

North Carolina School of Science and Mathematics

Admissions Math Assessment - Practice Test 4

Practice Test 4

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: $(3x^2 + 5x - 4) + (2x^2 - 7x - 1)$

A. $5x^2 + 12x - 3$

B. $5x^2 - 2x - 3$

C. $5x^2 + 2x - 5$

D. $5x^2 - 2x - 5$

E. $x^2 - 2x - 5$

2. Simplify the expression: $4(2a - b) - 3(a - 3b)$

A. $5a + 5b$

B. $5a - 13b$

C. $11a + 5b$

D. $5a - 7b$

E. $11a - 13b$

3. Simplify the expression: $x(3x + 2) - (x^2 - 4x + 9)$

A. $2x^2 - 2x + 9$

B. $2x^2 + 6x - 9$

C. $3x^2 - 2x - 9$

D. $2x^2 + 6x + 9$

E. $3x^2 + 6x - 9$

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

A. 1

B. 17

C. 15

D. 3

E. 0

5. Evaluate the expression: $25^{\frac{1}{2}} + 27^{\frac{1}{3}}$

- A. 14
- B. 5.5
- C. 8
- D. 32.5
- E. 7

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

- A. $6a^7b^1$
- B. $9a^{10}b^{-2}$
- C. $6a^{10}b^{-2}$
- D. $9a^7b^1$
- E. $9a^{25}b^{-2}$

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

- A. $\frac{xy^8}{4}$
- B. $\frac{xy^8}{2}$
- C. $-4xy^8$
- D. $\frac{x^9y^8}{4}$
- E. $\frac{x}{4y^4}$

8. Simplify the expression, assuming no variables are zero: $\frac{(2x^4y)^3}{6x^5y^3}$

- A. $\frac{4x^7}{3}$
- B. $\frac{8x^{12}}{6x^5}$
- C. $\frac{2x^7y}{3}$
- D. $\frac{4x^7y}{3}$
- E. $\frac{4x^7}{3y}$

9. Simplify the radical expression, assuming all variables represent positive numbers:
 $\sqrt{49a^{10}b^6}$

- A. $7a^5b^3$
- B. $7a^7b^4$
- C. $24.5a^5b^3$
- D. $7a^{10}b^6$
- E. $49a^5b^3$

10. Simplify the radical expression, assuming all variables represent positive numbers:
 $\sqrt{64m^2n^{12}p^4}$

- A. $8m^2n^6p^2$
- B. $32mn^6p^2$
- C. $8mn^6p^2$
- D. $8mn^{12}p^4$
- E. $8mn^6p$

11. Simplify the expression: $\frac{4}{x-1} - \frac{1}{x}$

- A. $\frac{3}{x^2-x}$
- B. $\frac{3x-1}{x^2-x}$
- C. $\frac{5x-1}{x^2-x}$
- D. $\frac{3x+1}{x^2-x}$
- E. $\frac{3x+1}{x-1}$

12. Simplify the expression: $\frac{y}{y+1} + \frac{2}{y-1}$

- A. $\frac{y^2+y+2}{y^2-1}$
- B. $\frac{y+2}{y^2-1}$
- C. $\frac{y+2}{2y}$
- D. $\frac{y^2-y+2}{y^2-1}$
- E. $\frac{y^2+y-2}{y^2-1}$

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

- A. 19
- B. 23
- C. 7
- D. 31
- E. 1

14. Determine the value of the expression $\frac{a+b}{a-b}$ if $a = 3$ and $b = -5$.

- A. 1
- B. -1
- C. $-\frac{1}{4}$
- D. $\frac{1}{4}$
- E. 4

15. Solve for x : $4x + 5 = 21$

- A. $x = 16$
- B. $x = 4$
- C. $x = 6.5$
- D. $x = 26$
- E. $x = 3$

16. Solve for y : $\frac{2}{3}y - 1 = 11$

- A. $y = 12$
- B. $y = 18$
- C. $y = 8$
- D. $y = 16.5$
- E. $y = \frac{22}{3}$

17. Solve for a : $5a - 3 = 2a + 12$

- A. $a = 3$
- B. $a = \frac{9}{7}$
- C. $a = 5$
- D. $a = -5$
- E. $a = \frac{15}{7}$

