

Pre-Algebra & Geometry

Self-Study Worksheet · 20 Essential Problems · Answers Below Each Section

How to use this worksheet: Read each question carefully. Choose your answer. After completing each section, check the Answer Key at the bottom of the page. Memory Keys are ultra-short rules — memorize them to solve problems faster.

— PRE-ALGEBRA —

Q01 Integers

Pre-Algebra

■ *Memory Key: SIGN RULE: same signs → (+) different signs → (-) Negative x Negative = Positive*

Which of the following has the greatest value?

Think carefully about the rules for multiplying negative numbers.

EXAMPLE

Example: $(-3) \times (-4) = +12$ | $(-3) \times (+4) = -12$ | $(-3) + (-4) = -7$

A. $(-5) \times (-3)$

B. $(-2) \times (-8)$

C. $(-6) + (-9)$

D. $3 \times (-5)$

Q02 Order of Operations

Pre-Algebra

■ *Memory Key: PEMDAS: Parentheses → Exponents → Multiply/Divide → Add/Subtract*

Evaluate: $3 + 2 \times (8 - 5)^2 \div 3$

The most common mistake is doing left-to-right without PEMDAS.

EXAMPLE

Steps: $(8-5)=3 \rightarrow 3^2=9 \rightarrow 2 \times 9=18 \rightarrow 18 \div 3=6 \rightarrow 3+6 = ?$

A. 21

B. 7

C. 9

D. 15

Q03 Fractions

Pre-Algebra

■ *Memory Key: KEEP-CHANGE-FLIP: dividing fractions → flip the second fraction and multiply*

What is $(3/4) \div (2/5)$?

Flip the second fraction, then multiply. Don't just multiply straight across!

EXAMPLE

$a/b \div c/d = a/b \times d/c$ So: $3/4 \div 2/5 = 3/4 \times 5/2 = ?$

A. $6/20$

B. $15/8$

C. $8/15$

D. $3/10$

Q04 Percent

Pre-Algebra

■ *Memory Key: PERCENT = per hundred · Sale price = Original \times (1 – discount rate)*

A jacket costs \$80. It is on sale for 35% off. What is the sale price?

Calculate the discount first, then subtract. Or use the shortcut: multiply by (1 – 0.35).

EXAMPLE

Method 1: Discount = $80 \times 0.35 = \$28 \rightarrow$ Sale price = $80 - 28$ Method 2 (faster): Sale price = 80×0.65

A. \$52.00

B. \$28.00

C. \$45.00

D. \$108.00

Q05 Solving Equations

Pre-Algebra

■ *Memory Key: UNDO in reverse — subtract before dividing · Balance both sides equally*

Solve for x: $2x + 7 = 19$

Use inverse operations. Whatever is done to x, undo it in reverse order.

EXAMPLE

Similar: $3x + 5 = 14 \rightarrow$ subtract 5 $\rightarrow 3x = 9 \rightarrow$ divide by 3 $\rightarrow x = 3$

A. $x = 5$

B. $x = 13$

C. $x = 6$

D. $x = 7$

Q06 Ratio & Proportion

Pre-Algebra

■ *Memory Key: CROSS-MULTIPLY: $a/b = c/d \rightarrow a \times d = b \times c$*

A car travels 150 miles in 3 hours. At the same speed, how many miles will it travel in 5 hours?

Set up a proportion and cross-multiply. Check your units match!

EXAMPLE

$150 \text{ mi} / 3 \text{ hr} = x \text{ mi} / 5 \text{ hr} \rightarrow$ Cross-multiply: $150 \times 5 = 3x$

A. 200 miles

B. 90 miles

C. 300 miles

D. 250 miles

Q07 Inequalities

Pre-Algebra
a

■ *Memory Key: FLIP THE SIGN when multiplying or dividing both sides by a NEGATIVE number!*

Solve: $-3x + 6 > 15$. Which value of x is a solution?

This is the #1 inequality mistake — forgetting to flip the sign when dividing by negative.

EXAMPLE

$-3x + 6 > 15 \rightarrow$ subtract 6 $\rightarrow -3x > 9 \rightarrow$ divide by -3 and FLIP $\rightarrow x < -3$

A. $x = -3$

B. $x = 0$

C. $x = -5$

D. $x = 2$

Q08 Exponents

Pre-Algebra
a

■ *Memory Key: ZERO POWER = 1 (any nonzero base) · Negative exponent = flip to denominator*

Which expression is equal to 1?

Apply exponent rules carefully. $a^0 = 1$ for any nonzero a .

EXAMPLE

$a^0 = 1 \mid a^{-1} = 1/a \mid 0^0 = 0 \mid (-1)^{-1} = -1$

A. $(-7)^0$

B. 7^{-1}

C. 0^0

D. $(-1)^{-1}$

Q09 Word Problems

Pre-Algebra
a

■ *Memory Key: DEFINE A VARIABLE first: let x = what you're looking for, then translate words to an equation*

Emma has twice as many stickers as Liam. Together they have 48. How many does Emma have?

"Twice as many" means $\times 2$. Don't forget the question asks for Emma's count, not Liam's!

EXAMPLE

Let Liam = x . Then Emma = $2x$. Together: $x + 2x = 48 \rightarrow 3x = 48 \rightarrow x = 16$

A. 24

B. 32

C. 16

D. 36

Q10 Number Patterns

Pre-Algebra

■ *Memory Key: ARITHMETIC = add a constant · GEOMETRIC = multiply by a constant. Check which type first!*

Find the missing term: 2, 6, 18, 54, ____

Always check: is the pattern addition (arithmetic) or multiplication (geometric)?

EXAMPLE

Arithmetic: 2, 5, 8, 11, ... (+3 each) Geometric: 2, 6, 18, 54, ... ($\times 3$ each)

A. 108

B. 58

C. 162

D. 72

— GEOMETRY —

Q11 Angles

Geometry

■ *Memory Key: SUPPLEMENTARY adds to 180° COMPLEMENTARY adds to 90° S \rightarrow Straight line, C \rightarrow Corner*

Two angles are supplementary. One measures 47° . What is the other angle?

Supplementary \neq Complementary. Learn the difference — it's tested every time!

EXAMPLE

Supplementary: $A + B = 180^\circ$ | Complementary: $A + B = 90^\circ$

A. 43°

B. 133°

C. 313°

D. 47°

■ *Memory Key: TRIANGLE ANGLE SUM = 180° always, without exception*

A triangle has angles x , $2x$, and $(x + 20^\circ)$. Find x .

Combine like terms first, then set equal to 180° and solve.

EXAMPLE

$$x + 2x + (x + 20^\circ) = 180^\circ \rightarrow 4x + 20^\circ = 180^\circ \rightarrow 4x = 160^\circ$$

A. $x = 40^\circ$

B. $x = 45^\circ$

C. $x = 60^\circ$

D. $x = 50^\circ$

■ *Memory Key: $a^2 + b^2 = c^2$ where c is the HYPOTENUSE (longest side, opposite the right angle)*

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

Memorize common triples: 3-4-5, 5-12-13, 8-15-17. This is $3 \times (3-4-5)$!

EXAMPLE

$$9^2 + 12^2 = 81 + 144 = 225 = c^2 \rightarrow c = \sqrt{225}$$

A. 13

B. 21

C. 15

D. $\sqrt{165}$

■ *Memory Key: TRIANGLE AREA = $(1/2) \times \text{base} \times \text{height}$ · Height must be PERPENDICULAR to base*

A triangle has base 14 cm and height 9 cm. What is its area?

Don't forget the $1/2$! Triangles are half of rectangles.

EXAMPLE

$$\text{Rectangle area} = b \times h \rightarrow \text{Triangle} = (1/2) \times b \times h$$

A. 126 cm^2

B. 63 cm^2

C. 46 cm^2

D. 31.5 cm^2

■ *Memory Key: Circumference = $\pi \times d$ Area = $\pi \times r^2$ Radius = diameter \div 2*

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

The formula uses RADIUS. Always halve the diameter first!

EXAMPLE

Diameter = 10 \rightarrow Radius = 5 | $A = \pi \times 5^2 = 3.14 \times 25$

A. 314 cm²

B. 31.4 cm²

C. 78.5 cm²

D. 157 cm²

■ *Memory Key: PERIMETER = total distance AROUND the shape · Rectangle: $P = 2(l + w)$*

A rectangle has perimeter 54 cm and length 16 cm. What is the width?

Perimeter (around) \neq Area (inside). Set up the formula and solve.

EXAMPLE

$P = 2(l + w) \rightarrow 54 = 2(16 + w) \rightarrow 27 = 16 + w \rightarrow w = ?$

A. 11 cm

B. 22 cm

C. 19 cm

D. 38 cm

■ *Memory Key: ALTERNATE INTERIOR = equal (Z-shape) · CO-INTERIOR (same-side) = supplementary (C-shape)*

Two parallel lines cut by a transversal. One alternate interior angle = 65°. Find the co-interior angle.

Learn which pairs are equal and which sum to 180°. Co-interior angles are supplementary!

EXAMPLE

Alternate interior: equal | Co-interior: sum to 180° | Corresponding: equal

A. 65°

B. 25°

C. 295°

D. 115°

■ *Memory Key: PRISM Volume = length × width × height (cubic units, e.g. cm³)*

A rectangular box has length 8 cm, width 5 cm, height 4 cm. What is its volume?

Volume = 3D (inside space). Don't confuse with surface area = 2D (outside wrapping).

EXAMPLE

$V = l \times w \times h$ | Surface Area = $2(lw + lh + wh)$ These are different!

A. 184 cm²

B. 160 cm³

C. 104 cm³

D. 17 cm³

Q19 Coordinate Geometry

Geometry

■ *Memory Key: SLOPE = rise ÷ run = $(y_2 - y_1) / (x_2 - x_1)$ · Always subtract in the SAME order*

What is the slope of the line through (2, 3) and (6, 11)?

Don't mix up x and y, and don't reverse the subtraction order for one pair.

EXAMPLE

$m = (y_2 - y_1) / (x_2 - x_1) = (11 - 3) / (6 - 2) = 8/4$

A. 2

B. 1/2

C. 4

D. 4/8

Q20 Similar Figures

Geometry

■ *Memory Key: AREA SCALE = (side ratio)² · Side ratio 3:5 → Area ratio 9:25*

Two similar triangles have sides in ratio 3:5. Smaller area = 27 cm². Larger area = ?

Area does NOT scale like sides — you must SQUARE the scale factor for areas!

EXAMPLE

Side ratio = 3/5 Area ratio = $(3/5)^2 = 9/25 \rightarrow 27 / A = 9/25$

A. 45 cm²

B. 135 cm²

C. 75 cm²

D. 50 cm²

ANSWER KEY

Pre-Algebra & Geometry

PRE-ALGEBRA (Q1–Q10)

Q01	B	Q02	C	Q03	B	Q04	A	Q05	C	Q06	D	Q07	C	Q08	A	Q09	B	Q10	C
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GEOMETRY (Q11–Q20)

Q11	B	Q12	A	Q13	C	Q14	B	Q15	C	Q16	A	Q17	D	Q18	B	Q19	A	Q20	C
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BRIEF EXPLANATIONS

Q01 (B) $A = +15$, $B = +16$, $C = -15$, $D = -15$. B is the greatest ($16 > 15$).

Q02 (C) $3 + 2 \times 9 \div 3 = 3 + 18 \div 3 = 3 + 6 = 9$. A(21) comes from adding $3+2$ first — PEMDAS error!

Q03 (B) $3/4 \times 5/2 = 15/8$. Choice A is multiplying without flipping. Choice C is the flipped fraction itself.

Q04 (A) $\$80 \times 0.35 = \28 (discount). Sale price = $\$80 - \$28 = \$52$. Choice B is the discount amount, not the sale price!

Q05 (C) $2x + 7 = 19 \rightarrow 2x = 12 \rightarrow x = 6$. Check: $2(6)+7 = 19 \checkmark$

Q06 (D) Speed = 50 mph. In 5 hours: $50 \times 5 = 250$ miles. Or: $150 \times 5 = 750 = 3x \rightarrow x = 250$.

Q07 (C) Solution: $x < -3$. Only -5 satisfies this. A: -3 is not strictly less than -3 .

Q08 (A) A: $(-7)^{\blacksquare} = 1 \checkmark$ B: $7^{\blacksquare} = 1/7$ C: $0^{\blacksquare} = 0$ D: $(-1)^{\blacksquare} = -1$

Q09 (B) Liam = 16, Emma = $2 \times 16 = 32$. Check: $16 + 32 = 48 \checkmark$. Choice C (16) is Liam's count — a classic trap!

Q10 (C) Each term $\times 3$: $2 \rightarrow 6 \rightarrow 18 \rightarrow 54 \rightarrow 162$. Choice A (108) is multiplying by 2 instead of 3.

Q11 (B) $180^\circ - 47^\circ = 133^\circ$. Choice A (43°) = $90^\circ - 47^\circ \rightarrow$ that's complementary, not supplementary!

Q12 (A) $4x = 160 \rightarrow x = 40^\circ$. Check: $40 + 80 + 60 = 180^\circ \checkmark$

Q13 (C) $\sqrt{225} = 15$. This is $(9,12,15) = 3 \times (3,4,5)$. Choice B (21) = $9+12$, just adding the legs!

Q14 (B) $(1/2) \times 14 \times 9 = 63 \text{ cm}^2$. Choice A (126) forgets the $1/2$. Choice C (46) is perimeter thinking.

Q15 (C) $r=5$, $A = 3.14 \times 25 = 78.5 \text{ cm}^2$. Choice A (314) uses diameter (10) instead of radius — very common!

Q16 (A) $27 = 16 + w \rightarrow w = 11 \text{ cm}$. Check: $2(16+11) = 54 \checkmark$. Choice B (22) forgets that $27 = l+w$, not just w .

Q17 (D) $180^\circ - 65^\circ = 115^\circ$. Choice A (65°) confuses co-interior with alternate interior (which are equal).

Q18 (B) $V = 8 \times 5 \times 4 = 160 \text{ cm}^3$. Choice A (184 cm^2) is surface area — different formula and different concept!

Q19 (A) $(11-3)/(6-2) = 8/4 = 2$. Choice B ($1/2$) puts x-values on top — flipping the formula!

Q20 (C) $9A = 27 \times 25 = 675 \rightarrow A = 75 \text{ cm}^2$. Choice A (45) uses the side ratio, not the squared area ratio!