North Carolina School of Science and Mathematics

Admissions Math Assessment - Practice Test 7

Practice Test 7

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

   A. $3x^2 - 6x - 4$
   B. $3x^2 + 6$
   C. $3x^2 - 4$
   D. $5x^2 - 6x - 4$
   E. $5x^2 + 6$

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

   A. $6a^2 + a$
   B. $6a^2 - 2a$
   C. $6a^2 + 7a$
   D. $2a^2 + a$
   E. $5a^2 - 2a$

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

   A. $2x^2 + y$
   B. $2x^2 - 11y$
   C. $2x^2 - 3y$
   D. $-15x^4 + y$
   E. $2x^2 - y$

4. Evaluate the expression: $(-1)^{10} + \frac{10^2}{5^2}$

   A. 5
   B. 3
   C. 26
   D. 14
   E. 1

5. Evaluate the expression: $81^{\frac{1}{4}} + 8^{\frac{2}{3}}$

A. 7

B. 23.25

C. 26

D. 5

E. 9

6. Simplify the expression: $(3m^{-3}n^2)^{-2}$

A. $9m^6n^{-4}$

B. $\frac{m^6}{9n^4}$

C. $\frac{n^4}{9m^6}$

D. $-6m^6n^{-4}$

E. $\frac{m^6}{6n^4}$

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

A. $12x^5y^{-1}$

B. $6x^5y^{-1}$

C. $12x^6y^{-3}$

D. $6x^6y^{-3}$

E. $12x^5y^{-2}$

8. Simplify the expression, assuming no variables are zero: $\frac{(4a^3b^{-2})^2}{8a^5b^{-1}}$

A. $2ab^{-3}$

B. ab^{-3}

C. $\frac{a}{2b^3}$

D. $2ab^{-5}$

E. $\frac{2a}{b^3}$

9. Simplify the radical expression, assuming all variables represent positive numbers: $\sqrt{25x^{20}y^8}$

A. $5x^{10}y^4$

B. $5x^5y^4$

C. $25x^{10}y^4$

D. $5x^{20}y^8$

E. $5x^{10}y^6$

10. Simplify the radical expression, assuming all variables represent positive numbers: $\sqrt{81a^2b^{12}c^4}$

A. $9ab^6c^2$

B. $9a^2b^6c^2$

C. $9ab^{12}c^4$

D. $81ab^6c^2$

E. $9ab^6c$

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

A. $\frac{x+3}{2x-2}$

B. $\frac{x^2+3x-6}{x^2-2x}$

C. $\frac{x^2+3x-2}{x^2-2x}$

D. $\frac{x+3}{x^2-2x}$

E. $\frac{x^2+3x+6}{x^2-2x}$

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

A. $\frac{1}{y^2-1}$

B. $\frac{y+1}{y^2-1}$

C. $\frac{y-1}{y^2-1}$

D. $\frac{y+3}{y^2-1}$

E. $\frac{y-3}{y^2-1}$

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

A. 0

B. 6

C. 30

D. 18

E. -6

14. Determine the value of the expression $\frac{1}{a} + \frac{1}{b}$ if $a = 2$ and $b = 3$.

A. $\frac{1}{5}$

B. $\frac{2}{5}$

C. $\frac{5}{6}$

D. 5

E. $\frac{1}{6}$

15. Solve for x: $3(x - 1) = 18$

A. $x = 6$

B. $x = \frac{19}{3}$

C. $x = 5$

D. $x = 7$

E. $x = 19$

16. Solve for a: $\frac{a}{3} + 5 = 2$

A. $a = 21$

B. $a = -1$

C. $a = -9$

D. $a = 9$

E. $a = -3$

17. Solve for y: $7y + 4 = 3y - 8$

A. $y = -1$

B. $y = -3$

C. $y = -1.2$

D. $y = 3$

E. $y = 1.2$

