Algebra 1 & Geometry

Self-Study Worksheet · 20 Problems · Multiple Choice · Grade 8–9

PART A: ALGEBRA 1 (Problems 1–10)

■ ***Quick Memory Points***

ISOLATE · BALANCE · INVERSE · DISTRIBUTE · SUBSTITUTE · SLOPE = rise/run · RATE × TIME = DISTANCE

Problem 01 · Age Word Problem

Emma is 3 times as old as her younger brother. In 4 years, she will be twice her brother's age. How old is Emma *now*?

Hint: Set up TWO equations. Let b = brother's age now. Now: Emma = 3b. In 4 years: (3b+4) = 2(b+4)

(A) 8 years old

(B) 12 years old

(C) 15 years old

(D) 9 years old

Problem 02 · Coin Problem

A jar contains only dimes (10¢) and quarters (25¢). There are 18 coins totaling $2.85. How many quarters are there?

Hint: TOTAL COINS + TOTAL VALUE → two equations. d + q = 18 and 10d + 25q = 285

(A) 7 quarters

(B) 8 quarters

(C) 9 quarters

(D) 11 quarters

Problem 03 · Mixture Problem

A chemist mixes a 20% acid solution with a 50% acid solution to make 60 mL of a 30% acid solution. How many mL of the 20% solution are needed?

Hint: 0.20x + 0.50(60 – x) = 0.30 × 60

(A) 20 mL

(B) 30 mL

(C) 40 mL

(D) 45 mL

Problem 04 · Distance–Rate–Time

Two trains leave the same station traveling in opposite directions. Train A travels at 60 mph and Train B at 80 mph. After how many hours will they be 420 miles apart?

Hint: OPPOSITE DIRECTION → add speeds. (60 + 80) × t = 420

(A) 2.5 hours

(B) 3 hours

(C) 3.5 hours

(D) 4 hours

Problem 05 · Slope & Linear Equation

A line passes through (2, 5) and (6, 13). Which equation correctly represents this line?

Hint: m = (y2 – y1) ÷ (x2 – x1) = 8 ÷ 4 = 2, then find b using y = mx + b

(A) y = 2x + 1

(B) y = 2x + 3

(C) y = 3x + 1

(D) y = 2x – 1

Problem 06 · Work Rate Problem

Printer A prints a report in 4 hours. Printer B prints it in 6 hours. How long if both work together?

Hint: Rate = 1/time. Together: 1/4 + 1/6 = 1/T

(A) 2 hours

(B) 2 hours 24 min

(C) 5 hours

(D) 3 hours

Problem 07 · Inequality Word Problem

Marcus wants to buy notebooks at $2.50 each. He has $20 but must keep at least $4.00 for bus fare. What is the maximum number of notebooks he can buy?

Hint: 2.50n ≤ 20 – 4 → solve and round DOWN

(A) 5 notebooks

(B) 7 notebooks

(C) 6 notebooks

(D) 8 notebooks

Problem 08 · Percent Increase

A jacket costs $80. Marked up 25%, then the new price is discounted 20%. What is the final price?

Hint: Multiply — don't add! $80 × 1.25 × 0.80

(A) $84.00

(B) $80.00

(C) $76.00

(D) $82.00

Problem 09 · Systems of Equations

A farm has chickens and cows. There are 30 animals total and 84 legs total. How many cows?

Hint: c + k = 30 and 4c + 2k = 84 (cows=4 legs, chickens=2 legs)

(A) 10 cows

(B) 12 cows

(C) 14 cows

(D) 18 cows

Problem 10 · Function & Pattern

A parking lot charges $3 for the first hour and $1.50 for each additional hour. Someone paid $12.00 total. How many hours did they park?

Hint: 3 + 1.50(h – 1) = 12 — the first hour is different!

(A) 5 hours

(B) 6 hours

(C) 7 hours

(D) 8 hours

PART B: GEOMETRY (Problems 11–20)

■ ***Quick Memory Points***

PYTHAGOREAN: $a^2+b^2=c^2$ · TRIANGLE: 180° · SUPPLEMENTARY: 180° · COMPLEMENTARY: 90° · CIRCLE AREA: πr^2 · SIMILAR: PROPORTIONAL

Problem 11 · Triangle Angles

In a triangle, two angles measure 47° and 68°. What is the measure of the third angle?

Hint: All three angles of ANY triangle sum to 180°.

(A) 55°
(B) 60°
(C) 65°
(D) 70°

Problem 12 · Pythagorean Theorem

A 13-foot ladder leans against a wall. The base is 5 feet from the wall. How high up does it reach?

Hint: $a^2 + b^2 = c^2 \rightarrow 5^2 + b^2 = 13^2$

(A) 10 feet
(B) 12 feet
(C) 11 feet
(D) 14 feet

Problem 13 · Area of Composite Shape

An L-shaped floor is a 10 m × 8 m rectangle with a 3 m × 4 m piece cut from one corner. What is the area?

Hint: Big area – small area = (10×8) – (3×4)

(A) 68 m²
(B) 80 m²
(C) 72 m²
(D) 64 m²

Problem 14 · Parallel Lines & Transversal

Two parallel lines are cut by a transversal. One co-interior (same-side interior) angle is 110°. What is the other co-interior angle?

Hint: Co-interior angles are SUPPLEMENTARY (add to 180°), NOT equal.

(A) 110°
(B) 70°
(C) 80°
(D) 90°

Problem 15 · Circle Area

A circular pizza has a diameter of 14 inches. What is its area? (Use $\pi \approx 3.14$)

Hint: $r = d/2 = 7$, then $A = \pi r^2 = 3.14 \times 7^2$ — use radius, NOT diameter!

(A) 43.96 in²
(B) 175.84 in²
(C) 153.86 in²
(D) 615.44 in²

Problem 16 · Similar Triangles

Two similar triangles have sides in ratio 3:5. The smaller triangle has area 27 cm². What is the larger triangle's area?

Hint: AREA ratio = (side ratio)² → (3/5)² = 9/25

(A) 45 cm²

(B) 75 cm²

(C) 135 cm²

(D) 81 cm²

Problem 17 · Volume of Rectangular Prism

A rectangular box is 8 cm long, 5 cm wide, and 3 cm tall. What is its volume?

Hint: V = length × width × height

(A) 120 cm³

(B) 79 cm³

(C) 240 cm³

(D) 40 cm³

Problem 18 · Exterior Angle Theorem

An exterior angle of a triangle measures 125°. One non-adjacent interior angle is 72°. Find the other non-adjacent interior angle.

Hint: Exterior angle = sum of the TWO non-adjacent interior angles.

(A) 55°

(B) 62°

(C) 53°

(D) 45°

Problem 19 · Perimeter with Pythagorean

A right triangle has legs of 9 cm and 12 cm. What is its perimeter?

Hint: Find hypotenuse first: $c^2 = 9^2 + 12^2 = 225$, $c = 15$

(A) 30 cm

(B) 36 cm

(C) 108 cm

(D) 21 cm

Problem 20 · Arc Length

A sector has central angle 60° and radius 12 cm. What is the arc length? ($\pi \approx 3.14$)

Hint: Arc = (angle/360°) × 2πr = (60/360) × 2 × 3.14 × 12

(A) 12.56 cm

(B) 25.12 cm

(C) 75.36 cm

(D) 6.28 cm

ANSWER KEY

1	B
2	A
3	C
4	B
5	A
6	B
7	C
8	B
9	B
10	C

11	C
12	B
13	A
14	B
15	C
16	B
17	A
18	C
19	B
20	A