

North Carolina School of Science and Mathematics

Admissions Math Assessment - Practice Test 3

Practice Test 3

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: $(9a - 2b) + (3a - 4b)$

- A. $12a - 6b$
- B. $12a + 2b$
- C. $6a - 6b$
- D. $12a - 2b$
- E. $6a + 2b$

2. Simplify the expression: $5(x - 3y) - 2(x + y)$

- A. $3x - 14y$
- B. $3x - 13y$
- C. $3x - 17y$
- D. $7x - 17y$
- E. $3x + 13y$

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

- A. $y + 1$
- B. $4y^2 + y + 1$
- C. $-7y + 1$
- D. $y^2 - 7y + 1$
- E. $4y^2 - 7y + 1$

4. Evaluate the expression: $-(\frac{1}{3})^3 + \frac{5^2}{5^1}$

- A. $5 + \frac{1}{27}$
- B. $5 - \frac{1}{9}$
- C. $5 - \frac{1}{27}$
- D. $\frac{134}{27}$
- E. $\frac{136}{27}$

5. Evaluate the expression: $64^{\frac{1}{3}} - 81^{\frac{1}{2}}$

- A. -1
- B. -5
- C. 1
- D. 7
- E. 12.5

6. Simplify the expression: $(2x^{-1}y^4)^3$

- A. $6x^{-3}y^{12}$
- B. $8x^2y^7$
- C. $8x^{-3}y^{12}$
- D. $6x^2y^{12}$
- E. $8x^{-3}y^7$

7. Simplify the expression: $(-4a^3b^{-1})(-2a^{-5}b^4)^2$

- A. $8a^{-7}b^7$
- B. $-16a^{-7}b^7$
- C. $16a^8b^7$
- D. $-16a^{-10}b^8$
- E. $-8a^{-2}b^3$

8. Simplify the expression, assuming no variables are zero: $\frac{5x^3y^7}{(5x^3y)^2}$

- A. $\frac{y^5}{5x^3}$
- B. y^5
- C. $\frac{y^5}{5x^6}$
- D. $\frac{y^6}{5x^3}$
- E. $\frac{1}{5x^3y}$

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

$$\sqrt{16x^{16}y^2}$$

- A. $4x^4y$
- B. $8x^8y$
- C. $4x^8y$
- D. $4x^{16}y$
- E. $4x^8y^2$

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

$$\sqrt{144a^4b^{10}c^8}$$

- A. $12a^2b^5c^4$
- B. $12a^2b^8c^4$
- C. $72a^2b^5c^4$
- D. $12a^4b^5c^4$
- E. $12a^2b^5c^6$

11. Simplify the expression: $\frac{2}{x} - \frac{5}{x-3}$

- A. $\frac{-3x-3}{x^2-3x}$
- B. $\frac{-3}{x-3}$
- C. $\frac{7x-6}{x^2-3x}$
- D. $\frac{-3x-6}{x^2-3x}$
- E. $\frac{-3x+6}{x^2-3x}$

12. Simplify the expression: $\frac{3}{a+2} + \frac{2}{a-2}$

- A. $\frac{5a-2}{a^2-4}$
- B. $\frac{5a+2}{a^2-4}$
- C. $\frac{5}{a^2-4}$
- D. $\frac{a-2}{a^2-4}$
- E. $\frac{5a+10}{a^2-4}$

13. Determine the value of the expression $a(a+b) - b^2$ if $a = 3$ and $b = -1$.

- A. 7
- B. 9
- C. 4
- D. 5
- E. 6

14. Determine the value of the expression $\frac{x^2-y}{z}$ if $x = 4$, $y = 6$, and $z = 2$.

- A. 1
- B. 5
- C. 4
- D. 10
- E. 13

15. Solve for x : $7 - x = 12$

- A. $x = 19$
- B. $x = 5$
- C. $x = -19$
- D. $x = -5$
- E. $x = \frac{12}{7}$

16. Solve for x : $\frac{1}{2}x + 3 = 8$

- A. $x = 2.5$
- B. $x = 11$
- C. $x = 22$
- D. $x = 10$
- E. $x = 5.5$

17. Solve for n : $10n + 4 = 3n - 10$

- A. $n = 2$
- B. $n = 14$
- C. $n = -2$
- D. $n = -14$
- E. $n = \frac{14}{13}$

18. Find the solution (x, y) to the system of equations: $x = 4y - 1$ and $2x + 3y = 9$

- A. $(7, 2)$
- B. $(3, 1)$
- C. $(11, 3)$
- D. $(0, \frac{13}{3})$
- E. $(2, \frac{3}{4})$

