

North Carolina School of Science and Mathematics

Admissions Math Assessment - Practice Test 15

Practice Test 15

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

- A. $a^2 - b$
- B. $a^2 - 11b$
- C. $a^2 + 2b$
- D. $3a^2 - 8b$
- E. $3a^2 - 11b$

2. Evaluate the expression: $x^3 - 3x$ if $x = -2$.

- A. -14
- B. -2
- C. 0
- D. 2
- E. 14

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

- A. $18x^3y^7$
- B. $6x^3y^7$
- C. $9x^3y^6$
- D. $18x^4y^6$
- E. $6x^4y^7$

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

- A. 12
- B. 14
- C. 18
- D. 26
- E. 82

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

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

6. Solve for y : $5(y - 1) = 3y + 9$

- A. $y = 2$
- B. $y = 4.5$
- C. $y = 5$
- D. $y = 7$
- E. $y = 1$

7. Find all solutions to the quadratic equation: $x^2 + 3x - 18 = 0$

- A. $x = 6, x = -3$
- B. $x = -6, x = 3$
- C. $x = 6, x = 3$
- D. $x = -9, x = 2$
- E. $x = 9, x = -2$

8. A box of 5 pencils costs \$1.50. At this rate, what is the cost of 12 pencils?

- A. \$3.00
- B. \$3.60
- C. \$4.50
- D. \$6.00
- E. \$18.00

9. Factor the quadratic expression: $2x^2 + 7x + 5$

- A. $(2x + 1)(x + 5)$
- B. $(2x + 5)(x + 1)$
- C. $(2x - 1)(x - 5)$
- D. $(2x - 5)(x - 1)$
- E. $(2x + 7)(x + 5)$

10. Simplify the radical expression, assuming all variables represent positive numbers:
 $\sqrt{45a^4b^7}$

- A. $3a^2b^3\sqrt{5b}$
- B. $9a^2b^3\sqrt{5b}$
- C. $3a^2b\sqrt{5b^5}$
- D. $5a^2b^3\sqrt{3b}$
- E. $9a^2b^3\sqrt{5}$

11. Solve the inequality: $10 - 3x < 1$

- A. $x < 3$
- B. $x > 3$
- C. $x < -3$
- D. $x > -3$
- E. $x > 9$

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

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

13. Find the solution to the system of equations: $5x + y = 13$ and $2x - y = 8$

- A. $(3, -2)$
- B. $(2, 3)$
- C. $(1, 8)$
- D. $(3, 2)$
- E. $(4, 0)$

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

- A. 0
- B. -1
- C. $2x^2 - 6x + 1$
- D. 1
- E. $-6x + 1$

15. Solve for a : $2a - b = 5b$. What is a in terms of b ?

- A. $a = 2b$
- B. $a = 3b$
- C. $a = 6b$
- D. $a = 4b$
- E. $a = 5b/2$

16. Factor the expression completely: $12y^2 - 27$

- A. $(6y - 3)(2y + 9)$
- B. $3(4y^2 - 9)$
- C. $3(2y - 3)(2y + 3)$
- D. $3(2y - 3)^2$
- E. Both B and C are correct

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

- A. 0

- B. 18
- C. -18
- D. 6
- E. -6

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

- A. $x = -1/2, x = 3$
- B. $x = 1/2, x = -3$
- C. $x = -1, x = 3/2$
- D. $x = 1, x = -3/2$
- E. $x = 2, x = 3$

19. Simplify the expression, assuming no variables are zero: $\frac{5x^3y^2}{15x^{-1}y^5}$

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

20. Find the solution (x, y) to the system of equations: $x = 3y - 1$ and $2x + y = 12$

- A. (2, 1)
- B. (8, 3)
- C. (5, 2)
- D. (11, 4)
- E. (2, -8)

21. A rectangular garden has an area of 48 square feet. If the length is 8 feet, what is the perimeter?

- A. 28 feet
- B. 14 feet
- C. 32 feet
- D. 24 feet
- E. 384 feet

22. Simplify the expression: $(\frac{3a^2}{b})^{-3}$

- A. $\frac{27a^6}{b^3}$
- B. $\frac{b^3}{27a^6}$
- C. $\frac{-9a^6}{b^3}$
- D. $\frac{b^3}{-9a^6}$
- E. $\frac{-27b^3}{a^6}$

