

SAT Math — 20 Essential Practice Questions

Topics Korean Students Miss Most | With Concepts, Examples & Answer Keys

Instructions: Each topic has 3 practice steps. Read the concept and example, then solve each step. Circle your answer. Answer key and explanation are provided at the bottom of each question. Cover the answer key while practicing!

Name: _____ Date: _____ Score: _____/20

Q1. Linear Equations

CONCEPT:

Linear equation form: $ax + b = c$. Isolate x by performing inverse operations on both sides.

Formula: $ax + b = c \rightarrow x = (c - b) / a$

Example: $3x + 7 = 22 \rightarrow 3x = 15 \rightarrow x = 5$

PRACTICE — Solve each step:

Step 1: Solve for x : $5x - 3 = 17$

A) $x = 2$

B) $x = 4$

C) $x = 3$

D) $x = 5$

Work space:

Step 2: Solve for x : $2(x + 5) = 24$

A) $x = 6$

B) $x = 7$

C) $x = 8$

D) $x = 9$

Work space:

Step 3: If $4x + 9 = 3x + 15$, what is x ?

A) $x = 4$

B) $x = 6$

C) $x = 3$

D) $x = 7$

Work space:

ANSWER KEY & EXPLANATIONS:

Step 1 Answer: B | $5x = 17 + 3 = 20$, so $x = 20 / 5 = 4$

Step 2 Answer: B | $2x + 10 = 24 \rightarrow 2x = 14 \rightarrow x = 7$

Step 3 Answer: B | Subtract $3x$: $x + 9 = 15 \rightarrow x = 6$

Q2. Systems of Equations

CONCEPT:

Two equations, two unknowns. Use substitution or elimination to solve.

Formula: Elimination: add/subtract equations to cancel one variable

Example: $x + y = 10$, $x - y = 2 \rightarrow$ Add: $2x = 12 \rightarrow x = 6$, $y = 4$

PRACTICE — Solve each step:

Step 1: Solve: $x + y = 7$ and $x - y = 3$. What is x ?

A) $x = 2$

B) $x = 5$

C) $x = 4$

D) $x = 3$

Work space:

Step 2: If $2x + y = 11$ and $x + y = 7$, what is x ?

A) $x = 2$

B) $x = 3$

C) $x = 4$

D) $x = 5$

Work space:

Step 3: If $3x - 2y = 8$ and $x = 2y$, find x .

A) $x = 6$

B) $x = 8$

C) $x = 4$

D) $x = 10$

Work space:

ANSWER KEY & EXPLANATIONS:

Step 1 Answer: B | Add: $2x = 10 \rightarrow x = 5$

Step 2 Answer: C | Subtract 2nd from 1st: $x = 4$

Step 3 Answer: C | Sub $x=2y$: $6y-2y=8 \rightarrow 4y=8 \rightarrow y=2 \rightarrow x=4$

Q3. Quadratic Equations

CONCEPT:

$ax^2 + bx + c = 0$. Solve by factoring or quadratic formula.

Formula: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Example: $x^2 - 5x + 6 = 0 \rightarrow (x-2)(x-3) = 0 \rightarrow x = 2$ or 3

PRACTICE — Solve each step:

Step 1: Solve: $x^2 - 7x + 12 = 0$. What are the solutions?

A) $x = 3, 4$

B) $x = 2, 6$

C) $x = 1, 12$

D) $x = -3, -4$

Work space:

Step 2: If $x^2 = 49$, what are the possible values of x ?

A) 7 only

B) -7 only

C) 7 and -7

D) $\pm\sqrt{7}$

Work space:

Step 3: Which value of x satisfies $2x^2 - 8 = 0$?

A) $x = 2$

B) $x = 4$

C) $x = \sqrt{2}$

D) $x = \sqrt{8}$

Work space:

ANSWER KEY & EXPLANATIONS:

Step 1 Answer: A | Factor: $(x-3)(x-4) = 0 \rightarrow x = 3$ or 4

Step 2 Answer: C | $x = \pm 7$ (both positive and negative root)

Step 3 Answer: A | $2x^2 = 8 \rightarrow x^2 = 4 \rightarrow x = \pm 2$

Q4. Functions & Function Notation

CONCEPT:

$f(a)$ means substitute a for every x in the function $f(x)$.