18. Find the solution (x, y) to the system of equations: $y = 3x + 2$ and $x + 2y = 11$

- A. $(1, 5)$
- B. $(5, 1)$
- C. $(-1, -1)$
- D. $(0, 2)$
- E. $(2, 4.5)$

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

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

20. Find the solution to the system of equations: $x + 3y = 5$ and $2x + 6y = 10$

- A. $(5, 0)$
- B. $(2, 1)$
- C. No solution
- D. $(0, \frac{5}{3})$
- E. Infinite solutions

21. Solve the inequality: $3x - 4 \geq 11$

- A. $x \geq \frac{7}{3}$
- B. $x \leq 5$
- C. $x \geq 5$
- D. $x \geq 15$
- E. $x \leq -5$

22. Solve the inequality: $4 - 3x > 16$

- A. $x > 4$
- B. $x < -4$
- C. $x > -4$
- D. $x < 4$
- E. $x < -\frac{20}{3}$

23. Find all solutions to the quadratic equation: $x^2 + 3x - 10 = 0$

- A. $x = 5, x = -2$
- B. $x = -10, x = 1$
- C. $x = 10, x = -1$
- D. $x = -5, x = 2$
- E. $x = 5, x = 2$

24. Find all solutions to the quadratic equation: $2x^2 - 5x = 3$

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

25. Find all solutions to the quadratic equation: $9x^2 = 1$

- A. $x = \frac{1}{9}, x = -\frac{1}{9}$
- B. $x = 1, x = -1$
- C. $x = 3, x = -3$
- D. $x = \frac{1}{3}$
- E. $x = \frac{1}{3}, x = -\frac{1}{3}$

26. Factor the expression completely: $12a^3b + 8ab^2$

- A. $4ab(3a^2 + 2b)$
- B. $4a(3a^2b + 2b^2)$
- C. $4ab^2(3a^2 + 2)$
- D. $2ab(6a^2 + 4b)$
- E. $4ab(3a^2 + 2b^2)$

27. Factor the expression completely: $25x^2 - 4y^2$

- A. $(5x - 2y)^2$
- B. $(5x - 2y)(5x + 2y)$
- C. $(25x - 4y)(x + y)$
- D. $(5x + 2y)^2$
- E. $(5x - 4y)(5x + y)$

28. Factor the quadratic expression: $3x^2 + 7x - 6$

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

29. If $\frac{1}{2}$ gallon of gas is used to mow $\frac{1}{5}$ of a lawn, how much gas is needed for the entire lawn?

- A. 2 gallons
- B. $\frac{1}{10}$ gallons
- C. $\frac{5}{2}$ gallons
- D. $\frac{2}{5}$ gallons
- E. 5 gallons

30. On a map, 3 centimeters represents 20 kilometers. How many kilometers are represented by 12 centimeters?

- A. 60 km
- B. 80 km
- C. 120 km
- D. 40 km
- E. 240 km

Answer Key

1. D

- *Explanation:* Remove the parentheses and combine like terms.
- $(3x^2 + 2x^2) + (5x - 7x) + (-4 - 1)$
- $5x^2 - 2x - 5.$

2. A

- *Explanation:* Distribute the coefficients to both terms in each parenthesis.
- $4(2a - b) \rightarrow 8a - 4b$
- $-3(a - 3b) \rightarrow -3a + 9b$
- Combine the results: $(8a - 3a) + (-4b + 9b) = 5a + 5b.$

3. B

- *Explanation:* Distribute x into the first parenthesis and the negative sign into the second.
- $x(3x + 2) \rightarrow 3x^2 + 2x$
- $-(x^2 - 4x + 9) \rightarrow -x^2 + 4x - 9$
- Combine like terms: $(3x^2 - x^2) + (2x + 4x) - 9 = 2x^2 + 6x - 9.$

4. A

- *Explanation:* Use the quotient rule for exponents: $\frac{3^4}{3^2} = 3^{4-2} = 3^2 = 9.$
- Evaluate the second term: $(-2)^3 = -2 \cdot -2 \cdot -2 = -8.$
- Add the results: $9 + (-8) = 1.$

