Algebra 2 & Geometry

Practice Problems Workbook · 20 Questions · Self-Study Edition

Name: _____ **Date:** _____ **Score:** _____ / 20

ALGEBRA 2

MEMORY POINTS	QUADRATIC: discriminant = b^2 - 4ac (>0: 2 roots =0: 1 root <0: none) EXPONENT: same base multiply -> ADD, divide -> SUBTRACT exponents LOG: log(AB)=logA+logB log(A/B)=logA-logB log(A^n)=n*logA INVERSE: swap x and y, then solve for y

Q1 **[Quadratic Formula]** ★ Tricky

A ball is thrown upward from 5 ft with initial velocity 40 ft/s. Its height follows h(t) = -16t^2 + 40t + 5. How many seconds does the ball take to hit the ground? (Round to nearest tenth.)

EXAMPLE NOTE *Set h = 0 and use the quadratic formula: t = (-b +/- sqrt(b^2-4ac)) / 2a. a = -16, b = 40, c = 5. Always take the POSITIVE root — time cannot be negative!*

( ) A. t ≈ 1.9 sec
( ) B. t ≈ 2.6 sec
( ) C. t ≈ 3.1 sec
( ) D. t ≈ 0.4 sec

Q2 **[Discriminant]** ★★ Confusing

Which value of k makes 3x^2 - kx + 3 = 0 have exactly ONE real solution?

MEMORY *Exactly one solution ↔ discriminant = 0. Formula: b^2 - 4ac = 0. Here b = -k, a = 3, c = 3. Solve k^2 = 36.*

( ) A. k = 3
( ) B. k = 4
( ) C. k = 6
( ) D. k = 9

Q3 **[Exponential Growth]** ★ Classic

A bacteria colony starts with 200 cells and doubles every 3 hours. How many cells are there after 12 hours?

FORMULA *A = A0 * 2^(t/d) where d = doubling time. Trap: use exponent, not multiplier!*

( ) A. 800
( ) B. 1,200
( ) C. 2,400
( ) D. 3,200

Q4 **[Logarithms]** ★★ Tricky

Solve for x: log_2(x + 3) + log_2(x - 1) = 5

LOG RULE	*Sum of logs → log of product: log_b(M) + log_b(N) = log_b(M*N). Then: log_b(K) = n means b^n = K. Always check domain (arguments must be positive)!*

( ) A. x = 3
( ) B. x = 5
( ) C. x = 7
( ) D. x = 9

Q5 **[Rational Functions]** ★★ Common Trap

What are the vertical asymptote(s) of f(x) = (x + 2) / (x^2 - 9)?

ASYMPTOTE vs HOLE	*Vertical asymptote: denom = 0, factor does NOT cancel. Hole: factor cancels top and bottom. Always factor both first!*

( ) A. x = -2 only
( ) B. x = 9 only
( ) C. x = 3 and x = -3
( ) D. x = 2 and x = 3

Q6 **[Polynomial Roots]** ★★ Tricky

Given p(x) = x^3 - 6x^2 + 11x - 6, which is the complete list of real zeros?

RATIONAL ROOT THEOREM	*Test factors of constant term / leading coefficient. Once you find one root, factor it out and solve the remaining quadratic.*

( ) A. x = 1, 2, 3
( ) B. x = 1, 2, -3
( ) C. x = -1, -2, -3
( ) D. x = 2, 3, 6

Q7 **[Complex Numbers]** ★★ Confusing

Simplify: (3 + 2i)(1 - 4i)

KEY RULE	*FOIL as usual, then substitute i^2 = -1 (NOT +1). Final form: real part + imaginary part.*

( ) A. 3 - 10i
( ) B. 5 - 10i
( ) C. 3 + 10i
( ) D. 11 - 10i

Q8 **[Arithmetic Series]** ★★ Word Problem

Sarah saves $100 in January and $15 more each month than the previous month. How much does she save in total over 12 months?

FORMULA	*S_n = (n/2)(a1 + an) or S_n = (n/2)[2a1 + (n-1)d]. First find the 12th term: a12 = 100 + 11(15).*

( ) A. $1,980
( ) B. $2,100
( ) C. $2,190
( ) D. $2,280

Q9 **[Inverse Functions]** ★★ Confusing

If f(x) = (2x + 1) / (x - 3), find f^(-1)(x).

STEPS	*1) Replace f(x) with y. 2) Swap x and y. 3) Solve for y. Trap: remember to factor out y before dividing!*

( ) A. (3x + 1) / (x - 2)
( ) B. (x - 3) / (2x + 1)
( ) C. (2x - 1) / (x + 3)
( ) D. (3x - 1) / (x + 2)

Q10 **[Distance-Rate-Time]** ★★ Word Problem

Two trains leave the same station in opposite directions — Train A at 60 mph, Train B at 80 mph. After how many hours will they be 420 miles apart?

KEY IDEA	*Opposite directions: ADD distances. 60t + 80t = 420. Trap: same direction = subtract; opposite = add!*

( ) A. 2.5 hours
( ) B. 3 hours
( ) C. 3.5 hours
( ) D. 4 hours

GEOMETRY

MEMORY POINTS	`TRIANGLE: angles sum = 180 deg | exterior angle = sum of 2 non-adjacent interiors CIRCLE: inscribed angle = (1/2) x intercepted arc | central angle = arc measure PARALLEL: alternate interior = equal (Z) | co-interior = supplementary = 180 deg (C) SIMILARITY: AA -> similar | corresponding sides proportional`

Q11 **[Triangle Angles]** ★ Classic

In triangle ABC, angle A = (2x + 10)°, angle B = (3x - 5)°, angle C = (x + 15)°. Find the measure of angle B.