19. Find the solution (x, y) to the system of equations: $3x + y = 1$ and $5x + 2y = 0$

- A. $(2, -5)$
- B. $(-2, 7)$
- C. $(0, 1)$
- D. $(2, 5)$
- E. $(-2, -5)$

20. Find the solution to the system of equations: $y = 4x - 1$ and $8x - 2y = 5$

- A. $(0, -1)$
- B. $(1, 3)$
- C. No solution
- D. $(\frac{1}{4}, 0)$
- E. Infinite solutions

21. Solve the inequality: $5(x + 2) < 3x + 18$

- A. $x < 4$
- B. $x > 4$
- C. $x < 14$
- D. $x < 1.4$
- E. $x > 14$

22. Solve the inequality: $10 - 2x \leq 4$

- A. $x \leq 3$
- B. $x \geq 3$
- C. $x \leq -3$
- D. $x \geq -3$
- E. $x \geq 7$

23. Find all solutions to the quadratic equation: $x^2 - 12x = -20$

- A. $x = 10, x = 2$
- B. $x = -10, x = -2$
- C. $x = 5, x = 4$
- D. $x = -5, x = -4$
- E. $x = 6, x = -6$

24. Find all solutions to the quadratic equation: $5x^2 + 13x = 6$

- A. $x = 2, x = -3$
- B. $x = \frac{2}{5}, x = 3$
- C. $x = 6, x = -1$
- D. $x = \frac{2}{5}, x = -3$
- E. $x = -\frac{2}{5}, x = 3$

25. Find all solutions to the quadratic equation: $x^2 - 36 = 0$

- A. $x = 18$
- B. $x = 6$
- C. $x = 6, x = -6$
- D. $x = 3, x = -3$
- E. $x = 12, x = 3$

26. Factor the expression completely: $15x^4y^2 - 10x^2y^3$

- A. $5x^2y^2(3x^2 - 2y)$
- B. $5x^2y(3x^2 - 2y^2)$
- C. $5xy(3x^3y - 2xy^2)$
- D. $5x^2y^2(3x^2 - 2y^2)$
- E. $10x^2y^2(x^2 - y)$

27. Factor the expression completely: $a^2 - 81b^2$

- A. $(a - 9b)^2$
- B. $(a - 9b)(a + 9b)$
- C. $(a + 9b)^2$
- D. $(a - 81b)(a + b)$
- E. $(a - 27b)(a + 3b)$

28. Factor the quadratic expression: $2x^2 + 11x + 12$

- A. $(2x + 6)(x + 2)$
- B. $(2x + 3)(x + 4)$
- C. $(2x + 4)(x + 3)$
- D. $(x + 6)(2x + 2)$
- E. $(2x - 3)(x - 4)$

29. If $\frac{3}{4}$ of a pound of soil is needed for $\frac{1}{2}$ of a flower pot, how many pounds of soil are needed for the entire pot?

- A. $\frac{3}{8}$ pounds
- B. $\frac{3}{2}$ pounds
- C. $\frac{2}{3}$ pounds
- D. $\frac{4}{3}$ pounds
- E. 2 pounds

30. A recipe for 4 dozen cookies requires 2 cups of sugar. How many cups of sugar are needed to make 10 dozen cookies?

- A. 4 cups
- B. 20 cups
- C. 8 cups
- D. 6 cups
- E. 5 cups

Answer Key

1. A

- *Explanation:* This is an addition of two polynomials. Remove the parentheses and group like terms.
- $(9a + 3a) + (-2b - 4b) = 12a - 6b.$

2. C

- *Explanation:* First, distribute the coefficients into each parenthesis.
- $5(x - 3y) \rightarrow 5x - 15y.$
- $-2(x + y) \rightarrow -2x - 2y.$
- Combine the results: $(5x - 15y) + (-2x - 2y).$
- Group like terms: $(5x - 2x) + (-15y - 2y) = 3x - 17y.$

3. A

- *Explanation:* Distribute the $-y$ into the second parenthesis: $-y(2y) - y(-4) = -2y^2 + 4y.$
- The full expression is $(2y^2 - 3y + 1) + (-2y^2 + 4y).$
- Combine like terms: $(2y^2 - 2y^2) + (-3y + 4y) + 1 = 0y^2 + 1y + 1 = y + 1.$

4. D

- *Explanation:* Evaluate the first term: $-(\frac{1}{3})^3 = -(\frac{1^3}{3^3}) = -\frac{1}{27}.$
- Evaluate the second term using exponent rules: $\frac{5^2}{5^1} = 5^{2-1} = 5^1 = 5.$
- Add the results: $-\frac{1}{27} + 5.$ Find a common denominator: $-\frac{1}{27} + \frac{135}{27} = \frac{134}{27}.$

5. B

- *Explanation:* $64^{\frac{1}{3}}$ is the cube root of 64, $\sqrt[3]{64} = 4.$
- $81^{\frac{1}{2}}$ is the square root of 81, $\sqrt{81} = 9.$
- Perform the subtraction: $4 - 9 = -5.$

