Math Quest!

Pre-Algebra & Geometry Worksheet

20 Essential Problems • Common Mistakes Focus

Name: _____ **Date:** _____

Score: _____ / 20 **Time:** _____ min

DIRECTIONS: Read each concept and example, then answer all 3 steps for each problem. Circle your answer. Each problem requires ALL 3 steps correct. Show your work in the space provided.

SECTION A: Pre-Algebra (Problems 1 - 10)

■ #1 Order of Operations (PEMDAS)

Pre-Algebra

■ **CONCEPT:** PEMDAS: Parentheses -> Exponents -> Multiplication/Division (L to R) -> Addition/Subtraction (L to R). WARNING: Always multiply BEFORE adding!

■ **EXAMPLE:**
Evaluate: 3 + 4 x 2
Step 1: Multiply first: 4 x 2 = 8
Step 2: Add: 3 + 8 = 11 (NOT 3+4=7 then x2=14)

■ QUESTION: Evaluate: 2 + 3 x 4 - 1

Step 1 of 3:

Step 1: Which operation do you do FIRST?

■ A) 2 + 3 = 5	■ B) 3 x 4 = 12
■ C) 4 - 1 = 3	■ D) 2 - 1 = 1

My Answer: _____

Step 2 of 3:

Step 2: After multiplying, what is the expression?

■ A) 2 + 12 - 1	■ B) 5 x 4 - 1
■ C) 2 + 3 x 3	■ D) 6 x 4 - 1

My Answer: _____

Step 3 of 3:

Step 3: Final answer = ?

■ A) 12	■ B) 14

■ C) 13	■ D) 11

My Answer: _____

Work Space:

■ #2 Solving One-Step Equations

Pre-Algebra

■ CONCEPT: Inverse Operations: Do the OPPOSITE to isolate x.
x + a = b => x = b - a | ax = b => x = b / a

■ EXAMPLE: Solve: x + 7 = 15
Subtract 7 from both sides: x = 15 - 7 = 8

■ QUESTION: Solve for x: 3x = 21

Step 1 of 3:

Step 1: What operation isolates x?

■ A) Multiply both sides by 3	■ B) Subtract 3 from both sides
■ C) Divide both sides by 3	■ D) Add 3 to both sides

My Answer: _____

Step 2 of 3:

Step 2: What is x?

■ A) x = 63	■ B) x = 18
■ C) x = 7	■ D) x = 24

My Answer: _____

Step 3 of 3:

Step 3: Check: does 3(7) = 21?

■ A) No, 3(7) = 18	■ B) Yes! 3(7) = 21 CHECK
■ C) No, 3(7) = 24	■ D) Yes but x = 6 also works

My Answer: _____

Work Space:

■ #3 Solving Two-Step Equations

Pre-Algebra

■ **CONCEPT:**

Two-Step Strategy:
1) Undo Addition or Subtraction FIRST
2) Then undo Multiplication or Division
Think: reverse the order of operations!

■ **EXAMPLE:**

Solve: 2x + 5 = 13
Step 1: Subtract 5 -> 2x = 8
Step 2: Divide by 2 -> x = 4

■ QUESTION: Solve for x: 4x - 3 = 17

Step 1 of 3:

Step 1: What do you do FIRST?

■ A) Divide by 4	■ B) Add 3 to both sides
■ C) Subtract 3	■ D) Multiply by 4

My Answer: _____

Step 2 of 3:

Step 2: Now solve 4x = 20. What is x?

■ A) x = 80	■ B) x = 16
■ C) x = 5	■ D) x = 4

My Answer: _____

Step 3 of 3:

Step 3: Verify: what is 4(5) - 3?

■ A) 17 CHECK	■ B) 23
■ C) 13	■ D) 19

My Answer: _____

Work Space:

■ #4 Fractions & Proportions

Pre-Algebra

■ **CONCEPT:**

Cross Multiplication: If a/b = c/d, then a x d = b x c
WARNING: Cross multiply (not same-side multiply)!

