

# North Carolina School of Science and Mathematics

## Admissions Math Assessment - Practice Test 17

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### Practice Test 17

**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:  $(3x^2 + 5x - 4) - (x^2 - 3x + 2)$ 
  - A.  $2x^2 + 2x - 2$
  - B.  $2x^2 + 8x - 6$
  - C.  $4x^2 + 2x - 2$
  - D.  $2x^2 + 2x - 6$
  - E.  $2x^2 + 8x - 2$
2. Evaluate the expression:  $5(a - b) - a^2$  if  $a = -1$  and  $b = 3$ .
  - A.  $-19$
  - B.  $-21$
  - C.  $-20$
  - D.  $19$
  - E.  $21$
3. Simplify the expression:  $(2a^3b^{-1})^2(a^{-1}b^3)$ 
  - A.  $4a^5b$
  - B.  $2a^5b$
  - C.  $4a^4b$
  - D.  $4a^5b^{-5}$
  - E.  $2a^4b$
4. Evaluate the expression:  $-(\frac{1}{2})^4$ 
  - A.  $16$
  - B.  $-16$
  - C.  $\frac{1}{16}$
  - D.  $-\frac{1}{16}$
  - E.  $-\frac{1}{8}$
5. Simplify the expression:  $5(x + y) - 3(x - y)$

- A.  $2x + 2y$   
B.  $2x + 8y$   
C.  $8x + 2y$   
D.  $2x + 4y$   
E.  $8x + 8y$
6. Solve for  $x$ :  $\frac{1}{3}x + 2 = \frac{2}{3}x - 1$   
A.  $x = 9$   
B.  $x = -9$   
C.  $x = 3$   
D.  $x = -3$   
E.  $x = 1$
7. Find all solutions to the quadratic equation:  $x^2 - 12x = -32$   
A.  $x = 4, x = 8$   
B.  $x = -4, x = -8$   
C.  $x = 4, x = -8$   
D.  $x = -4, x = 8$   
E.  $x = 2, x = 16$
8. A recipe calls for 2.5 cups of sugar to make 20 cookies. How many cups of sugar are needed to make 16 cookies?  
A. 1.5 cups  
B. 1.75 cups  
C. 2.0 cups  
D. 2.25 cups  
E. 3.0 cups
9. Factor the quadratic expression:  $3x^2 + 10x - 8$   
A.  $(3x - 2)(x + 4)$   
B.  $(3x + 2)(x - 4)$   
C.  $(3x - 4)(x + 2)$   
D.  $(3x + 4)(x - 2)$   
E.  $(3x - 1)(x + 8)$
10. Simplify the radical expression, assuming all variables represent positive numbers:  
 $\sqrt{72x^3y^6z}$   
A.  $6xy^3\sqrt{2xz}$   
B.  $6x^2y^3\sqrt{2z}$   
C.  $36xy^3\sqrt{2xz}$   
D.  $6xy^3\sqrt{2x}$   
E.  $3x\sqrt{8xz}$
11. Solve the inequality:  $5 - 2x \geq 11$

- A.  $x \geq -3$
- B.  $x \leq -3$
- C.  $x \geq 3$
- D.  $x \leq 3$
- E.  $x \leq 8$

12. Simplify the expression:  $\frac{2}{x+3} + \frac{4}{x-3}$

- A.  $\frac{6x+6}{x^2-9}$
- B.  $\frac{6x-6}{x^2-9}$
- C.  $\frac{6}{x^2-9}$
- D.  $\frac{6}{2x}$
- E.  $\frac{2x-18}{x^2-9}$

13. Find the solution to the system of equations:  $2x + 3y = 7$  and  $x - 2y = 0$

- A. (1, 2)
- B. (2, 1)
- C. (7, 0)
- D. (4, 2)
- E. (1, 5/3)

14. Simplify the expression:  $4(x - 2) - (x - 2)^2$

- A.  $-x^2 + 8x - 12$
- B.  $4x - 8 - x^2 - 4x + 4$
- C.  $-x^2 + 4x - 4$
- D.  $-x^2 + 8x - 4$
- E.  $x^2 + 8x - 12$

