# Math Practice Worksheet

Algebra & Geometry — Korean Students' Top Challenges

Name: _____ Date: _____ Score: _____ / 20

Instructions: For each problem, read the concept, study the worked example, then answer all 3 questions. Circle your answer.

## ■ Q1. Solving Linear Equations | Linear Equations

**■ Concept:**

A linear equation has the variable at degree 1. To solve: isolate the variable by doing the same operation on both sides.

**Formula / Key Rule: ax + b = c => x = (c - b) / a**

**■ Worked Example:**

**Q: Solve: 3x + 7 = 22**

➤ Step 1: Subtract 7 from both sides: 3x = 15

➤ Step 2: Divide by 3: x = 5

**■ Your Turn — Answer all 3 questions below:**

### Question 1: Q1: Solve for x: 2x - 5 = 11

■ A) x = 3

■ B) x = 6

■ C) x = 8

■ D) x = 5

Answer: C | Explanation: 2x = 16, x = 8

### Question 2: Q2: Solve: 5x + 3 = 3x + 11

■ A) x = 4

■ B) x = 7

■ C) x = 2

■ D) x = 6

Answer: A | Explanation: 2x = 8, x = 4

### Question 3: Q3: If (x+3)/2 = 7, find x

■ A) x = 11

■ B) x = 10

■ C) x = 14

■ D) x = 8

Answer: A | Explanation: x+3=14, x=11

Work Space:

## ■ Q2. Systems of Linear Equations | Systems of Equations

■ Concept:

A system of equations: find values satisfying ALL equations simultaneously. Use substitution or elimination.

```
Formula / Key Rule: Elimination: add/subtract equations to cancel a variable.
```

■ Worked Example:

**Q: Solve: x + y = 10 and x - y = 4**

➤ Step 1: Add equations: 2x = 14, x = 7
➤ Step 2: Substitute: y = 3

■ Your Turn — Answer all 3 questions below:

**Question 1: Q1: Solve: 2x+y=9 and x-y=3**

■ A) x=4,y=1
■ B) x=3,y=3
■ C) x=2,y=5
■ D) x=5,y=2

Answer: A | Explanation: Add: 3x=12, x=4; y=1

**Question 2: Q2: If 3x+2y=16 and x=2, find y**

■ A) y=4
■ B) y=5
■ C) y=6
■ D) y=7

Answer: B | Explanation: 6+2y=16, y=5

**Question 3: Q3: y=2x+1 and y=2x-3: how many solutions?**

■ A) One
■ B) Two
■ C) Infinite
■ D) No solution

Answer: D | Explanation: Parallel lines, no intersection

Work Space:

## ■ Q3. Factoring Quadratics | Factoring

■ Concept:

Factor x^2 + bx + c = (x+p)(x+q) where p*q = c and p+q = b.

```
Formula / Key Rule: x^2 + bx + c = (x+p)(x+q) where pq=c, p+q=b
```

■ **Worked Example:**

**Q: Factor: x^2 + 7x + 12**

➤ Find two numbers: 3 x 4 = 12 and 3 + 4 = 7
➤ Answer: (x+3)(x+4)

■ **Your Turn — Answer all 3 questions below:**

**Question 1: Q1: Factor: x^2 + 5x + 6**

■ A) (x+1)(x+6)
■ B) (x+2)(x+3)
■ C) (x+4)(x+2)
■ D) (x+5)(x+1)

Answer: B | Explanation: 2x4=8? No, 2x3=6, 2+3=5 ✓

**Question 2: Q2: Solutions of x^2 - 5x + 6 = 0?**

■ A) x=1,6
■ B) x=-2,-3
■ C) x=2,3
■ D) x=5,1

Answer: C | Explanation: (x-2)(x-3)=0

**Question 3: Q3: Factor x^2 - x - 12**

■ A) (x-4)(x+3)
■ B) (x+4)(x-3)
■ C) (x-6)(x+2)
■ D) (x+6)(x-2)

Answer: A | Explanation: (-4)(3)=-12, -4+3=-1 ✓

Work Space:

