North Carolina School of Science and Mathematics

Admissions Math Assessment - Practice Test 18

Practice Test 18

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: $(2x^2 + 6x - 3) - (3x^2 - x + 4)$

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

2. Evaluate the expression: $ab - b^2$ if $a = -2$ and $b = -3$.

   A. 15
   B. 12
   C. -3
   D. 0
   E. -15

3. Simplify the expression: $(3x^2y^{-2})^2(2x^{-1}y^5)$

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

4. Evaluate the expression: $16^{-\frac{1}{4}}$

   A. 4
   B. -4
   C. 2
   D. $\frac{1}{2}$
   E. $-\frac{1}{4}$

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

A. $a^2 - b^2$

B. $a^2 - 2ab - b^2$

C. $a^2 - 2ab + b^2$

D. $a^2 + b^2$

E. $a^2 - 2b^2$

6. Solve for x: $5(x - 2) = 2(x + 1)$

A. $x = 3$

B. $x = -3$

C. $x = 4$

D. $x = -4$

E. $x = 12$

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

A. $x = 2, x = 5$

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

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

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

E. $x = 1, x = -10$

8. A car uses 5 gallons of gas to travel 120 miles. How many gallons are needed to travel 300 miles?

A. 10

B. 12

C. 12.5

D. 15

E. 24

9. Factor the quadratic expression: $2x^2 + 5x - 12$

A. $(2x - 3)(x + 4)$

B. $(2x + 3)(x - 4)$

C. $(2x - 4)(x + 3)$

D. $(2x + 4)(x - 3)$

E. $(2x - 6)(x + 2)$

10. Simplify the radical expression, assuming all variables represent positive numbers: $\sqrt{48a^4b^7}$

A. $4a^2b^3\sqrt{3b}$

B. $2a^2b^3\sqrt{12b}$

C. $4a^2b^3\sqrt{3b^2}$

D. $16a^2b^3\sqrt{3b}$

E. $4a^2b\sqrt{3b}$

11. Solve the inequality: $2(4 - x) < 6$

A. $x > 1$

B. $x < 1$

C. $x > -1$

D. $x < 7$

E. $x > 7$

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

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

B. $\frac{3}{2x+1}$

C. $\frac{2x+1}{x^2+x}$

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

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

13. Find the solution to the system of equations: $3x + y = 11$ and $x - 2y = 6$

A. $(4, -1)$

B. $(3, 2)$

C. $(5, -4)$

D. $(0, 11)$

E. $(2, -2)$

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

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

B. $2x^2 - 7x - 3$

C. $2x^2 + 5x - 3$

D. $2x^2 - 6x - 3$

E. $2x^2 - 3$

15. Solve for x: $0.2x + 1 = 3$

A. $x = 20$

B. $x = 10$

C. $x = 5$

D. $x = 4$

E. $x = 0.4$

16. Factor the expression completely: $5x^2 - 45$

A. $5(x - 3)^2$

B. $5(x + 3)^2$

C. $(5x - 9)(x + 5)$

D. $5(x - 9)(x + 1)$

E. $5(x - 3)(x + 3)$

17. Evaluate the expression: $(3^2 - 2^3)^5$

A. 1

B. -1

C. 5

D. 10

E. 243

18. Find all solutions to the quadratic equation: $6x^2 - x = 1$

A. $x = 1/2, x = -1/3$

B. $x = -1/2, x = 1/3$

C. $x = 1, x = -1/6$

D. $x = -1, x = 1/6$

E. $x = 2, x = -3$

19. Simplify the expression, assuming no variables are zero: $\frac{5x^3y^{-2}}{15x^{-1}y^4}$

A. $\frac{x^2}{3y^6}$

B. $\frac{x^4}{3y^6}$

C. $\frac{x^4y^{-6}}{3}$

D. $\frac{x^2}{3y^2}$

E. $3x^4y^{-6}$

20. Find the solution (x, y) to the system of equations: $5x - 2y = 4$ and $y = 3x - 1$

A. $(2, 5)$

B. $(1, 2)$

C. $(0, -1)$

D. $(-2, -7)$

E. $(6, 13)$

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

A. 10π

B. 20π

C. 25π

D. 50π

E. 100π

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

