

# North Carolina School of Science and Mathematics

## Admissions Math Assessment - Practice Test 2

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### Practice Test 2

**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:  $(8x - 5) - (3x - 7)$ 
  - A.  $5x - 12$
  - B.  $5x - 2$
  - C.  $11x - 12$
  - D.  $5x + 2$
  - E.  $11x + 2$
2. Simplify the expression:  $(x^2 + 4x - 1) + 2x(3x - 1)$ 
  - A.  $7x^2 + 2x - 1$
  - B.  $7x^2 + 6x - 1$
  - C.  $6x^3 + x^2 + 4x - 1$
  - D.  $7x^2 + 3x$
  - E.  $3x^2 + 3x - 1$
3. Simplify the expression:  $4(a^2 - a + 3) - (a^2 + 2a - 5)$ 
  - A.  $3a^2 - 6a + 17$
  - B.  $3a^2 - 2a + 8$
  - C.  $4a^2 - 6a + 17$
  - D.  $3a^2 - 6a + 8$
  - E.  $3a^2 + 2a + 17$
4. Evaluate the expression:  $(\frac{1}{2})^3 + \frac{3^2}{3^0}$ 
  - A.  $\frac{73}{8}$
  - B.  $\frac{10}{8}$
  - C.  $\frac{19}{8}$
  - D.  $\frac{1}{8} + 3$
  - E. 9
5. Evaluate the expression:  $25^{\frac{1}{2}} + 27^{\frac{1}{3}}$

- A. 7
- B. 8
- C. 14.5
- D. 17.5
- E. 52

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

- A.  $8a^4b^{-6}$
- B.  $16a^4b^{-5}$
- C.  $16a^4b^{-6}$
- D.  $8a^4b^{-5}$
- E.  $16a^2b^{-6}$

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

- A.  $18xy$
- B.  $12xy$
- C.  $6xy$
- D.  $18x^7y^3$
- E.  $18xy^3$

8. Simplify the expression, assuming no variables are zero:  $\frac{(3a^4b^{-1})^3}{9a^{10}b^{-2}}$

- A.  $\frac{3a^2}{b}$
- B.  $3a^2b$
- C.  $\frac{a^2}{3b}$
- D.  $18a^2b^{-1}$
- E.  $\frac{3a^2}{b^5}$

9. Simplify the radical expression, assuming all variables represent positive numbers:  
 $\sqrt{49a^6b^2c^{12}}$

- A.  $7a^3b^2c^6$
- B.  $49a^3bc^6$
- C.  $7a^3bc^6$
- D.  $7a^6bc^{12}$
- E.  $7a^3bc^5$

10. Simplify the radical expression, assuming all variables represent positive numbers:  
 $\sqrt{64m^4p^{16}t^2}$

- A.  $32m^2p^8t$
- B.  $8m^2p^4t$
- C.  $8m^4p^{16}t$
- D.  $8m^2p^8t$
- E.  $8m^2p^8$

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

- A.  $\frac{1}{x(x-1)}$
- B.  $\frac{x+3}{x^2-x}$
- C.  $\frac{x-3}{x^2-x}$
- D.  $\frac{7x-3}{x^2-x}$
- E.  $\frac{x-1}{x(x-1)}$

12. Simplify the expression:  $\frac{4}{x-2} + \frac{3}{x+1}$

- A.  $\frac{7}{2x-1}$
- B.  $\frac{7x-2}{x^2-x-2}$
- C.  $\frac{x-2}{x^2-x-2}$
- D.  $\frac{7x+10}{x^2-x-2}$
- E.  $\frac{7x-2}{x^2-2}$

13. Determine the value of the expression  $5ab - c^2$  if  $a = 1$ ,  $b = 2$ , and  $c = -3$ .

- A. 1
- B. 19
- C. 16
- D. 4
- E. -1

14. Determine the value of the expression  $3a^2 - 2b$  if  $a = -2$  and  $b = 5$ .

- A. 2
- B. 22
- C. -22
- D. 16
- E. -2

15. Solve for  $x$ :  $8 - 2x = 14$

- A.  $x = 4$
- B.  $x = -11$
- C.  $x = 3$
- D.  $x = 11$
- E.  $x = -3$

16. Solve for  $x$ :  $\frac{2}{3}x + 1 = 7$

- A.  $x = 12$
- B.  $x = 9$
- C.  $x = 6$
- D.  $x = \frac{16}{3}$
- E.  $x = 4$