■ **EXAMPLE:**

Solve: x/3 = 8/12
Cross multiply: 12x = 24 => x = 2

■ QUESTION: Solve the proportion: x/5 = 12/20

Step 1 of 3:

Step 1: Apply cross multiplication. What equation do you get?

■ A) 5x = 60	■ B) 20x = 60
■ C) x = 240	■ D) 5x = 12

My Answer: _____

Step 2 of 3:

Step 2: Solve 20x = 60. What is x?

■ A) x = 1200	■ B) x = 40
■ C) x = 3	■ D) x = 2

My Answer: _____

Step 3 of 3:

Step 3: Check: is 3/5 equal to 12/20?

■ A) No, different values	■ B) Yes! Both = 0.6 CHECK
■ C) No, 12/20 = 0.7	■ D) Yes only after simplifying

My Answer: _____

Work Space:

■ #5 Percentages

Pre-Algebra

■ **CONCEPT:**

Part = (Percent/100) x Whole
% increase = (Change / Original) x 100
WARNING: Always divide by the ORIGINAL value, not the new one!

■ **EXAMPLE:**

$40 shirt, 25% discount: 25/100 x 40 = $10 off. Sale price = $30

■ QUESTION: A store marks up a $60 jacket by 15%. What is the NEW price?

Step 1 of 3:

Step 1: Calculate 15% of $60.

■ A) $6.00	■ B) $9.00
■ C) $15.00	■ D) $4.00

My Answer: _____

Step 2 of 3:

Step 2: New price = original + markup = ?

■ A) $51.00	■ B) $75.00
■ C) $69.00	■ D) $45.00

My Answer: _____

Step 3 of 3:

Step 3: What percent of $69 is the $9 markup? (nearest %)

■ A) 15%	■ B) 13%
■ C) 11%	■ D) 17%

My Answer: _____

—■ Work Space:

■ #6 Integer Operations

Pre-Algebra

■ **CONCEPT:**

(+)x(+)=(+) | (-)x(-)=(+) | (+)x(-)=(-)
Subtracting a negative = ADDING: a-(-b) = a+b

■ **EXAMPLE:**

-3 - (-7) = -3 + 7 = 4

■ QUESTION: Calculate: (-4) x (-3) + (-6) / 2

Step 1 of 3:

Step 1: What is (-4) x (-3)?

■ A) -12	■ B) +12
■ C) -7	■ D) +7

My Answer: _____

Step 2 of 3:

Step 2: What is (-6) / 2?

■ A) +3	■ B) -4
■ C) +4	■ D) -3

My Answer: _____

Step 3 of 3:

Step 3: Final answer = 12 + (-3) = ?

■ A) 15	■ B) -15
■ C) 9	■ D) -9

My Answer: _____

■ Work Space:

■ #7 Combining Like Terms

Pre-Algebra

■ **CONCEPT:**

Like Terms: same variable AND same exponent.
3x + 5x = 8x (like) | 3x + 5x^2 = cannot combine!
WARNING: Never add variables with different exponents!

■ **EXAMPLE:**

Simplify: 4x^2 + 3x - 2x^2 + 7x = 2x^2 + 10x

■ QUESTION: Simplify: 5x + 3y - 2x + 8y - x

Step 1 of 3:

Step 1: Group the x terms. Which are the x terms?

■ A) 5x, 3y, 8y	■ B) 5x, -2x, -x
■ C) 3y, 8y	■ D) 5x, 8y, -x

My Answer: _____

Step 2 of 3:

Step 2: Combine x terms: 5x - 2x - x = ?

■ A) 4x	■ B) 3x
■ C) 2x	■ D) 6x

My Answer: _____

Step 3 of 3:

Step 3: Final simplified expression?