23. Solve the inequality: $2(x + 1) < 3(x - 1)$

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

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

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

25. The area of a circle is 100π . What is its circumference?

- A. 10π
- B. 20π
- C. 50π
- D. 100π
- E. 25π

26. Simplify the expression: $\frac{x^2-9}{x+3}$

- A. $x - 3$
- B. $x + 3$
- C. $x - 9$
- D. $x - 6$
- E. $(x - 3)^2$

27. Factor the expression completely: $5x^2 - 10x - 15$

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

28. Find the solution to the system of equations: $y = -2x + 1$ and $4x + 2y = 6$

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

29. If $a = -1$ and $b = -2$, what is the value of a^3b^2 ?

- A. 4

- B.** -4
- C.** 1
- D.** -1
- E.** 6

30. A painter can paint $\frac{1}{4}$ of a room in 2 hours. At this rate, how many hours will it take to paint the entire room?

- A.** 4 hours
- B.** 6 hours
- C.** 8 hours
- D.** $\frac{1}{2}$ hour
- E.** 16 hours

Answer Key

1. A

- *Explanation:* Distribute 2: $2a^2 - 6b$. Distribute -1 : $-a^2 + 5b$.
- Combine like terms: $(2a^2 - a^2) + (-6b + 5b) = a^2 - b$.

2. B

- *Explanation:* Substitute $x = -2$: $(-2)^3 - 3(-2)$.
- $(-2)^3 = -8$. $-3(-2) = +6$.
- Combine: $-8 + 6 = -2$.

3. A

- *Explanation:* Apply the power (2): $(3x^2y^3)^2 = 3^2(x^2)^2(y^3)^2 = 9x^4y^6$.
- Multiply: $(9x^4y^6)(2x^{-1}y)$.
- Combine: $(9 \cdot 2) \cdot x^{4+(-1)} \cdot y^{6+1} = 18x^3y^7$.

4. B

- *Explanation:* $100^{\frac{1}{2}} = \sqrt{100} = 10$.
- $64^{\frac{1}{3}} = \sqrt[3]{64} = 4$.
- Add: $10 + 4 = 14$.

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:* Distribute 5: $5y - 5 = 3y + 9$.
- Subtract $3y$: $2y - 5 = 9$.
- Add 5: $2y = 14$. Divide by 2: $y = 7$.

7. B

- *Explanation:* Find two numbers that multiply to -18 and add to 3. The numbers are 6 and -3 .
- Factored form: $(x + 6)(x - 3) = 0$.
- Set factors to zero: $x = -6$ and $x = 3$.

8. B

- *Explanation:* First, find the cost per pencil: $\$1.50/5 = \0.30 per pencil.
- Multiply by 12: $12 \cdot \$0.30 = \3.60 .

9. B

- *Explanation:* Factor by grouping. $a \cdot c = 10$. $b = 7$. Numbers are 2 and 5.
- Rewrite: $2x^2 + 2x + 5x + 5$. Group: $2x(x + 1) + 5(x + 1)$.
- Factored form: $(2x + 5)(x + 1)$.

10. A

- *Explanation:* $\sqrt{45a^4b^7} = \sqrt{9 \cdot 5 \cdot a^4 \cdot b^6 \cdot b}$.
- Take out the roots: $\sqrt{9}\sqrt{a^4}\sqrt{b^6} \cdot \sqrt{5b} = 3a^2b^3\sqrt{5b}$.

11. B

- *Explanation:* Subtract 10: $-3x < -9$.
- Divide by -3 . **Flip the inequality sign.**
- $x > 3$.

12. B

- *Explanation:* The fractions already have a common denominator.
- Subtract the numerators: $\frac{x-2}{x+1}$.

13. A

- *Explanation:* Use elimination. Add the two equations: $(5x+y) + (2x-y) = 13+8$.
- Combine: $7x = 21$. Divide by 7: $x = 3$.
- Substitute $x = 3$ into $5x + y = 13$: $5(3) + y = 13 \rightarrow 15 + y = 13$.
- Subtract 15: $y = -2$. Solution is $(3, -2)$.

14. B

- *Explanation:* Distribute -1 : $x^2 - 3x - x^2 + 3x - 1$.
- Combine: $(x^2 - x^2) + (-3x + 3x) - 1 = 0 + 0 - 1 = -1$.

15. B

- *Explanation:* To solve for a , add b to both sides.
- $2a = 5b + b \rightarrow 2a = 6b$.
- Divide by 2: $a = 3b$.