15. Solve for  $x$ :  $1.5x + 3 = 9$

- A.  $x = 2$
- B.  $x = 3$
- C.  $x = 4$
- D.  $x = 6$
- E.  $x = 8$

16. Factor the expression completely:  $x^4 - 16$

- A.  $(x^2 - 4)^2$
- B.  $(x^2 - 4)(x^2 + 4)$
- C.  $(x - 2)(x + 2)(x^2 + 4)$
- D.  $(x - 2)^2(x + 2)^2$
- E. Both B and C are correct

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

- A. 0

- B. 2
- C. 32
- D. 64
- E. 128

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

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

19. Simplify the expression, assuming no variables are zero:  $\frac{(a^2b^{-1})^3}{a^4b^{-5}}$

- A.  $a^2b^2$
- B.  $a^1b^2$
- C.  $a^2b^{-8}$
- D.  $a^{10}b^2$
- E.  $a^2b^{-2}$

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

- A.  $(1, -5)$
- B.  $(0, 2)$
- C.  $(-2, 5)$
- D.  $(2, -1)$
- E.  $(-1, -13)$

21. The circumference of a circle is  $18\pi$ . What is its area?

- A.  $36\pi$
- B.  $81\pi$
- C.  $324\pi$
- D.  $9\pi$
- E.  $18\pi$

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

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

23. Solve the inequality:  $x - 1 > 3x + 7$

- A.  $x > -4$
- B.  $x < -4$

- C.  $x > 4$
- D.  $x < 4$
- E.  $x < -3$

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

- A.  $x = 0, x = -5$
- B.  $x = 5$
- C.  $x = 0, x = 5$
- D.  $x = 0, x = 2$
- E.  $x = 2, x = 5$

25. The perimeter of a rectangle is 30. If the length is twice the width, what is the area?

- A. 50
- B. 45
- C. 150
- D. 225
- E. 100

26. Simplify the expression:  $\frac{x^2-1}{x-1}$

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

27. Factor the expression completely:  $2y^3 + 4y^2 - 6y$

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

28. Find the solution to the system of equations:  $x + y = 3$  and  $x + y = 1$

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

29. If  $a = 4$  and  $b = -1$ , what is the value of  $(b - a)^b$ ?

- A. -5
- B. 5
- C.  $\frac{1}{5}$

- D.  $-\frac{1}{5}$
- E.  $-\frac{1}{3}$

30. A map has a scale of 1 inch = 50 miles. Two cities are 3.5 inches apart on the map. How many miles are they apart in reality?

- A. 100 miles
- B. 150 miles
- C. 175 miles
- D. 200 miles
- E. 53.5 miles

## Answer Key

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1. B

- *Explanation:* Distribute the negative:  $3x^2 + 5x - 4 - x^2 + 3x - 2$ .
- Combine like terms:  $(3x^2 - x^2) + (5x + 3x) + (-4 - 2) = 2x^2 + 8x - 6$ .

2. B

- *Explanation:* Substitute values:  $5((-1) - 3) - (-1)^2$ .
- Parentheses:  $5(-4) - (-1)^2$ . Exponent:  $5(-4) - 1$ .
- Multiply:  $-20 - 1 = -21$ .

3. A

- *Explanation:* Apply the power (2):  $(2a^3b^{-1})^2 = 2^2(a^3)^2(b^{-1})^2 = 4a^6b^{-2}$ .
- Multiply:  $(4a^6b^{-2})(a^{-1}b^3)$ .
- Combine:  $4 \cdot a^{6+(-1)} \cdot b^{-2+3} = 4a^5b^1 = 4a^5b$ .

4. D

- *Explanation:* The exponent applies to the  $\frac{1}{2}$ , not the negative.
- $-(\frac{1}{2})^4 = -(\frac{1^4}{2^4}) = -\frac{1}{16}$ .