Formula: $f(x) = \text{expression} \rightarrow f(a) = \text{replace } x \text{ with } a$

Example: $f(x) = 3x - 2$. Find $f(4)$: $f(4) = 3(4) - 2 = 10$

PRACTICE — Solve each step:

Step 1: If $f(x) = 2x + 5$, what is $f(3)$?

A) 11

B) 9

C) 13

D) 8

Work space:

Step 2: If $g(x) = x^2 - 4$, what is $g(-3)$?

A) 5

B) 13

C) -13

D) 1

Work space:

Step 3: If $h(x) = 3x - 1$ and $h(a) = 14$, find a .

A) $a = 4$

B) $a = 5$

C) $a = 3$

D) $a = 6$

Work space:

ANSWER KEY & EXPLANATIONS:

Step 1 Answer: A | $f(3) = 2(3) + 5 = 11$

Step 2 Answer: A | $g(-3) = (-3)^2 - 4 = 9 - 4 = 5$

Step 3 Answer: B | $3a - 1 = 14 \rightarrow 3a = 15 \rightarrow a = 5$

Q5. Slope & Linear Graphs

CONCEPT:

Slope $m = (y_2 - y_1) / (x_2 - x_1)$. Slope-intercept form: $y = mx + b$.

Formula: $m = (y_2 - y_1) / (x_2 - x_1)$

Example: Points (1,3) and (3,9) $\rightarrow m = (9-3)/(3-1) = 3$

PRACTICE — Solve each step:

Step 1: What is the slope of the line through (2, 5) and (6, 13)?

A) 2

B) 3

C) 4

D) 1

Work space:

Step 2: The line $y = -3x + 7$ has what y-intercept?

A) -3

B) 7

C) 3

D) -7

Work space:

Step 3: Which equation has slope 4 and passes through (0, -2)?

A) $y = 4x + 2$

B) $y = -2x + 4$

C) $y = 4x - 2$

D) $y = 2x - 4$

Work space:

ANSWER KEY & EXPLANATIONS:

Step 1 Answer: A | $m = (13-5)/(6-2) = 8/4 = 2$

Step 2 Answer: B | In $y = mx + b$, $b = 7$ is the y-intercept

Step 3 Answer: C | $y = 4x - 2$ (slope=4, b=-2)

Q6. Inequalities

CONCEPT:

Solve like equations, BUT flip the inequality sign when multiplying or dividing by a negative.

Formula: If $-ax > b$, then $x < -b/a$ (sign flips!)

Example: $-2x > 6 \rightarrow x < -3$ (sign flipped dividing by -2)

PRACTICE — Solve each step:

Step 1: Solve: $3x - 5 > 10$. Solution?

A) $x > 5$

B) $x > 3$

C) $x < 5$

D) $x > 15$

Work space:

Step 2: Solve: $-4x \geq 20$. What is x ?

A) $x \geq -5$

B) $x \leq -5$

C) $x \geq 5$

D) $x \leq 5$

Work space:

Step 3: Which values satisfy $2x + 3 < 11$ AND $x > 1$?

A) $1 < x < 4$

B) $x > 1$

C) $x < 4$

D) $0 < x < 4$

Work space:

ANSWER KEY & EXPLANATIONS:

Step 1 Answer: A | $3x > 15 \rightarrow x > 5$

Step 2 Answer: B | Divide by -4 (flip sign): $x \leq -5$

Step 3 Answer: A | $2x < 8 \rightarrow x < 4$. Combined: $1 < x < 4$

Q7. Percentages & Ratios

CONCEPT:

Percent change = $(\text{New} - \text{Old}) / \text{Old} \times 100$. Ratios use cross-multiplication.

Formula: % change = $(\text{New} - \text{Old}) / \text{Old} \times 100\%$

Example: \$40 to \$50 \rightarrow % increase = $(10/40) \times 100 = 25\%$

PRACTICE — Solve each step:

Step 1: A shirt costs \$60 after a 20% discount. Original price?

A) \$75

B) \$72

C) \$80

D) \$70

Work space:

Step 2: A population of 500 increases by 30%. New population?

A) 530

B) 600

C) 650

D) 580

Work space:

Step 3: Ratio boys:girls = 3:5 and 24 boys. How many girls?

