Algebra 1 & Geometry

Self-Study Workbook · 20 Core Problems · Answer Key Included

Algebra 1 — Word Problems

Q 01 **[Easy] Linear Equations**

■ MEMORY POINT

`DEFINE → EQUATION → SOLVE → CHECK`

Always name your variable first, then translate words into math.

Sarah has some money. After spending $14 on lunch and $9 on a book, she has $32 left. How much money did she start with?

■ *Common mistake: subtracting instead of adding back. Start – spending = left.*

A) $41	B) $37
C) $23	D) $55

Q 02 **[Easy] Rate & Speed**

■ MEMORY POINT

`D = R × T → "DIRT" formula`

Distance = Rate × Time. Rearrange as needed.

A car travels at 55 mph. How many hours does it take to travel 220 miles?

■ *Trap: dividing backwards. Divide distance by rate to get time.*

A) 3 hours	B) 5 hours
C) 4 hours	D) 6 hours

Q 03 **[Medium] Two Variables**

■ MEMORY POINT

`TOTAL + DIFFERENCE → Two equations, substitution`

When you know total and difference: x+y = T, x-y = D

Two numbers add up to 48. The larger number is 3 times the smaller number. What is the SMALLER number?

■ *Read carefully — the question asks for the SMALLER number, not the larger!*

A) 16	B) 12
C) 36	D) 24

Q 04 **[Medium] Percent & Markup**

■ MEMORY POINT

`Percent Increase → Original × (1 + rate)`

20% increase on $50: 50 × 1.20 = 60. NOT just 50 × 0.20!

A jacket costs $80. The store marks it up 25%, then a customer uses a 10% discount coupon. What is the final price?

■ *Apply the discount to the marked-up price ($100), not the original $80!*

A) $90	B) $88
C) $92	D) $86

Q 05 **[Medium] Consecutive Integers**

■ MEMORY POINT

`Consecutive ODD/EVEN integers: n, n+2, n+4 (not n, n+1, n+2!)`

Odd integers skip one number, so the gap between them is 2.

The sum of three consecutive odd integers is 93. What is the LARGEST of the three integers?

■ *Use n, n+2, n+4 — not n, n+1, n+2 — for odd integers.*

A) 29	B) 31
C) 33	D) 35

Q 06 [Tricky] Mixture Problems

■ MEMORY POINT

```
MIXTURE: (vol1 × %) + (vol2 × %) = total_vol × %_final
```

You cannot simply average the percentages. Weight by volume!

A scientist mixes 30 ml of 40% acid with 20 ml of 60% acid. What is the concentration of the final mixture?

■ *Never average (40+60)/2. You MUST weight each by volume.*

A) 50%	B) 48%
C) 52%	D) 45%

Q 07 [Easy] Proportions

■ MEMORY POINT

```
CROSS-MULTIPLY: a/b = c/d → ad = bc
```

Set up equal ratios, then cross-multiply to solve.

If 5 notebooks cost $12.50, how much do 8 notebooks cost?

■ *Set up a proportion. Don't just guess or scale mentally.*

A) $15.00	B) $18.50
C) $20.00	D) $22.50

Q 08 [Tricky] Work Rate Problems

■ MEMORY POINT

```
WORK RATE: 1/A + 1/B = 1/T (add RATES, not times!)
```

Rate = 1 job per X hours. Combined rate = sum of individual rates.

Alex paints a room in 6 hours; Jordan paints it in 4 hours. Working together, how long does it take?

■ *Never add 6+4=10 and divide. Add their RATES: 1/6 + 1/4.*

A) 5 hours	B) 2.4 hours
C) 3 hours	D) 1.5 hours

Q 09 **[Medium] Inequality Word Problem**

■ MEMORY POINT

```
Multiply/divide by NEGATIVE → FLIP the inequality sign
```

"At least" means ≥. "No more than" means ≤.

A student needs at least 360 points for an A. She has 85, 92, and 78 on three tests. What is the MINIMUM score she needs on the 4th test?

■ *'At least' = greater than or equal to (≥). Don't write > by mistake.*

A) 100	B) 105
C) 90	D) 115

Q 10 **[Tricky] Systems of Equations**

■ MEMORY POINT

```
ELIMINATION: align coefficients, then ADD or SUBTRACT equations
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Two unknowns = two equations. One for count, one for cost.

Adult tickets: $12; Child tickets: $7. A family buys 5 tickets for $44. How many adult tickets did they buy?

■ *You need TWO equations: one for ticket count, one for total money.*

A) 1	B) 2
C) 3	D) 4

Geometry — Core Problems

Q 11 [Easy] Triangle Angles

■ MEMORY POINT

`TRIANGLE ANGLE SUM = 180°. Always. No exceptions.`

Missing angle = 180 - (angle1 + angle2)

A triangle has angles of 47° and 68°. What is the measure of the third angle?

■ *Students add 47+68=115 and stop. You must subtract FROM 180!*

A) 55°	B) 70°
C) 65°	D) 75°

Q 12 [Easy] Pythagorean Theorem

■ MEMORY POINT

`a² + b² = c² | 'c' is ALWAYS the hypotenuse (longest side)`

Memorize triples: 3-4-5, 5-12-13, 8-15-17

A right triangle has legs of length 9 and 12. What is the length of the hypotenuse?

■ *Don't add 9+12. Square both legs, add, THEN take the square root.*

A) 18	B) 15
C) 21	D) 13

Q 13 [Medium] Circle: Area & Circumference

■ MEMORY POINT

`"Cherry Pie is Delicious" → C = πd | "Apple Pies are Round" → A = πr²`

Radius = diameter ÷ 2. Never plug diameter into the AREA formula!

A circle has a diameter of 10 cm. What is its area? (Use $\pi \approx 3.14$)

■ *#1 Mistake: using diameter (10) instead of radius (5) in $A = \pi r^2$.*

A) 314 cm²	B) 78.5 cm²
C) 31.4 cm²	D) 157 cm²

Q 14 [Medium] Parallel Lines & Transversal

■ MEMORY POINT

```
ALTERNATE INTERIOR = EQUAL | CO-INTERIOR (same side) = 180°
```

"Z-angles" = alternate interior (equal). "C-angles" = co-interior (sum to 180).

Two parallel lines are cut by a transversal. One angle is 112°. What is the co-interior (same-side interior) angle?

■ *Co-interior angles ADD to 180° — they are NOT equal!*

A) 112°	B) 78°
C) 68°	D) 58°

Q 15 [Medium] Volume of Cylinder

■ MEMORY POINT

```
V = πr²h → 'BASE AREA × HEIGHT'
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Cylinder = circle stacked up. Base area = πr², then × height.

A cylinder has a radius of 3 cm and a height of 7 cm. What is its volume? ($\pi \approx 3.14$)

■ *Use radius (3), not diameter. Square the radius FIRST, then multiply.*

A) 131.88 cm³	B) 263.76 cm³
C) 65.94 cm³	D) 197.82 cm³

Q 16 [Tricky] Similar Triangles

■ MEMORY POINT

```
SIMILAR → same shape. CORRESPONDING sides are PROPORTIONAL.
```

Match shortest-to-shortest, longest-to-longest. Find the scale factor first.

■ABC ~ ■DEF. In ■ABC, sides are 6, 8, 10. In ■DEF, the shortest side is 9. What is the LONGEST side of ■DEF?

■ *Match CORRESPONDING sides. Find scale factor: 9÷6 = 1.5, then apply to ALL sides.*

A) 12	B) 13.5
C) 15	D) 16

Q 17 [Medium] Exterior Angle Theorem

■ MEMORY POINT

```
EXTERIOR ANGLE = sum of the TWO NON-ADJACENT interior angles
```

ext∠ = remote int∠■ + remote int∠■ (shortcut — no need for 180!)

In a triangle, two interior angles measure 52° and 74°. What is the exterior angle adjacent to the THIRD interior angle?

■ *Don't find the third interior angle (54°) and stop. The exterior angle = 52+74 directly!*

A) 54°	B) 126°
C) 116°	D) 108°

Q 18 [Tricky] Composite Figures

■ MEMORY POINT

```
COMPOSITE AREA: Break into simple shapes → Add or Subtract
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Remaining area = Large shape area – Removed shape area

A square (side 10 cm) has a circle (diameter 6 cm) cut from its center. What is the remaining area? ($\pi \approx 3.14$)

■ *Use radius = 3 (not diameter = 6) in the circle formula.*

A) 87.74 cm²	B) 71.74 cm²
C) 100 cm²	D) 56.52 cm²

Q 19 [Tricky] 30-60-90 Triangle

■ MEMORY POINT

```
30-60-90 side ratio: 1 : √3 : 2
```

Short leg × 2 = Hypotenuse. Short leg × √3 = Long leg.

In a 30-60-90 triangle, the hypotenuse is 16. What is the length of the SHORTER leg?

■ *Short leg = hypotenuse ÷ 2. Don't divide by √3 — that gives the LONG leg calculation.*

A) $8\sqrt{3}$	B) 12
C) 8	D) $4\sqrt{3}$

Q 20 **[Tricky] Surface Area of Cone**

■ MEMORY POINT

`Cone Total SA = πr² + πrl → 'BASE + LATERAL'`

l = slant height (NOT the vertical height). Don't forget the base circle!

A cone has radius 5 cm and slant height 13 cm. What is the total surface area? ($\pi \approx 3.14$)

■ *Two traps: (1) using vertical height instead of slant height; (2) forgetting the base πr^2.*

A) 204.1 cm²	B) 376.8 cm²
C) 282.6 cm²	D) 314 cm²

Answer Key

Check your answers below. Review the explanations on the web version for full step-by-step solutions.

Q 01 → D Linear Equations	**Q 02 → C** Rate & Speed	**Q 03 → B** Two Variables	**Q 04 → A** Percent & Markup
Q 05 → C Consecutive Integers	**Q 06 → B** Mixture Problems	**Q 07 → C** Proportions	**Q 08 → B** Work Rate Problems
Q 09 → B Inequality Word Problem	**Q 10 → A** Systems of Equations	**Q 11 → C** Triangle Angles	**Q 12 → B** Pythagorean Theorem
Q 13 → B Circle: Area & Circumference	**Q 14 → C** Parallel Lines & Transversal	**Q 15 → D** Volume of Cylinder	**Q 16 → C** Similar Triangles
Q 17 → B Exterior Angle Theorem	**Q 18 → B** Composite Figures	**Q 19 → C** 30-60-90 Triangle	**Q 20 → C** Surface Area of Cone

For full explanations and interactive practice with instant feedback, open math_practice.html in your browser.