17. Solve for  $p$ :  $7p - 5 = 4p + 7$

A.  $p = \frac{12}{11}$

B.  $p = 12$

C.  $p = 4$

D.  $p = \frac{2}{3}$

E.  $p = \frac{2}{11}$

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.  $(3, 11)$

19. Find the solution  $(x, y)$  to the system of equations:  $5x + 2y = 8$  and  $3x - 2y = 8$

A.  $(0, 4)$

B.  $(8, -16)$

C.  $(2, -1)$

D.  $(4, -6)$

E.  $(2, 1)$

20. Find the solution to the system of equations:  $y = -3x + 1$  and  $6x + 2y = 2$

A.  $(0, 1)$

B.  $(1, -2)$

C. No solution

D.  $(0, 0)$

E. Infinite solutions

21. Solve the inequality:  $3(x - 1) \geq 5x + 9$

A.  $x \leq 6$

B.  $x \geq -6$

C.  $x \leq -6$

D.  $x \geq 6$

E.  $x \leq -4$

22. Solve the inequality:  $4x + 7 \leq 2x - 3$

A.  $x \geq -5$

B.  $x \leq 2$

C.  $x \geq 2$

D.  $x \leq -2$

E.  $x \leq -5$

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

A.  $x = 5, x = -2$

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

24. Find all solutions to the quadratic equation:  $2x^2 - 7x = -5$

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

25. Find all solutions to the quadratic equation:  $9x^2 - 1 = 0$

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

26. Factor the expression completely:  $8a^4b + 12a^2b^3$

- A.  $4a^2b(2a^2 + 3b^2)$
- B.  $4a^2b(2a^2 + 3b)$
- C.  $8a^2b(a^2 + 2b^2)$
- D.  $4ab(2a^3 + 3ab^2)$
- E.  $2a^2b(4a^2 + 6b^2)$

27. Factor the expression completely:  $25x^2 - 49y^2$

- A.  $(5x - 7y)^2$
- B.  $(25x - 49y)(x + y)$
- C.  $(5x - 7y)(5x + 7y)$
- D.  $(5x + 7y)^2$
- E.  $(5x - 49y)(5x + y)$

28. Factor the quadratic expression:  $3x^2 + 10x - 8$

- A.  $(3x + 2)(x - 4)$
- B.  $(3x - 4)(x + 2)$
- C.  $(x + 8)(3x - 1)$
- D.  $(3x + 4)(x - 2)$
- E.  $(3x - 2)(x + 4)$

29. If  $\frac{1}{2}$  gallon of paint covers  $\frac{1}{5}$  of a wall, how many gallons are needed for the entire wall?

- A. 2 gallons

- B. 5 gallons
- C.  $\frac{1}{10}$  gallons
- D.  $\frac{5}{2}$  gallons
- E. 3 gallons

30. On a map, 3 centimeters represents 5 kilometers. How many centimeters represent 12 kilometers?

- A. 7.2 cm
- B. 20 cm
- C. 1.25 cm
- D. 6.0 cm
- E. 7.5 cm

## Answer Key

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### 1. D

- *Explanation:* Distribute the negative sign to the second polynomial:  $(8x - 5) - 3x + 7$ .
- Combine like terms:  $(8x - 3x) + (-5 + 7) = 5x + 2$ .

### 2. A

- *Explanation:* Distribute the  $2x$  into the second parentheses:  $2x(3x) + 2x(-1) = 6x^2 - 2x$ .
- The full expression is  $(x^2 + 4x - 1) + (6x^2 - 2x)$ .
- Combine like terms:  $(x^2 + 6x^2) + (4x - 2x) - 1 = 7x^2 + 2x - 1$ .

### 3. A

- *Explanation:* Distribute the 4:  $4(a^2) + 4(-a) + 4(3) = 4a^2 - 4a + 12$ .
- Distribute the negative sign:  $-(a^2 + 2a - 5) = -a^2 - 2a + 5$ .
- Combine the results:  $(4a^2 - 4a + 12) + (-a^2 - 2a + 5)$ .
- Combine like terms:  $(4a^2 - a^2) + (-4a - 2a) + (12 + 5) = 3a^2 - 6a + 17$ .

