

North Carolina School of Science and Mathematics

Admissions Math Assessment - Practice Test 23

Practice Test 23

Instructions: This 30-question practice test is designed to be representative of the NC-SSM Admissions Math Assessment. This assessment is taken without a calculator. Select the best answer for each question.

1. Simplify the expression: $(3a^2 - 5b + c) + (a^2 + 2b - 4c)$

A. $4a^2 - 3b - 3c$

B. $4a^2 - 7b - 5c$

C. $3a^2 - 3b - 3c$

D. $4a^2 - 3b + 3c$

E. $4a^2 + 3b - 3c$

2. Evaluate the expression: $5(x - 2y)^2$ if $x = 1$ and $y = -1$.

A. 5

B. -5

C. 45

D. 25

E. 15

3. Simplify the expression: $(2x^3y^{-1})^3(3x^{-2}y^2)$

A. $24x^7y^{-1}$

B. $6x^7y^{-1}$

C. $24x^4y$

D. $8x^7y$

E. $\frac{24x^7}{y}$

4. Evaluate the expression: $9^{\frac{3}{2}}$

A. 9

B. 18

C. 27

D. 13.5

E. 3

5. Simplify the expression: $a(a + b) - b(a - b)$

- A. $a^2 - b^2$
- B. $a^2 + b^2$
- C. $a^2 + 2ab + b^2$
- D. $a^2 - 2ab - b^2$
- E. $a^2 + 2ab - b^2$

6. Solve for x : $10 - 2x = 5x - 11$

- A. $x = 1/3$
- B. $x = -1/3$
- C. $x = -3$
- D. $x = 3$
- E. $x = 7$

7. Find all solutions to the quadratic equation: $x^2 + 10x = -21$

- A. $x = 3, x = 7$
- B. $x = -3, x = -7$
- C. $x = 3, x = -7$
- D. $x = -3, x = 7$
- E. $x = 21, x = -1$

8. A model car is built to a scale of 1 : 20. If the model is 8 inches long, how long is the real car in feet?

- A. 160 feet
- B. 13.3 feet
- C. 28 feet
- D. 16 feet
- E. 12 feet

9. Factor the quadratic expression: $5x^2 - 14x - 3$

- A. $(5x + 1)(x - 3)$
- B. $(5x - 1)(x + 3)$
- C. $(5x - 3)(x - 1)$
- D. $(5x + 3)(x - 1)$
- E. $(x - 15)(x + 1)$

10. Simplify the radical expression, assuming all variables represent positive numbers:

$$\sqrt{50x^3y^6z^5}$$

- A. $5xy^3z^2\sqrt{2xz}$
- B. $2xy^3z^2\sqrt{5xz}$
- C. $5x^2y^3z^2\sqrt{2x}$
- D. $25xy^3z^2\sqrt{2xz}$
- E. $5xy^3z\sqrt{2xz}$

11. Solve the inequality: $15 \leq 3(x + 1)$

- A. $x \leq 4$
- B. $x \geq 4$
- C. $x \geq 5$
- D. $x \leq 5$
- E. $x \geq 6$

12. Simplify the expression: $\frac{3}{a+b} + \frac{1}{a-b}$

- A. $\frac{4}{a^2-b^2}$
- B. $\frac{4a+2b}{a^2-b^2}$
- C. $\frac{4a-2b}{a^2-b^2}$
- D. $\frac{2a+4b}{a^2-b^2}$
- E. $\frac{4}{2a}$

13. Find the solution to the system of equations: $y = 4x - 1$ and $2x + y = 5$

- A. (1, 3)
- B. (3, 1)
- C. (0, -1)
- D. (2, 7)
- E. (1, -1)

14. Simplify the expression: $(x - 5y)^2$

- A. $x^2 - 25y^2$
- B. $x^2 + 25y^2$
- C. $x^2 - 10xy + 25y^2$
- D. $x^2 + 10xy + 25y^2$
- E. $x^2 - 5xy + 25y^2$

