

Math Power Worksheet

Algebra 2 (10 Problems) + Geometry (10 Problems)

Korean Students — Most Tested Topics

Instructions: For each problem, read the concept and formula. Then answer all 3 steps. Show all work in the space provided. Circle your answer.

Name: _____ Date: _____ Score: _____ / 20

Q1 [Algebra 2] Quadratic Formula

Concept: The Quadratic Formula solves $ax^2 + bx + c = 0$. | Key Formula: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ | Discriminant = $b^2 - 4ac$

Step 1: What is the discriminant of $x^2 - 5x + 6 = 0$?

A) 1 B) 49 C) 11 D) -24

Work space:

Step 2: Solve $x^2 - 5x + 6 = 0$. What are the roots?

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

Work space:

Step 3: How many real solutions does $3x^2 + x + 2 = 0$ have?

A) 0 real solutions B) 1 real solution C) 2 real solutions D) 3 real solutions

Work space:

Q2 [Algebra 2] Polynomial Factoring

Concept: GCF first, then difference of squares: $a^2 - b^2 = (a+b)(a-b)$, or trinomial factoring. | Key Formula: $a^2 - b^2 = (a+b)(a-b)$
| $a^3 + b^3 = (a+b)(a^2 - ab + b^2)$

Step 1: Factor completely: $x^2 - 9$

A) $(x-3)(x+3)$ B) $(x-3)^2$ C) $(x+3)^2$ D) $(x-9)(x+1)$

Work space:

Step 2: Factor: $2x^2 + 7x + 3$

- A) $(2x+1)(x+3)$ B) $(2x+3)(x+1)$ C) $(x+7)(2x+3)$ D) $(2x-1)(x-3)$

Work space:

Step 3: Fully factored form of $3x^3 - 12x$?

- A) $3x(x^2-4)$ B) $3x(x-2)(x+2)$ C) $3(x^2-4x)$ D) $x(3x^2-12)$

Work space:

Q3 [Algebra 2] Complex Numbers

Concept: $i = \sqrt{-1}$, $i^2 = -1$. Cycle: $i^1=i$, $i^2=-1$, $i^3=-i$, $i^4=1$. | Key Formula: $i^2 = -1$ | $(a+bi)(c+di) = (ac-bd) + (ad+bc)i$

Step 1: What is i^{23} ?

- A) i B) $-i$ C) 1 D) -1

Work space:

Step 2: Simplify $(3+2i) + (1-5i)$

- A) $4-3i$ B) $2+7i$ C) $4+7i$ D) $2-3i$

Work space:

Step 3: Simplify $(2-i)(3+4i)$

- A) $10+5i$ B) $6-4i$ C) $6+4i$ D) $10-5i$

Work space:

Q4 [Algebra 2] Logarithms

Concept: $\log_a(xy) = \log_a(x) + \log_a(y)$ | $\log_a(x/y) = \log_a(x) - \log_a(y)$ | $\log_a(x^n) = n \log_a(x)$ | Key Formula: $\log_a(b) = c \iff a^c = b$

Step 1: Evaluate $\log_3(81)$

- A) 4 B) 3 C) 9 D) 27

Work space:

Step 2: Expand $\log_2(8x^3)$

- A) $3+3\log_2(x)$ B) $3\log_2(8x)$ C) $8+3x$ D) $\log_2(8)+\log_2(3)+\log x$

Work space:

Step 3: Solve $\log_5(x) + \log_5(x-4) = 1$

- A) $x=5$ B) $x=1$ C) $x=-1$ D) $x=4$

Work space:

Q5 [Algebra 2] Rational Expressions

Concept: Domain: denominator $\neq 0$. Simplify by factoring and canceling common factors. | Key Formula: $(a/b) / (c/d) = (a/b) \cdot (d/c)$

Step 1: Excluded value of $(x+3)/(x^2-4)$?

- A) $x = +/-2$ B) $x = -3$ C) $x = 4$ D) $x = 0$

Work space:

Step 2: Simplify $(x^2-9)/(x^2+5x+6)$

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

Work space:

Step 3: Simplify $(2/x) + (3/(x+1))$

- A) $(5x+2)/(x(x+1))$ B) $5/(2x+1)$ C) $(5x+2)/(x+1)$ D) $(2x+5)/(x(x+1))$

Work space:

Q6 [Algebra 2] Exponential Functions

Concept: $f(x) = a \cdot b^x$. Growth: $b > 1$. Decay: $0 < b < 1$. Compound: $A = P(1+r/n)^{nt}$. | Key Formula: $f(x) = a \cdot b^x$ | $A = P(1+r/n)^{nt}$

Step 1: Which function represents DECAY?

