors
If $P = Q \times Q$, then Q is a square root of P, one of its two equal factors.

12. A. $(a + b + c)(a + b - c)$
$(a + b)^2 - c^2$ is a difference of squares, so it equals $(a + b + c)(a + b - c)$.

13. D. Their product is positive and their sum is negative
The product 12 is positive, so both have the same sign. The sum −7 is negative, so both are negative: −3 and −4.

14. B. $a - b$
$P = (a + b)(a - b)$ and $Q = (a - b)^2$. The common factor with the lowest power is $a - b$.

15. D. $(3x + 2)(x + 3)$
Split $11x$ as $9x + 2x$. Then $3x(x + 3) + 2(x + 3) = (3x + 2)(x + 3)$.

16. **D. $x^2 + 4x + 4$**
$(x + 2)^2 = x^2 + 4x + 4$, so $\pm(x + 2)$ are its square roots.

17. **B. DMAS**
DMAS gives the order: division, multiplication, addition, subtraction.

18. **B. complex fraction**
Such a fraction is called a complex fraction.

19. **C. $(a + b)^2$**
A perfect square trinomial with a positive middle term is $(a + b)^2$.

20. **A. $(x^2 + 3x + 4)(x^2 + 3x - 3)$**
$(a - 4)(a + 5) + 8 = a^2 + a - 12 = (a + 4)(a - 3)$. Putting back a gives $(x^2 + 3x + 4)(x^2 + 3x - 3)$.

21. **D. $(x + 3)^2$ has the middle term 6x**
$(x + 3)^2 = x^2 + 6x + 9$. The middle term $6x$ is missing in $x^2 + 9$.

22. **D. A difference of two cubes has one linear and one quadratic factor**
The difference of two cubes always splits into a linear factor and a quadratic factor.

23. **D. $x - 2$**
$x^2 - 4 = (x - 2)(x + 2)$ and $x^2 - 4x + 4 = (x - 2)^2$. The common factor is $x - 2$.

24. **A. x + 1 is a factor of the whole numerator and denominator; x is only a term**
Only common factors can be cancelled, not terms inside a sum.

25. **A. find the LCM of the denominators**
The LCM of the denominators becomes the common denominator.

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