15. Solve for x : $\frac{x}{2} + \frac{x}{4} = 6$

- A. $x = 3$
- B. $x = 4$
- C. $x = 6$
- D. $x = 8$
- E. $x = 12$

16. Factor the expression completely: $2a^2b - 18b$

- A. $2b(a^2 - 9)$
- B. $2b(a - 3)^2$
- C. $2b(a - 3)(a + 3)$
- D. $2(a^2b - 9b)$
- E. Both A and C are correct

17. Evaluate the expression: $(5 - 3)^3 + (3 - 5)^2$

- A. 4
- B. 8
- C. 12
- D. 16
- E. 0

18. Find all solutions to the quadratic equation: $2x^2 = 7x + 4$

- A. $x = -1, x = 2$
- B. $x = 1, x = -2$
- C. $x = 1/2, x = -4$
- D. $x = -1/2, x = 4$
- E. $x = 2, x = -1/2$

19. Simplify the expression, assuming no variables are zero: $\frac{(x^4y)^3}{x^5y^{-1}}$

- A. x^7y^2
- B. x^7y^4
- C. x^2y^4
- D. x^2y^2
- E. $x^{17}y^2$

20. Find the solution (x, y) to the system of equations: $5x - 2y = 10$ and $x + 2y = 2$

- A. $(0, -5)$
- B. $(4, -1)$
- C. $(2, 0)$
- D. $(1, 1/2)$
- E. $(0, 1)$

21. The area of a square is 64 square inches. What is its perimeter?

- A. 16 inches
- B. 24 inches
- C. 32 inches
- D. 64 inches
- E. 8 inches

22. Simplify the expression: $(2^2 \cdot 3^1)^2$

- A. 144
- B. 72
- C. 24
- D. 36
- E. 12

23. Solve the inequality: $8 - 4x < 12$

- A. $x < -1$

- B. $x > -1$
- C. $x < 1$
- D. $x > 1$
- E. $x > -5$

24. Find all solutions to the quadratic equation: $4x^2 - 1 = 0$

- A. $x = 1/4$
- B. $x = 1/2$
- C. $x = -1/2$
- D. $x = 1/2, x = -1/2$
- E. $x = 1, x = -1$

25. A rectangle has a perimeter of 40. If its width is 5, what is its area?

- A. 75
- B. 80
- C. 100
- D. 150
- E. 200

26. Simplify the expression: $\frac{x^2-16}{x+4}$

- A. $x - 4$
- B. $x + 4$
- C. $x - 16$
- D. $x + 16$
- E. $x - 8$

27. Factor the expression completely: $a^3 - a^2 - 6a$

- A. $a(a - 3)(a + 2)$
- B. $a(a + 3)(a - 2)$
- C. $a(a^2 - a - 6)$
- D. $a(a - 6)(a + 1)$
- E. Both A and C are correct

28. Find the solution to the system of equations: $x = 2y + 1$ and $2x - 4y = 2$

- A. $(1, 0)$
- B. $(3, 1)$
- C. No solution
- D. Infinite solutions
- E. $(0, -1/2)$

29. If $a = 4$ and $b = 2$, what is the value of $(a + b)^{\frac{1}{b}}$?

- A. 6
- B. 3

- C. $\sqrt{6}$
- D. 12
- E. 36

30. A 10% tax is added to a 150 dollar item. What is the total cost?

- A. 15
- B. 135
- C. 155
- D. 160
- E. 165

Answer Key

1. A

- *Explanation:* $(3a^2 - 5b + c) + (a^2 + 2b - 4c)$.
- Combine like terms: $(3a^2 + a^2) + (-5b + 2b) + (c - 4c) = 4a^2 - 3b - 3c$.

2. C

- *Explanation:* Substitute values: $5((1) - 2(-1))^2$.
- Inside parentheses: $5(1 - (-2))^2 = 5(1 + 2)^2 = 5(3)^2$.
- Exponent: $5(9) = 45$.

