

PRACTICE EXAM 23: ALEKS PPL SIMULATION

1. A boat travels 20 miles upstream in 5 hours and 20 miles downstream in 2 hours. What is the speed of the current?

- A. 2 mph
- B. 3 mph
- C. 4 mph
- D. 6 mph

2. Simplify: $(3x^2 - 2x + 1) \cdot 2$.

- A. $6x^2 - 2x + 1$
- B. $3x^2 - 4x + 2$
- C. $6x^2 - 4x + 1$
- D. $6x^2 - 4x + 2$

3. Solve: $4^x = 64$.

- A. $x = 3$
- B. $x = 4$
- C. $x = 16$
- D. $x = 6$

4. What is the y -coordinate of the point where the lines $y = 2x - 3$ and $y = -x + 6$ intersect?

- A. 2
- B. 1
- C. 3
- D. 5

5. A right triangle has one leg measuring 5 and the angle between the hypotenuse and that leg is 60° . What is the length of the hypotenuse?

- A. 5
- B. $5\sqrt{3}$
- C. $10\sqrt{3}$
- D. 10

6. Simplify: $\log_2(32) - \log_2(2)$.

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

7. If $f(x) = 3x - 1$ and $f^{-1}(x)$ is its inverse, what is $f^{-1}(5)$?

- A. 2
- B. 3
- C. 4

D. 5

8. What is the equation of a circle with center $(-2, 3)$ and radius 5?

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

B. $(x - 2)^2 + (y + 3)^2 = 25$

C. $(x + 2)^2 + (y - 3)^2 = 25$

D. $(x - 2)^2 + (y - 3)^2 = 25$

9. Evaluate: $4^3 - 2^2(3 + 1)$.

A. 40

B. 48

C. 56

D. 64

10. Simplify: $\sqrt{(18x^4y^2)}$, assuming $x, y \geq 0$.

A. $3x^2y$

B. $3x^2y^2\sqrt{2}$

C. $9x^2y$

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

11. The population of a town doubles every 10 years. If the current population is 5,000, what will it be in 30 years?

A. 15,000

B. 20,000

C. 30,000

D. 40,000

12. Solve: $|x + 3| = 8$.

A. $x = 5$ or $x = -11$

B. $x = 5$ or $x = 11$

C. $x = -5$ or $x = 11$

D. $x = -5$ or $x = -11$

13. A box contains 6 items. Three are chosen at random. How many different combinations are possible?

A. 18

B. 12

C. 20

D. 15

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

A. $x^2 - x$

B. $x^2 - 1$

C. $x^2 + x^2$

D. $x^4 - 1$

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

A. $x = 1$

B. $x = 2$

C. $x = 0$

D. $x = 3$

16. A cube has a volume of 64 cm^3 . What is the length of its space diagonal?

A. 4 cm

B. $4\sqrt{2}$ cm

C. 8 cm

D. $4\sqrt{3}$ cm

17. What is the amplitude of $y = 3 \sin(x)$?

A. 1

B. 3

C. 2π

D. π

18. The average of 4 test scores is 88. If three of the scores are 85, 90, and 92, what is the fourth score?

A. 80

B. 82

C. 85

D. 88

19. Factor: $x^4 - 16$.

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

B. $(x - 2)(x + 2)^2$

C. $(x^2 - 4)^2$

D. $(x - 16)(x + 1)$

20. If y varies directly with x , and $y = 12$ when $x = 4$, what is y when $x = 10$?

A. 3

B. 7

C. 20

D. 30

21. Solve: $\frac{3}{x} + \frac{2}{3} = 1$, where $x \neq 0$.

A. $x = 9$

B. $x = 6$

C. $x = 3$

D. $x = 1$

22. What is the exact value of $\tan(45^\circ) - \sin(30^\circ)$?

A. 1

B. 0

C. $\frac{1}{2}$

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

23. A rectangle's length is 5 more than twice its width. If the perimeter is 52, what is the length?

- A. 7
- B. 12
- C. 17
- D. 19

24. Simplify: $(x + 5)^2 - (x - 5)(x + 5)$.

- A. $10x$
- B. $10x + 50$
- C. $20x + 50$
- D. 50

25. A cone has radius 4 and height 6. What is its volume? (Use π .)

- A. 32π
- B. 48π
- C. 96π
- D. 16π

26. What is the slope of the line $4x - 2y = 10$?

- A. 4
- B. -2
