SAT Math Master

20 Must-Know Problems — ■■ 20■■ ■■ ■■

Korean Students' Most Missed Topics

Instructions: For each problem, read the Concept and Example first, then attempt all 3 Practice Questions. Circle your answer. Show your work in the blank space provided. Check your answers with the Answer Key at the end.

Name: _____ **Date:** _____ **Score:** _____ **/ 60**

Linear Equations

Algebra ● Medium

■ Concept

- A linear equation has one variable. Goal: isolate the variable.
- Steps: Distribute if needed → Combine like terms → Move variables/constants → Divide by coefficient.
- Formula: ax + b = c → x = (c - b) / a

■ Example

Solve: 3x + 7 = 22 | Step 1: 3x = 22 - 7 = 15 | Step 2: x = 5

■ Practice Questions — Solve all 3!

Q1. Solve for x: 4x - 3 = 17

- ■ A) x = 3
- ■ B) x = 4
- ■ C) x = 5
- ■ D) x = 6

Work Space:

Q2. Solve for x: 2(x + 3) = 14

- ■ A) x = 2
- ■ B) x = 3
- ■ C) x = 4
- ■ D) x = 7

Work Space:

Q3. If 5x + 2 = 3x + 10, what is x?

- ■ A) x = 2
- ■ B) x = 3
- ■ C) x = 4
- ■ D) x = 5

Work Space:

Q2 Quadratic Equations

Quadratics ● Hard

■ Concept

- Standard form: $ax^2 + bx + c = 0$
- Methods: Factoring, Quadratic Formula x = (-b ± sqrt(b2-4ac)) / 2a, Completing the Square
- Discriminant: b2 - 4ac | > 0: two roots | = 0: one root | < 0: no real roots

■ Example

Solve: x2 - 5x + 6 = 0 | Factor: (x-2)(x-3) = 0 | x = 2 or x = 3

■ Practice Questions — Solve all 3!

Q1. What are the solutions to x2 - 7x + 12 = 0?

- ■ A) x = 2, 6
- ■ B) x = 3, 4
- ■ C) x = 1, 12
- ■ D) x = -3, -4

Work Space:

Q2. Which k makes x2 + kx + 9 = 0 have exactly one solution?

- ■ A) k = 3
- ■ B) k = 6
- ■ C) k = 9

■ D) k = 12

Work Space:

Q3. Solve: 2x2 - 4x - 6 = 0. What are the solutions?

■ A) x = 1, -3

■ B) x = 3, -1

■ C) x = 2, -1

■ D) x = -2, 3

Work Space:

Q3 Slope & Lines

Linear / Geometry ● Medium

■ Concept

- Slope: m = (y2 - y1) / (x2 - x1)
- Slope-Intercept form: y = mx + b (m = slope, b = y-intercept)
- Parallel: same slope | Perpendicular: slopes multiply to -1

■ Example

Slope through (2,3) and (6,11): m = (11-3)/(6-2) = 8/4 = 2

■ Practice Questions — Solve all 3!

Q1. Slope through (-1, 2) and (3, 10)?

■ A) 1

■ B) 2

■ C) 3

■ D) 4

Work Space:

Q2. Line y = -3x + 5. Perpendicular slope?

■ A) -3

■ B) 3

■ C) 1/3

■ D) -1/3

Work Space:

Q3. Line parallel to y = 2x - 4 through (0, 3)?

■ A) y = 2x + 3

■ B) y = -2x + 3

■ C) y = (1/2)x + 3

■ D) y = 3x + 2

Work Space:

Q4 Systems of Equations

Systems of Equations ● Hard

■ Concept

- Substitution: Solve one equation for a variable, substitute into the other.
- Elimination: Add/subtract equations to cancel a variable.
- No solution: parallel lines | Infinite solutions: same line

■ Example

x + y = 5 and 2x - y = 4 | Add: 3x = 9 → x = 3, y = 2

■ Practice Questions — Solve all 3!

Q1. 3x + y = 11 and x - y = 1. What is x?