RULE	*Sum of triangle angles = 180°. Set up: (2x+10)+(3x-5)+(x+15) = 180. Solve for x, then substitute.*

( ) A. 55°
( ) B. 70°
( ) C. 75°
( ) D. 80°

Q12 **[Parallel Lines]** ★★ Confusing

Two parallel lines are cut by a transversal. One angle measures (4x + 20)° and its co-interior (same-side interior) angle measures (2x + 40)°. Find x.

CO-INTERIOR	*Co-interior angles (same-side interior) are SUPPLEMENTARY: they sum to 180°. Trap: NOT equal — that rule applies to alternate interior angles (Z-angles)!*

( ) A. x = 15
( ) B. x = 18
( ) C. x = 20
( ) D. x = 25

Q13 **[Similar Triangles]** ★★ Proportion

A 6-foot person casts a 9-foot shadow. At the same time, a tree casts a 24-foot shadow. How tall is the tree?

PROPORTION	*height1 / shadow1 = height2 / shadow2. Cross-multiply and solve. Keep the same object's measurements in each ratio.*

( ) A. 14 feet
( ) B. 16 feet
( ) C. 18 feet
( ) D. 20 feet

Q14 **[Circle — Inscribed Angle]** ★★★ Hard

An inscribed angle intercepts an arc of 140°. What is the measure of the inscribed angle?

THEOREM	*Inscribed angle = (1/2) x intercepted arc. Trap: many students confuse inscribed angle WITH the arc value, or double instead of halving!*

( ) A. 140°
( ) B. 70°
( ) C. 35°
( ) D. 280°

Q15 **[Pythagorean Theorem]** ★ Classic

A ladder's base is 5 feet from a wall and reaches 12 feet up. How long is the ladder?

FORMULA	*a^2 + b^2 = c^2 (c = hypotenuse, opposite the right angle). Memorize triples: 3-4-5, 5-12-13, 8-15-17, 7-24-25.*

( ) A. 11 feet
( ) B. 12 feet
( ) C. 13 feet
( ) D. 17 feet

Q16 **[Area & Perimeter]** ★★ Tricky

A rectangle has perimeter 54 cm. Its length is 3 cm more than twice its width. What is the area of the rectangle?

SETUP	*Let width = w, length = l. Equations: 2l + 2w = 54 AND l = 2w + 3. Substitute, solve for w, then find area = l x w.*

( ) A. 152 cm²
( ) B. 170 cm²
( ) C. 189 cm²
( ) D. 200 cm²

Q17 **[Exterior Angle Theorem]** ★★ Classic Trap

An exterior angle of a triangle measures 115°. One non-adjacent interior angle is 58°. What is the other non-adjacent interior angle?

THEOREM	*Exterior angle = SUM of the two non-adjacent interior angles. 58 + x = 115 → x = ? This is faster than finding the adjacent interior angle first.*

( ) A. 47°
( ) B. 53°
( ) C. 57°
( ) D. 65°

Q18 **[Circle — Arc Length]** ★★ Confusing

A circle has radius 9 cm and a sector has central angle 80°. Find the arc length in terms of pi.

FORMULA	*Arc length = (angle / 360) x 2*pi*r. Trap: use CIRCUMFERENCE formula (2 pi r), NOT area formula (pi r^2)!*

( ) A. 4pi cm
( ) B. 5pi cm
( ) C. 8pi cm
( ) D. 9pi cm

Q19 **[Surface Area — Cylinder]** ★★ 3D Shape

A cylinder has radius 4 cm and height 10 cm. What is the total surface area?

FORMULA *Total SA = 2*pi*r^2 + 2*pi*r*h (two circles + lateral rectangle). Trap: forgetting both circular ends and only calculating lateral area (80 pi).*

( ) A. 80pi cm²
( ) B. 96pi cm²
( ) C. 112pi cm²
( ) D. 120pi cm²

Q20 **[Coordinate Geometry]** ★★ Midpoint

Point M is the midpoint of segment AB. A = (2, -3) and M = (5, 1). Find coordinates of B.

REVERSE MIDPOINT *To find endpoint: x_B = 2*x_M - x_A and y_B = 2*y_M - y_A. Shortcut: 'double the midpoint, subtract the known point.'*

( ) A. (7, 4)
( ) B. (8, 5)
( ) C. (6, 3)
( ) D. (3, -1)

ANSWER KEY

Q1	**B**	Q2	**C**	Q3	**D**	Q4	**B**	Q5	**C**
Q6	**A**	Q7	**D**	Q8	**C**	Q9	**A**	Q10	**B**
Q11	**B**	Q12	**C**	Q13	**B**	Q14	**B**	Q15	**C**
Q16	**A**	Q17	**C**	Q18	**A**	Q19	**C**	Q20	**B**

Algebra 2 Answers: Q1–B, Q2–C, Q3–D, Q4–B, Q5–C, Q6–A, Q7–D, Q8–C, Q9–A, Q10–B

Geometry Answers: Q11–B, Q12–C, Q13–B, Q14–B, Q15–C, Q16–A, Q17–C, Q18–A, Q19–C, Q20–B