- C. 2
- D. -4

27. Simplify: $(x + 1)/(x + 2) + (x - 1)/(x + 2)$, assuming $x \neq -2$.

- A. $2/(x + 2)$
- B. $2x/(x + 2)^2$
- C. $2x + 2/(x + 2)$
- D. $2x/(x + 2)$

28. If the sum of two numbers is 20 and their difference is 4, what is the larger number?

- A. 12
- B. 10
- C. 14
- D. 16

29. A spinner has 5 equal sectors labeled A, B, C, D, E. What is the probability of spinning A or E?

- A. $1/5$
- B. $3/5$
- C. $2/5$
- D. $4/5$

30. Evaluate: $2 + 3 \cdot 5 - 4$.

- A. 14
- B. 13
- C. 21
- D. 11

PRACTICE EXAM 23: ANSWER KEY AND EXPLANATIONS

1. B — 3 mph, derived by setting up a system of equations for boat speed and current. Upstream: $b - c = 20/5 = 4$; downstream: $b + c = 20/2 = 10$. Add the equations: $2b = 14$, giving $b = 7$ and $c = 3$. Stream-and-current problems always reduce to this standard system where speeds add downstream and subtract upstream.
2. D — $6x^2 - 4x + 2$, obtained by distributing the 2 through every term inside the parentheses. Each term in the polynomial gets multiplied by 2: $2(3x^2) = 6x^2$, $2(-2x) = -4x$, $2(1) = 2$. The distributive property is the foundation of every polynomial multiplication and must apply to all terms — skipping any one produces a wrong answer.
3. A — $x = 3$, because $4^3 = 64$ matches the base of 4 on the left side. When bases match on both sides of an exponential equation, the exponents must be equal. This base-matching approach is always faster than using logarithms when the right side can be rewritten as a power of the left-side base.
4. C — $y = 3$, found by first solving for x and then substituting back. Set the equations equal: $2x - 3 = -x + 6$, giving $3x = 9$ and $x = 3$. Substitute into either equation: $y = 2(3) - 3 = 3$. Intersection points of two lines always satisfy both equations simultaneously.
5. D — 10, calculated using the cosine relationship for the 60° angle. $\cos(60^\circ) = \text{adjacent}/\text{hypotenuse} = 5/h = 1/2$, so $h = 10$. Alternatively, this is a 30-60-90 triangle where the leg adjacent to 60° is half the hypotenuse. Memorizing standard triangle ratios accelerates these problems significantly.
6. B — 4, obtained by applying the quotient law of logarithms. $\log_2(32) - \log_2(2) = \log_2(32/2) = \log_2(16) = 4$, since $2^4 = 16$. Always combine logs with the same base using the quotient law before evaluating. Memorize small powers of 2 for quick logarithm computation.
7. A — 2, found by setting the function equal to 5 and solving for x . $f(x) = 3x - 1 = 5$, giving $3x = 6$ and $x = 2$. So $f^{-1}(5) = 2$. Finding a specific inverse value is often faster than constructing the entire inverse function — just solve the equation for that output value.
8. C — $(x + 2)^2 + (y - 3)^2 = 25$, from the standard form $(x - h)^2 + (y - k)^2 = r^2$ with center (h, k) . For center $(-2, 3)$, rewrite $(x - (-2))^2 = (x + 2)^2$. Square the radius: $r^2 = 25$. Always watch the sign flip when the center coordinates are negative — the parentheses introduce a +.
9. B — 48, found by applying PEMDAS in the correct order. Exponents first: $4^3 = 64$, $2^2 = 4$. Parentheses: $(3 + 1) = 4$. Multiplication: $4 \times 4 = 16$. Subtract: $64 - 16 = 48$. Always respect order of operations to avoid cumulative errors — shortcuts often produce wrong answers.

