Algebra 2 · Geometry

Name: _____ Date: _____ Score: _____ / 20

Quick Reference — Memory Keys

Quadratic Formula	x = (-b ± √(b²-4ac)) / 2a
Discriminant	b²-4ac: >0 two real roots, =0 one, <0 no real roots
Log Rules	log(AB)=logA+logB | log(A/B)=logA-logB | log(A^n)=n·logA
Arithmetic Seq	a_n = a_1 + (n-1)d
Geometric Sum	S_n = a_1(1-r^n)/(1-r)
Pythagorean Thm	a²+b²=c² (c = hypotenuse)
Interior Angles	Sum = (n-2)×180°
Arc Length	(θ/360°)×2πr
30-60-90 Triangle	sides: x : x√3 : 2x
Volume of Cone	V = (1/3)πr²h

ALGEBRA 2

Questions 1-10

Q 01

Quadratic Formula

■ MEMORY KEY: x = (-b +/- sqrt(b^2-4ac)) / 2a — plug in a, b, c from ax^2+bx+c=0

Example: Solve x^2 - 5x + 6 = 0. Here a=1, b=-5, c=6. Discriminant = 25-24=1. So x = (5+/-1)/2, giving x=3 or x=2.

Solve: 2x^2 + 3x - 2 = 0

A	x = 1/2 and x = -2
B	x = 2 and x = 1/2
C	x = -1 and x = 3
D	x = 1 and x = -3/2

Work space / Notes:

Q 02

Discriminant & Nature of Roots

■ MEMORY KEY: b^2 - 4ac: Positive = 2 real roots | Zero = 1 repeated root | Negative = no real roots

Watch out! "No real roots" does NOT mean "no roots." Complex roots always exist — they just don't appear on the number line. Compute the discriminant FIRST before solving.

How many real solutions does 3x^2 - 4x + 5 = 0 have?

A	Two distinct real solutions
B	One real solution (repeated)
C	No real solutions
D	Infinitely many solutions

Work space / Notes:

Q 03

Logarithm Properties

■ MEMORY KEY: log(AB) = logA + logB | log(A/B) = logA - logB | log(A^n) = n*logA

WRONG: log(A+B) = logA + logB. The product rule ONLY works for multiplication INSIDE the log.

Simplify: log base 2 of 48 minus log base 2 of 3

A	4
B	log_2(45)
C	16
D	8

Work space / Notes:

Q 04

Complex Numbers — Multiplication

■ MEMORY KEY: Use FOIL, then replace i^2 with -1. Cycle: i, -1, -i, 1, i, ... (period 4)

Multiplying complex numbers uses FOIL just like polynomials. But ALWAYS replace i^2 = -1 at the very end!

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

A	11 - 10i
B	3 - 10i
C	11 + 10i
D	-5 - 10i

Work space / Notes:

Q 05

Systems of Equations — Substitution

■ MEMORY KEY: Isolate one variable → Substitute → Solve → Back-substitute. Always CHECK both equations!

Always plug your answer BACK IN to verify both equations. Satisfying only one equation is not enough!

Solve the system: y = 2x + 1 and 3x + y = 16

A	x=3, y=7
B	x=5, y=11
C	x=4, y=9

D	x=2, y=5

Work space / Notes:

Q 06

Arithmetic Sequences

■ MEMORY KEY: a_n = a_1 + (n-1)d → "First plus common difference times (n minus one)"

It uses (n-1), NOT n! The first term already exists, so you only add d exactly (n-1) more times.

Find the 20th term of the sequence: 5, 9, 13, 17, ...

A	80
B	81
C	76
D	85

Work space / Notes:

Q 07

Geometric Sequences — Sum

■ MEMORY KEY: S_n = a_1(1 - r^n) / (1 - r) when r is not equal to 1

The sum formula uses r^n (not r^(n-1)). Students often mix these up!

Find the sum of the first 5 terms: 2, 6, 18, 54, ...