- A) $f(x)=0.7^x$ B) $f(x)=1.3^x$ C) $f(x)=2^x$ D) $f(x)=(4/3)^x$

Work space:

Step 2: y-intercept of $f(x) = 3 \cdot 2^x$?

- A) 3 B) 2 C) 6 D) 1

Work space:

Step 3: Solve $4^x = 32$

- A) $x = 5/2$ B) $x = 2$ C) $x = 8$ D) $x = 3$

Work space:

Q7 [Algebra 2] Systems of Equations

Concept: Methods: Substitution, Elimination, Matrix. Solutions: 1 (intersect), 0 (parallel), infinite (same line). | Key Formula:
Substitution: isolate one variable; Elimination: add/subtract equations

Step 1: Solve: $y=2x-1$ and $3x+y=9$

- A) (2,3) B) (1,1) C) (3,5) D) (0,-1)

Work space:

Step 2: Solutions of $2x+4y=6$ and $x+2y=4$?

- A) No solution B) One solution C) Infinite solutions D) Two solutions

Work space:

Step 3: Solve: $3x+2y=12$ and $x-2y=4$

- A) (4,0) B) (2,3) C) (3,1.5) D) (0,6)

Work space:

Q8 [Algebra 2] Radical Expressions

Concept: $\sqrt{ab}=\sqrt{a} \cdot \sqrt{b}$. Rationalize denominators using conjugate. | Key Formula: $a^{(m/n)} = \text{nth_root}(a^m)$ |
Rationalize: multiply by conjugate

Step 1: Simplify $\sqrt{72}$

- A) $6\sqrt{2}$ B) $4\sqrt{3}$ C) $3\sqrt{8}$ D) $2\sqrt{18}$

Work space:

Step 2: Simplify $\sqrt{27} + 2\sqrt{3}$

- A) $5\sqrt{3}$ B) $3\sqrt{3}$ C) $2\sqrt{6}$ D) $\sqrt{30}$

Work space:

Step 3: Rationalize $\frac{6}{\sqrt{5}-1}$

- A) $\frac{3\sqrt{5}+3}{2}$ B) $6\sqrt{5}-6$ C) $3(\sqrt{5}+1)/2$ D) $6/(\sqrt{5}+1)$

Work space:

Q9 [Algebra 2] Arithmetic Sequences & Series

Concept: Arithmetic: $a_n = a_1 + (n-1)d$. Sum: $S_n = n(a_1+a_n)/2$. Geometric: $a_n = a_1 \cdot r^{(n-1)}$. | Key Formula: $a_n = a_1 + (n-1)d$ | $S_n = n(a_1+a_n)/2$

Step 1: In 5, 8, 11, 14..., what is the 20th term?

- A) 62 B) 59 C) 65 D) 56

Work space:

Step 2: Sum of first 10 terms of 2, 5, 8, 11...?

- A) 155 B) 120 C) 140 D) 95

Work space:

Step 3: Geometric sequence 3, 6, 12... What is the 6th term?

- A) 96 B) 48 C) 192 D) 72

Work space:

Q10 [Algebra 2] Function Transformations

Concept: $f(x)+k$: shift up k . $f(x+h)$: shift left h . $-f(x)$: reflect x -axis. $a \cdot f(x)$: vertical stretch. | Key Formula: $y = a \cdot f(x-h) + k$ (vertex form / transformation form)

Step 1: Vertex of $y = (x-2)^2 + 5$?

- A) (2,5) B) (-2,5) C) (5,2) D) (2,-5)

Work space:

Step 2: How does $y = f(x+3)$ transform $f(x)$?

- A) Shifts left 3 B) Shifts right 3 C) Shifts up 3 D) Shifts down 3

Work space:

Step 3: $f(x)=x^2$. What is $g(x) = -f(x-1)+4$?

- A) $g(x)=-x^2+4$ B) $g(x)=(x+1)^2+4$ C) $g(x)=-x^2-4$ D) $g(x)=(x-1)^2-4$

Work space:

Q11 [Geometry] Triangle Congruence

Concept: Congruence: SSS, SAS, ASA, AAS, HL. Note: SSA and AAA do NOT guarantee congruence. | Key Formula: SSS | SAS | ASA | AAS | HL (right triangles only)

Step 1: All three sides equal. What congruence postulate?

- A) SSS B) SAS C) ASA D) AAS

Work space:

Step 2: Which is NOT a valid congruence shortcut?

- A) SSA B) SAS C) ASA D) AAS

Work space:

Step 3: Right triangles with equal hypotenuse and one leg. Which postulate?

- A) HL B) SSA C) AAS D) AAA

Work space:

Q12 [Geometry] Circle Theorems

Concept: Inscribed angle = half central angle. Tangent is perpendicular to radius. Opposite angles in cyclic quad = 180 degrees. | Key Formula: Inscribed angle = $(1/2) * \text{intercepted arc}$

Step 1: Inscribed angle intercepts arc of 140 degrees. Find the inscribed angle.

