PRACTICE EXAM 21: ALEKS PPL SIMULATION

1. The distance between two points is given by $d = \sqrt{((x_2 - x_1)^2 + (y_2 - y_1)^2)}$. Find the distance between $(2, -3)$ and $(-4, 5)$.

A. 8

B. 10

C. 12

D. 14

2. Simplify: $(x^3 - 27)/(x - 3)$, assuming $x \neq 3$.

A. $x^2 - 3x + 9$

B. $x^2 - 9$

C. $x^2 + 9x - 3$

D. $x^2 + 3x + 9$

3. If $\cos \theta = 0$ and $0° \leq \theta < 360°$, what are the possible values of θ?

A. 90° or 270°

B. 0° or 180°

C. 45° or 135°

D. 30° or 150°

4. A line passes through (1, −2) and (4, 7). What is the slope?

A. −3

B. 3/2

C. 3

D. 1/3

5. Simplify: $(x + 2)/3 − (x − 4)/6$, with a common denominator of 6.

A. $(x + 4)/6$

B. $(x + 8)/6$

C. $(3x − 4)/6$

D. $(x − 4)/6$

6. What is the equation of a parabola with vertex at (0, 0) opening upward with a = 1?

A. $y = x^2$

B. $y = x^2 + 1$

C. $y = (x + 1)^2$

D. $y = −x^2$

7. A fair die is rolled once. What is the probability of rolling a 2 or 5?

A. 1/6

B. 1/2

C. 1/4

D. 1/3

8. Solve: $\sqrt{(x)} = 6$.

A. $x = 6$

B. $x = 3$

C. $x = 36$

D. $x = 12$

9. Simplify: $2(x + 3) - 3(x - 1)$.

A. $9 + x$

B. $9 - x$

C. $-x - 9$

D. $x - 9$

10. A rectangle has a perimeter of 36 cm and a length that is 3 cm more than its width. What is the width?

A. 7.5 cm

B. 6 cm

C. 4.5 cm

D. 9 cm

11. What is the exact value of $\cos(60°)$?

A. 1

B. $\sqrt{2}/2$

C. 1/2

D. $\sqrt{3}/2$

12. Simplify: $(2 + 3i) + (5 - i)$, where $i = \sqrt{(-1)}$.

A. $7 + 2i$

B. $7 - 2i$

C. $3 + 4i$

D. $-3 + 4i$

13. A cylinder has radius 2 cm and height 10 cm. What is its lateral surface area? (Use π.)

A. 4π cm²

B. 20π cm²

C. 30π cm²

D. 40π cm²

14. Solve: $x^2 - 9x + 14 = 0$.

A. $x = 14$ or $x = -1$

B. $x = 2$ or $x = 7$

C. $x = -2$ or $x = -7$

D. $x = 9$ or $x = 14$

15. Find the midpoint of $(3, 6)$ and $(-1, 2)$.

A. $(2, 4)$

B. $(1, 3)$

C. $(1, 4)$

D. $(2, 3)$

16. A jacket is marked up 30% from its cost of $60. What is the selling price?

A. $72

B. $90

C. $75

D. $78

17. Simplify: $(x^2 - 25)/(x + 5)$, assuming $x \neq -5$.

A. $x - 5$

B. $x + 5$

C. $x^2 - 5$

D. $(x + 5)/(x - 5)$

18. Solve: 2^x = 8.

A. $x = 2$

B. $x = 3$

C. $x = 4$

D. $x = 6$

19. What is the circumference of a circle with radius 5? (Use π.)

A. 5π

B. 20π

C. 25π

D. 10π

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

A. 0

B. 50

C. $-40x$

D. $40x$

21. A function is defined by $f(x) = 2x + 1$. What is $f(f(2))$?

A. 11

B. 12

C. 13

D. 15

22. The area of a triangle with base b and height h is 48. If b = 8, what is h?

A. 6

B. 8

C. 12

D. 16

23. Simplify: 3^(x) · 3^(2 − x).

A. 3

B. 9

C. 3^(x)

D. 6

24. What is the slope of the line parallel to $y = 5 - 2x$?

A. 5

B. 2

C. 1/2

D. −2

25. A sphere has a diameter of 12 cm. What is its volume? (Use π.)

A. 288π cm³

B. 48π cm³

C. 144π cm³

D. 864π cm³

26. Solve: $(x/4) + 3 = 7$.

A. $x = 4$

B. $x = 16$

C. $x = 12$

D. $x = 20$

27. A line has equation $3x + 2y = 12$. What is the y-intercept?

A. 4

B. 12

C. 6

D. −6

28. The graph of $y = \sqrt{x}$ passes through which point?

A. (4, 2)

B. (2, 4)

C. (16, 2)

D. (4, 16)

29. Simplify: $1 - \cos^2\theta$.

A. $\cos^2\theta$

B. $2\cos^2\theta$

C. $\tan^2\theta$

D. $\sin^2\theta$

30. A triangle has vertices at (0, 0), (5, 0), and (0, 12). What is the length of the hypotenuse?

A. 7

B. 13

C. 17

D. 60

PRACTICE EXAM 21: ANSWER KEY AND EXPLANATIONS

1. B — Apply the distance formula: $\sqrt{((-4-2)^2 + (5-(-3))^2)} = \sqrt{(36+64)} = \sqrt{100} = 10$. The distance formula is the Pythagorean theorem applied to coordinate differences. The (6, 8, 10) multiple of the 3-4-5 triple eliminates computation.