A	242
B	240
C	244
D	162

Work space / Notes:

Q 08

Vertex Form of a Parabola

■ MEMORY KEY: y = a(x - h)^2 + k → vertex = (h, k). BEWARE: the sign of h FLIPS!

Most common mistake: For y = (x-3)^2 + 2, students say vertex is (-3, 2). It's (3, 2). The h value has a hidden sign flip!

What is the vertex of y = -2(x + 4)^2 - 1 ?

A	(4, -1)
B	(-4, -1)
C	(-4, 1)
D	(4, 1)

Work space / Notes:

Q 09

Exponential Equations — Same Base

> ■ MEMORY KEY: Same base on both sides? Set the exponents EQUAL. Hint: 4 = 2^2, 8 = 2^3

Key insight: if b^m = b^n, then m = n. Rewrite everything in the same base first!

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

A	x = 3
B	x = 5
C	x = 7
D	x = 2

Work space / Notes:

Q 10

Rational Expressions — Simplify

> ■ MEMORY KEY: Factor FIRST, then cancel FACTORS (never terms). Always note excluded values (where denominator = 0).

Biggest mistake: cancelling terms instead of factors. ALWAYS fully factor numerator and denominator before cancelling anything.

Simplify: (x^2 - 9) / (x^2 - x - 6)

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

Work space / Notes:

GEOMETRY

Questions
G1-G10

G 01

Pythagorean Theorem

■ MEMORY KEY: a^2 + b^2 = c^2 — c is ALWAYS the hypotenuse (opposite the right angle)

Identify the RIGHT ANGLE first. The hypotenuse is the side OPPOSITE the right angle, not just any long side.

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

A	25
B	sqrt(527)
C	26
D	31

Work space / Notes:

G 02

Interior Angles of Polygons

■ MEMORY KEY: Sum of interior angles = (n - 2) x 180 degrees. Each angle of regular polygon = sum / n

Use (n-2), NOT n! Any polygon can be cut into (n-2) triangles — that is where the formula comes from.

What is the measure of ONE interior angle of a regular hexagon?

A	108 degrees
B	120 degrees
C	135 degrees
D	144 degrees

Work space / Notes:

G 03

Arc Length

■ MEMORY KEY: Arc length = (theta / 360) x 2 x pi x r — "fraction of full circle times circumference"

*Arc LENGTH uses 2*pi*r (circumference). Arc AREA (sector) uses pi*r^2. Do NOT swap these!*

A circle has radius 9. Find the arc length for a central angle of 80 degrees. Leave answer in terms of pi.

A	2 pi
B	4 pi
C	3 pi
D	6 pi

Work space / Notes:

G 04

Similar Triangles

■ MEMORY KEY: Similar = same angles + proportional sides. Match CORRESPONDING sides and cross-multiply.

Always match CORRESPONDING sides! Wrong pairing = completely wrong answer. Check the order of the triangle names.

Triangles ABC and DEF are similar. If AB = 6, BC = 9, and DE = 10, find EF.

A	12
B	13
C	15
D	14

Work space / Notes:

G 05

Midpoint Formula

■ MEMORY KEY: Midpoint = ((x1+x2)/2 , (y1+y2)/2) — Average the x-values and average the y-values.

Sneaky type: given one endpoint AND the midpoint, you must find the OTHER endpoint. Set up midpoint formula and solve for the unknown.

Midpoint of PQ is M(3, -1). If P = (7, 5), find Q.

A	(-1, -7)

B	(5, 3)
C	(-1, 3)
D	(1, -5)

Work space / Notes:

G 06

Volume of a Cone

■ MEMORY KEY: V = (1/3) x pi x r^2 x h — Cone = exactly one-third of the cylinder with same base and height

*Do NOT forget the 1/3! Writing pi*r^2*h gives the volume of a CYLINDER, not a cone.*

Find the volume of a cone with radius 6 and height 10. Leave in terms of pi.