3. E

- *Explanation:* Apply power (3): $(2x^3y^{-1})^3 = 2^3(x^3)^3(y^{-1})^3 = 8x^9y^{-3}$.
- Multiply: $(8x^9y^{-3})(3x^{-2}y^2)$.
- Combine: $(8 \cdot 3) \cdot x^{9+(-2)} \cdot y^{-3+2} = 24x^7y^{-1}$.
- Write with positive exponent: $\frac{24x^7}{y}$.

4. C

- *Explanation:* $9^{\frac{3}{2}} = (\sqrt{9})^3$.
- $\sqrt{9} = 3$.
- $3^3 = 27$.

5. B

- *Explanation:* Distribute a : $a^2 + ab$. Distribute $-b$: $-ba + b^2$.
- Combine: $a^2 + ab - ab + b^2 = a^2 + b^2$.

6. D

- *Explanation:* Add $2x$ to both sides: $10 = 7x - 11$.
- Add 11 to both sides: $21 = 7x$.
- Divide by 7: $x = 3$.

7. B

- *Explanation:* Set to zero: $x^2 + 10x + 21 = 0$.
- Find two numbers that multiply to 21 and add to 10. The numbers are 7 and 3.
- Factored form: $(x + 7)(x + 3) = 0$.
- Set factors to zero: $x = -7$ and $x = -3$.

8. B

- *Explanation:* Set up a proportion: $\frac{\text{model}}{\text{real}} = \frac{1}{20} = \frac{8 \text{ in}}{x \text{ in}}$.
- $x = 8 \times 20 = 160$ inches.
- To convert to feet, divide by 12: $160/12$.
- $120/12 = 10$. Remainder is 40. $36/12 = 3$. Remainder 4.
- $10 + 3 = 13$ with $4/12$ remainder. $13\frac{4}{12} = 13\frac{1}{3}$ feet. 13.3... feet.

9. A

- *Explanation:* Factor by grouping. $a \cdot c = -15$. $b = -14$. Numbers are -15 and 1 .
- Rewrite: $5x^2 - 15x + 1x - 3$. Group: $5x(x - 3) + 1(x - 3)$.
- Factored form: $(5x + 1)(x - 3)$.

10. A

- *Explanation:* $\sqrt{50x^3y^6z^5} = \sqrt{25 \cdot 2 \cdot x^2 \cdot x \cdot y^6 \cdot z^4 \cdot z}$.
- Take out roots: $\sqrt{25}\sqrt{x^2}\sqrt{y^6}\sqrt{z^4} \cdot \sqrt{2xz} = 5xy^3z^2\sqrt{2xz}$.

11. B

- *Explanation:* Distribute 3: $15 \leq 3x + 3$.
- Subtract 3: $12 \leq 3x$.
- Divide by 3: $4 \leq x$, or $x \geq 4$.

12. C

- *Explanation:* Common denominator is $(a + b)(a - b) = a^2 - b^2$.
- $\frac{3(a-b)}{a^2-b^2} + \frac{1(a+b)}{a^2-b^2} = \frac{3a-3b+a+b}{a^2-b^2}$.
- Combine: $\frac{(3a+a)+(-3b+b)}{a^2-b^2} = \frac{4a-2b}{a^2-b^2}$.

13. A

- *Explanation:* Substitute $y = 4x - 1$ into the second equation: $2x + (4x - 1) = 5$.
- Combine: $6x - 1 = 5$. Add 1: $6x = 6$.
- Divide by 6: $x = 1$.
- Find y : $y = 4(1) - 1 = 3$. Solution is $(1, 3)$.

14. C

- *Explanation:* $(x - 5y)^2 = (x - 5y)(x - 5y) = x(x) + x(-5y) - 5y(x) - 5y(-5y)$.
- $x^2 - 5xy - 5xy + 25y^2$.
- Combine like terms: $x^2 - 10xy + 25y^2$.

15. D

- *Explanation:* Find a common denominator (4): $\frac{2x}{4} + \frac{x}{4} = 6$.
- Combine: $\frac{3x}{4} = 6$.
- Multiply by 4: $3x = 24$. Divide by 3: $x = 8$.