■ A) 2x + 5y	■ B) 2x + 11y
■ C) 3x + 11y	■ D) 2x + 8y

My Answer: _____

Work Space:

■ #8 Inequalities

Pre-Algebra

■ **CONCEPT:**

KEY RULE: Multiply/divide by NEGATIVE -> FLIP the inequality sign!
3x > 12 => x > 4 (no flip) | -3x > 12 => x < -4 (FLIP!)

■ **EXAMPLE:**

Solve: -2x + 1 > 7
-2x > 6 => divide by -2 (FLIP!) => x < -3

■ QUESTION: Solve: -3x + 6 <= -9

Step 1 of 3:

Step 1: Subtract 6 from both sides. Result?

■ A) -3x <= -3	■ B) -3x <= -15
■ C) -3x <= 3	■ D) -3x <= 15

My Answer: _____

Step 2 of 3:

Step 2: Divide by -3. What happens to the sign?

■ A) Stays: x <= 5	■ B) FLIPS: x >= 5
■ C) FLIPS: x >= -5	■ D) Disappears

My Answer: _____

Step 3 of 3:

Step 3: Which value satisfies x >= 5?

■ A) x = 4	■ B) x = 0
■ C) x = -5	■ D) x = 7

My Answer: _____

■ Work Space:

■ #9 Slope & Linear Equations

Pre-Algebra

■ **CONCEPT:**

Slope formula: m = (y2 - y1) / (x2 - x1)
y = mx + b (slope-intercept form)
WARNING: m = delta-y / delta-x, NOT delta-x / delta-y!

■ **EXAMPLE:**

Slope through (1,2) and (3,8): m = (8-2)/(3-1) = 6/2 = 3

■ QUESTION: Find the slope through points (2, 5) and (6, 13).

Step 1 of 3:

Step 1: What goes in the NUMERATOR (top)?

■ A) 6 - 2 = 4	■ B) 13 - 5 = 8
■ C) 5 - 13 = -8	■ D) 2 - 6 = -4

My Answer: _____

Step 2 of 3:

Step 2: What is the DENOMINATOR (change in x)?

■ A) 8	■ B) 8 (sum)
■ C) 6 - 2 = 4	■ D) -4

My Answer: _____

Step 3 of 3:

Step 3: m = 8/4 = ?

■ A) m = 0.5	■ B) m = 4
■ C) m = 3	■ D) m = 2

My Answer: _____

Work Space:

■ #10 Exponent Rules

Pre-Algebra

■ **CONCEPT:**

x^a x x^b = x^(a+b) | x^a / x^b = x^(a-b)
(x^a)^b = x^(axb) | x^0 = 1

■ **EXAMPLE:**

x^3 x x^4 = x^7 (add exponents, same base)

■ QUESTION: Simplify: (2^3)^2 x 2^0

Step 1 of 3:

Step 1: Simplify (2^3)^2. Rule for (x^a)^b?

■ A) x^(a+b)	■ B) x^(a/b)
■ C) x^(axb)	■ D) x^(a-b)

My Answer: _____

Step 2 of 3:

Step 2: What is 2^0?

■ A) 0	■ B) 2
■ C) undefined	■ D) 1

My Answer: _____

Step 3 of 3:

Step 3: Calculate 2^6 x 1 = 2^6 = ?

■ A) 32	■ B) 64
■ C) 12	■ D) 128

My Answer: _____

■ Work Space:

SECTION B: Geometry (Problems 11 - 20)

■ #11 Triangle: Angle Sum Theorem

Geometry

■ **CONCEPT:**

Sum of interior angles of any triangle = 180 degrees
For right triangles: the other two angles are complementary (sum to 90 degrees)

■ **EXAMPLE:**

Triangle angles 50 + 70 + x = 180 => x = 60 degrees

■ QUESTION: A triangle has angles of 45 degrees and 75 degrees. Find the third angle.

Step 1 of 3:

Step 1: All angles in a triangle sum to what?