16. C

- *Explanation:* Factor out the GCF, 3: $3(4y^2 - 9)$.
- The term in parenthesis is a difference of squares: $(2y)^2 - 3^2$.
- The fully factored form is $3(2y - 3)(2y + 3)$. Option B is not fully factored.

17. A

- *Explanation:* $-3^2 = -(3 \cdot 3) = -9$. (Exponent applies to 3 only).
- $(-3)^2 = (-3) \cdot (-3) = 9$. (Exponent applies to -3).
- Add: $-9 + 9 = 0$.

18. B

- *Explanation:* Set to zero: $2x^2 + 5x - 3 = 0$.
- Factor by grouping. $a \cdot c = -6$. $b = 5$. 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: $2x - 1 = 0 \rightarrow x = 1/2$. And $x + 3 = 0 \rightarrow x = -3$.

19. A

- *Explanation:* Divide coefficients: $\frac{5}{15} = \frac{1}{3}$.
- Subtract x exponents: $x^{3-(-1)} = x^{3+1} = x^4$.
- Subtract y exponents: $y^{2-5} = y^{-3}$.
- Result: $\frac{1}{3}x^4y^{-3} = \frac{x^4}{3y^3}$.

20. C

- *Explanation:* Substitute $x = 3y - 1$ into the second equation: $2(3y - 1) + y = 12$.
- Distribute: $6y - 2 + y = 12$. Combine: $7y - 2 = 12$.
- Add 2: $7y = 14$. Divide by 7: $y = 2$.
- Find x : $x = 3(2) - 1 = 6 - 1 = 5$. Solution is $(5, 2)$.

21. A

- *Explanation:* Area = $L \times W$. $48 = 8 \times W$.
- Divide by 8: $W = 6$ feet.
- Perimeter = $2(L + W) = 2(8 + 6) = 2(14) = 28$ feet.

22. B

- *Explanation:* The negative exponent inverts the fraction: $(\frac{b}{3a^2})^3$.
- Apply the power (3) to all terms: $\frac{b^3}{3^3(a^2)^3} = \frac{b^3}{27a^6}$.

23. C

- *Explanation:* Distribute: $2x + 2 < 3x - 3$.
- Subtract $2x$: $2 < x - 3$.
- Add 3: $5 < x$, or $x > 5$.

24. B

- *Explanation:* Set to zero: $x^2 - x - 20 = 0$.
- Find two numbers that multiply to -20 and add to -1 . The numbers are -5 and 4 .
- Factored form: $(x - 5)(x + 4) = 0$.
- Set factors to zero: $x = 5$ and $x = -4$.

25. B

- *Explanation:* Area = πr^2 . $100\pi = \pi r^2$.
- Divide by π : $100 = r^2$. Take the square root: $r = 10$.
- Circumference = $2\pi r = 2\pi(10) = 20\pi$.

26. A

- *Explanation:* The numerator is a difference of squares: $x^2 - 3^2 = (x - 3)(x + 3)$.
- $\frac{(x-3)(x+3)}{x+3}$. The $(x + 3)$ terms cancel out.
- Result: $x - 3$.

27. A

- *Explanation:* Factor out the GCF, 5: $5(x^2 - 2x - 3)$.
- Factor the trinomial: find two numbers that multiply to -3 and add to -2 . The numbers are -3 and 1 .
- The fully factored form is $5(x - 3)(x + 1)$.

28. D

- *Explanation:* Substitute $y = -2x + 1$ into the second equation: $4x + 2(-2x + 1) = 6$.
- Distribute: $4x - 4x + 2 = 6$.
- Combine x terms: $2 = 6$. This is a false statement, so there is no solution.

29. B

- *Explanation:* Substitute values: $(-1)^3(-2)^2$.
- $(-1)^3 = -1$. $(-2)^2 = 4$.
- Multiply: $(-1)(4) = -4$.

30. C

- *Explanation:* Let T be the total time. Set up a proportion: $\frac{\text{portion}}{\text{time}}$.
- $\frac{1/4 \text{ room}}{2 \text{ hours}} = \frac{1 \text{ room}}{T \text{ hours}}$.
- Cross-multiply: $\frac{1}{4} \cdot T = 1 \cdot 2 \rightarrow \frac{T}{4} = 2$.
- Multiply by 4: $T = 8$ hours.