5. C

- *Explanation:* $25^{\frac{1}{2}}$ is the square root of 25, $\sqrt{25} = 5.$
- $27^{\frac{1}{3}}$ is the cube root of 27, $\sqrt[3]{27} = 3.$
- Add the results: $5 + 3 = 8.$

6. B

- *Explanation:* Apply the power rule (squaring) to each factor inside the parentheses.
- $3^2 = 9.$ $(a^5)^2 = a^{5 \cdot 2} = a^{10}.$ $(b^{-1})^2 = b^{-1 \cdot 2} = b^{-2}.$
- The result is $9a^{10}b^{-2}.$

7. A

- *Explanation:* Apply the power rule (-2) to the first term: $(2x^2y^{-3})^{-2} = 2^{-2}(x^2)^{-2}(y^{-3})^{-2} = \frac{1}{4}x^{-4}y^6.$
- Multiply this by the second term: $(\frac{1}{4}x^{-4}y^6)(x^5y^2).$
- Combine terms: $\frac{1}{4} \cdot x^{-4+5} \cdot y^{6+2} = \frac{1}{4}x^1y^8 = \frac{xy^8}{4}.$

8. A

- *Explanation:* Apply the power rule (cubing) to the numerator: $(2x^4y)^3 = 2^3(x^4)^3(y)^3 = 8x^{12}y^3$.
- Now divide by the denominator: $\frac{8x^{12}y^3}{6x^5y^3}$.
- Simplify coefficients: $\frac{8}{6} = \frac{4}{3}$. Subtract x exponents: $x^{12-5} = x^7$. Subtract y exponents: $y^{3-3} = y^0 = 1$.
- The result is $\frac{4x^7}{3}$.

9. A

- *Explanation:* Take the square root of the coefficient and divide each exponent by 2.
- $\sqrt{49} = 7$. $\sqrt{a^{10}} = a^{10/2} = a^5$. $\sqrt{b^6} = b^{6/2} = b^3$.
- The result is $7a^5b^3$.

10. C

- *Explanation:* Take the square root of the coefficient and divide each exponent by 2.
- $\sqrt{64} = 8$. $\sqrt{m^2} = m^{2/2} = m$. $\sqrt{n^{12}} = n^{12/2} = n^6$. $\sqrt{p^4} = p^{4/2} = p^2$.
- The result is $8mn^6p^2$.

11. D

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

12. A

- *Explanation:* The common denominator is $(y+1)(y-1)$, or y^2-1 .
- Multiply the first fraction by $\frac{y-1}{y-1}$: $\frac{y(y-1)}{y^2-1} = \frac{y^2-y}{y^2-1}$.
- Multiply the second fraction by $\frac{y+1}{y+1}$: $\frac{2(y+1)}{y^2-1} = \frac{2y+2}{y^2-1}$.
- Add the numerators: $\frac{(y^2-y)+(2y+2)}{y^2-1} = \frac{y^2+y+2}{y^2-1}$.

13. C

- *Explanation:* Substitute the values: $3(5) - 2(-2)^2$.
- Evaluate the exponent first: $3(5) - 2(4)$.
- Multiply: $15 - 8$.
- Subtract: 7.

14. C

- *Explanation:* Substitute the values: $\frac{3+(-5)}{3-(-5)}$.
- Simplify the numerator: $3 - 5 = -2$.
- Simplify the denominator: $3 + 5 = 8$.
- Reduce the fraction: $\frac{-2}{8} = -\frac{1}{4}$.

15. B

- *Explanation:* Subtract 5 from both sides: $4x = 21 - 5 \rightarrow 4x = 16$.
- Divide by 4: $x = 4$.

16. B

- *Explanation:* Add 1 to both sides: $\frac{2}{3}y = 12$.
- Multiply by the reciprocal, $\frac{3}{2}$: $y = 12 \cdot \frac{3}{2} = \frac{36}{2} = 18$.

17. C

- *Explanation:* Subtract $2a$ from both sides: $3a - 3 = 12$.
- Add 3 to both sides: $3a = 15$.
- Divide by 3: $a = 5$.

18. A

- *Explanation:* Use substitution. Replace y in the second equation with $(3x + 2)$.
- $x + 2(3x + 2) = 11$. Distribute: $x + 6x + 4 = 11$.
- Combine terms: $7x + 4 = 11$. Subtract 4: $7x = 7$.
- Divide by 7: $x = 1$.
- Find y : $y = 3(1) + 2 = 5$. Solution is $(1, 5)$.