18. Find the solution (x, y) to the system of equations: $y = 4x - 1$ and $2x + y = 5$

A. $(2, 7)$

B. $(0, -1)$

C. $(1, 3)$

D. $(1, -1)$

E. $(3, 11)$

19. Find the solution (x, y) to the system of equations: $3x + 2y = 8$ and $x - y = 1$

A. $(2, 1)$

B. $(3, 2)$

C. $(1, 0)$

D. $(0, 4)$

E. $(4, 3)$

20. Find the solution to the system of equations: $y = 2x - 5$ and $4x - 2y = 10$

A. No solution

B. $(0, -5)$

C. $(1, -3)$

D. Infinite solutions

E. $(2.5, 0)$

21. Solve the inequality: $5x + 3 > 18$

A. $x > 3$

B. $x < 3$

C. $x > 15$

D. $x > 4.2$

E. $x < 15$

22. Solve the inequality: $10 - 2x \leq 16$

A. $x \leq 3$

B. $x \geq 3$

C. $x \leq -3$

D. $x \geq -3$

E. $x \geq 13$

23. Find all solutions to the quadratic equation: $x^2 - 8x + 15 = 0$

A. $x = -5, x = -3$

B. $x = 15, x = -8$

C. $x = 5, x = 3$

D. $x = -5, x = 3$

E. $x = 5, x = -3$

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

A. $x = 2, x = -\frac{3}{5}$

B. $x = -2, x = \frac{3}{5}$

C. $x = 3, x = -\frac{2}{5}$

D. $x = -3, x = \frac{2}{5}$

E. $x = -3, x = -\frac{2}{5}$

25. Find all solutions to the quadratic equation: $x^2 = 81$

A. $x = 9$

B. $x = 9, x = -9$

C. $x = \sqrt{81}$

D. $x = 3, x = -3$

E. $x = 40.5$

26. Factor the expression completely: $5x^4y + 10x^3y^2$

A. $5x^3y(x + 2y)$

B. $5x^2y(x^2 + 2xy)$

C. $5x^3(xy + 2y^2)$

D. $x^3y(5x + 10y)$

E. $5x^3y(x + 10y)$

27. Factor the expression completely: $a^2b^2 - 4$

A. $(a^2b^2 - 2)^2$

B. $(ab - 2)^2$

C. $(ab - 2)(ab + 2)$

D. $(a^2b - 2)(ab + 2)$

E. $(ab - 4)(ab + 1)$

28. Factor the quadratic expression: $7x^2 - 20x - 3$

A. $(7x - 3)(x + 1)$

B. $(7x + 1)(x - 3)$

C. $(7x - 1)(x + 3)$

D. $(7x + 3)(x - 1)$

E. $(x - 1)(7x + 3)$

29. If a car travels 20 miles on $\frac{1}{4}$ of a tank of gas, how many miles can it travel on a full tank?

A. 40 miles

B. 5 miles

C. 60 miles

D. 80 miles

E. 100 miles

30. A recipe for 2 dozen muffins requires 3 cups of flour. How many cups of flour are needed for 6 dozen muffins?

A. 6 cups

B. 9 cups

C. 12 cups

D. 4.5 cups

E. 18 cups

Answer Key

1. B

- *Explanation:* Distribute the negative sign: $4x^2 - 3x + 1 - x^2 + 3x + 5$.
- Combine like terms: $(4x^2 - x^2) + (-3x + 3x) + (1 + 5) = 3x^2 + 0x + 6 = 3x^2 + 6$.

2. A

- *Explanation:* Distribute a: $a(2a-3) \to 2a^2-3a$. Distribute $4a$: $4a(a+1) \to 4a^2+4a$.
- Combine results: $(2a^2 + 4a^2) + (-3a + 4a) = 6a^2 + a$.

3. A

- *Explanation:* Distribute 5: $5(x^2 - y) \to 5x^2 - 5y$. Distribute -3: $-3(x^2 - 2y) \to -3x^2 + 6y$.
- Combine results: $(5x^2 - 3x^2) + (-5y + 6y) = 2x^2 + y$.