■ A) 2

■ B) 3

■ C) 4

■ D) 5

Work Space:

Q2. For what k does 2x + ky = 6 and 4x + 2y = 12 have infinite solutions?

- ■ A) k = 0
- ■ B) k = 1
- ■ C) k = 2
- ■ D) k = 3

Work Space:

Q3. y = 3x - 2 and y = 3x + 5: how many solutions?

- ■ A) 0
- ■ B) 1
- ■ C) 2
- ■ D) Infinitely many

Work Space:

Q5 Functions & Notation

Functions ● Medium

■ Concept

- A function assigns exactly one output to each input. Written as f(x).
- Domain: all valid inputs | Range: all possible outputs
- Composition: f(g(x)) means apply g first, then f

—■ Example

f(x) = 2x2 - 3 | f(4) = 2(16) - 3 = 29

■ Practice Questions — Solve all 3!

Q1. f(x) = x2 + 2x - 1. What is f(3)?

- ■ A) 12
- ■ B) 13
- ■ C) 14
- ■ D) 15

Work Space:

Q2. f(x) = 3x+1, g(x) = x-4. What is f(g(5))?

- ■ A) 2
- ■ B) 4
- ■ C) 6
- ■ D) 8

Work Space:

Q3. Which x is NOT in the domain of f(x) = 1/(x-3)?

- ■ A) x = 0
- ■ B) x = 1
- ■ C) x = 3
- ■ D) x = 5

Work Space:

Q6 Mean, Median & Data — Statistics — ● Medium

■ Concept

- Mean = sum of all values / number of values
- Median = middle value when sorted
- Weighted mean: sum(value x weight) / sum(weight)

■ Example

Mean of 4, 7, 2, 9, 3: Sum = 25, n = 5 → Mean = 5

■ Practice Questions — Solve all 3!

Q1. Scores: 82, 90, 76, 88, 74. What is the mean?

- ■ A) 80
- ■ B) 82
- ■ C) 84

■ D) 86

Work Space:

Q2. Avg on 4 tests is 85. Score needed on test 5 to avg 87?

■ A) 89
■ B) 93
■ C) 95
■ D) 97

Work Space:

Q3. Median of: 13, 7, 21, 4, 17, 9, 15?

■ A) 9
■ B) 13
■ C) 14
■ D) 15

Work Space:

Q7 Triangles & Angles — Geometry — ● Medium

■ Concept

- Sum of interior angles of a triangle = 180 degrees
- Pythagorean Theorem: a2 + b2 = c2 (right triangles)
- 30-60-90: sides x, x*sqrt(3), 2x | 45-45-90: x, x, x*sqrt(2)

■ Example

Right triangle, legs 6 and 8: c2 = 36 + 64 = 100 → c = 10

■ Practice Questions — Solve all 3!

Q1. Angles 54 and 73 in a triangle. Third angle?

■ A) 43

■ B) 53

■ C) 63

■ D) 73

Work Space:

Q2. In a 30-60-90 triangle, shortest side = 5. Hypotenuse?

■ A) 5*sqrt(2)

■ B) 5*sqrt(3)

■ C) 10

■ D) 15

Work Space:

Q3. Right triangle: hypotenuse 13, one leg 5. Other leg?

■ A) 8

■ B) 10

■ C) 12

■ D) 14

Work Space:

Q8 Ratio & Proportion — Word Problems — ● Medium

■ Concept

- Cross-multiplication: if a/b = c/d, then ad = bc
- Percent = part / whole x 100
- Percent change = (new - old) / old x 100

—■ Example

3 notebooks cost $7.50. Cost of 8? → 3x = 7.50x8 = 60 → $20

■ Practice Questions — Solve all 3!

Q1. Boys:Girls = 3:4, 28 students total. How many boys?

- ■ A) 10
- ■ B) 12
- ■ C) 14
- ■ D) 16

Work Space:

Q2. Car goes 240 mi in 4 hrs. Time to go 360 mi?

- ■ A) 5 hrs
- ■ B) 6 hrs
- ■ C) 7 hrs
- ■ D) 8 hrs

Work Space:

Q3. $80 item discounted 25%. Sale price?