19. B

- *Explanation:* Use elimination. Multiply the second equation by 3: $3(3x - y) = 3(5) \rightarrow 9x - 3y = 15$.
- Add this new equation to the first: $(2x + 3y) + (9x - 3y) = 7 + 15 \rightarrow 11x = 22$.
- Divide by 11: $x = 2$.
- Substitute $x = 2$ into $3x - y = 5$: $3(2) - y = 5 \rightarrow 6 - y = 5 \rightarrow y = 1$. Solution is $(2, 1)$.

20. E

- *Explanation:* Multiply the first equation by 2: $2(x + 3y) = 2(5) \rightarrow 2x + 6y = 10$.
- This is identical to the second equation. This means the lines are the same, and there are infinite solutions.

21. C

- *Explanation:* Add 4 to both sides: $3x \geq 15$.
- Divide by 3: $x \geq 5$.

22. B

- *Explanation:* Subtract 4 from both sides: $-3x > 12$.
- Divide by -3 . **Remember to flip the inequality sign** when dividing by a negative.
- $x < \frac{12}{-3} \rightarrow x < -4$.

23. D

- *Explanation:* Factor the quadratic. Find two numbers that multiply to -10 and add to 3 . The numbers are 5 and -2 .
- Factored form: $(x + 5)(x - 2) = 0$.
- Set factors to zero: $x + 5 = 0 \rightarrow x = -5$. And $x - 2 = 0 \rightarrow x = 2$.

24. C

- *Explanation:* Set the equation to zero: $2x^2 - 5x - 3 = 0$.
- Factor by grouping. Find numbers that multiply to $a \cdot c$ ($2 \cdot -3 = -6$) and add to b (-5). The numbers are -6 and 1 .
- Rewrite: $2x^2 - 6x + 1x - 3 = 0$.
- Group: $2x(x - 3) + 1(x - 3) = 0$.
- Factored form: $(2x + 1)(x - 3) = 0$.
- Set factors to zero: $x - 3 = 0 \rightarrow x = 3$. And $2x + 1 = 0 \rightarrow x = -\frac{1}{2}$.

25. E

- *Explanation:* Isolate x^2 : $x^2 = \frac{1}{9}$.
- Take the square root of both sides, remembering the positive and negative root.
- $x = \pm\sqrt{\frac{1}{9}} \rightarrow x = \pm\frac{1}{3}$.

26. A

- *Explanation:* Find the GCF. GCF of 12 and 8 is 4 . GCF of a^3 and a is a . GCF of b and b^2 is b .
- The overall GCF is $4ab$.
- Factor it out: $4ab(3a^2) + 4ab(2b) = 4ab(3a^2 + 2b)$.

27. B

- *Explanation:* This is a difference of squares: $a^2 - b^2 = (a - b)(a + b)$.
- $25x^2 - 4y^2 = (5x)^2 - (2y)^2$.
- Factored form: $(5x - 2y)(5x + 2y)$.

28. A

- *Explanation:* Factor by grouping. Find numbers that multiply to $a \cdot c$ ($3 \cdot -6 = -18$) and add to b (7). The numbers are 9 and -2 .
- Rewrite: $3x^2 + 9x - 2x - 6 = 0$.
- Group: $3x(x + 3) - 2(x + 3) = 0$.
- Factored form: $(3x - 2)(x + 3)$.

29. C

- *Explanation:* Set up a proportion: $\frac{\text{gallons}}{\text{lawn portion}}$. Let x be gallons for 1 whole lawn.
- $\frac{1/2}{1/5} = \frac{x}{1}$.
- Solve for x : $x = \frac{1/2}{1/5} = \frac{1}{2} \div \frac{1}{5} = \frac{1}{2} \cdot \frac{5}{1} = \frac{5}{2}$ gallons, or 2.5 gallons.

30. B

- *Explanation:* Set up a proportion: $\frac{\text{cm}}{\text{km}}$. Let x be the unknown km.
- $\frac{3}{20} = \frac{12}{x}$.
- Cross-multiply: $3x = 20 \cdot 12 \rightarrow 3x = 240$.
- Divide by 3: $x = 80$ km.