A) 30

B) 35

C) 40

D) 45

Work space:

ANSWER KEY & EXPLANATIONS:

Step 1 Answer: A | $60 = 80\%$ of original $\rightarrow 60/0.80 = \$75$

Step 2 Answer: C | $500 \times 1.30 = 650$

Step 3 Answer: C | $3/5 = 24/g \rightarrow g = 24 \times 5/3 = 40$

Q8. Exponents & Radicals

CONCEPT:

$x^a * x^b = x^{(a+b)}$, $(x^a)^b = x^{(ab)}$, $x^{(1/2)} = \text{sqrt}(x)$, $x^{(-n)} = 1/x^n$

Formula: $x^a * x^b = x^{(a+b)}$ | $(x^a)^b = x^{(ab)}$

Example: $2^3 * 2^4 = 2^7 = 128$

PRACTICE — Solve each step:

Step 1: Simplify: $x^3 * x^5 = ?$

A) x^8

B) x^{15}

C) x^2

D) $2x^8$

Work space:

Step 2: What is $(2^3)^4$?

A) 2^7

B) 2^{12}

C) 8^4

D) 6^4

Work space:

Step 3: Simplify: $16^{(1/2)} = ?$

A) 8

B) 4

C) 2

D) 64

Work space:

ANSWER KEY & EXPLANATIONS:

Step 1 Answer: A | Add exponents: $x^{(3+5)} = x^8$

Step 2 Answer: B | Multiply exponents: $2^{(3*4)} = 2^{12}$

Step 3 Answer: B | $16^{(1/2)} = \text{sqrt}(16) = 4$

Q9. Rate & Work Problems

CONCEPT:

Rate x Time = Work. Combined rate: $1/A + 1/B = 1/T$.

Formula: Combined: $1/A + 1/B = 1/T$

Example: A in 4h, B in 6h $\rightarrow 1/4 + 1/6 = 5/12$ per hour $\rightarrow T = 2.4$ h

PRACTICE — Solve each step:

Step 1: Car travels 150 miles in 3 hours. Speed in mph?

- A) 40
B) 45
C) 50
D) 55

Work space:

Step 2: Machine A fills tank in 6h, B in 3h. Together?

- A) 2 hours
B) 4 hours
C) 1.5 hours
D) 4.5 hours

Work space:

Step 3: At \$12/hour, hours needed to earn \$156?

- A) 11 hrs
B) 13 hrs
C) 14 hrs
D) 12 hrs

Work space:

ANSWER KEY & EXPLANATIONS:

Step 1 Answer: C | $150/3 = 50$ mph

Step 2 Answer: A | $1/6 + 1/3 = 1/2$ per hour $\rightarrow T = 2$ hours

Step 3 Answer: B | $156 / 12 = 13$ hours

Q10. Geometry — Triangles

CONCEPT:

Angles in triangle sum to 180 degrees. Pythagorean theorem: $a^2 + b^2 = c^2$.

Formula: $a^2 + b^2 = c^2$ | **Angles sum = 180 degrees**

Example: Legs 3 and 4 $\rightarrow c = \sqrt{9+16} = 5$

PRACTICE — Solve each step:

Step 1: Right triangle, legs 5 and 12. Hypotenuse?

A) 13

B) 15

C) 11

D) 17

Work space:

Step 2: Triangle has angles 45° and 70°. Third angle?

A) 55°

B) 65°

C) 75°

D) 85°

Work space:

Step 3: Isosceles triangle, vertex angle 40°. Base angles?

A) 60° each

B) 70° each

C) 80° each

D) 50° each

Work space:

ANSWER KEY & EXPLANATIONS:

Step 1 Answer: A | $\sqrt{25+144} = \sqrt{169} = 13$

Step 2 Answer: B | $180 - 45 - 70 = 65$ degrees

Step 3 Answer: B | $(180-40)/2 = 70$ degrees each

Q11. Circles

CONCEPT:

Area = πr^2 . Circumference = $2\pi r$. Arc = $(\theta/360) \times 2\pi r$.

