

North Carolina School of Science and Mathematics

Admissions Math Assessment - Practice Test 20

Practice Test 20

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: $(9x^2 - 4x + 1) - (3x^2 - 4x - 5)$

- A. $6x^2 - 6$
- B. $6x^2 + 6$
- C. $6x^2 - 8x - 4$
- D. $6x^2 - 8x + 6$
- E. $12x^2 - 4$

2. Evaluate the expression: $x(x - y)^2$ if $x = 2$ and $y = 5$.

- A. 18
- B. -18
- C. 14
- D. 28
- E. 12

3. Simplify the expression: $(2a^4b^{-2})^3(a^{-2}b^7)$

- A. $8a^{10}b$
- B. $6a^{10}b$
- C. $8a^4b$
- D. $6a^4b$
- E. $8a^{10}b^{-13}$

4. Evaluate the expression: $(-3)^3 + 4^{\frac{1}{2}}$

- A. -25
- B. -29
- C. -7
- D. 11
- E. -1

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

- A. $3x - y$
- B. $3x + 7y$
- C. $3x + 13y$
- D. $7x + 7y$
- E. $3x + 5y$

6. Solve for x : $7x - 5 = 4x + 10$

- A. $x = 3$
- B. $x = 15$
- C. $x = 5/3$
- D. $x = 5$
- E. $x = -5$

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

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

8. A map has a scale of 1 inch = 20 miles. Two cities are 4.5 inches apart on the map. How many miles are they apart in reality?

- A. 80 miles
- B. 85 miles
- C. 90 miles
- D. 100 miles
- E. 24.5 miles

9. Factor the quadratic expression: $3x^2 - 11x - 4$

- A. $(3x - 1)(x + 4)$
- B. $(3x + 1)(x - 4)$
- C. $(3x - 4)(x - 1)$
- D. $(3x + 4)(x - 1)$
- E. $(x - 12)(x + 1)$

10. Simplify the radical expression, assuming all variables represent positive numbers:
 $\sqrt{27a^3b^6c^9}$

- A. $3ab^3c^4\sqrt{3ac}$
- B. $9ab^3c^4\sqrt{3ac}$
- C. $3a^2b^3c^4\sqrt{3ac}$
- D. $3ab^3c^3\sqrt{3ac}$
- E. $9ab^3c^4\sqrt{3c}$

11. Solve the inequality: $12 - 4x > 20$

- A. $x > -2$
- B. $x < -2$
- C. $x > 8$
- D. $x < 8$
- E. $x > -8$

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

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

13. Find the solution to the system of equations: $x + 2y = 8$ and $3x - 4y = 4$

- A. (2, 3)
- B. (4, 2)
- C. (0, 4)
- D. (8, 0)
- E. (6, 1)

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

- A. $9x^2 - 4$
- B. $9x^2 + 4$
- C. $9x^2 - 6x + 4$
- D. $9x^2 - 12x + 4$
- E. $6x - 4$

15. Solve for x : $\frac{x}{5} - \frac{x}{10} = 1$

- A. $x = 10$
- B. $x = 5$
- C. $x = 1$
- D. $x = \frac{1}{10}$
- E. $x = 15$

16. Factor the expression completely: $3x^3 - 12x$

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

17. Evaluate the expression: $(1^5 - 5^1)^2$

- A. 0

- B. 16
- C. -16
- D. 24
- E. -4

18. Find all solutions to the quadratic equation: $10x^2 + x = 2$

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

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

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

20. Find the solution (x, y) to the system of equations: $4x + 3y = 1$ and $y = 2x + 7$

- A. (1, 9)
- B. (-2, 3)
- C. (-1, 5/3)
- D. (4, 15)
- E. (-2, -11)

21. The area of a triangle is 30. If its base is 10, what is its height?

- A. 3
- B. 4
- C. 5
- D. 6
- E. 12

22. Simplify the expression: $(a^5b^{-1})^{-1}(a^5b^1)$

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

23. Solve the inequality: $3(x - 1) \leq 5(x + 1) - 6$

- A. $x \leq -1$

- B. $x \geq -1$
- C. $x \geq -2$
- D. $x \geq -4$
- E. $x \leq 4$

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

- A. $x = 9$
- B. $x = -9$
- C. $x = 9, x = -9$
- D. $x = 3, x = -3$
- E. $x = 81$