■ A) 90 deg	■ B) 270 deg
■ C) 360 deg	■ D) 180 deg

My Answer: _____

Step 2 of 3:

Step 2: What is 45 + 75?

■ A) 110 deg	■ B) 130 deg
■ C) 120 deg	■ D) 115 deg

My Answer: _____

Step 3 of 3:

Step 3: Solve for the missing angle.

■ A) 70 deg	■ B) 50 deg
■ C) 80 deg	■ D) 60 deg

My Answer: _____

—■ Work Space:

■ #12 Area of Rectangle & Triangle

Geometry

■ **CONCEPT:**

Rectangle: A = length x width
Triangle: A = (1/2) x base x height
WARNING: Height must be PERPENDICULAR to base (not slant side)!

■ **EXAMPLE:** Triangle: base=8, height=5
A = (1/2) x 8 x 5 = 20 cm^2

■ QUESTION: A triangle has base = 12 cm and height = 7 cm. Find its area.

Step 1 of 3:

Step 1: Which formula?

■ A) A = b x h	■ B) A = (1/2) x b x h
■ C) A = b^2 x h	■ D) A = b + h

My Answer: _____

Step 2 of 3:

Step 2: Calculate base x height = ?

■ A) 60	■ B) 19
■ C) 84	■ D) 42

My Answer: _____

Step 3 of 3:

Step 3: (1/2) x 84 = ?

■ A) 21 cm^2	■ B) 48 cm^2
■ C) 42 cm^2	■ D) 28 cm^2

My Answer: _____

Work Space:

■ #13 Circle: Area & Circumference

Geometry

■ **CONCEPT:**

Circumference: C = 2(pi)r = (pi)d
Area: A = (pi)r^2
WARNING: Use RADIUS (not diameter) in area formula! r = d/2

■ **EXAMPLE:**

r=5: C = 10(pi) ~= 31.4 | A = 25(pi) ~= 78.5

■ QUESTION: Circle with diameter = 10 cm. Find area. (pi ~= 3.14)

Step 1 of 3:

Step 1: Diameter = 10 cm. What is the RADIUS?

■ A) r = 10 cm	■ B) r = 20 cm
■ C) r = 5 cm	■ D) r = 100 cm

My Answer: _____

Step 2 of 3:

Step 2: Calculate r^2.

■ A) 25	■ B) 10
■ C) 100	■ D) 50

My Answer: _____

Step 3 of 3:

Step 3: A = (pi) x 25 ~= 3.14 x 25 = ?

■ A) 31.4 cm^2	■ B) 62.8 cm^2
■ C) 78.5 cm^2	■ D) 157 cm^2

My Answer: _____

Work Space:

■ #14 Pythagorean Theorem

Geometry

■ **CONCEPT:**

For a RIGHT triangle: a^2 + b^2 = c^2
c = hypotenuse (longest side, opposite right angle)
WARNING: c is ALWAYS the biggest side (hypotenuse)!

■ **EXAMPLE:** Legs 3 and 4: 9 + 16 = c^2 => c^2 = 25 => c = 5

■ QUESTION: Right triangle with legs 6 and 8. Find the hypotenuse.

Step 1 of 3:

Step 1: Set up the equation (a=6, b=8, find c).

■ A) 6 + 8 = c	■ B) 6^2 x 8^2 = c^2
■ C) 6^2 + 8^2 = c^2	■ D) c^2 = 6 - 8

My Answer: _____

Step 2 of 3:

Step 2: Calculate 6^2 + 8^2.

■ A) 100	■ B) 48
■ C) 14	■ D) 78

My Answer: _____

Step 3 of 3:

Step 3: c^2 = 100. What is c?

■ A) c = 50	■ B) c = 10
■ C) c = 14	■ D) c = 20

My Answer: _____

■ Work Space:

■ #15 Volume of Rectangular Prism

Geometry

■ **CONCEPT:** V = length x width x height (units are CUBED: cm^3)
WARNING: Area is squared (^2), Volume is cubed (^3)!

