Algebra 2 & Geometry

Word Problem Worksheet — 20 Core Questions

PART 1 — Algebra 2

A-01 · Quadratic Functions · Vertex

[KEY] VERTEX-X = -b / 2a → gives MAX time

A ball is thrown upward from a height of 5 ft with initial velocity 40 ft/s. Its height is h(t) = -16t² + 40t + 5. How long does it take to reach its maximum height?

(A) 1.0 sec

(B) 1.25 sec

(C) 2.5 sec

(D) 0.625 sec

A-02 · Exponential Functions · Compound Interest

[KEY] COMPOUND = P(1 + r/n)^(nt) → divide rate, multiply time by n

A bank account starts with $2,000 at 6% annual interest compounded monthly. Which expression gives the value after 3 years?

(A) 2000(1.06)^3

(B) 2000(1 + 0.06/12)^36

(C) 2000(1.06)^36

(D) 2000(1 + 0.06/12)^3

A-03 · Exponential Growth · Multiplying Periods

[KEY] EXPO-GROWTH = initial x rate^(t / period) → count periods correctly!

Bacteria in a culture triple every 4 hours. If there are 500 bacteria initially, how many are there after 12 hours?

(A) 4,500

(B) 6,000

(C) 13,500

(D) 1,500

A-04 · Quadratic Inequalities

[KEY] INEQUALITY-QUAD → solve =, take BETWEEN roots (for concave-down parabola)

A rocket's height is h = -5t² + 30t meters. A sensor detects it only when h ≥ 40 m. For how many seconds is the rocket detected?

(A) 2 seconds

(B) 4 seconds

(C) 6 seconds

(D) 3 seconds

A-05 · Exponential Decay

[KEY] DECAY = P x (1 - r)^t → subtract from 1, NOT add!

A car worth $24,000 depreciates 15% per year. What is its value after 5 years? (Round to nearest dollar.)

(A) $10,670

(B) $10,641

(C) $12,000

(D) $6,300

A-06 · Logarithms · Real-World Application

[KEY] LOG-DIVISION: log(a/b) = log a - log b → subtract the exponents

The loudness formula is L = 10 log(I / I0), where I0 = 10^(-12). A sound has intensity I = 10^(-4) W/m². What is its loudness in decibels?

(A) 40 dB

(B) 80 dB

(C) 120 dB

(D) 8 dB

A-07 · Systems of Equations · Geometry Setup

[KEY] SYSTEM-SETUP: label variables, write 2 equations, substitute

A rectangular garden has perimeter 60 ft. The length is 3 times the width. What is the area of the garden?

(A) 150 sq ft

(B) 200 sq ft

(C) 202.5 sq ft

(D) 225 sq ft

A-08 · Natural Exponential · Doubling Time

[KEY] DOUBLE-TIME: t = ln(2) / rate → works for continuous growth e^(rt)

A deer population follows P(t) = 300 * e^(0.05t). After how many years does the population first exceed 600? (ln 2 ≈ 0.693)

(A) ~10 years

(B) ~13.9 years

(C) ~20 years

(D) ~6.9 years

A-09 · Rational Equations · Work Problems

[KEY] RATE-ADD: 1/A + 1/B = 1/T → add RATES not times!

Two pipes fill a tank together in 6 hours. Pipe A alone takes 10 hours. How long does Pipe B alone take?

(A) 4 hours

(B) 12 hours

(C) 15 hours

(D) 16 hours

A-10 · Arithmetic Sequences · Series Sum

[KEY] ARITH-SUM = n/2 x (first + last) → find last term FIRST with a_n = a1 + (n-1)d

Theater rows follow a pattern: Row 1 has 15 seats, Row 2 has 18, Row 3 has 21, etc. The theater has 20 rows. How many total seats are there?