25. The perimeter of a square is 36. What is its area?

- A. 18
- B. 36
- C. 64
- D. 81
- E. 144

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

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

27. Factor the expression completely: $2x^3 + 16x^2 + 30x$

- A. $2x(x^2 + 8x + 15)$
- B. $2x(x+3)(x+5)$
- C. $2x(x-3)(x-5)$
- D. $x(2x+6)(x+5)$
- E. Both A and B are correct

28. Find the solution to the system of equations: $y = 2x$ and $x + y = 3$

- A. (1, 2)
- B. (2, 1)
- C. (3, 0)
- D. (0, 3)
- E. (1.5, 1.5)

29. If $a = -2$ and $b = 2$, what is the value of $(b - a)^{a+b}$?

- A. 0
- B. 1

- C.** 4
- D.** 16
- E.** -4

30. A 15% tip is added to a 50 dollar restaurant bill. What is the total cost?

- A.** 57.50
- B.** 65.00
- C.** 55.00
- D.** 51.50
- E.** 7.50

Answer Key

1. B

- *Explanation:* Distribute the negative: $9x^2 - 4x + 1 - 3x^2 + 4x + 5$.
- Combine like terms: $(9x^2 - 3x^2) + (-4x + 4x) + (1 + 5) = 6x^2 + 0x + 6 = 6x^2 + 6$.

2. A

- *Explanation:* Substitute values: $2(2 - 5)^2$.
- Parentheses: $2(-3)^2$. Exponent: $2(9)$.
- Multiply: 18.

3. A

- *Explanation:* Apply power (3): $(2a^4b^{-2})^3 = 2^3(a^4)^3(b^{-2})^3 = 8a^{12}b^{-6}$.
- Multiply: $(8a^{12}b^{-6})(a^{-2}b^7)$.
- Combine: $8 \cdot a^{12+(-2)} \cdot b^{-6+7} = 8a^{10}b^1 = 8a^{10}b$.

4. A

- *Explanation:* $(-3)^3 = -27$.
- $4^{\frac{1}{2}} = \sqrt{4} = 2$.
- Add: $-27 + 2 = -25$.

5. C

- *Explanation:* Distribute 5: $5x + 10y$. Distribute -1: $-2x + 3y$.
- Combine: $(5x - 2x) + (10y + 3y) = 3x + 13y$.

6. D

- *Explanation:* Subtract $4x$ from both sides: $3x - 5 = 10$.
- Add 5 to both sides: $3x = 15$.
- Divide by 3: $x = 5$.

7. D

- *Explanation:* Set to zero: $x^2 + 2x - 24 = 0$.
- Find two numbers that multiply to -24 and add to 2. The numbers are 6 and -4 .
- Factored form: $(x + 6)(x - 4) = 0$.
- Set factors to zero: $x = -6$ and $x = 4$.

8. C

- *Explanation:* Set up a proportion: $\frac{\text{inches}}{\text{miles}} = \frac{1}{20} = \frac{4.5}{x}$.
- Cross-multiply: $1 \cdot x = 20 \cdot 4.5$.
- $x = 20 \times 4.5 = 20 \times (4 + 0.5) = 80 + 10 = 90$ miles.

9. B

- *Explanation:* Factor by grouping. $a \cdot c = -12$. $b = -11$. Numbers are -12 and 1.

- Rewrite: $3x^2 - 12x + 1x - 4$. Group: $3x(x - 4) + 1(x - 4)$.
- Factored form: $(3x + 1)(x - 4)$.

10. A

- *Explanation:* $\sqrt{27a^3b^6c^9} = \sqrt{9 \cdot 3 \cdot a^2 \cdot a \cdot b^6 \cdot c^8 \cdot c}$.
- Take out roots: $\sqrt{9}\sqrt{a^2}\sqrt{b^6}\sqrt{c^8} \cdot \sqrt{3ac} = 3ab^3c^4\sqrt{3ac}$.

11. B

- *Explanation:* Subtract 12: $-4x > 8$.
- Divide by -4 . **Flip the inequality sign.**
- $x < -2$.

12. C

- *Explanation:* Common denominator is $(x - 1)(x + 1) = x^2 - 1$.
- $\frac{3(x+1)}{x^2-1} - \frac{2(x-1)}{x^2-1} = \frac{3x+3-(2x-2)}{x^2-1}$.
- $\frac{3x+3-2x+2}{x^2-1} = \frac{x+5}{x^2-1}$.