- ■ A) $55
- ■ B) $60
- ■ C) $65
- ■ D) $70

Work Space:

Polynomials & Exponents

Algebra

● Hard

■ Concept

- x^a x x^b = x^(a+b) | x^a / x^b = x^(a-b) | (x^a)^b = x^ab
- (a+b)2 = a2 + 2ab + b2 | (a-b)(a+b) = a2 - b2

—■ Example

(2x3)2 x x-1 = 4x6 x x-1 = 4x5

■ Practice Questions — Solve all 3!

Q1. Simplify: (x2)3 / x4

- ■ A) x2
- ■ B) x3
- ■ C) x4
- ■ D) x5

Work Space:

Q2. What is (3x + 2)2?

- ■ A) 9x2+4
- ■ B) 9x2+6x+4
- ■ C) 9x2+12x+4
- ■ D) 9x2+12x+8

Work Space:

Q3. Factor completely: x2 - 16

- ■ A) (x-4)2
- ■ B) (x+4)(x-4)
- ■ C) (x-8)(x+2)
- ■ D) (x-4)(x+2)

Work Space:

Q 10 **Circles** Geometry ● **Medium**

■ Concept

- Circumference: C = 2*pi*r | Area: A = pi*r2
- Arc length = (angle/360) x 2*pi*r | Sector area = (angle/360) x pi*r2
- Central angle = Arc angle | Inscribed angle = (1/2) x Arc angle

—■ Example

Radius = 6. Area = pi(36) = 36*pi

■ Practice Questions — Solve all 3!

Q1. Circumference = 10*pi. Radius?

- ■ A) 3
- ■ B) 4
- ■ C) 5
- ■ D) 6

Work Space:

Q2. Radius 9, central angle 80. Arc length?

- ■ A) 2*pi
- ■ B) 3*pi
- ■ C) 4*pi
- ■ D) 5*pi

Work Space:

Q3. (x-3)2 + (y+2)2 = 25. Radius?

- ■ A) 3
- ■ B) 4
- ■ C) 5
- ■ D) 25

Work Space:

Q 11 Linear Inequalities

Linear / Inequalities

● Hard

■ Concept

- Solve like equations, BUT flip the inequality sign when multiplying or dividing by a NEGATIVE.
- Compound: 'and' = intersection, 'or' = union

■ Example

-3x + 5 > 14 → -3x > 9 → x < -3 (sign flips!)

■ Practice Questions — Solve all 3!

Q1. Solve: 2x - 5 > 7

- ■ A) x>1
- ■ B) x>4
- ■ C) x>6
- ■ D) x>8

Work Space:

Q2. Solve: -4x <= 20

- ■ A) x<=-5
- ■ B) x>=-5
- ■ C) x<=5
- ■ D) x>=5

Work Space:

Q3. Which x satisfies 3 < 2x+1 <= 9?

- ■ A) x=0
- ■ B) x=1
- ■ C) x=3
- ■ D) x=5

Work Space:

Q 12

Probability

Statistics / Probability

● Hard

■ Concept

- P(event) = favorable outcomes / total outcomes
- P(A and B) = P(A) x P(B) [independent]
- P(A or B) = P(A) + P(B) - P(A and B)

■ Example

Bag: 4 red, 6 blue. P(red) = 4/10 = 2/5

■ Practice Questions — Solve all 3!

Q1. Die rolled. P(number > 4)?

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

Work Space:

Q2. P(A)=0.6, P(B)=0.4, independent. P(A and B)?

- ■ A) 0.10
- ■ B) 0.24
- ■ C) 0.48
- ■ D) 1.00

Work Space:

Q3. 30 students: 18 like math, 12 science, 5 both. How many like at least one?

- ■ A) 20
- ■ B) 25
- ■ C) 28
- ■ D) 30

Work Space:

Q 13 **Absolute Value** Algebra ● Medium

■ Concept

- |x| = x if x >= 0; |x| = -x if x < 0
- To solve |ax+b| = c: Case 1: ax+b = c | Case 2: ax+b = -c
- |x| < c means -c < x < c | |x| > c means x < -c or x > c

■ Example

|2x-3| = 7 → x = 5 or x = -2

■ Practice Questions — Solve all 3!

