

North Carolina School of Science and Mathematics

Admissions Math Assessment - Practice Test 5

Practice Test 5

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: $(a^2 - 3a + 5) - (2a^2 + a - 2)$

- A. $-a^2 - 4a + 7$
- B. $-a^2 - 2a + 3$
- C. $3a^2 - 2a + 3$
- D. $-a^2 - 4a + 3$
- E. $3a^2 - 4a + 7$

2. Simplify the expression: $-2(x + 3y) + 3(x - y)$

- A. $x - 9y$
- B. $x - 7y$
- C. $x - 3y$
- D. $5x - 9y$
- E. $x + 9y$

3. Simplify the expression: $4x(x - 2) - (x^2 + 3x - 1)$

- A. $3x^2 - 5x + 1$
- B. $3x^2 - 11x + 1$
- C. $3x^2 - 11x - 1$
- D. $4x^2 - 11x + 1$
- E. $3x^2 - 5x - 1$

4. Evaluate the expression: $(-3)^2 + \frac{2^5}{2^2}$

- A. 17
- B. 1
- C. 15
- D. 7
- E. 34

5. Evaluate the expression: $100^{\frac{1}{2}} - 64^{\frac{1}{3}}$

- A. 2
- B. 4
- C. 6
- D. 18
- E. 104

6. Simplify the expression: $(4a^{-2}b^3)^2$

- A. $16a^{-4}b^6$
- B. $8a^{-4}b^6$
- C. $16a^{-4}b^5$
- D. $8a^0b^5$
- E. $16ab$

7. Simplify the expression: $(x^3y^{-1})^2(2x^{-2}y^5)$

- A. $2x^4y^3$
- B. $2x^8y^3$
- C. $2x^4y^4$
- D. $2x^3y^3$
- E. $2x^8y^4$

8. Simplify the expression, assuming no variables are zero: $\frac{(3m^2n)^3}{9m^4n^5}$

- A. $3m^2n^2$
- B. $\frac{m^2}{n^2}$
- C. $3m^2n^{-2}$
- D. $3m^2$
- E. $\frac{3m}{n^2}$

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

$$\sqrt{36x^6y^{10}z^2}$$

- A. $6x^3y^5z$
- B. $6x^4y^5z$
- C. $18x^3y^5z$
- D. $6x^6y^{10}z^2$
- E. $6x^3y^8z$

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

$$\sqrt{4x^{100}y^{36}}$$

- A. $2x^{10}y^6$
- B. $2x^{50}y^{18}$
- C. $2x^{25}y^9$
- D. $4x^{50}y^{18}$
- E. $2x^{50}y^6$

11. Simplify the expression: $\frac{3}{y+2} + \frac{2}{y}$

- A. $\frac{5}{y+2}$
- B. $\frac{5y+4}{y^2+2y}$
- C. $\frac{5y+2}{y^2+2y}$
- D. $\frac{5}{2y+2}$
- E. $\frac{y+4}{y^2+2y}$

12. Simplify the expression: $\frac{x}{x-4} - \frac{3}{x+1}$

- A. $\frac{x^2-2x-12}{x^2-3x-4}$
- B. $\frac{x-3}{x^2-3x-4}$
- C. $\frac{x^2-2x+12}{x^2-3x-4}$
- D. $\frac{x^2+4x+12}{x^2-3x-4}$
- E. $\frac{x-3}{-5}$

13. Determine the value of the expression $5(x - y) + x^2$ if $x = 3$ and $y = 1$.

- A. 16
- B. 19
- C. 13
- D. 25
- E. 20

14. Determine the value of the expression $a^3 - b^2$ if $a = 2$ and $b = -4$.

- A. -8
- B. 24
- C. 12
- D. 40
- E. -4

15. Solve for x : $2x + 11 = 5$

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

16. Solve for z : $\frac{3}{5}z + 2 = 14$

- A. $z = 12$
- B. $z = 20$
- C. $z = \frac{36}{5}$
- D. $z = \frac{80}{3}$
- E. $z = 24$

17. Solve for x : $9x - 5 = 4x + 20$

- A. $x = 3$
- B. $x = \frac{15}{13}$
- C. $x = 25$
- D. $x = 5$
- E. $x = \frac{25}{13}$