Formula: $A = \pi r^2$ | $C = 2\pi r$

Example: $r=5 \rightarrow$ Area = 25π , $C = 10\pi$

PRACTICE — Solve each step:

Step 1: Circle radius 7. Area? (Use $\pi = 22/7$)

- A) 154
B) 44
C) 22
D) 308

Work space:

Step 2: Circumference of circle, diameter 10? ($\pi=3.14$)

- A) 31.4
B) 78.5
C) 62.8
D) 15.7

Work space:

Step 3: 90° arc, radius 4. Arc length? ($\pi=3.14$)

- A) 6.28
B) 3.14
C) 12.56
D) 2π

Work space:

ANSWER KEY & EXPLANATIONS:

Step 1 Answer: A | $(22/7)(49) = 154$

Step 2 Answer: A | $C = \pi \cdot d = 3.14 \times 10 = 31.4$

Step 3 Answer: A | $(90/360) \times 2(3.14)(4) = (1/4)(25.12) = 6.28$

Q12. Statistics — Mean, Median, Mode

CONCEPT:

Mean = sum/count. Median = middle value (sorted). Outliers affect mean more than median.

Formula: Mean = Sum / n | Median = middle value (sorted data)

Example: 2,5,5,7,11 → Mean=6, Median=5, Mode=5

PRACTICE — Solve each step:

Step 1: Scores: 70, 80, 90, 60, 100. Mean?

A) 80

B) 90

C) 75

D) 85

Work space:

Step 2: Data: 3, 7, 7, 9, 14. Median?

A) 7

B) 9

C) 8

D) 7.5

Work space:

Step 3: Adding 200 to {4,5,6,7,8} most affects which measure?

A) Mean only

B) Median only

C) Both equally

D) Neither

Work space:

ANSWER KEY & EXPLANATIONS:

Step 1 Answer: A | $(70+80+90+60+100)/5 = 400/5 = 80$

Step 2 Answer: A | Middle of 5 sorted values = 7

Step 3 Answer: A | Outliers pull the mean dramatically; median barely changes

Q13. Probability

CONCEPT:

$P(\text{event}) = \text{favorable} / \text{total}$. Independent events: $P(A \text{ and } B) = P(A) \times P(B)$.

Formula: $P(A) = \text{favorable} / \text{total} \mid P(A \text{ and } B) = P(A) \times P(B)$

Example: 3 red, 7 blue $\rightarrow P(\text{red}) = 3/10 = 0.3$

PRACTICE — Solve each step:

Step 1: Bag: 4 red, 6 blue, 2 green. $P(\text{red})$?

A) $1/3$

B) $1/4$

C) $1/2$

D) $1/6$

Work space:

Step 2: Flip fair coin twice. $P(\text{heads both times})$?

A) $1/2$

B) $1/3$

C) $1/4$

D) $3/4$

Work space:

Step 3: From 5 students, 2 chosen. $P(A \text{ and } B \text{ both chosen})$?

A) $1/10$

B) $2/10$

C) $1/5$

D) $1/20$

Work space:

ANSWER KEY & EXPLANATIONS:

Step 1 Answer: A $\mid 4/12 = 1/3$

Step 2 Answer: C $\mid 1/2 \times 1/2 = 1/4$

Step 3 Answer: A $\mid C(5,2)=10$. Only 1 way to pick A and B $\rightarrow P = 1/10$

Q14. Polynomials & Factoring

CONCEPT:

FOIL: $(a+b)(c+d)=ac+ad+bc+bd$. Special: $a^2-b^2=(a+b)(a-b)$, $(a+b)^2=a^2+2ab+b^2$

Formula: $(a+b)^2 = a^2+2ab+b^2$ | $a^2-b^2 = (a+b)(a-b)$

Example: $x^2-9 = (x+3)(x-3)$

PRACTICE — Solve each step:

Step 1: Expand: $(x + 3)(x + 5) = ?$

A) $x^2+8x+15$

B) $x^2+5x+15$

C) x^2+8x+8

D) x^2+15

Work space:

Step 2: Factor: $x^2 - 16 = ?$

A) $(x-4)^2$

B) $(x+4)(x-4)$

C) $(x+8)(x-2)$

D) $(x+16)(x-1)$

Work space:

Step 3: Factor: $x^2 + 6x + 9 = ?$

A) $(x+3)^2$

B) $(x+9)(x+1)$

C) $(x+6)(x+3)$

D) $(x-3)^2$

Work space:

ANSWER KEY & EXPLANATIONS:

Step 1 Answer: A | FOIL: $x^2+5x+3x+15 = x^2+8x+15$

Step 2 Answer: B | Difference of squares: $(x+4)(x-4)$

Step 3 Answer: A | Perfect square: $(x+3)^2$

Q15. Data Interpretation

CONCEPT:

Read tables carefully. Calculate % of total = (part/whole) x 100.