A	120 pi
B	360 pi
C	60 pi
D	90 pi

Work space / Notes:

G 07

Inscribed Angle Theorem

■ MEMORY KEY: Inscribed angle = HALF the intercepted arc. Central angle = the arc itself (same measure).

Students confuse: Central angle EQUALS the arc. Inscribed angle = HALF the arc. They are NOT equal!

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

A	140 degrees
B	280 degrees
C	70 degrees
D	35 degrees

Work space / Notes:

G 08

Triangle Congruence (SSS, SAS, ASA, AAS)

■ MEMORY KEY: SSS, SAS, ASA, AAS = CONGRUENT. SSA and AAA = NOT sufficient for congruence.

SSA (two sides + non-included angle) does NOT guarantee congruence. AAA only proves SIMILARITY. Neither proves congruence.

Two triangles share two angles (45 deg and 80 deg) and the side BETWEEN those angles is equal. Which rule applies?

A	SSS
B	SAS
C	ASA
D	AAA

Work space / Notes:

G 09

Distance Formula

■ MEMORY KEY: d = sqrt((x2-x1)^2 + (y2-y1)^2) — Square the differences, add them, take square root.

It does not matter which point you call (x1,y1) since you square the difference. But do NOT forget the square root at the end!

Find the distance between A(-3, 2) and B(5, -4).

A	10
B	sqrt(72)
C	sqrt(92)
D	8

Work space / Notes:

G 10

30-60-90 Special Right Triangle

■ MEMORY KEY: Sides ratio: x : x*sqrt(3) : 2x (short 30-deg leg : long 60-deg leg : hypotenuse)

*Hypotenuse is ALWAYS 2x. Long leg (opposite 60 deg) is x*sqrt(3). Short leg (opposite 30 deg) is x. Know which is which!*

In a 30-60-90 triangle, the hypotenuse is 14. Find the shorter leg.

A	7*sqrt(3)
B	14*sqrt(3)
C	7
D	14/sqrt(3)

Work space / Notes:

ANSWER KEY

Algebra 2

Algebra 2

Q#	Answer	Brief Explanation
Q01	A	2x^2+3x-2=0 → x=(-3±5)/4 → x=1/2 or x=-2
Q02	C	Discriminant = 16-60 = -44 < 0 → no real solutions
Q03	A	log_2(48/3) = log_2(16) = 4
Q04	A	(3+2i)(1-4i) = 3-12i+2i-8i^2 = 3-10i+8 = 11-10i
Q05	A	Substitute y=2x+1 into 3x+y=16 → 5x=15 → x=3, y=7
Q06	B	a_20 = 5 + 19×4 = 5 + 76 = 81
Q07	A	S_5 = 2(1-3^5)/(1-3) = 2(-242)/(-2) = 242
Q08	B	y=-2(x-(-4))^2+(-1) → vertex = (-4, -1)
Q09	B	2^(2x+2) = 2^(3x-3) → 2x+2=3x-3 → x=5
Q10	A	(x+3)(x-3)/[(x-3)(x+2)] = (x+3)/(x+2), x≠3

Geometry

Q#	Answer	Brief Explanation
G01	A	c^2 = 49+576=625 → c=25 (7-24-25 triple)
G02	B	(6-2)×180=720 → 720/6=120 degrees
G03	B	(80/360)×2π(9) = (2/9)×18π = 4π
G04	C	6/10 = 9/EF → EF = 90/6 = 15
G05	A	(7+x)/2=3→x=-1 ; (5+y)/2=-1→y=-7 → Q=(-1,-7)
G06	A	(1/3)π(36)(10) = 360π/3 = 120π
G07	C	Inscribed angle = (1/2)×140 = 70 degrees
G08	C	Two angles + included side = ASA
G09	A	sqrt((5-(-3))^2+(-4-2)^2)=sqrt(64+36)=sqrt(100)=10

G10	**C**	2x=14 → x=7 → shorter leg = 7