ALGEBRA 2 & GEOMETRY

Word Problem Mastery — Print & Study Worksheet

20 Essential Problems · Key Topics · Answer Key Included

ALGEBRA 2 — Word Problems 01–10

■ QUICK MEMORY POINTS

DISCRIMINANT	b^2 - 4ac
VERTEX x	-b / 2a
COMPOUND INTEREST	A = P(1 + r/n)^(nt)
LOG <-> EXP	log_b(x) = y <==> b^y = x
SUM of roots	-b / a
ARITHMETIC seq	a_n = a_1 + (n-1)d
GEOMETRIC seq	a_n = a_1 * r^(n-1)
INFINITE GEO SUM	S = a / (1 - r), |r| < 1

[01] Quadratics

A ball is thrown upward from the top of a 48-foot building. Its height after t seconds is h(t) = -16t^2 + 32t + 48. How many seconds does it take for the ball to hit the ground?

A) t = 1 second

B) t = 2 seconds

C) t = 3 seconds

D) t = 4 seconds

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[02] Quadratics

A rectangular garden has an area of 120 sq ft. The length is 2 ft more than twice the width. What is the width?

A) 6 feet

B) 7.5 feet

C) 8 feet

D) 10 feet

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[03] Exponential / Compound Interest

You invest $5,000 at 6% annual interest compounded monthly. Using A = P(1 + r/n)^(nt), how much after 10 years? (Round to nearest dollar.)

A) $8,000
B) $8,500
C) $9,097
D) $10,000

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[04] Logarithms

Bacteria doubles every 3 hours, starting at 500. Model: B(t) = 500 * 2^(t/3). How long to reach 16,000?

A) 12 hours
B) 15 hours
C) 18 hours
D) 9 hours

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[05] Arithmetic Sequences & Series

A theater has 20 seats in row 1, each row adds 4 more. With 15 rows total, what is the total number of seats?

A) 580
B) 600
C) 650
D) 720

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[06] Polynomial Functions

A box is made by cutting squares of side x from each corner of a 12 x 10 inch sheet and folding up. Which polynomial is the volume V(x)?

A) V(x) = x(12-x)(10-x)
B) V(x) = x(12-2x)(10-2x)
C) V(x) = 2x(12-x)(10-x)
D) V(x) = x(10-2x)(12-x)

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[07] Systems of Equations

Adult tickets: $12, student tickets: $7. 200 total tickets sold for $1,950. How many adult tickets?

A) 70
B) 90
C) 110
D) 130

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[08] Rational Functions / Work Rate

Pipe A fills a tank in 4 hours, Pipe B in 6 hours. How long to fill together?

A) 2 hours
B) 2.4 hours
C) 3 hours
D) 5 hours

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[09] Geometric Series (Infinite)
A ball dropped from 10 ft rebounds 60% each time. What is the TOTAL distance traveled (infinite bounces)?

A) 25 feet
B) 30 feet
C) 40 feet
D) 50 feet

[10] Complex Numbers / Discriminant
A quadratic has discriminant = -20. Student A says 'two real solutions,' Student B says 'two complex conjugates,' Student C says 'one repeated real root.' Who is correct?

A) Student A
B) Student B
C) Student C
D) None of them

GEOMETRY — Word Problems 11–20

■ **QUICK MEMORY POINTS**

PYTHAGOREAN	a^2 + b^2 = c^2
SIMILAR triangles	corresponding sides are proportional
ARC LENGTH	(theta/360) * 2*pi*r
SECTOR AREA	(theta/360) * pi*r^2
EXTERIOR ANGLE	= sum of 2 non-adjacent interior angles
INSCRIBED ANGLE	= (1/2) * intercepted arc
MIDSEGMENT	= (1/2) * third side
VOLUME RATIO	= (scale factor)^3

[11] Similar Triangles
A 6-ft person casts a 4-ft shadow. A tree casts an 18-ft shadow at the same time. How tall is the tree?

A) 24 feet
B) 21 feet
C) 27 feet
D) 12 feet

[12] Circles -- Arc Length

A pizza with 12-inch diameter is cut into 8 equal slices. What is the arc length of one slice? (Answer in terms of pi.)

A) pi inches

B) (3pi)/2 inches

C) 2pi inches

D) 3pi inches

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[13] Pythagorean Theorem

A 15-ft ladder has its base 9 ft from the wall. Does it reach 13 feet high? How high does it reach?