16. C

- *Explanation:* Factor out GCF, $2b$: $2b(a^2 - 9)$.
- $a^2 - 9$ is a difference of squares: $(a - 3)(a + 3)$.
- Fully factored form: $2b(a - 3)(a + 3)$. Option A is not fully factored.

17. C

- *Explanation:* First term: $(5 - 3)^3 = (2)^3 = 8$.
- Second term: $(3 - 5)^2 = (-2)^2 = 4$.

- Add: $8 + 4 = 12$.

18. D

- *Explanation:* Set to zero: $2x^2 - 7x - 4 = 0$.
- Factor by grouping. $a \cdot c = -8$. $b = -7$. Numbers are -8 and 1 .
- Rewrite: $2x^2 - 8x + 1x - 4 = 0$. Group: $2x(x - 4) + 1(x - 4) = 0$.
- Factored: $(2x + 1)(x - 4) = 0$.
- Set factors to zero: $x = -1/2$ and $x = 4$.

19. B

- *Explanation:* Apply power (3) to numerator: $(x^4)^3(y)^3 = x^{12}y^3$.
- Divide: $\frac{x^{12}y^3}{x^5y^{-1}}$.
- Subtract exponents: $x^{12-5}y^{3-(-1)} = x^7y^{3+1} = x^7y^4$.

20. C

- *Explanation:* Use elimination. Add the two equations.
- $(5x - 2y) + (x + 2y) = 10 + 2 \rightarrow 6x = 12$.
- Divide by 6: $x = 2$.
- Find y : $(2) + 2y = 2 \rightarrow 2y = 0 \rightarrow y = 0$. Solution is $(2, 0)$.

21. C

- *Explanation:* Area = s^2 . $s^2 = 64 \rightarrow s = 8$.
- Perimeter = $4 \times s = 4 \times 8 = 32$ inches.

22. A

- *Explanation:* $(2^2 \cdot 3^1)^2 = (4 \cdot 3)^2 = (12)^2 = 144$.
- Alternatively: $(2^2)^2 \cdot (3^1)^2 = 2^4 \cdot 3^2 = 16 \cdot 9 = 144$.

23. B

- *Explanation:* Subtract 8: $-4x < 4$.
- Divide by -4 . **Flip the inequality sign.**
- $x > -1$.

24. D

- *Explanation:* This is a difference of squares. $4x^2 - 1 = (2x)^2 - 1^2 = 0$.
- Factor: $(2x - 1)(2x + 1) = 0$.
- Set factors to zero: $x = 1/2$ and $x = -1/2$.

25. A

- *Explanation:* Perimeter = $2(L + W)$. $40 = 2(L + 5)$.
- Divide by 2: $20 = L + 5$.
- Subtract 5: $L = 15$.
- Area = $L \times W = 15 \times 5 = 75$.

26. A

- *Explanation:* Factor numerator (diff. of squares): $x^2 - 16 = (x - 4)(x + 4)$.
- $\frac{(x-4)(x+4)}{x+4}$. The $(x + 4)$ terms cancel.
- Result: $x - 4$.

27. A

- *Explanation:* Factor out GCF, a : $a(a^2 - a - 6)$.
- Factor trinomial: find numbers that multiply to -6 and add to -1 . The numbers are -3 and 2 .
- Fully factored form: $a(a - 3)(a + 2)$.

28. D

- *Explanation:* Substitute $x = 2y + 1$ into the second equation: $2(2y + 1) - 4y = 2$.
- Distribute: $4y + 2 - 4y = 2$.
- Combine: $2 = 2$. This is a true statement.
- The equations are identical (second is $2 \times$ the first). There are infinite solutions.

29. C

- *Explanation:* Substitute values: $((4) + (2))^{\frac{1}{(2)}}$.
- Base: $4 + 2 = 6$. Exponent: $\frac{1}{2}$.
- $(6)^{\frac{1}{2}} = \sqrt{6}$.

30. E

- *Explanation:* A 10% tax is added.
- 10% of 150 is 15.
- Total cost: $150 + 15 = 165$.