Q1. How many solutions does |x+4| = 9 have?

- ■ A) 0
- ■ B) 1
- ■ C) 2
- ■ D) 3

Work Space:

Q2. |3x-6| = 12. Positive solution?

- ■ A) 2
- ■ B) 4
- ■ C) 5
- ■ D) 6

Work Space:

Q3. What values satisfy |x| < 5?

- ■ A) x<-5 or x>5
- ■ B) -5 < x < 5
- ■ C) x>5

■ D) x<5

Work Space:

Q 14 Exponential Functions

Functions ● Hard

■ Concept

- Growth: f(x) = a * b^x where b > 1 | Decay: b between 0 and 1
- a = initial value, b = growth/decay factor
- Compound interest: A = P(1 + r/n)^(nt)

■ Example

1000 grows at 5%/yr. After 3 years: 1000(1.05)3 = 1157.6

■ Practice Questions — Solve all 3!

Q1. f(x) = 4 * (1/2)^x. What is f(3)?

■ A) 1/2
■ B) 1
■ C) 3/4
■ D) 2

Work Space:

Q2. $2000 at 6% annual. Value after t years?

■ A) 2000(0.06)t
■ B) 2000(1.06)t
■ C) 2000+0.06t
■ D) 2000(1.6)t

Work Space:

Q3. 500 bacteria, doubles every 2 hrs. After 6 hrs?

■ A) 1000

■ B) 2000

■ C) 3000

■ D) 4000

Work Space:

Q 15 Area & Volume

Geometry ● Medium

■ Concept

- Rectangle: A = lw | Triangle: A = (1/2)bh | Trapezoid: A = (1/2)(b1+b2)h
- Cylinder: V = pi*r2*h | Sphere: V = (4/3)*pi*r3

■ Example

Cylinder r=3, h=10: V = pi(9)(10) = 90*pi

■ Practice Questions — Solve all 3!

Q1. Trapezoid: parallel sides 6 and 10, height 4. Area?

■ A) 24

■ B) 32

■ C) 36

■ D) 40

Work Space:

Q2. Prism 5x3x4. All dims doubled: volume factor?

■ A) 2

■ B) 4

■ C) 6

■ D) 8

Work Space:

Q3. Sphere radius 3. Volume (in terms of pi)?

■ A) 12*pi

■ B) 27*pi

■ C) 36*pi

■ D) 48*pi

Work Space:

Q 16 Work & Rate Problems

Word Problems ● Hard

■ Concept

- Work = Rate x Time | Rate = 1/time for one job
- Together: 1/T = 1/A + 1/B → T = AB/(A+B)
- Distance = Speed x Time

■ Example

Pipe A: 4 hrs, Pipe B: 6 hrs. Together: T = 24/10 = 2.4 hrs

■ Practice Questions — Solve all 3!

Q1. Alex paints in 6 hrs, Ben in 4 hrs. Together?

■ A) 1.2 hrs

■ B) 2.4 hrs

■ C) 3.0 hrs

■ D) 5.0 hrs

Work Space:

Q2. Train: 60 mph for 2 hrs, then 80 mph for 3 hrs. Total distance?

■ A) 320

■ B) 340

■ C) 360

■ D) 380

Work Space:

Q3. Two cars leave same point: 50 mph and 70 mph opposite directions. Distance after 3 hrs?

- ■ A) 210
- ■ B) 270
- ■ C) 350
- ■ D) 360

Work Space:

Q 17 Scatterplots & Best Fit

Statistics ● Hard

■ Concept

- Positive correlation: as x increases, y increases
- Negative correlation: as x increases, y decreases
- Slope of best-fit line = rate of change in real-world context

—■ Example

y = 2.5x + 10. Predict y when x=8: y = 20 + 10 = 30

■ Practice Questions — Solve all 3!

Q1. Study hrs up, test scores up. Correlation type?

- ■ A) Negative
- ■ B) No correlation
- ■ C) Positive
- ■ D) Causation only

Work Space:

Q2. Best-fit y = -3x + 45. What does slope mean?