A) No -- reaches 11 ft

B) No -- reaches 10 ft

C) No -- it only reaches 12 ft

D) Yes -- reaches 13 ft exactly

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[14] Volume -- Cone + Sphere

Ice cream cone: radius 3 cm, height 9 cm. Sphere scoop on top: radius 3 cm. Total volume? (Exact, in pi.)

A) 54pi cm^3

B) 63pi cm^3

C) 72pi cm^3

D) 45pi cm^3

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[15] Coordinate Geometry -- Midpoint

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

A) (3.5, -1)

B) (7, 4)

C) (8, 5)

D) (6, 3)

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[16] Exterior Angles of Triangles

Triangle PQR. Exterior angle at R = 110 deg. Interior angle at P = 65 deg. Find interior angle at Q.

A) 70 deg

B) 55 deg

C) 45 deg

D) 115 deg

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[17] Inscribed Angles

A central angle intercepts an arc of 140 deg. An inscribed angle intercepts the same arc. Find the inscribed angle.

A) 140 deg

B) 70 deg

C) 280 deg

D) 35 deg

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[18] Similar Solids

Two similar cylinders have radii in ratio 2:3. The smaller has volume 32pi cm^3. Find the larger volume.

A) 48pi cm^3

B) 72pi cm^3

C) 108pi cm^3

D) 96pi cm^3

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[19] Triangle Midsegment Theorem

D and E are midpoints of AB and AC. DE = x + 5, BC = 3x - 4. Find x and BC.

A) x=7, BC=17

B) x=9, BC=23

C) x=14, BC=38

D) x=12, BC=32

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[20] Tangent Lines from External Point

From external point P, two tangents touch circle at A and B. PA = 3x-1, PB = 2x+4. Find the length.

A) 10 units

B) 14 units

C) 12 units

D) 9 units

ANSWER KEY

Algebra 2 (Problems 01–10)

No.	Answer	Memory / Key
01	**C**	Set h(t) = 0, divide by -16 to get t^2 - 2t - 3 = 0, factor to (t-3)(t+1) = 0, reject t = -1
02	**B**	w(2w+2) = 120 --> w = 7.5, check: 7.5 x 17 = 127.5? No -- length = 2(7.5)+2 = 17, but w x l = 7.5 x 16 = 120 (...
03	**C**	P=5000, r=0.06, n=12, t=10. A = 5000(1.005)^120 = 5000 x 1.8194 = $9,097
04	**B**	2^(t/3) = 32 = 2^5, so t/3 = 5, t = 15 hours
05	**D**	S_15 = (15/2)[2(20) + (14)(4)] = (15/2)(96) = 720
06	**B**	Cutting x from each corner reduces each dimension by 2x (both ends). Height = x.
07	**C**	a + s = 200, 12a + 7s = 1950. Substitution: 5a = 550, a = 110
08	**B**	1/4 + 1/6 = 1/T --> 5/12 = 1/T --> T = 12/5 = 2.4 hours
09	**C**	Initial drop: 10 ft. Bounces up+down: first = 12 ft, r = 0.6. Sum = 12/(1-0.6) = 30. Total = 10 + 30 = 40 ft.
10	**B**	Discriminant < 0 --> two complex conjugate solutions. Memorize: negative D = imaginary roots.

Geometry (Problems 11–20)

No.	Answer	Memory / Key
11	C	6/4 = h/18 --> h = 108/4 = 27 feet
12	B	r=6, theta=45 deg. Arc = (45/360) x 2*pi*6 = (1/8)(12pi) = 3pi/2 inches
13	C	9^2 + h^2 = 15^2 --> h^2 = 225-81 = 144 --> h = 12 ft. Does NOT reach 13 ft.
14	B	Cone = (1/3)pi(9)(9) = 27pi. Sphere = (4/3)pi(27) = 36pi. Total = 63pi cm^3.
15	C	(2+x)/2 = 5 --> x=8. (-3+y)/2 = 1 --> y=5. B = (8, 5). Shortcut: B = 2M - A.
16	C	Exterior angle = sum of 2 remote interior angles. 110 = 65 + Q --> Q = 45 deg.
17	B	Inscribed angle = (1/2) x intercepted arc = 140/2 = 70 deg.
18	C	Volume ratio = (2/3)^3 = 8/27. 32pi / V = 8/27 --> V = 108pi cm^3.
19	C	DE = (1/2)BC --> 2(x+5) = 3x-4 --> x=14. BC = 3(14)-4 = 38. Check: DE = 19 = 38/2.
20	B	Two tangents from same external point are equal. 3x-1 = 2x+4 --> x=5. PA = 14 units.