5. B

- *Explanation:* Distribute 5:  $5x + 5y$ . Distribute -3:  $-3x + 3y$ .
- Combine:  $(5x - 3x) + (5y + 3y) = 2x + 8y$ .

6. A

- *Explanation:* To clear fractions, multiply everything by 3:  $3(\frac{1}{3}x) + 3(2) = 3(\frac{2}{3}x) - 3(1) \rightarrow x + 6 = 2x - 3$ .
- Subtract  $x$ :  $6 = x - 3$ . Add 3:  $9 = x$ .

7. A

- *Explanation:* Set to zero:  $x^2 - 12x + 32 = 0$ .
- Find two numbers that multiply to 32 and add to -12. The numbers are -4 and -8.
- Factored form:  $(x - 4)(x - 8) = 0$ .
- Set factors to zero:  $x = 4$  and  $x = 8$ .

8. C

- *Explanation:* Find the rate:  $2.5 \text{ cups} \div 20 \text{ cookies} = \frac{2.5}{20} = \frac{5}{40} = \frac{1}{8} \text{ cups per cookie}$ .
- Multiply by 16:  $16 \cdot \frac{1}{8} = \frac{16}{8} = 2.0 \text{ cups}$ .

9. A

- *Explanation:* Factor by grouping.  $a \cdot c = -24$ .  $b = 10$ . Numbers are 12 and -2.
- Rewrite:  $3x^2 + 12x - 2x - 8$ . Group:  $3x(x + 4) - 2(x + 4)$ .
- Factored form:  $(3x - 2)(x + 4)$ .

10. A

- *Explanation:*  $\sqrt{72x^3y^6z} = \sqrt{36 \cdot 2 \cdot x^2 \cdot x \cdot y^6 \cdot z}$ .
- Take out roots:  $\sqrt{36}\sqrt{x^2}\sqrt{y^6} \cdot \sqrt{2xz} = 6xy^3\sqrt{2xz}$ .

11. B

- *Explanation:* Subtract 5:  $-2x \geq 6$ .
- Divide by  $-2$ . **Flip the inequality sign.**
- $x \leq -3$ .

12. A

- *Explanation:* Common denominator is  $(x+3)(x-3) = x^2 - 9$ .
- $\frac{2(x-3)}{x^2-9} + \frac{4(x+3)}{x^2-9} = \frac{2x-6+4x+12}{x^2-9}$ .
- Combine numerator:  $\frac{6x+6}{x^2-9}$ .

13. B

- *Explanation:* From  $x - 2y = 0$ ,  $x = 2y$ . Substitute this into the first equation.
- $2(2y) + 3y = 7 \rightarrow 4y + 3y = 7 \rightarrow 7y = 7 \rightarrow y = 1$ .
- Find  $x$ :  $x = 2(1) = 2$ . Solution is  $(2, 1)$ .

14. A

- *Explanation:* Expand  $(x-2)^2 = (x-2)(x-2) = x^2 - 4x + 4$ .
- Full expression:  $4(x-2) - (x^2 - 4x + 4) = 4x - 8 - x^2 + 4x - 4$ .
- Combine:  $-x^2 + (4x + 4x) + (-8 - 4) = -x^2 + 8x - 12$ .

15. C

- *Explanation:*  $1.5x$  is  $\frac{3}{2}x$ . So,  $\frac{3}{2}x + 3 = 9$ .
- Subtract 3:  $\frac{3}{2}x = 6$ .
- Multiply by  $\frac{2}{3}$ :  $x = 6 \cdot \frac{2}{3} = \frac{12}{3} = 4$ .

16. C

- *Explanation:*  $x^4 - 16$  is a difference of squares:  $(x^2)^2 - 4^2 = (x^2 - 4)(x^2 + 4)$ .
- $x^2 - 4$  is also a difference of squares:  $(x - 2)(x + 2)$ .
- Fully factored form:  $(x - 2)(x + 2)(x^2 + 4)$ . Option B is not fully factored.