2. D — Apply the difference of cubes pattern $a^3 - b^3 = (a-b)(a^2+ab+b^2)$ with $a = x$, $b = 3$: numerator $= (x-3)(x^2+3x+9)$. Cancel $(x-3)$: result is x^2+3x+9. The middle term of the quadratic factor is positive for a difference of cubes.

3. A — On the unit circle, cosine equals the x-coordinate. $\cos\theta = 0$ where the x-coordinate is zero: at $\theta = 90°$ and $270°$. These are the quadrantal angles where the terminal side lies along the y-axis.

4. C — Slope $= (7-(-2))/(4-1) = 9/3 = 3$. Always subtract y-values over x-values in the same order. The slope is the rate at which y changes per unit change in x.

5. B — Rewrite with LCD 6: $2(x+2)/6 - (x-4)/6$. Combine: $(2x+4-x+4)/6 = (x+8)/6$. Always distribute the subtraction across every term in the second numerator.

6. A — Vertex form $a(x-h)^2 + k$ with $h = 0$, $k = 0$, $a = 1$: $y = x^2$. This is the standard parent parabola with vertex at the origin and opening upward.

7. D — Favorable outcomes: {2, 5} = 2 numbers. Total outcomes: 6 sides. Probability = 2/6 = 1/3. "Or" probabilities for mutually exclusive events add directly.

8. C — Square both sides: $x = 6^2 = 36$. Always square both sides to eliminate the radical, then verify the solution in the original equation.

9. B — Distribute: $2x + 6 - 3x + 3 = -x + 9 = 9 - x$. Always flip every sign in the subtracted polynomial before combining like terms.

10. A — Let w = width; length = w + 3. Perimeter: $2(w+3) + 2w = 36$, giving $4w + 6 = 36$ and $w = 7.5$ cm. The perimeter formula for rectangles always distributes 2 to both dimensions.

11. C — $\cos(60°) = 1/2$ is a memorized unit-circle value. The standard first-quadrant angles (0°, 30°, 45°, 60°, 90°) and their cosines and sines must be memorized.

12. A — Add real parts: $2 + 5 = 7$. Add imaginary parts: $3i - i = 2i$. Sum: $7 + 2i$. Complex number addition combines real parts separately from imaginary parts.

13. D — Lateral surface area of a cylinder = $2\pi rh = 2\pi(2)(10) = 40\pi$ cm². The lateral surface is only the curved side; for total surface area, add $2\pi r^2$ for the two circular ends.

14. B — Two numbers multiplying to 14 and adding to −9 are −2 and −7. Factored: $(x - 2)(x - 7) = 0$. Solutions: $x = 2$ or $x = 7$. Sign discipline ensures both factors come out with correct signs.

15. C — Midpoint = $((3 + (-1))/2, (6 + 2)/2) = (1, 4)$. Average both coordinates separately. Addition — not subtraction — distinguishes the midpoint formula from the distance formula.

16. D — Markup: $\$60 \times (1 + 0.30) = \$60 \times 1.30 = \$78$. Always apply the multiplier (1 + rate) to find the result after a percent increase.

17. A — Factor numerator as a difference of squares: $(x + 5)(x - 5)$. Cancel $(x + 5)$: result is $x - 5$. Always factor completely before canceling common factors.

18. B — Rewrite 8 as 2^3: $2^x = 2^3$, so $x = 3$. When bases match on both sides, exponents must be equal. Always attempt base-matching before resorting to logarithms.

19. D — Circumference = $2\pi r = 2\pi(5) = 10\pi$. Always double the radius when applying the circumference formula. Diameter times π also gives circumference.

20. C — Apply the pattern $(a - b)^2 - (a + b)^2 = -4ab$ with $a = 2x$, $b = 5$: $-4(2x)(5) = -40x$. Recognize conjugate-pair identities for rapid simplification.

21. A — Evaluate inner function first: $f(2) = 2(2) + 1 = 5$. Then $f(5) = 2(5) + 1 = 11$. Composition applies the inside function first; the output becomes the new input.

22. C — Area = (1/2)(base)(height) = 48, with base = 8: $(1/2)(8)(h) = 48$, so $4h = 48$ and $h = 12$. Always divide by the coefficient of h to isolate height.

23. B — Apply the product rule: $3^{(x + 2 - x)} = 3^2 = 9$. The x terms cancel in the exponent, simplifying to a numerical value.

24. D — Rewrite $y = 5 - 2x$ as $y = -2x + 5$. Slope = −2. Parallel lines share the same slope. Always isolate y first to read the slope.

25. A — Diameter 12 → radius 6. Volume = $(4/3)\pi r^3 = (4/3)\pi(216) = 288\pi$ cm³. Always halve the diameter before substituting into volume formulas.

26. B — Subtract 3: $x/4 = 4$. Multiply by 4: $x = 16$. Always isolate the fraction first, then clear it by multiplying both sides by the denominator.

27. C — Set $x = 0$: $2y = 12$, so $y = 6$. The y-intercept is always found by substituting zero for x. In standard form $Ax + By = C$, the y-intercept equals C/B.

28. A — Check: $\sqrt{4} = 2$, so (4, 2) is on the graph. The function $f(x) = \sqrt{x}$ passes through (0, 0), (1, 1), (4, 2), and (9, 3). Memorize these key points.

29. D — By the fundamental Pythagorean identity, $\sin^2\theta + \cos^2\theta = 1$, which rearranges to $1 - \cos^2\theta = \sin^2\theta$. One of the three fundamental identities used constantly in trig simplification.

30. B — Legs 5 and 12. Hypotenuse = $\sqrt{(25 + 144)} = \sqrt{169} = 13$. The (5, 12, 13) Pythagorean triple is one of the most frequently tested combinations.