10. D — $3x^2y\sqrt{2}$, obtained by factoring the radicand into perfect-square factors and simplifying. $\sqrt{(18x^4y^2)} = \sqrt{(9 \cdot 2 \cdot x^4 \cdot y^2)} = 3x^2y \cdot \sqrt{2}$. Extract all perfect-square factors; what remains inside the radical cannot be further simplified.
11. D — 40,000, derived from exponential growth doubling over 3 periods. Every 10 years the population doubles, so in 30 years it doubles three times: $5000 \times 2^3 = 5000 \times 8 = 40,000$. Always compute the number of doubling periods first, then apply the doubling factor.
12. A — $x = 5$ or $x = -11$, obtained by splitting the absolute value into two cases. Case 1: $x + 3 = 8$, giving $x = 5$. Case 2: $x + 3 = -8$, giving $x = -11$. Every absolute value equation $|\text{expression}| = k$ (with $k > 0$) produces exactly two solutions — never drop the negative case.
13. C — 20, calculated using the combinations formula $C(n, k) = n!/(k!(n - k)!)$. For $C(6, 3) = 6!/(3! \cdot 3!) = 720/(6 \cdot 6) = 720/36 = 20$. Combinations count arrangements where order does not matter — always use combinations rather than permutations when selecting a subset.
14. B — $x^2 - 1$, obtained by dividing each term in the numerator by x^2 . $x^4/x^2 = x^2$ (subtract exponents); $x^2/x^2 = 1$. Result: $x^2 - 1$. Always divide term by term when the denominator is a monomial — this is the inverse of the distributive property.
15. A — $x = 1$, found by distributing the -2 and then isolating x . $5 - 2x - 2 = 1$, giving $3 - 2x = 1$ and $2x = 2$, so $x = 1$. Always distribute before combining like terms, paying close attention to signs when subtracting a product.
16. D — $4\sqrt{3}$ cm, calculated using the cube diagonal formula. Side length = $\sqrt[3]{64} = 4$ cm. Space diagonal = $s\sqrt{3} = 4\sqrt{3}$ cm. The factor $\sqrt{3}$ comes from extending the Pythagorean theorem to three dimensions — it is the diagonal across the cube's interior, not just a face.
17. B — 3, because the amplitude of $y = a \sin(x)$ is $|a|$, and here $a = 3$. The amplitude represents the maximum vertical distance from the center line of the sine wave. Vertical stretches of sine and cosine graphs always scale the amplitude by the leading coefficient.
18. C — 85, calculated by finding the required total and subtracting the known scores. Sum needed: $88 \times 4 = 352$. Known sum: $85 + 90 + 92 = 267$. Fourth score: $352 - 267 = 85$. Average problems always reduce to finding the required sum and solving for the missing value.
19. A — $(x^2 - 4)(x^2 + 4)$, applying the difference of squares pattern $a^2 - b^2$ with $a = x^2$, $b = 4$. This produces two factors. The first factor $(x^2 - 4)$ factors further as $(x - 2)(x + 2)$, but the answer choices stop at the first application. Always check for repeated applications of factoring patterns.
20. D — 30, found from the direct variation relationship $y = kx$. Substitute to find k : $12 = k(4)$, giving $k = 3$. Then $y = 3x = 3(10) = 30$. Direct variation always has the form $y = kx$ where k is the constant of proportionality — it remains the same for every pair of corresponding values.

21. A — $x = 9$, obtained by isolating the fraction and cross-multiplying. $3/x + 2/3 = 1 \rightarrow 3/x = 1/3$ (subtract $2/3$ from both sides). Cross-multiply: $9 = x$. Always isolate the term containing the variable before applying cross-multiplication to avoid errors.
22. C — $1/2$, found by computing each trig value separately and subtracting. $\tan(45^\circ) = 1$ and $\sin(30^\circ) = 1/2$. Difference: $1 - 1/2 = 1/2$. Always evaluate memorized trig values independently first, then combine — this minimizes computational errors.
23. D — 19, obtained by setting up a perimeter equation and solving. Let $w =$ width; length $= 2w + 5$. Perimeter: $2(2w + 5) + 2w = 6w + 10 = 52$, giving $w = 7$. Length $= 2(7) + 5 = 19$. Always check that the final answer makes geometric sense by verifying the perimeter.
24. B — $10x + 50$, obtained by expanding both expressions and subtracting. $(x + 5)^2 = x^2 + 10x + 25$; $(x - 5)(x + 5) = x^2 - 25$. Subtract: $(x^2 + 10x + 25) - (x^2 - 25) = 10x + 50$. Distributing the negative sign through the entire second polynomial is critical.
25. A — 32π , calculated using the cone volume formula $V = (1/3)\pi r^2 h$. $V = (1/3)\pi(16)(6) = 32\pi$ cubic units. Always include the one-third factor when computing cone volume — omitting it is a common error that triples the intended answer.
26. C — 2, found by rewriting the equation in slope-intercept form. $4x - 2y = 10 \rightarrow -2y = -4x + 10 \rightarrow y = 2x - 5$. The coefficient of x in slope-intercept form is the slope: 2. Always isolate y before identifying the slope.
27. D — $2x/(x + 2)$, obtained by adding the numerators over the common denominator. $(x + 1) + (x - 1) = 2x$. Result: $2x/(x + 2)$. Like denominators always allow direct numerator combination — and the middle terms $+1$ and -1 cancel cleanly here.
28. A — 12, found using the sum-and-difference system for two numbers. $x + y = 20$; $x - y = 4$. Adding the equations eliminates y : $2x = 24$, giving $x = 12$. Always add the equations to eliminate the variable with opposite coefficients — the elimination method is fastest.
29. C — $2/5$, calculated by dividing favorable outcomes by total. Favorable: A or E = 2 sectors. Total: 5 sectors. Probability $= 2/5$. "Or" probabilities for mutually exclusive events always add their individual probabilities.
30. B — 13, obtained by applying PEMDAS with multiplication before addition and subtraction. $3 \times 5 = 15$. Then $2 + 15 - 4 = 13$. Always multiply before adding or subtracting unless parentheses override the default order.