■ **EXAMPLE:** l=4, w=3, h=5: V = 4 x 3 x 5 = 60 cm^3

■ QUESTION: Find the volume of a box: 8 cm long, 5 cm wide, 3 cm tall.

Step 1 of 3:

Step 1: Formula for volume of rectangular prism?

■ A) V = l + w + h	■ B) V = 2(lw+lh+wh)
■ C) V = l x w x h	■ D) V = l x w

My Answer: _____

Step 2 of 3:

Step 2: Multiply l x w. What is 8 x 5?

■ A) 13	■ B) 45
■ C) 40	■ D) 24

My Answer: _____

Step 3 of 3:

Step 3: Multiply 40 x 3 (with units)?

■ A) 120 cm^2	■ B) 43 cm^3
■ C) 120 cm^3	■ D) 240 cm^3

My Answer: _____

■ Work Space:

■ #16 Parallel Lines & Transversals

Geometry

■ **CONCEPT:** Alternate Interior Angles = EQUAL (Z-shape)
Corresponding Angles = EQUAL (F-shape)
Co-interior (same-side) = Supplementary (add to 180 deg)

■ **EXAMPLE:** One angle = 65 deg. Alternate interior = 65 deg. Co-interior = 115 deg.

■ QUESTION: Two parallel lines cut by transversal. One angle is 110 deg. What is its alternate interior angle?

Step 1 of 3:

Step 1: Alternate interior angles are... ?

■ A) Add to 360 deg	■ B) Supplementary (180 deg)
■ C) Equal	■ D) One is double other

My Answer: _____

Step 2 of 3:

Step 2: If one angle is 110 deg, the alternate interior angle is?

■ A) 70 deg	■ B) 110 deg
■ C) 180 deg	■ D) 55 deg

My Answer: _____

Step 3 of 3:

Step 3: What is the co-interior (same-side) angle?

■ A) 110 deg	■ B) 55 deg
■ C) 70 deg	■ D) 90 deg

My Answer: _____

■ Work Space:

■ #17 Properties of Quadrilaterals

Geometry

■ **CONCEPT:** All quadrilateral interior angles sum to 360 degrees.
Parallelogram: opposite angles EQUAL, adjacent angles SUPPLEMENTARY (add to 180 deg)

■ **EXAMPLE:** Parallelogram angle = 60 deg. Opposite = 60 deg. Adjacent = 120 deg.

■ QUESTION: A parallelogram has one angle of 70 degrees. What are ALL four angles?

Step 1 of 3:

Step 1: Opposite angles in a parallelogram are... ?

■ A) Supplementary (180 deg)	■ B) Equal
■ C) Complementary (90 deg)	■ D) All equal

My Answer: _____

Step 2 of 3:

Step 2: Adjacent angles are supplementary. Find the other two.

■ A) 60 and 60	■ B) 110 and 110
■ C) 90 and 90	■ D) 130 and 130

My Answer: _____

Step 3 of 3:

Step 3: Do all four sum to 360 deg?

■ A) 70+70+110+110=360 CHECK	■ B) 70+70+70+70=280
■ C) 110+110+110+110=440	■ D) 70+110+90+90=360

My Answer: _____

■ Work Space:

■ #18 Perimeter of Composite Shapes

Geometry

■ **CONCEPT:** Perimeter = TOTAL length of ALL outer sides only.
WARNING: Do NOT count inner shared sides! Calculate any missing sides first.

■ **EXAMPLE:** L-shape: find missing sides using given measurements, then add ALL outer sides.

■ QUESTION: L-shape with sides: 10m, 6m, 4m, 6m, 6m, 4m. Find the perimeter.

Step 1 of 3:

Step 1: How many sides does an L-shape have?

■ A) 4 sides	■ B) 8 sides
■ C) 6 sides	■ D) 5 sides

My Answer: _____

Step 2 of 3:

Step 2: Strategy to find perimeter of composite shape?