6. C

- *Explanation:* Apply the power rule (cubing) to each part inside the parentheses.
- $2^3 = 8.$ $(x^{-1})^3 = x^{-1 \cdot 3} = x^{-3}.$ $(y^4)^3 = y^{4 \cdot 3} = y^{12}.$
- The result is $8x^{-3}y^{12}.$

7. B

- *Explanation:* First, apply the power rule (squaring) to the second term: $(-2a^{-5}b^4)^2 = (-2)^2(a^{-5})^2(b^4)^2 = 4a^{-10}b^8.$
- Now multiply this result by the first term: $(-4a^3b^{-1})(4a^{-10}b^8).$
- Multiply coefficients: $-4 \cdot 4 = -16.$ Add a exponents: $a^{3+(-10)} = a^{-7}.$ Add b exponents: $b^{-1+8} = b^7.$
- The result is $-16a^{-7}b^7.$

8. A

- *Explanation:* First, apply the power rule (squaring) to the denominator: $(5x^3y)^2 = 5^2(x^3)^2(y)^2 = 25x^6y^2$.
- Now divide the original numerator by this result: $\frac{5x^3y^7}{25x^6y^2}$.
- Divide coefficients: $\frac{5}{25} = \frac{1}{5}$. Subtract x exponents: $x^{3-6} = x^{-3}$. Subtract y exponents: $y^{7-2} = y^5$.
- The result is $\frac{1}{5}x^{-3}y^5$, which is $\frac{y^5}{5x^3}$.

9. C

- *Explanation:* Take the square root of the coefficient and divide each exponent by 2.
- $\sqrt{16} = 4$. $\sqrt{x^{16}} = x^{16/2} = x^8$. $\sqrt{y^2} = y^{2/2} = y^1 = y$.
- The result is $4x^8y$.

10. A

- *Explanation:* Take the square root of the coefficient and divide each exponent by 2.
- $\sqrt{144} = 12$. $\sqrt{a^4} = a^{4/2} = a^2$. $\sqrt{b^{10}} = b^{10/2} = b^5$. $\sqrt{c^8} = c^{8/2} = c^4$.
- The result is $12a^2b^5c^4$.

11. D

- *Explanation:* The common denominator is $x(x-3)$.
- Multiply the first fraction by $\frac{x-3}{x-3}$: $\frac{2(x-3)}{x(x-3)} = \frac{2x-6}{x^2-3x}$.
- Multiply the second fraction by $\frac{x}{x}$: $\frac{5x}{x(x-3)} = \frac{5x}{x^2-3x}$.
- Subtract the numerators: $\frac{(2x-6)-5x}{x^2-3x} = \frac{-3x-6}{x^2-3x}$.

12. A

- *Explanation:* The common denominator is $(a+2)(a-2)$, which is a^2-4 .
- Multiply the first fraction by $\frac{a-2}{a-2}$: $\frac{3(a-2)}{(a+2)(a-2)} = \frac{3a-6}{a^2-4}$.
- Multiply the second fraction by $\frac{a+2}{a+2}$: $\frac{2(a+2)}{(a+2)(a-2)} = \frac{2a+4}{a^2-4}$.
- Add the numerators: $\frac{(3a-6)+(2a+4)}{a^2-4} = \frac{5a-2}{a^2-4}$.

13. D

- *Explanation:* Substitute the values into the expression: $3(3 + (-1)) - (-1)^2$.
- Simplify inside the parenthesis: $3(2) - (-1)^2$.
- Evaluate the exponent: $3(2) - 1$.
- Multiply: $6 - 1 = 5$.

14. B

- *Explanation:* Substitute the values: $\frac{4^2-6}{2}$.
- Evaluate the exponent: $\frac{16-6}{2}$.
- Subtract in the numerator: $\frac{10}{2}$.
- Divide: 5.

15. D

- *Explanation:* Subtract 7 from both sides: $7 - 7 - x = 12 - 7 \rightarrow -x = 5$.
- Multiply by -1 : $x = -5$.

16. D

- *Explanation:* Subtract 3 from both sides: $\frac{1}{2}x = 8 - 3 \rightarrow \frac{1}{2}x = 5$.
- Multiply by the reciprocal, 2: $x = 5 \cdot 2 = 10$.

17. C

- *Explanation:* Subtract $3n$ from both sides: $10n - 3n + 4 = 3n - 3n - 10 \rightarrow 7n + 4 = -10$.
- Subtract 4 from both sides: $7n = -14$.
- Divide by 7: $n = -2$.

18. B

- *Explanation (for corrected problem $2x + 3y = 9$):* Use substitution. Replace x in the second equation with $(4y - 1)$.
- $2(4y - 1) + 3y = 9$. Distribute the 2: $8y - 2 + 3y = 9$.
- Combine like terms: $11y - 2 = 9$. Add 2: $11y = 11$.
- Divide by 11: $y = 1$.
- Substitute $y = 1$ back into $x = 4y - 1$: $x = 4(1) - 1 = 3$.
- The solution is $(3, 1)$.