13. B

- *Explanation:* Multiply first equation by 2 to use elimination: $2(x + 2y = 8) \rightarrow 2x + 4y = 16$.
- Now subtract the second equation: $(2x + 4y) - (3x - 4y) = 16 - 4$.
- *Correction (Addition is easier):* Add $(2x + 4y = 16)$ to $(3x - 4y = 4)$.
- $(2x + 4y) + (3x - 4y) = 16 + 4 \rightarrow 5x = 20 \rightarrow x = 4$.
- Find y : $4 + 2y = 8 \rightarrow 2y = 4 \rightarrow y = 2$. Solution is $(4, 2)$.

14. D

- *Explanation:* $(3x - 2)^2 = (3x - 2)(3x - 2) = 3x(3x) + 3x(-2) - 2(3x) - 2(-2)$.
- $9x^2 - 6x - 6x + 4$.
- Combine like terms: $9x^2 - 12x + 4$.

15. A

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

16. E

- *Explanation:* Factor out GCF, $3x$: $3x(x^2 - 4)$.
- $x^2 - 4$ is a difference of squares: $(x - 2)(x + 2)$.
- Fully factored form: $3x(x - 2)(x + 2)$. Both A and D are correct.

17. B

- *Explanation:* Parentheses first: $1^5 = 1$. $5^1 = 5$.
- $(1 - 5)^2 = (-4)^2$.
- Result: 16.

18. B

- *Explanation:* Set to zero: $10x^2 + x - 2 = 0$.
- Factor by grouping. $a \cdot c = -20$. $b = 1$. Numbers are 5 and -4 .
- Rewrite: $10x^2 + 5x - 4x - 2 = 0$. Group: $5x(2x + 1) - 2(2x + 1) = 0$.
- Factored: $(5x - 2)(2x + 1) = 0$.
- Set factors to zero: $x = 2/5$ and $x = -1/2$.

19. A

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

20. B

- *Explanation:* Substitute $y = 2x + 7$ into the first equation: $4x + 3(2x + 7) = 1$.
- Distribute: $4x + 6x + 21 = 1$. Combine: $10x + 21 = 1$.
- Subtract 21: $10x = -20$. Divide by 10: $x = -2$.
- Find y : $y = 2(-2) + 7 = -4 + 7 = 3$. Solution is $(-2, 3)$.

21. D

- *Explanation:* Area = $\frac{1}{2} \times \text{base} \times \text{height}$.
- $30 = \frac{1}{2} \times 10 \times h \rightarrow 30 = 5h$.
- Divide by 5: $h = 6$.

22. B

- *Explanation:* Apply power (-1) : $(a^5)^{-1}(b^{-1})^{-1} = a^{-5}b^1$.
- Multiply: $(a^{-5}b^1)(a^5b^1)$.
- Combine: $a^{-5+5}b^{1+1} = a^0b^2 = 1 \cdot b^2 = b^2$.

23. B

- *Explanation:* Distribute: $3x - 3 \leq 5x + 5 - 6$.
- Combine: $3x - 3 \leq 5x - 1$.
- Subtract $3x$: $-3 \leq 2x - 1$.
- Add 1: $-2 \leq 2x$. Divide by 2: $-1 \leq x$, or $x \geq -1$.

24. C

- *Explanation:* $x^2 = 81 \rightarrow \sqrt{x^2} = \pm\sqrt{81}$.
- $x = 9$ and $x = -9$.

25. D

- *Explanation:* Perimeter = $4 \times s$. $36 = 4s$. Side length $s = 9$.
- Area = $s^2 = 9^2 = 81$.

26. A

- *Explanation:* Factor numerator (GCF): $3(x + 3)$.
- Factor denominator (diff. of squares): $(x - 3)(x + 3)$.

- $\frac{3(x+3)}{(x-3)(x+3)}$. The $(x + 3)$ terms cancel.
- Result: $\frac{3}{x-3}$.

27. E

- *Explanation:* Factor out GCF, $2x$: $2x(x^2 + 8x + 15)$.
- Factor trinomial: find numbers that multiply to 15 and add to 8. The numbers are 3 and 5.
- Fully factored form: $2x(x + 3)(x + 5)$. Option A is not fully factored.

28. A

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

29. B

- *Explanation:* Substitute values: $((2) - (-2))^{(-2)+(2)}$.
- Base: $2 + 2 = 4$. Exponent: $-2 + 2 = 0$.
- $(4)^0$. Any non-zero number to the power of 0 is 1.

30. A

- *Explanation:* A 15% tip. 10% of 50 is 5. 5% is half of that, so 2.50.
- Tip = $5.00 + 2.50 = 7.50$.
- Total cost: $50 + 7.50 = 57.50$.