Formula: % of total = (part / whole) x 100

Example: Mon=50, Tue=70, Wed=80. Total=200. Wed share = 40%

PRACTICE — Solve each step:

Step 1: 200 students: 80 prefer math. What % prefer math?

- | | |
|--------|--------|
| A) 30% | B) 35% |
| C) 40% | D) 45% |

Work space:

Step 2: Sales \$500 Jan to \$750 Feb. % increase?

- | | |
|--------|--------|
| A) 33% | B) 40% |
| C) 50% | D) 25% |

Work space:

Step 3: Class avg was 72 for 9 students. New student scores 92. New avg (10 total)?

- | | |
|-------|-------|
| A) 74 | B) 73 |
| C) 75 | D) 76 |

Work space:

ANSWER KEY & EXPLANATIONS:

Step 1 Answer: C | $80/200 \times 100 = 40\%$

Step 2 Answer: C | $(750-500)/500 \times 100 = 50\%$

Step 3 Answer: A | $(9 \times 72 + 92)/10 = 740/10 = 74$

Q16. Absolute Value

CONCEPT:

$|x| = k \rightarrow x = k$ or $x = -k$. For $|ax+b|=c$, set up two equations.

Formula: $|x| = k \rightarrow x = k$ OR $x = -k$

Example: $|x-3|=5 \rightarrow x=8$ or $x=-2$

PRACTICE — Solve each step:

Step 1: Solve: $|x| = 7$. All solutions?

A) $x=7$ only

B) $x=-7$ only

C) $x=7$ or -7

D) $x=49$

Work space:

Step 2: Solve: $|x + 4| = 10$. Positive solution?

A) $x=6$

B) $x=14$

C) $x=4$

D) $x=10$

Work space:

Step 3: For which values does $|2x - 1| < 5$?

A) $-2 < x < 3$

B) $x > 3$ or $x < -2$

C) $-5 < x < 5$

D) $0 < x < 5$

Work space:

ANSWER KEY & EXPLANATIONS:

Step 1 Answer: C | $|x|=7$ means $x=7$ or $x=-7$

Step 2 Answer: A | $x+4=10 \rightarrow x=6$ (or $x+4=-10 \rightarrow x=-14$)

Step 3 Answer: A | $-5 < 2x-1 < 5 \rightarrow -4 < 2x < 6 \rightarrow -2 < x < 3$

Q17. Coordinate Geometry

CONCEPT:

Distance: $d = \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}$. Midpoint: $M = ((x_1+x_2)/2, (y_1+y_2)/2)$.

Formula: $d = \sqrt{(dx)^2 + (dy)^2}$ | $M = ((x_1+x_2)/2, (y_1+y_2)/2)$

Example: (1,2) and (4,6): $d=5$, Midpoint=(2.5, 4)

PRACTICE — Solve each step:

Step 1: Distance between (0,0) and (6,8)?

A) 10

B) 14

C) 12

D) 8

Work space:

Step 2: Midpoint of (2,4) and (8,10)?

A) (5,7)

B) (6,7)

C) (4,5)

D) (5,8)

Work space:

Step 3: Endpoints (1,3) and (x,9), midpoint (4,6). Find x.

A) $x=5$

B) $x=7$

C) $x=6$

D) $x=8$

Work space:

ANSWER KEY & EXPLANATIONS:

Step 1 Answer: A | $\sqrt{36+64} = \sqrt{100} = 10$

Step 2 Answer: A | $((2+8)/2, (4+10)/2) = (5, 7)$

Step 3 Answer: B | $(1+x)/2 = 4 \rightarrow x = 7$

Q18. Advanced Proportions

CONCEPT:

Direct: $y = kx$ (y grows with x). Inverse: $y = k/x$ (y decreases as x grows).