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

Work space:

Step 2: Tangent and radius at point of tangency. Angle formed?

- A) 90 degrees B) 45 degrees C) 180 degrees D) 60 degrees

Work space:

Step 3: Cyclic quadrilateral, one angle = 75 degrees. Opposite angle?

- A) 105 degrees B) 75 degrees C) 90 degrees D) 285 degrees

Work space:

Q13 [Geometry] Pythagorean Theorem

Concept: $a^2 + b^2 = c^2$. Special: 45-45-90 ($1:1:\sqrt{2}$), 30-60-90 ($1:\sqrt{3}:2$). Triples: 3-4-5, 5-12-13. | Key Formula: $a^2 + b^2 = c^2$ | 45-45-90: sides = $x, x, x\sqrt{2}$

Step 1: Right triangle legs 5 and 12. Find hypotenuse.

- A) 13 B) 15 C) 17 D) 11

Work space:

Step 2: 45-45-90 triangle, leg = 7. Find hypotenuse.

- A) $7\sqrt{2}$ B) 14 C) $7\sqrt{3}$ D) $7/\sqrt{2}$

Work space:

Step 3: 30-60-90 triangle, short leg = 5. Find longest side.

- A) 10 B) $5\sqrt{3}$ C) $5\sqrt{2}$ D) 15

Work space:

Q14 [Geometry] Area & Perimeter

Concept: Rectangle: $A=lw$. Triangle: $A=(1/2)bh$. Circle: $A=\pi r^2$, $C=2\pi r$. Trapezoid: $A=(1/2)(b_1+b_2)h$. | Key Formula: Circle: $A = \pi r^2$, $C = 2\pi r$ | Trapezoid: $A = (1/2)(b_1+b_2)h$

Step 1: Circle with circumference 14π . Find radius.

- A) 7 B) 14 C) 28 D) 7π

Work space:

Step 2: Trapezoid with bases 8 and 12, height 5. Find area.

- A) 50 B) 60 C) 40 D) 100

Work space:

Step 3: Square with area 144. Find perimeter.

- A) 48 B) 36 C) 24 D) 72

Work space:

Q15 [Geometry] Similarity & Proportions

Concept: Similar triangles: AA, SAS~, SSS~. Area ratio = (side ratio)². Volume ratio = (side ratio)³. | Key Formula: $a/d = b/e = c/f$ | Area ratio = (scale factor)²

Step 1: Minimum info to prove triangles similar by AA?

- A) 2 pairs of equal angles B) 3 pairs of equal sides C) 2 sides proportional D) 1 angle and 1 side

Work space:

Step 2: Triangle ABC ~ DEF. AB=6, DE=9, AC=4. Find DF.

- A) 6 B) 9 C) 3 D) 12

Work space:

Step 3: Similar triangles, sides ratio 2:5. Small area=8. Find large area.

- A) 50 B) 20 C) 40 D) 25

Work space:

Q16 [Geometry] Volume & Surface Area

Concept: Cylinder: $V = \pi r^2 h$. Cone: $V = \frac{1}{3} \pi r^2 h$. Sphere: $V = \frac{4}{3} \pi r^3$, $SA = 4 \pi r^2$. | Key Formula: Cone: $V = \frac{1}{3} \pi r^2 h$ | Sphere: $SA = 4 \pi r^2$

Step 1: Cone: radius=3, height=4. Find volume (use pi).

- A) 12π B) 36π C) 48π D) 9π

Work space:

Step 2: Sphere radius=3. Find surface area.

- A) 36π B) 12π C) 36 D) 9π

Work space:

Step 3: Similar cylinders with radii 2 and 6. Ratio of volumes?

- A) 1:27 B) 1:9 C) 1:3 D) 1:6

Work space:

Q17 [Geometry] Angle Relationships

Concept: Complementary=90 degrees. Supplementary=180 degrees. Vertical angles equal. Alt. interior (parallel lines) equal. Exterior angle = sum of non-adjacent interior. | Key Formula: Exterior angle of triangle = sum of two non-adjacent interior angles

Step 1: Supplementary angles. One = 73 degrees. Find the other.

- A) 107 degrees B) 17 degrees C) 117 degrees D) 287 degrees

Work space:

Step 2: Triangle with angles 45 and 65 degrees. Exterior angle at third vertex?

- A) 110 degrees B) 70 degrees C) 180 degrees D) 250 degrees

Work space:

Step 3: Each interior angle of a regular hexagon?