19. A

- *Explanation:* Use elimination. Multiply the first equation by -2 to get $-6x - 2y = -2$.
- Add this to the second equation: $(-6x - 2y) + (5x + 2y) = -2 + 0 \rightarrow -x = -2 \rightarrow x = 2$.
- Substitute $x = 2$ into the first equation: $3(2) + y = 1 \rightarrow 6 + y = 1 \rightarrow y = -5$.
- The solution is $(2, -5)$.

20. C

- *Explanation:* Use substitution. Replace y in the second equation with $(4x - 1)$.
- $8x - 2(4x - 1) = 5$. Distribute the -2 : $8x - 8x + 2 = 5$.
- Combine x terms: $0x + 2 = 5 \rightarrow 2 = 5$.
- This is a false statement. The variables canceled, leaving a contradiction. This means there is no solution.

21. A

- *Explanation:* Distribute the 5: $5x + 10 < 3x + 18$.
- Subtract $3x$ from both sides: $2x + 10 < 18$.
- Subtract 10 from both sides: $2x < 8$.
- Divide by 2: $x < 4$.

22. B

- *Explanation:* Subtract 10 from both sides: $-2x \leq -6$.
- Divide by -2 . **Remember to flip the inequality sign** when dividing by a negative.
- $x \geq \frac{-6}{-2} \rightarrow x \geq 3$.

23. A

- *Explanation:* Set the equation to zero: $x^2 - 12x + 20 = 0$.
- Factor the quadratic. Find two numbers that multiply to 20 and add to -12 . The numbers are -10 and -2 .
- Factored form: $(x - 10)(x - 2) = 0$.
- Set factors to zero: $x - 10 = 0 \rightarrow x = 10$. And $x - 2 = 0 \rightarrow x = 2$.

24. D

- *Explanation:* Set the equation to zero: $5x^2 + 13x - 6 = 0$.
- Factor by grouping. Find numbers that multiply to $a \cdot c$ ($5 \cdot -6 = -30$) and add to b (13). The numbers are 15 and -2 .
- Rewrite: $5x^2 + 15x - 2x - 6 = 0$.
- Group: $5x(x + 3) - 2(x + 3) = 0$.
- Factored form: $(5x - 2)(x + 3) = 0$.
- Set factors to zero: $5x - 2 = 0 \rightarrow x = \frac{2}{5}$. And $x + 3 = 0 \rightarrow x = -3$.

25. C

- *Explanation:* This is a difference of squares: $a^2 - b^2 = (a - b)(a + b)$.
- $x^2 - 36 = x^2 - 6^2 = (x - 6)(x + 6) = 0$.
- Set factors to zero: $x - 6 = 0 \rightarrow x = 6$. And $x + 6 = 0 \rightarrow x = -6$.

26. A

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

27. B

- *Explanation:* This is a difference of squares: $a^2 - b^2 = (a - b)(a + b)$.
- $a^2 - 81b^2 = (a)^2 - (9b)^2$.
- Factored form: $(a - 9b)(a + 9b)$.

28. B

- *Explanation:* Factor by grouping. Find numbers that multiply to $a \cdot c$ ($2 \cdot 12 = 24$) and add to b (11). The numbers are 8 and 3.
- Rewrite: $2x^2 + 8x + 3x + 12$.
- Group: $2x(x + 4) + 3(x + 4)$.
- Factored form: $(2x + 3)(x + 4)$.

29. B

- *Explanation:* Set up a proportion: $\frac{\text{pounds of soil}}{\text{portion of pot}}$. Let x be the pounds for 1 whole pot.
- Set up a proportion: $\frac{\text{pounds of soil}}{\text{portion of pot}}$. Let x be the pounds for 1 whole pot.
- $\frac{3/4}{1/2} = \frac{x}{1}$.
- Solve for x : $x = \frac{3/4}{1/2} = \frac{3}{4} \div \frac{1}{2} = \frac{3}{4} \cdot \frac{2}{1} = \frac{6}{4} = \frac{3}{2}$ pounds.

30. E

- *Explanation:* Set up a proportion: $\frac{\text{cups of sugar}}{\text{dozen cookies}}$. Let x be the unknown cups of sugar.
- $\frac{2 \text{ cups}}{4 \text{ dozen}} = \frac{x \text{ cups}}{10 \text{ dozen}}$.
- $\frac{2}{4} = \frac{x}{10} \rightarrow \frac{1}{2} = \frac{x}{10}$.
- Cross-multiply: $2 \cdot x = 1 \cdot 10 \rightarrow 2x = 10$.
- Divide by 2: $x = 5$ cups.