4. A

- *Explanation:* (-1) to an even power is 1. $\frac{10^2}{5^2} = (\frac{10}{5})^2 = 2^2 = 4$.
- Add: $1 + 4 = 5$.

5. A

- *Explanation:* $81^{\frac{1}{4}} = \sqrt[4]{81} = 3$ (since $3 \cdot 3 \cdot 3 \cdot 3 = 81$).
- $8^{\frac{2}{3}} = (\sqrt[3]{8})^2 = (2)^2 = 4$.
- Add: $3 + 4 = 7$.

6. B

- *Explanation:* Apply the power (-2) to each factor: $3^{-2} = \frac{1}{3^2} = \frac{1}{9}$. $(m^{-3})^{-2} = m^{-3 \cdot -2} = m^6$. $(n^2)^{-2} = n^{2 \cdot -2} = n^{-4}$.
- Result is $\frac{1}{9}m^6n^{-4} = \frac{m^6}{9n^4}$.

7. A

- *Explanation:* Apply the power (2) to the first term: $(2x^3y)^2 = 2^2(x^3)^2(y)^2 = 4x^6y^2$.
- Multiply by the second term: $(4x^6y^2)(3x^{-1}y^{-3})$.
- Combine: $(4 \cdot 3) \cdot x^{6+(-1)} \cdot y^{2+(-3)} = 12x^5y^{-1}$.

8. E

- *Explanation:* Apply the power (2) to the numerator: $(4a^3b^{-2})^2 = 4^2(a^3)^2(b^{-2})^2 = 16a^6b^{-4}$.
- Divide by the denominator: $\frac{16a^6b^{-4}}{8a^5b^{-1}}$.
- Simplify coefficients: $\frac{16}{8} = 2$. Subtract a exponents: $a^{6-5} = a^1 = a$. Subtract b exponents: $b^{-4-(-1)} = b^{-4+1} = b^{-3}$.
- Result is $2ab^{-3} = \frac{2a}{b^3}$.

9. A

- *Explanation:* $\sqrt{25} = 5$. $\sqrt{x^{20}} = x^{20/2} = x^{10}$. $\sqrt{y^8} = y^{8/2} = y^4$.

- Result: $5x^{10}y^4$.

10. A

- *Explanation:* $\sqrt{81} = 9$. $\sqrt{a^2} = a^{2/2} = a$. $\sqrt{b^{12}} = b^{12/2} = b^6$. $\sqrt{c^4} = c^{4/2} = c^2$.
- Result: $9ab^6c^2$.

11. B

- *Explanation:* Common denominator is $x(x-2)$.
- $\frac{x}{x-2} \cdot \frac{x}{x} = \frac{x^2}{x(x-2)}$.
- $\frac{3}{x} \cdot \frac{x-2}{x-2} = \frac{3(x-2)}{x(x-2)} = \frac{3x-6}{x^2-2x}$.
- Add numerators: $\frac{x^2+(3x-6)}{x^2-2x} = \frac{x^2+3x-6}{x^2-2x}$.

12. D

- *Explanation:* Common denominator is $(y-1)(y+1) = y^2 - 1$.
- $\frac{2}{y-1} \cdot \frac{y+1}{y+1} = \frac{2(y+1)}{y^2-1} = \frac{2y+2}{y^2-1}$.
- $\frac{1}{y+1} \cdot \frac{y-1}{y-1} = \frac{1(y-1)}{y^2-1} = \frac{y-1}{y^2-1}$.
- Subtract numerators: $\frac{(2y+2)-(y-1)}{y^2-1} = \frac{2y+2-y+1}{y^2-1} = \frac{y+3}{y^2-1}$.

13. E

- *Explanation:* Substitute values: $x^2y - xy^2 = (2)^2(3) - (2)(3)^2$.
- Evaluate exponents: $(4)(3) - (2)(9)$.
- Multiply: $12 - 18$.
- Subtract: -6.