### 4. A

- *Explanation:* Evaluate the first term:  $(\frac{1}{2})^3 = \frac{1^3}{2^3} = \frac{1}{8}$ .
- Evaluate the second term. Any non-zero number to the power of 0 is 1, so  $3^0 = 1$ .  $\frac{3^2}{3^0} = \frac{9}{1} = 9$ .
- Add the results:  $\frac{1}{8} + 9$ . Find a common denominator:  $\frac{1}{8} + \frac{72}{8} = \frac{73}{8}$ .

### 5. B

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

### 6. C

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

### 7. A

- *Explanation:* First, apply the power rule to the first term:  $(3x^2y^{-2})^2 = 3^2(x^2)^2(y^{-2})^2 = 9x^4y^{-4}$ .
- Now multiply this by the second term:  $(9x^4y^{-4})(2x^{-3}y^5)$ .
- Multiply coefficients:  $9 \cdot 2 = 18$ . Add  $x$  exponents:  $x^{4+(-3)} = x^1 = x$ . Add  $y$  exponents:  $y^{-4+5} = y^1 = y$ .
- The result is  $18xy$ .

### 8. A

- *Explanation:* Apply the power rule (cubing) to the numerator:  $(3a^4b^{-1})^3 = 3^3(a^4)^3(b^{-1})^3 = 27a^{12}b^{-3}$ .
- Now divide by the denominator:  $\frac{27a^{12}b^{-3}}{9a^{10}b^{-2}}$ .
- Divide coefficients:  $\frac{27}{9} = 3$ . Subtract  $a$  exponents:  $a^{12-10} = a^2$ . Subtract  $b$  exponents:  $b^{-3-(-2)} = b^{-3+2} = b^{-1}$ .
- The result is  $3a^2b^{-1}$ , which is  $\frac{3a^2}{b}$ .

#### 9. C

- *Explanation:* Take the square root of the coefficient and divide each exponent by 2.
- $\sqrt{49} = 7$ .  $\sqrt{a^6} = a^{6/2} = a^3$ .  $\sqrt{b^2} = b^{2/2} = b^1 = b$ .  $\sqrt{c^{12}} = c^{12/2} = c^6$ .
- The result is  $7a^3bc^6$ .

#### 10. D

- *Explanation:* Take the square root of the coefficient and divide each exponent by 2.
- $\sqrt{64} = 8$ .  $\sqrt{m^4} = m^{4/2} = m^2$ .  $\sqrt{p^{16}} = p^{16/2} = p^8$ .  $\sqrt{t^2} = t^{2/2} = t^1 = t$ .
- The result is  $8m^2p^8t$ .

#### 11. B

- *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  $\frac{x-1}{x-1}$ :  $\frac{3(x-1)}{x(x-1)} = \frac{3x-3}{x(x-1)}$ .
- Subtract the numerators:  $\frac{4x-(3x-3)}{x(x-1)} = \frac{4x-3x+3}{x^2-x} = \frac{x+3}{x^2-x}$ .

#### 12. B

- *Explanation:* The common denominator is  $(x-2)(x+1)$ .
- Multiply the first fraction by  $\frac{x+1}{x+1}$ :  $\frac{4(x+1)}{(x-2)(x+1)} = \frac{4x+4}{(x-2)(x+1)}$ .
- Multiply the second fraction by  $\frac{x-2}{x-2}$ :  $\frac{3(x-2)}{(x-2)(x+1)} = \frac{3x-6}{(x-2)(x+1)}$ .
- Add the numerators:  $\frac{(4x+4)+(3x-6)}{(x-2)(x+1)} = \frac{7x-2}{x^2-x-2}$ .

#### 13. A

- *Explanation:* Substitute the values:  $5(1)(2) - (-3)^2$ .
- Follow order of operations (exponents, then multiplication):  $5(2) - 9 = 10 - 9 = 1$ .

#### 14. A

- *Explanation:* Substitute the values:  $3(-2)^2 - 2(5)$ .
- Evaluate the exponent first:  $3(4) - 2(5)$ .
- Multiply:  $12 - 10 = 2$ .

#### 15. E

- *Explanation:* Subtract 8 from both sides:  $8 - 8 - 2x = 14 - 8 \rightarrow -2x = 6$ .



- Divide by  $-2$ :  $x = \frac{6}{-2} = -3$ .