## ■ Q4. Quadratic Formula | Quadratic Equations

■ **Concept:**

The quadratic formula solves ax^2+bx+c=0. The discriminant b^2-4ac tells the number of real solutions.

```
Formula / Key Rule: x = (-b +/- sqrt(b^2 - 4ac)) / (2a)
```

■ **Worked Example:**

**Q: Solve: x^2 - 3x - 4 = 0**

➤ a=1, b=-3, c=-4
➤ x = (3 +/- sqrt(9+16))/2 = (3 +/- 5)/2
➤ x = 4 or x = -1

■ **Your Turn — Answer all 3 questions below:**

**Question 1: Q1: Discriminant of 2x^2 - 4x + 2 = 0?**

■ A) 0

■ B) 8
■ C) 16
■ D) -8

Answer: A | Explanation: 16 - 4(2)(2) = 0

### Question 2: Q2: Solve x^2 - 6x + 5 = 0

■ A) x=1,5
■ B) x=2,3
■ C) x=-1,-5
■ D) x=3,2

Answer: A | Explanation: x=(6+-4)/2 = 5 or 1

### Question 3: Q3: How many real solutions: x^2+x+1=0?

■ A) Two
■ B) One
■ C) None
■ D) Infinite

Answer: C | Explanation: 1-4=-3 < 0, no real solutions

Work Space:

## ■ Q5. Slope and Linear Functions | Functions & Slope

■ **Concept:**

Slope = rise/run = (y2-y1)/(x2-x1). In y=mx+b: m is slope, b is y-intercept.

```
Formula / Key Rule: m = (y2 - y1)/(x2 - x1) ; y = mx + b
```

■ **Worked Example:**

**Q: Find the slope between (1,3) and (4,9)**

➤ m = (9-3)/(4-1) = 6/3 = 2

■ **Your Turn — Answer all 3 questions below:**

### Question 1: Q1: Slope through (2,4) and (6,12)?

■ A) 1
■ B) 2
■ C) 3
■ D) 4

Answer: B | Explanation: (12-4)/(6-2)=8/4=2

### Question 2: Q2: y-intercept of y=3x-7?

■ A) 3
■ B) 7
■ C) -7

■ D) -3

Answer: C | Explanation: b = -7

### Question 3: Q3: Line parallel to slope 2/3 has slope?

■ A) -3/2
■ B) 3/2
■ C) 2/3
■ D) -2/3

Answer: C | Explanation: Parallel lines have equal slopes

Work Space:

## ■ Q6. Inequalities | Linear Inequalities

■ Concept:

Solve like equations BUT flip the sign when multiplying/dividing by a NEGATIVE number!

```
Formula / Key Rule: If a > b and c < 0, then ac < bc (flip!)
```

■ Worked Example:

**Q: Solve: -3x + 1 > 7**

➤ Subtract 1: -3x > 6
➤ Divide by -3 (FLIP!): x < -2

■ Your Turn — Answer all 3 questions below:

### Question 1: Q1: Solve: -2x + 5 >= 11

■ A) x>=-3
■ B) x<=-3
■ C) x>=3
■ D) x<=3

Answer: B | Explanation: -2x>=6 => x<=-3 (flip!)

### Question 2: Q2: Which satisfies 3x-4 < 2x+1?

■ A) x=6
■ B) x=5
■ C) x=4
■ D) x=3

Answer: D | Explanation: x<5, only x=3 works

### Question 3: Q3: Solve: -1 <= 2x+3 <= 9

■ A) -2<=x<=3
■ B) -2<=x<=6
■ C) 1<=x<=3
■ D) 0<=x<=3

Answer: A | Explanation: Subtract 3, divide by 2

Work Space:

## ■ Q7. Exponent Rules | Exponents

■ Concept:

Key rules: a^m * a^n = a^(m+n); a^m/a^n = a^(m-n); (a^m)^n = a^(mn); a^(-n) = 1/a^n

```
Formula / Key Rule: a^m * a^n = a^(m+n) | (a^m)^n = a^(mn) | a^(-n) = 1/a^n
```