14. C

- *Explanation:* Substitute values: $\frac{1}{2} + \frac{1}{3}$.
- Find common denominator (6): $\frac{3}{6} + \frac{2}{6}$.
- Add: $\frac{5}{6}$.

15. D

- *Explanation:* Divide by 3: $x - 1 = 6$.
- Add 1: $x = 7$.

16. C

- *Explanation:* Subtract 5: $\frac{a}{3} = 2 - 5 \rightarrow \frac{a}{3} = -3$.
- Multiply by 3: $a = -9$.

17. B

- *Explanation:* Subtract $3y$: $4y + 4 = -8$.
- Subtract 4: $4y = -12$.
- Divide by 4: $y = -3$.

18. C

- *Explanation:* Substitute $y = 4x - 1$ into the second equation: $2x + (4x - 1) = 5$.
- Combine terms: $6x - 1 = 5$. Add 1: $6x = 6$.
- Divide by 6: $x = 1$.
- Find y: $y = 4(1) - 1 = 3$. Solution is $(1, 3)$.

19. A

- *Explanation:* From the second equation, $x = y + 1$. Substitute this into the first equation: $3(y + 1) + 2y = 8$.
- Distribute: $3y + 3 + 2y = 8$. Combine terms: $5y + 3 = 8$.
- Subtract 3: $5y = 5$. Divide by 5: $y = 1$.
- Find x: $x = 1 + 1 = 2$. Solution is $(2, 1)$.

20. D

- *Explanation:* From the first equation, $y = 2x - 5$. Substitute into the second: $4x - 2(2x - 5) = 10$.
- Distribute: $4x - 4x + 10 = 10$.
- Combine x terms: $10 = 10$. This is a true statement, so there are infinite solutions.

21. A

- *Explanation:* Subtract 3: $5x > 15$.
- Divide by 5: $x > 3$.

22. D

- *Explanation:* Subtract 10: $-2x \leq 6$.
- Divide by -2. **Flip the inequality sign**.
- $x \geq \frac{6}{-2} \rightarrow x \geq -3$.

23. C

- *Explanation:* Find two numbers that multiply to 15 and add to -8. The numbers are -5 and -3.
- Factored form: $(x - 5)(x - 3) = 0$.
- Set factors to zero: $x = 5$ and $x = 3$.

24. D

- *Explanation:* Set to zero: $5x^2 + 13x - 6 = 0$.
- Factor by grouping. Multiply $a \cdot c$: $5 \cdot -6 = -30$. Find numbers that multiply to -30 and add to 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: $x = -3$ and $x = \frac{2}{5}$.

25. B

- *Explanation:* Take the square root of both sides, remembering the positive and negative root.
- $x = \pm\sqrt{81} \rightarrow x = 9$ and $x = -9$.

26. A

- *Explanation:* GCF of $5, 10$ is 5. GCF of x^4, x^3 is x^3. GCF of y, y^2 is y.
- Overall GCF is $5x^3y$.
- Factor it out: $5x^3y(x) + 5x^3y(2y) = 5x^3y(x + 2y)$.

27. C

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

28. B

- *Explanation:* Factor by grouping. Multiply $a \cdot c$: $7 \cdot -3 = -21$. Find numbers that multiply to -21 and add to -20. The numbers are -21 and 1.
- Rewrite: $7x^2 - 21x + 1x - 3 = 0$.
- Group: $7x(x - 3) + 1(x - 3) = 0$.
- Factored form: $(7x + 1)(x - 3)$.

29. D

- *Explanation:* $\frac{1}{4}$ of a tank gives 20 miles. A full tank is $\frac{4}{4}$.
- Multiply the distance by 4: $20 \cdot 4 = 80$ miles.

30. B

- *Explanation:* Find the ratio of muffins: 6 dozen $\div$ 2 dozen $= 3$.
- The new batch is 3 times larger.
- Multiply the flour by 3: 3 cups $\cdot\, 3 = 9$ cups.