- A) 120 degrees B) 108 degrees C) 60 degrees D) 135 degrees

Work space:

Q18 [Geometry] Coordinate Geometry

Concept: Distance: $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$. Midpoint: $M = ((x_1 + x_2)/2, (y_1 + y_2)/2)$. Perpendicular: slopes are negative reciprocals. | Key Formula: $d = \sqrt{(\Delta x)^2 + (\Delta y)^2}$ | $m_{\text{perp}} = -1/m$

Step 1: Distance from (0,0) to (3,4).

- A) 5 B) 7 C) 12 D) 4

Work space:

Step 2: Midpoint of (-2, 6) and (4, -2).

- A) (1, 2) B) (2, 4) C) (0, 2) D) (1, 4)

Work space:

Step 3: Line with slope 3. Perpendicular slope?

- A) -1/3 B) 1/3 C) -3 D) 3

Work space:

Q19 [Geometry] Trigonometric Ratios

Concept: SOH-CAH-TOA: $\sin = \text{opp}/\text{hyp}$, $\cos = \text{adj}/\text{hyp}$, $\tan = \text{opp}/\text{adj}$. Key: $\sin 30 = 1/2$, $\cos 60 = 1/2$, $\tan 45 = 1$. | Key Formula: $\sin(\theta) = \text{opp}/\text{hyp}$ | $\cos(\theta) = \text{adj}/\text{hyp}$ | $\tan(\theta) = \text{opp}/\text{adj}$

Step 1: Right triangle, opp=3, hyp=5. Find sin(theta).

- A) 3/5 B) 4/5 C) 3/4 D) 5/3

Work space:

Step 2: What is tan(45 degrees)?

- A) 1 B) $\sqrt{2}$ C) $\sqrt{3}/2$ D) 1/2

Work space:

Step 3: Right triangle, adj=8, hyp=17. Find cos(theta).

- A) 8/17 B) 15/17 C) 8/15 D) 17/8

Work space:

Q20 [Geometry] Transformations

Concept: Translation: $(x+a, y+b)$. Reflect x-axis: $(x,-y)$. Reflect y-axis: $(-x,y)$. Rotate 90 CCW: $(-y,x)$. Rotate 180: $(-x,-y)$. | Key
Formula: Rotation 90 degrees CCW: $(x, y) \rightarrow (-y, x)$

Step 1: Translate $(2,-3)$ by vector $(-1,4)$.

- A) $(1,1)$ B) $(3,-7)$ C) $(-1,4)$ D) $(2,4)$

Work space:

Step 2: Reflect $(-3, 5)$ over the y-axis.

- A) $(3, 5)$ B) $(-3, -5)$ C) $(5, -3)$ D) $(-5, 3)$

Work space:

Step 3: Rotate $(4,-2)$ by 90 degrees counterclockwise.

- A) $(2, 4)$ B) $(-2, 4)$ C) $(-4, 2)$ D) $(2, -4)$

Work space:

Answer Key

Q#	Title	Step 1	Step 2	Step 3
1	Quadratic Formula	A) 1	A) $x=2, x=3$	A) 0 real solutions
2	Polynomial Factoring	A) $(x-3)(x+3)$	A) $(2x+1)(x+3)$	B) $3x(x-2)(x+2)$
3	Complex Numbers	B) $-i$	A) $4-3i$	A) $10+5i$
4	Logarithms	A) 4	A) $3+3*\log_2(x)$	A) $x=5$
5	Rational Expressions	A) $x = +/-2$	A) $(x-3)/(x+2)$	A) $(5x+2)/(x(x+1))$

6	Exponential Functions	A) $f(x)=0.7^x$	A) 3	A) $x = 5/2$
7	Systems of Equations	A) (2,3)	A) No solution	A) (4,0)
8	Radical Expressions	A) $6\sqrt{2}$	A) $5\sqrt{3}$	C) $3(\sqrt{5}+1)/2$
9	Arithmetic Sequences & Series	A) 62	A) 155	A) 96
10	Function Transformations	A) (2,5)	A) Shifts left 3	A) $g(x)=-(x-1)^2+4$
11	Triangle Congruence	A) SSS	A) SSA	A) HL
12	Circle Theorems	A) 70 degrees	A) 90 degrees	A) 105 degrees
13	Pythagorean Theorem	A) 13	A) $7\sqrt{2}$	A) 10
14	Area & Perimeter	A) 7	A) 50	A) 48
15	Similarity & Proportions	A) 2 pairs of equal angles	A) 6	A) 50
16	Volume & Surface Area	A) 12π	A) 36π	A) 1:27
17	Angle Relationships	A) 107 degrees	A) 110 degrees	A) 120 degrees
18	Coordinate Geometry	A) 5	A) (1, 2)	A) $-1/3$
19	Trigonometric Ratios	A) $3/5$	A) 1	A) $8/17$
20	Transformations	A) (1,1)	A) (3, 5)	A) (2, 4)