Algebra 2 & Geometry

Core Practice Problems · 20 Questions · Self-Study Edition

Part 1 — Algebra 2

Q01 · Quadratic Equations

[Key] KEY: discriminant = b^2 - 4ac | one solution => discriminant = 0

The equation 2x^2 - 5x + k = 0 has exactly one real solution. Find k.

Hint: Set b^2 - 4ac = 0 and solve for k.

A) 15/8
B) 25/8
C) 5/2
D) 5

Q02 · Parabola / Vertex

[Key] KEY: vertex x = -b/(2a), complete the square to find minimum

The parabola f(x) = x^2 - 6x + 11 opens upward. What is its minimum value?

Hint: Complete the square: f(x) = (x-3)^2 + 2

A) 2 (at x = -3)
B) 2 (at x = 3)
C) 11
D) -3

Q03 · Logarithms

[Key] KEY: log(ab) = log a + log b | Check domain after solving!

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

Hint: Combine logs -> (x+3)(x-1) = 2^3 = 8, then check domain (both args > 0).

A) x = 1
B) x = -5 or 3
C) x = 3 only
D) x = 5

Q04 · Rational Exponents

[Key] KEY: x^(m/n) = (n-th root of x)^m --> root first, then power

Simplify: 27^(2/3)

A) 18
B) 3
C) 9
D) 81

Q05 · Inverse Functions

[Key] KEY: f^(-1)(x) means swap x & y, then solve for y. NOT 1/f(x)!

If f(x) = 3x - 7, what is f^(-1)(x)?

Hint: Common trap: choosing (x-7)/3 (forgot +7 when moving to other side).

A) 1/(3x-7)
B) 3x+7
C) (x+7)/3
D) (x-7)/3

Q06 · Complex Numbers

[Key] KEY: i^2 = -1 | FOIL complex numbers like binomials

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

A) 3 - 2i
B) 1 + 5i
C) 5 - i
D) 5 + i

Q07 · Arithmetic Sequences

*[Key] KEY: a_n = a_1 + (n-1)d | S_n = n/2 * (a_1 + a_n)*

In an arithmetic sequence, the 3rd term is 11 and the 7th term is 27. Find the sum of the first 10 terms.

Hint: Find d from (a7 - a3) = 4d, then find a1, then use the sum formula.

A) 180
B) 200
C) 155
D) 220

Q08 · Absolute Value Equations

[Key] KEY: |x| = a => x = a OR x = -a (two cases!)

Solve: |2x - 5| = 9. Which lists BOTH solutions?

A) x = 7 only
B) x = 2 and x = -7
C) x = 7 and x = -2
D) x = 4 and x = -3

Q09 · Exponential Equations

[Key] KEY: same base => set exponents equal | 4 = 2^2, 8 = 2^3

Solve for x: 4^(x+1) = 8^(x-1)

Hint: Rewrite as 2^(2(x+1)) = 2^(3(x-1)), then equate exponents.

A) x = 3
B) x = 5
C) x = 7
D) x = 1

Q10 · Variation

[Key] KEY: inverse variation y = k/x | find k first!

y varies inversely with x. When x = 4, y = 15. Find y when x = 12.

A) 45
B) 5
C) 20
D) 3

Part 2 — Geometry

Q11 · Triangle Exterior Angles

[Key] KEY: exterior angle = sum of 2 NON-ADJACENT interior angles

In triangle ABC, angle A = 48 deg and angle B = 63 deg. What is the exterior angle at C?

Hint: Don't stop at interior angle C (69 deg) -- the exterior angle is 180 - 69 = 111 deg.

A) 69 deg
B) 111 deg
C) 90 deg
D) 132 deg

Q12 · Pythagorean Theorem

[Key] KEY: a^2 + b^2 = c^2 | c is always the HYPOTENUSE

A right triangle has legs 7 and 24. What is the hypotenuse?

Hint: (7, 24, 25) is a common Pythagorean triple.

A) 26
B) 25
C) 31
D) sqrt(575)

Q13 · Circle Arc Length

*[Key] KEY: arc length = (angle/360) x 2*pi*r*

A circle has radius 10. A central angle measures 72 deg. What is the arc length? (Use pi ~ 3.14)

Hint: 72/360 = 1/5. Many students use 72 directly -- don't!

A) 4*pi only
B) 4*pi = approx 12.57
C) 2*pi
D) 72*pi

Q14 · Similar Triangles

[Key] KEY: area ratio = (side ratio)^2 | NOT the same as side ratio!

Two similar triangles have sides in ratio 3:5. The smaller has area 27 cm^2. Find the larger area.

Hint: Area ratio = (3/5)^2 = 9/25. Cross multiply.

A) 45 cm^2
B) 75 cm^2
C) 135 cm^2
D) 50 cm^2

Q15 · Inscribed Angles

[Key] KEY: inscribed angle = 1/2 x intercepted arc (half the arc!)

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

Hint: A central angle would equal 140 deg, but inscribed angle is half.

A) 140 deg
B) 280 deg
C) 70 deg
D) 35 deg

Q16 · Volume of Cylinder

*[Key] KEY: V = pi * r^2 * h (use RADIUS, not diameter)*

A cylinder has radius 3 cm and height 8 cm. Find its volume (in terms of pi).

A) 48*pi cm^3
B) 24*pi cm^3
C) 72*pi cm^3
D) 192*pi cm^3

Q17 · Parallel Lines & Transversals

[Key] KEY: co-interior (same-side) angles are SUPPLEMENTARY (add to 180)

Two parallel lines are cut by a transversal. One co-interior angle is 112 deg. Find the other.

Hint: Co-interior = supplementary. Alternate interior angles are equal, but these are on the SAME side.

A) 112 deg
B) 68 deg
C) 22 deg
D) 148 deg

Q18 · 30-60-90 Triangle

*[Key] KEY: 30-60-90 sides = x, x*sqrt(3), 2x (hypotenuse is 2x)*

In a 30-60-90 triangle, the hypotenuse is 16. What is the side opposite 30 deg?

A) 16
B) 8
C) 8*sqrt(3)
D) 4*sqrt(3)

Q19 · Triangle Midsegment

[Key] KEY: midsegment = 1/2 x base, and it is parallel to the base

In triangle PQR, M and N are midpoints of PQ and PR. If MN = 3x-2 and QR = 4x+6, find x.

Hint: Set 3x-2 = (1/2)(4x+6).

A) x = 4
B) x = 2
C) x = 5
D) x = 3

Q20 · Surface Area of Sphere

*[Key] KEY: SA = 4*pi*r^2 | Use RADIUS (= diameter / 2)*

A sphere has diameter 10 cm. What is its surface area (in terms of pi)?

Hint: Common mistake -- using diameter 10 instead of radius 5.

A) 400*pi cm^2

B) 100*pi cm^2

C) 25*pi cm^2

D) 200*pi cm^2

Answer Key

Q01: B	Q02: B	Q03: C	Q04: C	Q05: C
Q06: C	Q07: B	Q08: C	Q09: B	Q10: B
Q11: B	Q12: B	Q13: B	Q14: B	Q15: C
Q16: C	Q17: B	Q18: B	Q19: C	Q20: B