(A) 540

(B) 870

(C) 720

(D) 300

PART 2 — Geometry

G-01 · Pythagorean Theorem

[KEY] PYTHAGORAS: a² + b² = c² → c is ALWAYS the hypotenuse (longest side)

A 13-foot ladder leans against a wall. The base is 5 feet from the wall. How high up the wall does the ladder reach?

(A) 8 feet

(B) 12 feet

(C) 10 feet

(D) 11.4 feet

G-02 · Circles · Arc Length

[KEY] ARC-LENGTH = r * theta → convert degrees to radians first!

A circular pizza has diameter 16 inches and is cut into 8 equal slices. What is the arc length of ONE slice's crust? (pi = 3.14)

(A) 3.14 in

(B) 6.28 in

(C) 12.56 in

(D) 2.0 in

G-03 · Similar Solids · Volume Ratio

[KEY] SIMILAR-CONE: volume ratio = (scale factor)^3 → NOT the linear ratio!

A cone-shaped cup has radius 3 cm and height 9 cm. Water fills it to height 4.5 cm (halfway). What fraction of the cup's total volume is filled?

(A) 1/2

(B) 1/4

(C) 1/8

(D) 1/6

G-04 · Trigonometry · Angle of Depression

[KEY] DEPRESSION = ELEVATION (alternate angles) → always use TAN = opp/adj

From the top of a 50-meter lighthouse, the angle of depression to a boat is 30°. How far is the boat from the base of the lighthouse?

(A) ~28.9 m

(B) ~86.6 m

(C) ~50 m

(D) ~100 m

G-05 · Similar Triangles · Scale Factor

[KEY] SIMILAR: find scale factor first, then multiply ALL sides of perimeter

Two triangles are similar. Sides of the smaller are 4, 6, 8. The longest side of the larger is 20. What is the perimeter of the larger triangle?

(A) 36

(B) 45

(C) 40

(D) 54

G-06 · Volume · Sphere vs. Cylinder

[KEY] SPHERE = (4/3)pi*r^3 | CYLINDER = pi*r^2*h → divide, cancel pi and r^2

A sphere and cylinder both have radius r = 6 cm. The cylinder has height 8 cm. What is the ratio of sphere's volume to cylinder's volume?

(A) 1 : 1

(B) 3 : 2

(C) 4 : 3

(D) 2 : 3

G-07 · Coordinate Geometry · Triangle Area

[KEY] COORD-AREA = 1/2 x base x height → use axes to identify base easily

Vertices of a triangle: A(0,0), B(6,0), C(3,4). What is the area of the triangle?

(A) 24 sq units

(B) 12 sq units

(C) 18 sq units

(D) 6 sq units

G-08 · Regular Polygons · Hexagon Area

[KEY] HEX-AREA = 6 x (sqrt(3)/4) x s^2 → 6 equilateral triangles formula

A regular hexagon has side length 6 cm. What is its area?

(A) 36*sqrt(3) cm²

(B) 54*sqrt(3) cm²

(C) 72 cm²

(D) 108 cm²

G-09 · Circles · Chord and Radius

[KEY] CHORD-RADIUS: perpendicular from center bisects chord → Pythagoras!

A chord is 8 cm long and is 3 cm from the center of a circle. What is the radius of the circle?

(A) 4 cm

(B) 5 cm

(C) sqrt(73) cm

(D) 7 cm

G-10 · 3D Geometry · Space Diagonal

[KEY] 3D-DIAGONAL = sqrt(l² + w² + h²) → Pythagoras extended to 3 dimensions

A rectangular prism has length 10, width 6, height 8. What is the length of its space diagonal?

(A) sqrt(164)

(B) 10*sqrt(2)

(C) 24

(D) sqrt(136)

Answer Key

A-01	B	A-02	B
A-03	C	A-04	A
A-05	B	A-06	B
A-07	C	A-08	B
A-09	C	A-10	B
G-01	B	G-02	B
G-03	C	G-04	B
G-05	B	G-06	A
G-07	B	G-08	B
G-09	B	G-10	B