16. B

- *Explanation:* Subtract 1 from both sides:  $\frac{2}{3}x = 7 - 1 \rightarrow \frac{2}{3}x = 6$ .
- Multiply by the reciprocal  $\frac{3}{2}$ :  $x = 6 \cdot (\frac{3}{2}) = \frac{18}{2} = 9$ .

17. C

- *Explanation:* Subtract  $4p$  from both sides:  $7p - 4p - 5 = 4p - 4p + 7 \rightarrow 3p - 5 = 7$ .
- Add 5 to both sides:  $3p = 12$ .
- Divide by 3:  $p = 4$ .

18. A

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

19. C

- *Explanation:* Use elimination. The  $y$  terms ( $+2y$  and  $-2y$ ) are opposites. Add the two equations.
- $(5x + 2y) + (3x - 2y) = 8 + 8 \rightarrow 8x = 16$ .
- Divide by 8:  $x = 2$ .
- Substitute  $x = 2$  into the first equation:  $5(2) + 2y = 8 \rightarrow 10 + 2y = 8$ .
- Subtract 10:  $2y = -2$ . Divide by 2:  $y = -1$ . The solution is  $(2, -1)$ .

20. E

- *Explanation:* Use substitution. Replace  $y$  in the second equation with  $(-3x + 1)$ .
- $6x + 2(-3x + 1) = 2$ . Distribute the 2:  $6x - 6x + 2 = 2$ .
- Combine  $x$  terms:  $0x + 2 = 2 \rightarrow 2 = 2$ .
- This is a true statement. The variables canceled out, leaving a true equality. This means there are infinite solutions. (The lines are identical).

21. C

- *Explanation:* Distribute the 3:  $3x - 3 \geq 5x + 9$ .
- Subtract  $5x$  from both sides:  $-2x - 3 \geq 9$ .
- Add 3 to both sides:  $-2x \geq 12$ .
- Divide by  $-2$ . **Flip the inequality sign:**  $x \leq -6$ .

22. E

- *Explanation:* Subtract  $2x$  from both sides:  $2x + 7 \leq -3$ .
- Subtract 7 from both sides:  $2x \leq -10$ .
- Divide by 2:  $x \leq -5$ .

23. B

- *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:  $2x^2 - 7x + 5 = 0$ .
- Factor by grouping. Find numbers that multiply to  $a \cdot c$  ( $2 \cdot 5 = 10$ ) and add to  $b$  ( $-7$ ). The numbers are  $-5$  and  $-2$ .
- Rewrite:  $2x^2 - 2x - 5x + 5 = 0$ .
- Group:  $2x(x - 1) - 5(x - 1) = 0$ .
- Factored form:  $(2x - 5)(x - 1) = 0$ .
- Set factors to zero:  $2x - 5 = 0 \rightarrow x = \frac{5}{2}$ . And  $x - 1 = 0 \rightarrow x = 1$ .

**25. D**

- *Explanation:* This is a difference of squares:  $a^2 - b^2 = (a - b)(a + b)$ .
- $9x^2 - 1 = (3x)^2 - (1)^2 = (3x - 1)(3x + 1) = 0$ .
- Set factors to zero:  $3x - 1 = 0 \rightarrow x = \frac{1}{3}$ . And  $3x + 1 = 0 \rightarrow x = -\frac{1}{3}$ .

**26. A**

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

**27. C**

- *Explanation:* This is a difference of squares:  $a^2 - b^2 = (a - b)(a + b)$ .
- $25x^2 - 49y^2 = (5x)^2 - (7y)^2$ .
- Factored form:  $(5x - 7y)(5x + 7y)$ .

**28. E**

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

**29. D**

- *Explanation:* Set up a proportion:  $\frac{\text{gallons}}{\text{wall portion}}$ . Let  $x$  be the gallons for  $1$  whole wall.
- $\frac{1/2}{1/5} = \frac{x}{1}$ .
- 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. A**

- *Explanation:* Set up a proportion:  $\frac{\text{cm}}{\text{km}}$ . Let  $x$  be the unknown cm.
- $\frac{3}{5} = \frac{x}{12}$ .
- Cross-multiply:  $5 \cdot x = 3 \cdot 12 \rightarrow 5x = 36$ .
- Divide by 5:  $x = \frac{36}{5} = 7.2$  cm.