A. a^6b^{-5}

B. a^6b^5

C. b^{-5}

D. a^0b^{-5}

E. $\frac{a^6}{b^5}$

23. Solve the inequality: $5(x + 2) > 6(x - 1)$

A. $x > 16$

B. $x < 16$

C. $x > 4$

D. $x < 4$

E. $x < -16$

24. Find all solutions to the quadratic equation: $4x^2 + 12x = 0$

A. $x = 0, x = -3$

B. $x = 0, x = 3$

C. $x = -3$

D. $x = 0, x = -1/3$

E. $x = 4, x = -3$

25. The area of a rectangle is 48. If the length is 3 times the width, what is the perimeter?

A. 16

B. 24

C. 32

D. 48

E. 64

26. Simplify the expression: $\frac{x^2-16}{x+4}$

A. $x - 4$

B. $x + 4$

C. $x - 16$

D. $x + 16$

E. $x^2 - 4$

27. Factor the expression completely: $a^2(x - 1) + b^2(x - 1)$

A. $(a^2 + b^2)(x - 1)$

B. $a^2b^2(x - 1)$

C. $(a + b)^2(x - 1)$

D. $(a - b)(a + b)(x - 1)$

E. $(a^2b^2)(x - 1)$

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

A. $(1, 1)$

B. $(0, -1)$

C. Infinite solutions

D. No solution

E. $(2, 3)$

29. If $x = -1$ and $y = 5$, what is the value of $(x - y)^{-x}$?

A. -6

B. 6

C. 4

D. -4

E. $\frac{1}{4}$

30. A 25% discount is applied to a 40 dollar item. What is the new price?

A. 10

B. 20

C. 25

D. 30

E. 35

Answer Key

1. **A**
   - *Explanation:* Distribute the negative: $2x^2 + 6x - 3 - 3x^2 + x - 4$.
   - Combine like terms: $(2x^2 - 3x^2) + (6x + x) + (-3 - 4) = -x^2 + 7x - 7$.
2. **C**
   - *Explanation:* Substitute values: $(-2)(-3) - (-3)^2$.
   - Multiply: $6 - (-3)^2$. Exponent: $6 - 9$.
   - Subtract: $6 - 9 = -3$.
3. **A**
   - *Explanation:* Apply power (2): $(3x^2y^{-2})^2 = 3^2(x^2)^2(y^{-2})^2 = 9x^4y^{-4}$.
   - Multiply: $(9x^4y^{-4})(2x^{-1}y^5)$.
   - Combine: $(9 \cdot 2) \cdot x^{4+(-1)} \cdot y^{-4+5} = 18x^3y^1 = 18x^3y$.
4. **D**
   - *Explanation:* $16^{-\frac{1}{4}} = \frac{1}{16^{\frac{1}{4}}}$.
   - $16^{\frac{1}{4}} = \sqrt[4]{16} = 2$.
   - The result is $\frac{1}{2}$.
5. **B**
   - *Explanation:* Distribute a: $a^2 - ab$. Distribute $-b$: $-ab - b^2$.
   - Combine: $a^2 - ab - ab - b^2 = a^2 - 2ab - b^2$.
6. **C**
   - *Explanation:* Distribute: $5x - 10 = 2x + 2$.
   - Subtract $2x$: $3x - 10 = 2$. Add 10: $3x = 12$.
   - Divide by 3: $x = 4$.
7. **C**
   - *Explanation:* Set to zero: $x^2 - 3x - 10 = 0$.
   - 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: $x = 5$ and $x = -2$.
8. **C**
   - *Explanation:* Find the rate: 120 miles $\div$ 5 gallons $=$ 24 miles per gallon.
   - Divide 300 miles by the rate: $300 \div 24$.
   - $300/24 = 150/12 = 75/6 = 25/2 = 12.5$ gallons.
9. **A**
   - *Explanation:* Factor by grouping. $a \cdot c = -24$. $b = 5$. Numbers are 8 and -3.

- Rewrite: $2x^2 + 8x - 3x - 12$. Group: $2x(x + 4) - 3(x + 4)$.
- Factored form: $(2x - 3)(x + 4)$.

10. A

- *Explanation:* $\sqrt{48a^4b^7} = \sqrt{16 \cdot 3 \cdot a^4 \cdot b^6 \cdot b}$.
- Take out roots: $\sqrt{16}\sqrt{a^4}\sqrt{b^6} \cdot \sqrt{3b} = 4a^2b^3\sqrt{3b}$.

11. A

- *Explanation:* Distribute: $8 - 2x < 6$.
- Subtract 8: $-2x < -2$.
- Divide by -2. **Flip the inequality sign**.
- $x > 1$.

12. D

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

13. A

- *Explanation:* From $x - 2y = 6$, $x = 2y + 6$. Substitute this into the first equation.
- $3(2y + 6) + y = 11 \rightarrow 6y + 18 + y = 11 \rightarrow 7y + 18 = 11$.
- Subtract 18: $7y = -7$. Divide by 7: $y = -1$.
- Find x: $x = 2(-1) + 6 = -2 + 6 = 4$. Solution is $(4, -1)$.