- ■ A) y up 3 per x
- ■ B) y down 3 per x
- ■ C) x up 45
- ■ D) y starts at 3

Work Space:

Q3. y = 1.5x + 20. Predicted y when x=10?

- ■ A) 30
- ■ B) 32
- ■ C) 35
- ■ D) 37

Work Space:

Q 18 Function Transformations

Functions ● Medium

■ Concept

- y = f(x) + k: UP k | y = f(x) - k: DOWN k
- y = f(x+h): LEFT h | y = f(x-h): RIGHT h
- y = -f(x): reflect over x-axis | y = af(x): vertical stretch/compression

—■ Example

g(x) = (x-3)2 + 2 is x2 shifted RIGHT 3, UP 2. Vertex: (3, 2)

■ Practice Questions — Solve all 3!

Q1. g(x) = f(x+4) shifts f(x) which way?

- ■ A) Right 4
- ■ B) Left 4
- ■ C) Up 4
- ■ D) Down 4

Work Space:

Q2. g(x) = (x-2)2 + 5. Vertex?

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

■ D) (5,2)

Work Space:

Q3. g(x) = 3f(x). What transformation?

■ A) Horizontal stretch

■ B) Vertical compression

■ C) Vertical stretch

■ D) Reflection

Work Space:

Q 19 Standard Deviation & Normal Dist.

Statistics ● Hard

■ Concept

- Standard deviation (SD) measures spread around the mean.
- 68-95-99.7 Rule: 68% within 1 SD, 95% within 2 SD, 99.7% within 3 SD
- z-score = (value - mean) / SD

■ Example

Mean=70, SD=10. Scores 60-80 are within 1 SD → about 68%

■ Practice Questions — Solve all 3!

Q1. Normal dist: mean 75, SD 8. % between 67 and 83?

■ A) 34%

■ B) 50%

■ C) 68%

■ D) 95%

Work Space:

Q2. Data A: SD=2. Data B: SD=8. More spread out?

■ A) A

■ B) B

■ C) Same

■ D) Can't tell

Work Space:

Q3. Score=90, mean=78, SD=6. z-score?

■ A) 1

■ B) 1.5

■ C) 2

■ D) 2.5

Work Space:

Q 20 Nonlinear Systems

Systems / Quadratics ● Hard

■ Concept

- To find intersections: set equations equal, solve the resulting equation.
- Number of intersections = number of real solutions of the combined equation.
- Use discriminant to determine how many intersection points exist.

═■ Example

y=x2 and y=x+2: x2=x+2 → x2-x-2=0 → x=2 or x=-1

■ Practice Questions — Solve all 3!

Q1. y = x2 - 4 and y = 0. How many intersections?

■ A) 0

■ B) 1

■ C) 2

■ D) 3

Work Space:

Q2. y=x2-3x and y=4 intersect at what x-values?

- A) x=-1,4
- B) x=1,-4
- C) x=4,-1
- D) x=2,-2

Work Space:

Q3. y=2x+3 and y=x2-1. How many intersections?

- A) 0
- B) 1
- C) 2
- D) 3

Work Space:

Answer Key

Prob	Q1	Q2	Q3	Topic
Q1	C	C	C	Algebra
Q2	B	B	B	Quadratics
Q3	B	C	A	Linear / Geometry
Q4	B	B	A	Systems of Equations
Q5	C	B	C	Functions
Q6	B	C	B	Statistics
Q7	B	C	C	Geometry
Q8	B	B	B	Word Problems
Q9	A	C	B	Algebra
Q10	C	C	C	Geometry
Q11	C	B	C	Linear / Inequalities
Q12	B	B	B	Statistics / Probability
Q13	C	D	B	Algebra
Q14	A	B	D	Functions
Q15	B	D	C	Geometry
Q16	B	C	D	Word Problems
Q17	C	B	C	Statistics
Q18	B	C	C	Functions
Q19	C	B	C	Statistics
Q20	C	A	C	Systems / Quadratics

Score: _____ / 60 questions

Good luck! You've got this! ■