18. Find the solution (x, y) to the system of equations: $y = 2x - 3$ and $3x + y = 7$

- A. $(1, -1)$
- B. $(0, -3)$
- C. $(2, 1)$
- D. $(10, 17)$
- E. $(2, -1)$

19. Find the solution (x, y) to the system of equations: $2x + 5y = 3$ and $x - 3y = 7$

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

20. Find the solution to the system of equations: $y = -3x + 4$ and $6x + 2y = 8$

- A. $(0, 4)$
- B. $(1, 1)$
- C. No solution
- D. $(2, -2)$
- E. Infinite solutions

21. Solve the inequality: $2(x - 3) > 10$

- A. $x > 5$
- B. $x > 8$
- C. $x < 8$
- D. $x > 13$
- E. $x > 6.5$

22. Solve the inequality: $15 - 5x \geq 25$

- A. $x \geq 2$
- B. $x \leq 2$
- C. $x \geq -2$
- D. $x \leq -2$
- E. $x \geq -8$

23. Find all solutions to the quadratic equation: $x^2 - x - 12 = 0$

- A. $x = 6, x = -2$

- B. $x = 4, x = -3$
- C. $x = -4, x = 3$
- D. $x = 12, x = -1$
- E. $x = -6, x = 2$

24. Find all solutions to the quadratic equation: $3x^2 + 7x = -2$

- A. $x = -2, x = -\frac{1}{3}$
- B. $x = 2, x = \frac{1}{3}$
- C. $x = -2, x = \frac{1}{3}$
- D. $x = 2, x = -\frac{1}{3}$
- E. $x = 1, x = \frac{2}{3}$

25. Find all solutions to the quadratic equation: $5x^2 - 20 = 0$

- A. $x = 4, x = -4$
- B. $x = 2$
- C. $x = 2, x = -2$
- D. $x = \sqrt{2}, x = -\sqrt{2}$
- E. $x = 5, x = -4$

26. Factor the expression completely: $10a^4b^2 + 15a^2b^3$

- A. $5a^2b^2(2a^2 + 3b)$
- B. $5a^2b(2a^2 + 3b^2)$
- C. $10a^2b^2(a^2 + 5b)$
- D. $5a^2b^2(2a^2 + 3b^2)$
- E. $5(2a^4b^2 + 3a^2b^3)$

27. Factor the expression completely: $49m^2 - 100n^2$

- A. $(7m - 10n)^2$
- B. $(7m + 10n)^2$
- C. $(49m - 10n)(m + 10n)$
- D. $(7m - 10n)(7m + 10n)$
- E. $(7m - 50n)(7m + 2n)$

28. Factor the quadratic expression: $5x^2 - 17x + 6$

- A. $(5x - 6)(x - 1)$
- B. $(5x - 3)(x - 2)$
- C. $(5x - 2)(x - 3)$
- D. $(5x + 2)(x + 3)$
- E. $(x - 6)(5x - 1)$

29. A map scale shows that 2 inches represents 25 miles. How many miles are represented by 5 inches?

- A. 62.5 miles

- B.** 50 miles
- C.** 125 miles
- D.** 10 miles
- E.** 75 miles

30. A pancake recipe for 12 pancakes requires $\frac{3}{4}$ cup of flour. How many cups of flour are needed to make 36 pancakes?

- A.** 3 cups
- B.** 2 cups
- C.** 4 cups
- D.** $\frac{9}{4}$ cups
- E.** $\frac{3}{2}$ cups

Answer Key

1. A

- *Explanation:* Distribute the negative sign: $a^2 - 3a + 5 - 2a^2 - a + 2$.
- Combine like terms: $(a^2 - 2a^2) + (-3a - a) + (5 + 2) = -a^2 - 4a + 7$.

2. A

- *Explanation:* Distribute both coefficients: $-2(x + 3y) \rightarrow -2x - 6y$. $3(x - y) \rightarrow 3x - 3y$.
- Combine the results: $(-2x + 3x) + (-6y - 3y) = x - 9y$.

3. B

- *Explanation:* Distribute $4x$: $4x(x - 2) \rightarrow 4x^2 - 8x$. Distribute the negative: $-(x^2 + 3x - 1) \rightarrow -x^2 - 3x + 1$.
- Combine like terms: $(4x^2 - x^2) + (-8x - 3x) + 1 = 3x^2 - 11x + 1$.

4. A

- *Explanation:* Evaluate the first term: $(-3)^2 = 9$.
- Evaluate the second term: $\frac{2^5}{2^2} = 2^{5-2} = 2^3 = 8$.
- Add the results: $9 + 8 = 17$.

5. C

- *Explanation:* $100^{\frac{1}{2}} = \sqrt{100} = 10$.
- $64^{\frac{1}{3}} = \sqrt[3]{64} = 4$.
- Subtract: $10 - 4 = 6$.

6. A

- *Explanation:* Apply the power rule (squaring) to each factor: $4^2 = 16$. $(a^{-2})^2 = a^{-2 \cdot 2} = a^{-4}$. $(b^3)^2 = b^{3 \cdot 2} = b^6$.
- The result is $16a^{-4}b^6$.

7. A

- *Explanation:* Apply the power rule (squaring) to the first term: $(x^3y^{-1})^2 = (x^3)^2(y^{-1})^2 = x^6y^{-2}$.
- Multiply by the second term: $(x^6y^{-2})(2x^{-2}y^5) = 2 \cdot x^{6+(-2)} \cdot y^{-2+5} = 2x^4y^3$.

8. C

- *Explanation:* Apply the power rule (cubing) to the numerator: $(3m^2n)^3 = 3^3(m^2)^3n^3 = 27m^6n^3$.
- Divide by the denominator: $\frac{27m^6n^3}{9m^4n^5}$.
- Simplify coefficients: $\frac{27}{9} = 3$. Subtract m exponents: $m^{6-4} = m^2$. Subtract n exponents: $n^{3-5} = n^{-2}$.
- The result is $3m^2n^{-2}$.

9. A

- *Explanation:* Take the square root of the coefficient and divide each exponent by 2.
- $\sqrt{36} = 6$. $\sqrt{x^6} = x^{6/2} = x^3$. $\sqrt{y^{10}} = y^{10/2} = y^5$. $\sqrt{z^2} = z^{2/2} = z$.
- The result is $6x^3y^5z$.

10. B

- *Explanation:* Take the square root of the coefficient and divide each exponent by 2.
- $\sqrt{4} = 2$. $\sqrt{x^{100}} = x^{100/2} = x^{50}$. $\sqrt{y^{36}} = y^{36/2} = y^{18}$.
- The result is $2x^{50}y^{18}$.

11. B

- *Explanation:* The common denominator is $y(y + 2)$.
- Multiply the first fraction by $\frac{y}{y} \cdot \frac{3y}{y(y+2)}$.
- Multiply the second fraction by $\frac{y+2}{y+2} \cdot \frac{2(y+2)}{y(y+2)} = \frac{2y+4}{y^2+2y}$.
- Add the numerators: $\frac{3y+(2y+4)}{y^2+2y} = \frac{5y+4}{y^2+2y}$.

12. C

- *Explanation:* The common denominator is $(x - 4)(x + 1)$.
- Multiply the first fraction by $\frac{x+1}{x+1} \cdot \frac{x(x+1)}{(x-4)(x+1)} = \frac{x^2+x}{x^2-3x-4}$.
- Multiply the second fraction by $\frac{x-4}{x-4} \cdot \frac{3(x-4)}{(x-4)(x+1)} = \frac{3x-12}{x^2-3x-4}$.
- Subtract the numerators: $\frac{(x^2+x)-(3x-12)}{x^2-3x-4} = \frac{x^2+x-3x+12}{x^2-3x-4} = \frac{x^2-2x+12}{x^2-3x-4}$.

13. B

- *Explanation:* Substitute the values: $5(3 - 1) + 3^2$.
- Simplify inside the parenthesis: $5(2) + 3^2$.
- Evaluate the exponent: $5(2) + 9$.
- Multiply: $10 + 9 = 19$.

14. A

- *Explanation:* Substitute the values: $2^3 - (-4)^2$.
- Evaluate exponents: $8 - 16$.
- Subtract: -8 .

15. B

- *Explanation:* Subtract 11 from both sides: $2x = 5 - 11 \rightarrow 2x = -6$.
- Divide by 2: $x = -3$.

16. B

- *Explanation:* Subtract 2 from both sides: $\frac{3}{5}z = 14 - 2 \rightarrow \frac{3}{5}z = 12$.
- Multiply by the reciprocal, $\frac{5}{3}$: $z = 12 \cdot \frac{5}{3} = \frac{60}{3} = 20$.

17. D

- *Explanation:* Subtract $4x$ from both sides: $5x - 5 = 20$.
- Add 5 to both sides: $5x = 25$.
- Divide by 5: $x = 5$.

18. C

- *Explanation:* Use substitution. Replace y in the second equation with $(2x - 3)$.
- $3x + (2x - 3) = 7$. Combine terms: $5x - 3 = 7$.
- Add 3: $5x = 10$. Divide by 5: $x = 2$.
- Find y : $y = 2(2) - 3 = 4 - 3 = 1$. Solution is $(2, 1)$.

19. A

- *Explanation:* Use elimination. Multiply the second equation by -2 : $-2(x - 3y) = -2(7) \rightarrow -2x + 6y = -14$.
- Add this to the first equation: $(2x + 5y) + (-2x + 6y) = 3 + (-14) \rightarrow 11y = -11$.
- Divide by 11: $y = -1$.
- Substitute $y = -1$ into $x - 3y = 7$: $x - 3(-1) = 7 \rightarrow x + 3 = 7 \rightarrow x = 4$. Solution is $(4, -1)$.

20. E

- *Explanation:* Use substitution. Replace y in the second equation with $(-3x + 4)$.
- $6x + 2(-3x + 4) = 8$. Distribute: $6x - 6x + 8 = 8$.
- Combine x terms: $0x + 8 = 8 \rightarrow 8 = 8$.
- This is a true statement. The variables canceled, leaving a true identity. This means the lines are the same, and there are infinite solutions.

21. B

- *Explanation:* Distribute the 2: $2x - 6 > 10$.
- Add 6 to both sides: $2x > 16$.
- Divide by 2: $x > 8$.

22. D

- *Explanation:* Subtract 15 from both sides: $-5x \geq 10$.
- Divide by -5 . **Remember to flip the inequality sign** when dividing by a negative.
- $x \leq \frac{10}{-5} \rightarrow x \leq -2$.

23. B

- *Explanation:* Factor the quadratic. Find two numbers that multiply to -12 and add to -1 . The numbers are -4 and 3 .
- Factored form: $(x - 4)(x + 3) = 0$.
- Set factors to zero: $x - 4 = 0 \rightarrow x = 4$. And $x + 3 = 0 \rightarrow x = -3$.

24. A

- *Explanation:* Set the equation to zero: $3x^2 + 7x + 2 = 0$.

- Factor by grouping. Find numbers that multiply to $a \cdot c$ ($3 \cdot 2 = 6$) and add to b (7). The numbers are 6 and 1.
- Rewrite: $3x^2 + 6x + 1x + 2 = 0$.
- Group: $3x(x + 2) + 1(x + 2) = 0$.
- Factored form: $(3x + 1)(x + 2) = 0$.
- Set factors to zero: $x + 2 = 0 \rightarrow x = -2$. And $3x + 1 = 0 \rightarrow x = -\frac{1}{3}$.

25. C

- *Explanation:* First, isolate x^2 . Divide by 5: $x^2 = 4$.
- Take the square root of both sides, remembering the positive and negative root.
- $x = \pm\sqrt{4} \rightarrow x = 2$ and $x = -2$.

26. A

- *Explanation:* Find the GCF. GCF of 10 and 15 is 5. GCF of a^4 and a^2 is a^2 . GCF of b^2 and b^3 is b^2 .
- The overall GCF is $5a^2b^2$.
- Factor it out: $5a^2b^2(2a^2) + 5a^2b^2(3b) = 5a^2b^2(2a^2 + 3b)$.

27. D

- *Explanation:* This is a difference of squares: $a^2 - b^2 = (a - b)(a + b)$.
- $49m^2 - 100n^2 = (7m)^2 - (10n)^2$.
- Factored form: $(7m - 10n)(7m + 10n)$.

28. C

- *Explanation:* Factor by grouping. Find numbers that multiply to $a \cdot c$ ($5 \cdot 6 = 30$) and add to b (-17). The numbers are -15 and -2 .
- Rewrite: $5x^2 - 15x - 2x + 6 = 0$.
- Group: $5x(x - 3) - 2(x - 3) = 0$.
- Factored form: $(5x - 2)(x - 3)$.

29. A

- *Explanation:* Set up a proportion: $\frac{\text{inches}}{\text{miles}}$. Let x be the unknown miles.
- $\frac{2}{25} = \frac{5}{x}$.
- Cross-multiply: $2x = 25 \cdot 5 \rightarrow 2x = 125$.
- Divide by 2: $x = \frac{125}{2} = 62.5$ miles.

30. D

- *Explanation:* First, find the ratio of pancakes: $36 \div 12 = 3$.
- The new batch is 3 times larger than the original recipe.
- Multiply the flour required by 3: $\frac{3}{4} \cdot 3 = \frac{9}{4}$ cups.