Formula: Direct: $y/x = k$ | Inverse: $xy = k$

Example: y inversely proportional to x. $y=6, x=2 \rightarrow k=12$. When $x=3: y=4$

PRACTICE — Solve each step:

Step 1: y directly proportional to x. $y=15$ when $x=5$. Find y when $x=9$.

A) 25

B) 27

C) 3

D) 45

Work space:

Step 2: Map: 1 inch = 50 miles. Cities 3.5 inches apart. Real distance?

A) 150 mi

B) 175 mi

C) 200 mi

D) 125 mi

Work space:

Step 3: y varies inversely as x. $x=4, y=18$. Find y when $x=12$.

A) 6

B) 9

C) 54

D) 3

Work space:

ANSWER KEY & EXPLANATIONS:

Step 1 Answer: B | $k = 15/5 = 3$. $y = 3 \times 9 = 27$

Step 2 Answer: B | $3.5 \times 50 = 175$ miles

Step 3 Answer: A | $xy = 72$. $y = 72/12 = 6$

Q19. Scatterplots & Correlation

CONCEPT:

Positive r : both variables increase. Negative r : one up, one down. $|r|$ closer to 1 = stronger.

Formula: $r > 0$: positive | $r < 0$: negative | $|r|$ near 1: strong

Example: Study hours vs. scores: positive correlation, $y = 8x + 30$

PRACTICE — Solve each step:

Step 1: As temperature rises, ice cream sales rise. This correlation is:

A) Positive

B) Negative

C) Zero

D) Perfect

Work space:

Step 2: Line of best fit: $y = 2x + 10$. Predict y when $x = 15$.

A) 35

B) 40

C) 30

D) 45

Work space:

Step 3: Which r -value shows the STRONGEST correlation?

A) $r=0.3$

B) $r=-0.9$

C) $r=0.5$

D) $r=0$

Work space:

ANSWER KEY & EXPLANATIONS:

Step 1 Answer: A | Both increase together = positive correlation

Step 2 Answer: B | $y = 2(15) + 10 = 40$

Step 3 Answer: B | $|-0.9|=0.9$ is the largest absolute value → strongest

Q20. Trigonometry Basics

CONCEPT:

SOH-CAH-TOA: $\sin = \text{Opp}/\text{Hyp}$, $\cos = \text{Adj}/\text{Hyp}$, $\tan = \text{Opp}/\text{Adj}$. Also: $\sin^2 + \cos^2 = 1$.

Formula: $\sin = \text{O}/\text{H}$ | $\cos = \text{A}/\text{H}$ | $\tan = \text{O}/\text{A}$

Example: Opposite=3, Hypotenuse=5 $\rightarrow \sin(\theta) = 3/5 = 0.6$

PRACTICE — Solve each step:

Step 1: Opposite = 4, Hypotenuse = 5. What is $\sin(\theta)$?

A) 4/5

B) 3/5

C) 4/3

D) 5/4

Work space:

Step 2: $\cos(\theta) = 5/13$. What is $\sin(\theta)$?

A) 12/13

B) 13/5

C) 5/12

D) 13/12

Work space:

Step 3: Opposite = 7, adjacent = 7. What is $\tan(\theta)$?

A) 1

B) 0

C) $\sqrt{2}$

D) 7

Work space:

ANSWER KEY & EXPLANATIONS:

Step 1 Answer: A | $\sin = \text{Opp}/\text{Hyp} = 4/5$

Step 2 Answer: A | $\sin^2 = 1 - 25/169 = 144/169 \rightarrow \sin = 12/13$

Step 3 Answer: A | $\tan = 7/7 = 1$ ($\theta = 45^\circ$)

Score Summary

Q#	Topic	✓/✗
1	Linear Equations	
2	Systems of Equations	
3	Quadratic Equations	
4	Functions & Function Notation	
5	Slope & Linear Graphs	
6	Inequalities	
7	Percentages & Ratios	
8	Exponents & Radicals	
9	Rate & Work Problems	
10	Geometry — Triangles	
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12	Statistics — Mean, Median, Mode	
13	Probability	
14	Polynomials & Factoring	
15	Data Interpretation	
16	Absolute Value	
17	Coordinate Geometry	
18	Advanced Proportions	
19	Scatterplots & Correlation	
20	Trigonometry Basics	

Total Score: _____ / 20 Time Taken: _____