■ A) Multiply all sides	■ B) Add only longer sides
■ C) Add all 6 outer sides	■ D) Use l x w

My Answer: _____

Step 3 of 3:

Step 3: 10+6+4+6+6+4 = ?

■ A) 30m	■ B) 36m
■ C) 40m	■ D) 44m

My Answer: _____

■ Work Space:

■ #19 Distance Formula

Geometry

■ **CONCEPT:**

d = sqrt[(x2-x1)^2 + (y2-y1)^2]
This is the Pythagorean theorem on a coordinate grid!
WARNING: SQUARE the differences before adding!

■ **EXAMPLE:**

Distance (0,0) to (3,4): d = sqrt(9+16) = sqrt(25) = 5

■ QUESTION: Find the distance between A(1, 2) and B(4, 6).

Step 1 of 3:

Step 1: Calculate (x2 - x1)^2 where x1=1, x2=4.

■ A) (4-1)^2 = 9	■ B) (4-1)^2 = 3
■ C) (4+1)^2 = 25	■ D) (4x1)^2 = 16

My Answer: _____

Step 2 of 3:

Step 2: Calculate (y2 - y1)^2 where y1=2, y2=6.

■ A) (6+2)^2 = 64	■ B) (6-2)^2 = 8
■ C) (6x2)^2 = 144	■ D) (6-2)^2 = 16

My Answer: _____

Step 3 of 3:

Step 3: d = sqrt(9 + 16) = ?

■ A) d = 5	■ B) d = 25
■ C) d = sqrt(25) = 5 CHECK	■ D) d = 7

My Answer: _____

Work Space:

■ #20 Surface Area of a Cube

Geometry

■ **CONCEPT:**

SA = 6s^2 (6 faces, each face = s^2)
WARNING: Surface Area uses s^2 (squared); Volume uses s^3 (cubed)!
Don't forget to multiply by 6!

■ **EXAMPLE:** Cube s=3: SA = 6 x 9 = 54 cm^2 | Volume = 27 cm^3 (different!)

■ QUESTION: A cube has side length 5 cm. Find its surface area.

Step 1 of 3:

Step 1: How many faces does a cube have?

■ A) 4	■ B) 8
■ C) 6	■ D) 12

My Answer: _____

Step 2 of 3:

Step 2: Area of ONE face (s=5 cm)?

■ A) 5 x 6 = 30 cm^2	■ B) 5^2 = 25 cm^2
■ C) 5^3 = 125 cm^3	■ D) 2 x 5 = 10 cm^2

My Answer: _____

Step 3 of 3:

Step 3: SA = 6 x 25 = ?

■ A) 125 cm^2	■ B) 150 cm^2
■ C) 30 cm^2	■ D) 100 cm^2

My Answer: _____

Work Space:

Answer Key

#	Topic	Step 1	Step 2	Step 3
1	Order of Operations (PEMDAS)	B	A	C
2	Solving One-Step Equations	C	C	B
3	Solving Two-Step Equations	B	C	A
4	Fractions & Proportions	B	C	B
5	Percentages	B	C	B
6	Integer Operations	B	D	C
7	Combining Like Terms	B	C	B
8	Inequalities	B	B	D
9	Slope & Linear Equations	B	C	D
10	Exponent Rules	C	D	B
11	Triangle: Angle Sum Theorem	D	C	D
12	Area of Rectangle & Triangle	B	C	C
13	Circle: Area & Circumference	C	A	C
14	Pythagorean Theorem	C	A	B
15	Volume of Rectangular Prism	C	C	C
16	Parallel Lines & Transversals	C	B	C
17	Properties of Quadrilaterals	B	B	A
18	Perimeter of Composite Shapes	C	C	B
19	Distance Formula	A	D	C
20	Surface Area of a Cube	C	B	B

Purple rows = Pre-Algebra (1-10) | Green rows = Geometry (11-20)