17. A

- *Explanation:* Use power rule:  $(2^3)^2 = 2^{3 \cdot 2} = 2^6 = 64$ .
- $(2^2)^3 = 2^{2 \cdot 3} = 2^6 = 64$ .
- Subtract:  $64 - 64 = 0$ .

18. A

- *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:  $(2x - 1)(x + 3) = 0$ .
- Set factors to zero:  $x = 1/2$  and  $x = -3$ .

**19. A**

- *Explanation:* Apply power (3) to numerator:  $(a^2)^3(b^{-1})^3 = a^6b^{-3}$ .
- Divide:  $\frac{a^6b^{-3}}{a^4b^{-5}}$ .
- Subtract exponents:  $a^{6-4}b^{-3-(-5)} = a^2b^{-3+5} = a^2b^2$ .

**20. D**

- *Explanation:* Substitute  $y = 4x - 9$  into the first equation:  $3x + 2(4x - 9) = 4$ .
- Distribute:  $3x + 8x - 18 = 4$ . Combine:  $11x - 18 = 4$ .
- Add 18:  $11x = 22$ . Divide by 11:  $x = 2$ .
- Find  $y$ :  $y = 4(2) - 9 = 8 - 9 = -1$ . Solution is  $(2, -1)$ .

**21. B**

- *Explanation:* Circumference  $= 2\pi r$ .  $18\pi = 2\pi r$ .
- Divide by  $2\pi$ :  $r = 9$ .
- Area  $= \pi r^2 = \pi(9)^2 = 81\pi$ .

**22. B**

- *Explanation:* Apply power  $(-1)$ :  $(x^2)^{-1}(y^{-3})^{-1} = x^{-2}y^3$ .
- Multiply:  $(x^{-2}y^3)(x^2y)$ .
- Combine:  $x^{-2+2}y^{3+1} = x^0y^4 = 1 \cdot y^4 = y^4$ .

**23. B**

- *Explanation:* Subtract  $x$ :  $-1 > 2x + 7$ .
- Subtract 7:  $-8 > 2x$ .
- Divide by 2:  $-4 > x$ , or  $x < -4$ .

**24. C**

- *Explanation:* Factor out the GCF,  $2x$ :  $2x(x - 5) = 0$ .
- Set both factors to zero:  $2x = 0 \rightarrow x = 0$ . And  $x - 5 = 0 \rightarrow x = 5$ .

**25. A**

- *Explanation:* Perimeter  $= 2(L + W)$ . Let  $W = w$  and  $L = 2w$ .
- $30 = 2(2w + w) \rightarrow 30 = 2(3w) \rightarrow 30 = 6w$ .
- Divide by 6:  $w = 5$ . Length  $L = 2w = 10$ .
- Area  $= L \times W = 10 \times 5 = 50$ .

**26. C**

- *Explanation:* Numerator is a difference of squares:  $x^2 - 1^2 = (x - 1)(x + 1)$ .
- $\frac{(x-1)(x+1)}{x-1}$ . The  $(x - 1)$  terms cancel.
- Result:  $x + 1$ .

27. E

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

28. D

- *Explanation:*  $x + y$  cannot equal  $3$  and  $1$  at the same time.
- If you subtract the equations:  $(x + y) - (x + y) = 3 - 1 \rightarrow 0 = 2$ .
- This is a false statement (contradiction), so there is no solution.

29. D

- *Explanation:* Substitute values:  $((-1) - 4)^{-1}$ .
- Parentheses:  $(-5)^{-1}$ .
- A negative exponent inverts the base:  $\frac{1}{-5} = -\frac{1}{5}$ .

30. C

- *Explanation:* Set up a proportion:  $\frac{\text{inches}}{\text{miles}}$ .
- $\frac{1}{50} = \frac{3.5}{x}$ .
- Cross-multiply:  $1 \cdot x = 50 \cdot 3.5$ .
- $x = 50 \cdot (3 + 0.5) = 50 \cdot 3 + 50 \cdot 0.5 = 150 + 25 = 175$  miles.