14. A

- *Explanation:* FOIL: $(2x + 1)(x - 3) = 2x(x) + 2x(-3) + 1(x) + 1(-3)$.
- $2x^2 - 6x + x - 3$.
- Combine like terms: $2x^2 - 5x - 3$.

15. B

- *Explanation:* $0.2x$ is $\frac{1}{5}x$. So, $\frac{1}{5}x + 1 = 3$.
- Subtract 1: $\frac{1}{5}x = 2$.
- Multiply by 5: $x = 10$.

16. E

- *Explanation:* Factor out GCF, 5: $5(x^2 - 9)$.
- $x^2 - 9$ is a difference of squares: $(x - 3)(x + 3)$.
- Fully factored form: $5(x - 3)(x + 3)$.

17. A

- *Explanation:* Parentheses first: $3^2 = 9$. $2^3 = 8$.
- $(9 - 8)^5 = (1)^5$.
- 1 to any power is 1.

18. A

- *Explanation:* Set to zero: $6x^2 - x - 1 = 0$.
- Factor by grouping. $a \cdot c = -6$. $b = -1$. Numbers are -3 and 2.
- Rewrite: $6x^2 - 3x + 2x - 1 = 0$. Group: $3x(2x - 1) + 1(2x - 1) = 0$.
- Factored: $(3x + 1)(2x - 1) = 0$.
- Set factors to zero: $x = -1/3$ and $x = 1/2$.

19. B

- *Explanation:* Divide coefficients: $\frac{5}{15} = \frac{1}{3}$.
- Subtract exponents for x: $x^{3-(-1)} = x^{3+1} = x^4$.
- Subtract exponents for y: $y^{-2-4} = y^{-6}$.
- Combine: $\frac{1}{3}x^4y^{-6} = \frac{x^4}{3y^6}$.

20. A

- *Explanation:* Substitute $y = 3x - 1$ into the first equation: $5x - 2(3x - 1) = 4$.
- Distribute: $5x - 6x + 2 = 4$. Combine: $-x + 2 = 4$.
- Subtract 2: $-x = 2$. Divide by -1: $x = -2$.
- Find y: $y = 3(-2) - 1 = -6 - 1 = -7$. Solution is $(-2, -7)$.
- *Correction:* Let's re-check the calculation. $5x - 2(3x - 1) = 4 \rightarrow 5x - 6x + 2 = 4 \rightarrow -x + 2 = 4 \rightarrow -x = 2 \rightarrow x = -2$.
- $y = 3(-2) - 1 = -6 - 1 = -7$. The correct answer is $(-2, -7)$, which is **D**.

21. B

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

22. E

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

23. B

- *Explanation:* Distribute: $5x + 10 > 6x - 6$.
- Subtract $5x$: $10 > x - 6$.
- Add 6: $16 > x$, or $x < 16$.

24. A

- *Explanation:* Factor out the GCF, $4x$: $4x(x + 3) = 0$.
- Set factors to zero: $4x = 0 \rightarrow x = 0$. And $x + 3 = 0 \rightarrow x = -3$.

25. C

- *Explanation:* Area = $L \times W$. Let $W = w$ and $L = 3w$.

- $48 = (3w)(w) \rightarrow 48 = 3w^2$. Divide by 3: $16 = w^2$.
- Take square root: $w = 4$. Length $L = 3w = 12$.
- Perimeter = $2(L + W) = 2(12 + 4) = 2(16) = 32$.

26. A

- *Explanation:* Numerator is a difference of squares: $(x - 4)(x + 4)$.
- $\frac{(x-4)(x+4)}{x+4}$. The $(x + 4)$ terms cancel.
- Result: $x - 4$.

27. A

- *Explanation:* The common factor in both terms is $(x - 1)$.
- Factor out $(x - 1)$: $(x - 1)(a^2 + b^2)$.

28. C

- *Explanation:* Substitute $y = 2x - 1$ into the second equation: $4x - 2(2x - 1) = 2$.
- Distribute: $4x - 4x + 2 = 2$.
- Combine: $2 = 2$. This is a true statement, meaning the lines are identical.
- There are infinite solutions.

29. A

- *Explanation:* Substitute values: $((-1) - 5)^{-(-1)}$.
- Parentheses: $(-6)^1$.
- Result: -6.

30. D

- *Explanation:* A 25% discount means $1/4$ off.
- $1/4$ of 40 is 10.
- New price: $40 - 10 = 30$.