■ Worked Example:

**Q: Simplify: (2x^3)^2 * x^(-1)**

➤ (2x^3)^2 = 4x^6

➤ 4x^6 * x^(-1) = 4x^5

■ Your Turn — Answer all 3 questions below:

### Question 1: Q1: Simplify: (x^5 * x^3)/x^4

■ A) x^4

■ B) x^6

■ C) x^2

■ D) x^8

Answer: A | Explanation: x^(5+3-4) = x^4

### Question 2: Q2: Value of 2^(-3)?

■ A) -8

■ B) -6

■ C) 1/8

■ D) 1/6

Answer: C | Explanation: 2^(-3) = 1/8

### Question 3: Q3: Simplify: (3x^2 y)^3

■ A) 9x^6y^3

■ B) 27x^6y^3

■ C) 27x^5y^3

■ D) 9x^5y

Answer: B | Explanation: 27 * x^6 * y^3

Work Space:

## ■ Q8. Function Notation | Functions

■ Concept:

f(x) = output when input is x. To find f(3): substitute x=3 into the formula.

**Formula / Key Rule: f(a) = substitute x = a into f(x)**

■ **Worked Example:**

**Q: If f(x) = x^2 - 2x + 3, find f(4)**

➤ f(4) = 16 - 8 + 3 = 11

■ **Your Turn — Answer all 3 questions below:**

**Question 1: Q1: f(x)=3x-5, find f(4)**

■ A) 7
■ B) 12
■ C) 17
■ D) 9

Answer: A | Explanation: 3(4)-5=7

**Question 2: Q2: g(x)=x^2+1, find g(-3)**

■ A) -8
■ B) 8
■ C) 10
■ D) -10

Answer: C | Explanation: 9+1=10

**Question 3: Q3: f(x)=2x^2-x, f(a)=6, find a**

■ A) a=2
■ B) a=4
■ C) a=3
■ D) a=1

Answer: A | Explanation: 2(4)-2=6 ✓

Work Space:

## ■ Q9. Polynomials — FOIL | Polynomials

■ **Concept:**

FOIL: First, Outer, Inner, Last. Note: (a+b)^2 = a^2 + 2ab + b^2 (NOT just a^2+b^2)!

**Formula / Key Rule: (a+b)(c+d) = ac + ad + bc + bd**

■ **Worked Example:**

**Q: Expand: (x+3)(x-2)**

➤ First: x^2, Outer: -2x, Inner: 3x, Last: -6
➤ = x^2 + x - 6

■ **Your Turn — Answer all 3 questions below:**

**Question 1: Q1: Expand: (x+4)(x+2)**

■ A) x^2+8x+6
■ B) x^2+6x+8
■ C) x^2+4x+8
■ D) x^2+8

Answer: B | Explanation: x^2+2x+4x+8=x^2+6x+8

### Question 2: Q2: Expand: (x-5)^2

■ A) x^2-25
■ B) x^2-10x+25
■ C) x^2+10x+25
■ D) x^2-5x+25

Answer: B | Explanation: a^2-2ab+b^2

### Question 3: Q3: Expand: (2x+1)(3x-4)

■ A) 6x^2-5x-4
■ B) 6x^2+5x-4
■ C) 5x^2-5x-4
■ D) 6x^2-8x+3

Answer: A | Explanation: 6x^2-8x+3x-4=6x^2-5x-4

Work Space:

## ■ Q10. Proportions & Ratios | Proportions

■ Concept:

A proportion: a/b = c/d. Cross multiply: ad = bc.

```
Formula / Key Rule: a/b = c/d => ad = bc
```

■ Worked Example:

**Q: Solve: x/5 = 12/20**

➤ 20x = 60
➤ x = 3

■ Your Turn — Answer all 3 questions below:

### Question 1: Q1: Solve: x/4 = 9/12

■ A) x=2
■ B) x=3
■ C) x=4
■ D) x=6

Answer: B | Explanation: 12x=36, x=3

### Question 2: Q2: Scale 1:500, map 8cm = how far?

■ A) 400cm

■ B) 500cm
■ C) 4000cm
■ D) 4000m

Answer: C | Explanation: 8 x 500 = 4000 cm

### Question 3: Q3: 3/(x-1) = 6/(x+4), find x

■ A) x=5
■ B) x=10
■ C) x=6
■ D) x=14

Answer: C | Explanation: 3(x+4)=6(x-1), x=6

Work Space:

## ■ Q11. Pythagorean Theorem | Right Triangles

■ Concept:

In a right triangle: a^2 + b^2 = c^2, where c is the hypotenuse (longest side, opposite 90 deg).

**Formula / Key Rule: a^2 + b^2 = c^2**

■ Worked Example:

**Q: Legs 6 and 8. Find the hypotenuse.**

➤ c^2 = 36 + 64 = 100
➤ c = 10

■ Your Turn — Answer all 3 questions below:

### Question 1: Q1: Legs 5 and 12. Hypotenuse?

■ A) 13
■ B) 17
■ C) 15
■ D) 11

Answer: A | Explanation: 25+144=169=13^2

### Question 2: Q2: Hyp=10, leg=6, find other leg

■ A) 4
■ B) 6
■ C) 8
■ D) 9

Answer: C | Explanation: 100-36=64, sqrt=8

### Question 3: Q3: Is 7,24,25 a right triangle?

■ A) Yes, 7^2+24^2=25^2
■ B) No

■ C) Only if 90 deg

■ D) Cannot tell

Answer: A | Explanation: 49+576=625=25^2 ✓

Work Space:

## ■ Q12. Area of Triangles | Area

■ Concept:

Area of triangle = (1/2) x base x height. Height must be perpendicular to the base!

**Formula / Key Rule: A = (1/2) x base x height**

■ Worked Example:

**Q: Base=10, height=6. Find area.**

➤ A = (1/2)(10)(6) = 30

■ Your Turn — Answer all 3 questions below:

**Question 1: Q1: Base=14cm, height=9cm. Area?**

■ A) 63cm^2

■ B) 126cm^2

■ C) 46cm^2

■ D) 31.5cm^2

Answer: A | Explanation: (1/2)(14)(9)=63

**Question 2: Q2: Area=36, base=12. Find height.**

■ A) 3

■ B) 6

■ C) 9

■ D) 4

Answer: B | Explanation: 36=(1/2)(12)h, h=6

**Question 3: Q3: Equilateral side=4, h=2sqrt(3). Area?**

■ A) 4sqrt(3)

■ B) 8sqrt(3)

■ C) 2sqrt(3)

■ D) 6sqrt(3)

Answer: A | Explanation: (1/2)(4)(2sqrt3)=4sqrt3

Work Space:

## ■ Q13. Circle — Area & Circumference | Circles

■ Concept:

Circle formulas use pi (approx 3.14). r=radius, d=2r=diameter.

```
Formula / Key Rule: C = 2*pi*r A = pi*r^2
```

■ Worked Example:

**Q: Radius=5. Find C and A.**

➤ C = 10*pi approx 31.4

➤ A = 25*pi approx 78.5

■ Your Turn — Answer all 3 questions below:

### Question 1: Q1: Diameter=12. Area?

■ A) 36*pi

■ B) 144*pi

■ C) 12*pi

■ D) 6*pi

Answer: A | Explanation: r=6, A=pi(36)=36*pi

### Question 2: Q2: Circumference=16*pi. Radius?

■ A) 4

■ B) 8

■ C) 16

■ D) 32

Answer: B | Explanation: 2*pi*r=16*pi, r=8

### Question 3: Q3: Area=49*pi. Circumference?

■ A) 7*pi

■ B) 14*pi

■ C) 49*pi

■ D) 28*pi

Answer: B | Explanation: r=7, C=14*pi

Work Space:

## ■ Q14. Angles — Parallel Lines | Angle Relationships

■ Concept:

Transversal + parallel lines: Alternate interior = equal; Corresponding = equal; Co-interior = 180 deg.

```
Formula / Key Rule: Co-interior angles: angle A + angle B = 180 deg
```

■ Worked Example:

**Q: Alternate interior angle of 65 deg = ?**

➤ Alternate interior angles are equal = 65 deg

■ Your Turn — Answer all 3 questions below:

### Question 1: Q1: Co-interior angle is 110 deg. Other?

- ■ A) 110
- ■ B) 70
- ■ C) 80
- ■ D) 60

Answer: B | Explanation: 110+x=180, x=70

### Question 2: Q2: Corresponding: (3x+15)=90. Find x.

- ■ A) 15
- ■ B) 25
- ■ C) 30
- ■ D) 20

Answer: B | Explanation: 3x=75, x=25

### Question 3: Q3: Vertically opposite angles are:

- ■ A) Supplementary
- ■ B) Complementary
- ■ C) Equal
- ■ D) Adjacent

Answer: C | Explanation: Always equal

Work Space:

## ■ Q15. Triangle Angle Sum | Triangles

**■ Concept:**

Angles in a triangle sum to 180 deg. Exterior angle = sum of two non-adjacent interior angles.

```
Formula / Key Rule: Angle A + Angle B + Angle C = 180 deg
```

**■ Worked Example:**

**Q: Angles 55 and 75. Find the third.**

- ➤ 55+75+x=180
- ➤ x=50 deg

**■ Your Turn — Answer all 3 questions below:**

### Question 1: Q1: Angles x, 2x, 3x. Find x.

- ■ A) 20
- ■ B) 30
- ■ C) 40
- ■ D) 60

Answer: B | Explanation: 6x=180, x=30

### Question 2: Q2: Exterior angle=120, two equal angles. Each?

■ A) 30
■ B) 60
■ C) 45
■ D) 40

Answer: B | Explanation: 2a=120, a=60

### Question 3: Q3: Isosceles, vertex=40. Base angles?

■ A) 70 each
■ B) 60 each
■ C) 40 each
■ D) 80 each

Answer: A | Explanation: 2b=140, b=70

Work Space:

## ■ Q16. Volume of 3D Shapes | Volume

■ Concept:

Volume is the amount of 3D space. Rectangular prism: lwh. Cylinder: pi*r^2*h.

```
Formula / Key Rule: Prism: V = lwh Cylinder: V = pi*r^2*h Cube: V = s^3
```

■ Worked Example:

**Q: Cylinder r=3, h=5. Volume?**

➤ V = pi(9)(5) = 45*pi

■ Your Turn — Answer all 3 questions below:

### Question 1: Q1: Box l=8, w=5, h=3. Volume?

■ A) 80
■ B) 120
■ C) 160
■ D) 90

Answer: B | Explanation: 8x5x3=120

### Question 2: Q2: Cylinder r=4, h=9. Volume?

■ A) 36*pi
■ B) 72*pi
■ C) 144*pi
■ D) 288*pi

Answer: C | Explanation: pi(16)(9)=144*pi

### Question 3: Q3: Cube volume=125. Side length?

■ A) 5
■ B) 10

■ C) 25

■ D) 15

Answer: A | Explanation: 5^3=125

Work Space:

## ■ Q17. Similarity & Congruence | Similar & Congruent Figures

■ Concept:

Similar: same shape, proportional sides. Congruent: identical shape AND size. AAA => similar only!

```
Formula / Key Rule: Similar: a1/a2 = b1/b2 = c1/c2 = k (scale factor)
```

■ Worked Example:

**Q: Triangle 3,4,5 and 6,8,10 — similar?**

➤ 6/3=8/4=10/5=2 (all equal)

➤ Yes, similar with scale factor 2

■ Your Turn — Answer all 3 questions below:

### Question 1: Q1: Scale factor 3, smaller area=12. Larger?

■ A) 36

■ B) 72

■ C) 108

■ D) 144

Answer: C | Explanation: 12 x 3^2 = 108

### Question 2: Q2: ABC~DEF, AB=6,DE=9,BC=8. EF=?

■ A) 10

■ B) 11

■ C) 12

■ D) 15

Answer: C | Explanation: EF/8=9/6=1.5, EF=12

### Question 3: Q3: Which does NOT guarantee congruence?

■ A) SSS

■ B) SAS

■ C) AAA

■ D) ASA

Answer: C | Explanation: AAA gives similarity, not congruence

Work Space:

## ■ Q18. Coordinate Geometry | Coordinate Geometry

■ Concept:

Distance formula uses Pythagorean theorem. Midpoint is the average of coordinates.

```
Formula / Key Rule: d = sqrt((x2-x1)^2+(y2-y1)^2) M = ((x1+x2)/2, (y1+y2)/2)
```

■ Worked Example:

**Q: Distance between (1,2) and (4,6)?**

➤ d = sqrt(9+16) = sqrt(25) = 5

■ Your Turn — Answer all 3 questions below:

**Question 1: Q1: Distance (0,0) to (3,4)?**

■ A) 5
■ B) 7
■ C) 6
■ D) sqrt(7)

Answer: A | Explanation: sqrt(9+16)=5

**Question 2: Q2: Midpoint of (2,8) and (6,4)?**

■ A) (4,6)
■ B) (8,12)
■ C) (3,5)
■ D) (2,4)

Answer: A | Explanation: (8/2, 12/2)=(4,6)

**Question 3: Q3: M(5,3) midpoint of A(2,1) and B(x,y). B=?**

■ A) (8,5)
■ B) (7,5)
■ C) (3,2)
■ D) (6,4)

Answer: A | Explanation: (2+x)/2=5 => x=8; y=5

Work Space:

## ■ Q19. Properties of Quadrilaterals | Quadrilaterals

■ Concept:

Quadrilateral angles sum to 360 deg. Parallelogram: opp angles equal, adjacent supplementary.

```
Formula / Key Rule: Angle sum = 360 deg Trapezoid area = (1/2)(b1+b2)*h
```

■ Worked Example:

**Q: Angles 90,85,110,x. Find x.**

➤ 285+x=360
➤ x=75 deg

■ **Your Turn — Answer all 3 questions below:**

**Question 1: Q1: Parallelogram, one angle=65. Others?**

- ■ A) 65,115,115
- ■ B) 65,65,115
- ■ C) 65,65,65
- ■ D) 115,65,65

Answer: A | Explanation: Opp=equal, adj=180 deg

**Question 2: Q2: Trapezoid b1=8,b2=12,h=5. Area?**

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

Answer: A | Explanation: (1/2)(20)(5)=50

**Question 3: Q3: All sides equal AND all 90 deg angles?**

- ■ A) Rhombus
- ■ B) Rectangle
- ■ C) Square
- ■ D) Parallelogram

Answer: C | Explanation: Only a square has both properties

Work Space:

## ■ Q20. Surface Area | Surface Area

■ **Concept:**

Surface area = total area of all faces. Double dimensions => quadruple surface area (2D scaling!).

```
Formula / Key Rule: Prism: SA = 2(lw+lh+wh) Cylinder: SA = 2*pi*r^2 + 2*pi*r*h
```

■ **Worked Example:**

**Q: Box l=4, w=3, h=2. SA=?**

➤ SA = 2(12+8+6) = 52

■ **Your Turn — Answer all 3 questions below:**

**Question 1: Q1: Cube side=6. Surface area?**

- ■ A) 36
- ■ B) 144
- ■ C) 216
- ■ D) 72

Answer: C | Explanation: 6 faces x 36 = 216

**Question 2: Q2: Cylinder r=3, h=7. Lateral SA?**

- A) 21*pi
- B) 42*pi
- C) 63*pi
- D) 18*pi

Answer: B | Explanation: 2*pi*r*h=42*pi

### Question 3: Q3: Double all dims. SA changes how?

- A) x2
- B) x3
- C) x4
- D) x8

Answer: C | Explanation: 2D scale: 2^2=4x

Work Space: