

# Math Mastery Worksheet

Pre-Algebra (10 problems) · Geometry (10 problems) · Total: 20 problems

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## Part 1 — Pre-Algebra

Order of Operations · Integers · Fractions · Equations · Ratios · Inequalities · Percents

### Q1. Order of Operations (PEMDAS) [TRICKY]

Simplify:  $3 + 4 \times 2 - (6 \div 3)^2$

*Hint: Exponents before Multiply/Divide before Add/Subtract*

**KEY: PEMDAS**

Parentheses > Exponents > Multiply/Divide > Add/Subtract

(A) A) 10

(B) B) 14

(C) C) 7

(D) D) 5

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### Q2. Integer Operations [TRICKY]

A submarine is at -120 ft. It rises 45 ft, then descends 80 ft. What is its final depth?

*Rise = add positive. Descend = subtract.*

**KEY: Integer Number Line**

Up/Rise = (+) | Down/Drop = (-) | Start from WHERE YOU ARE

(A) -35 ft

(B) -155 ft

(C) -245 ft

(D) -75 ft

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### Q3. Solving Equations

Solve for x:  $3x - 7 = 2x + 5$

*Get all x's on one side, all numbers on the other.*

**KEY: Balance Rule**

Whatever you do to one side, do the SAME to the other side.

(A)  $x = 2$

(B)  $x = 12$

(C)  $x = -2$

(D)  $x = 5$

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### Q4. Fraction x Mixed Number [TRICKY]

A recipe needs  $\frac{2}{3}$  cup of sugar. You make 2 and  $\frac{1}{2}$  times the recipe. How much sugar?

*Convert 2-1/2 to improper fraction first:  $\frac{5}{2}$*

**KEY: Mixed -> Improper**

Whole x Denom + Numerator, over Denominator.  $2(1/2) = 5/2$

(A)  $\frac{4}{3}$  cups

(B)  $\frac{5}{3}$  cups

(C)  $\frac{7}{6}$  cups

(D) 2 cups

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**Q5. Writing & Solving Equations**

Notebooks \$4 each, pens \$1.50 each. Maria spends \$15 total. If she buys 3 notebooks, how many pens?

Equation:  $4n + 1.5p = 15$ , plug in  $n = 3$

**KEY: Word -> Equation**

Identify knowns (plug in) > Identify unknown (variable) > Solve step by step

- (A) 1 pen (B) 2 pens  
(C) 3 pens (D) 4 pens
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**Q6. Proportions & Scale [TRICKY]**

Map scale: 1 inch = 25 miles. Two cities are 3.4 inches apart. Actual distance?

Set up proportion:  $1/25 = 3.4/x$

**KEY: Cross-Multiply**

$a/b = c/d \Rightarrow a \times d = b \times c$  (cross the equals sign like an X!)

- (A) 75 miles (B) 85 miles  
(C) 90 miles (D) 68 miles
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**Q7. Inequalities [HARD]**

Solve the inequality:  $-3x + 6 > 15$

*WARNING: Dividing by a NEGATIVE number FLIPS the inequality sign!*

**KEY: FLIP the Sign**

Divide or multiply by NEGATIVE -> > becomes < | < becomes >

- (A)  $x > -3$ , shade right (B)  $x < -3$ , shade left  
(C)  $x > 3$ , shade right (D)  $x < 3$ , shade left
- 

**Q8. Percent Discount**

A \$80 jacket is 35% off. What is the sale price?

Two methods: find 35% and subtract, OR multiply by  $(1 - 0.35)$

**KEY: Discount Shortcut**

Sale price = Original  $\times (1 - \text{discount } \%) \Rightarrow \$80 \times 0.65 = ?$

- (A) \$45.00 (B) \$52.00  
(C) \$56.00 (D) \$28.00
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**Q9. Exponents with Negatives [TRICKY]**

Evaluate:  $(-2)^3 + (-3)^2$

Is  $(-3)^2$  positive or negative? Think about parentheses!

**KEY: Negative Exponents**

$(-)^{\text{EVEN}} = \text{positive}$  |  $(-)^{\text{ODD}} = \text{negative}$  |  $(-3)^2 = 9$  |  $-3^2 = -9$

- (A) -17 (B) 1  
(C) -1 (D) 17
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**Q10. Distance-Rate-Time [HARD]**

Train A goes east at 60 mph. Train B goes west at 75 mph. How far apart after 2.5 hours?

*Opposite directions -> ADD the distances.*

**KEY:  $D = R \times T$**

Same direction = SUBTRACT | Opposite direction = ADD

(A) 262.5 miles

(B) 337.5 miles

(C) 150 miles

(D) 375 miles

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## Part 2 — Geometry

Angles · Triangles · Area & Perimeter · Circles · Pythagorean Theorem · Transformations

**Q11. Vertical & Supplementary Angles [TRICKY]**

Two lines intersect. One angle is 52 degrees. What are the other three angles?

*Vertical angles = equal. Supplementary angles = 180 degrees.*

**KEY: Intersecting Lines**

Vertical (across) = EQUAL | Adjacent angles = 180 degrees (supplementary)

(A) All three are 52 deg

(B) 52, 128, 128 deg

(C) 52, 128, and 52 deg

(D) 90, 90, 52 deg

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**Q12. Pythagorean Theorem**

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

*Use  $a^2 + b^2 = c^2$ . Hint: 9-12-15 is a Pythagorean triple.*

**KEY: Pythagorean Triples**

3-4-5 | 5-12-13 | 8-15-17 | Multiples work: 6-8-10, 9-12-15, 10-24-26

(A) 13

(B) 15

(C)  $\sqrt{225}=16$

(D) 21

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**Q13. Circle Area [TRICKY]**

A circular pizza has diameter 14 inches. What is its area? ( $\pi = 3.14$ )

*WARNING: Use RADIUS not diameter in  $A = \pi r^2$  ( $r = d/2 = 7$ )*

**KEY: Circle Formulas**

Area =  $\pi r^2$  | Circumference =  $2\pi r = \pi d$  |  $r = d / 2$  (ALWAYS!)

(A) 43.96 sq in

(B) 87.92 sq in

(C) 153.86 sq in

(D) 615.44 sq in

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**Q14. Triangle Angle Sum [TRICKY]**

In triangle ABC: angle A = 48, angle B = 73. Find angle C and name the triangle type.

*All three angles of ANY triangle always add to 180 degrees.*

**KEY: Triangle Angle Sum = 180**

Acute: all < 90 | Right: one = 90 | Obtuse: one > 90

- (A) 59 deg, acute (B) 59 deg, obtuse  
(C) 121 deg, obtuse (D) 61 deg, acute
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**Q15. Trapezoid Area**

A trapezoid has parallel sides 6 cm and 10 cm, height 4 cm. What is its area?

*Formula:  $A = (1/2)(b_1 + b_2) \times h$*

**KEY: Trapezoid = Average bases x height**

$A = (b_1 + b_2)/2 \times h$  (think: average base times height)

- (A) 40 sq cm (B) 32 sq cm  
(C) 24 sq cm (D) 64 sq cm
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**Q16. Parallel Lines & Transversal [HARD]**

Two parallel lines cut by a transversal. One angle = 110 deg. Which statement is NOT correct?

*Know your pairs: corresponding, alternate interior, co-interior.*

**KEY: Parallel Line Pairs**

Corresponding = equal (F) | Alternate interior = equal (Z) | Co-interior = 180 deg (C)

- (A) Corresponding = 110 deg (B) Alt. interior = 110 deg  
(C) Co-interior = 110 deg (D) Supplementary adj. = 70 deg
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**Q17. Rectangle Perimeter + Algebra [TRICKY]**

Rectangle perimeter = 46 cm. Length is 3 more than twice the width. Find dimensions.

*Let  $w = \text{width}$ ,  $\text{length} = 2w + 3$ . Then  $2(w + 2w + 3) = 46$ .*

**KEY: Perimeter = 2(L + W)**

Define variable FIRST. Write equation. THEN solve. Never guess!

- (A)  $w=8, L=15$  (B)  $w=8, L=19$   
(C)  $w=10, L=13$  (D)  $w=7, L=16$
- 

**Q18. Reflections & Translations [HARD]**

Point P(2, -3) is reflected across the y-axis, then translated 4 units up. Final coordinates?

*Reflection over y-axis flips x-sign. Translation up adds to y.*

**KEY: Transformations**

Reflect y-axis:  $(x,y) \rightarrow (-x,y)$  | Reflect x-axis:  $(x,y) \rightarrow (x,-y)$  | Up +k:  $y \rightarrow y+k$

- (A) (-2, -7) (B) (-2, 1)  
(C) (2, 1) (D) (-2, -3)
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**Q19. Composite Figures [TRICKY]**

Rectangle (10 x 6) with a semicircle on top (diameter = 10). Total area? ( $\pi = 3.14$ )

Semicircle radius = 5. Area =  $(1/2) \cdot \pi \cdot r^2$

**KEY: Composite Strategy**

BREAK APART -> find each area -> ADD them up. Never do it all at once!

(A)  $60+78.5=138.5$

(B)  $60+39.25=99.25$

(C)  $60+31.4=91.4$

(D)  $60+15.7=75.7$

**Q20. Similar Figures - Area Ratio [HARD]**

Two similar triangles, side ratio 3:5. Smaller area = 27 sq cm. Larger area = ?

*TRICKY: side ratio 3:5 does NOT mean area ratio 3:5. Area scales by ratio SQUARED.*

**KEY: Similar Figures Scale**

Side ratio =  $k$  | Perimeter ratio =  $k$  | Area ratio =  $k^2$  | Volume ratio =  $k^3$

(A) 45 sq cm

(B) 75 sq cm

(C) 135 sq cm

(D) 50 sq cm

**ANSWER KEY**

Q1: <b>C</b>	Q2: <b>B</b>	Q3: <b>B</b>	Q4: <b>B</b>	Q5: <b>B</b>
Q6: <b>B</b>	Q7: <b>B</b>	Q8: <b>B</b>	Q9: <b>B</b>	Q10: <b>B</b>
Q11: <b>C</b>	Q12: <b>B</b>	Q13: <b>C</b>	Q14: <b>A</b>	Q15: <b>B</b>
Q16: <b>C</b>	Q17: <b>B</b>	Q18: <b>B</b>	Q19: <b>B</b>	Q20: <b>B</b>