

# MATH MASTER WORKSHEET

Pre-Algebra • Geometry • Ratio & Graphs  
30 Problems • 3 Steps Each • Self-Study Edition

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Score: \_\_\_\_\_ / 30

DIRECTIONS: Each problem has a concept review, worked example, and 3 practice questions. Circle the letter of the best answer. All 3 steps must be correct to earn full credit for the problem.

## ■ Pre-Algebra

### Problem 1 — Order of Operations (PEMDAS)

CONCEPT | Order of Operations (PEMDAS)

PEMDAS: Parentheses → Exponents → Multiplication/Division → Addition/Subtraction. Work left to right at the same level.

Example: Evaluate:  $3 + 4 \times 2$  Multiply first:  $4 \times 2 = 8$ . Then add:  $3 + 8 = 11$ . [NOT 14!]

Step 1: Evaluate:  $12 / 4 + 3 \times 2$

- A) 9
- B) 11
- C) 10
- D) 8

Step 2: Evaluate:  $5 + (3^2 - 4) \times 2$

- A) 15
- B) 19
- C) 13
- D) 11

Step 3: Evaluate:  $2^3 + 6 / 2 - 1$

- A) 10
- B) 9
- C) 12
- D) 6

Work Space:

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## Problem 2 — Solving One-Step Equations

### CONCEPT | Solving One-Step Equations

To isolate the variable, perform the inverse operation on BOTH sides. Whatever you do to one side, do to the other.

*Example: Solve:  $x + 7 = 12$  Subtract 7 from both sides:  $x = 12 - 7 = 5$ . Check:  $5 + 7 = 12$  ✓*

Step 1: Solve:  $x - 9 = 4$

- A)  $x = 13$
- B)  $x = 5$
- C)  $x = -5$
- D)  $x = 45$

Step 2: Solve:  $6x = 42$

- A)  $x = 252$
- B)  $x = 36$
- C)  $x = 7$
- D)  $x = 8$

Step 3: Solve:  $x/5 = 9$

- A)  $x = 1.8$
- B)  $x = 45$
- C)  $x = 4$
- D)  $x = 14$

Work Space:

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### Problem 3 — Solving Two-Step Equations

#### CONCEPT | Solving Two-Step Equations

Undo addition/subtraction FIRST, then multiplication/division (reverse PEMDAS order).

*Example: Solve:  $2x + 3 = 11$  Step 1:  $2x = 8$ . Step 2:  $x = 4$ . Check:  $2(4)+3 = 11$  ✓*

Step 1: Solve:  $3x - 5 = 16$

- A)  $x = 7$
- B)  $x = 11$
- C)  $x = 3$
- D)  $x = 4$

Step 2: Solve:  $x/4 + 2 = 6$

- A)  $x = 32$
- B)  $x = 16$
- C)  $x = 8$
- D)  $x = 2$

Step 3: Solve:  $5x + 10 = -5$

- A)  $x = -1$
- B)  $x = -3$
- C)  $x = 1$
- D)  $x = 3$

Work Space:

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#### Problem 4 — Distributive Property

**CONCEPT | Distributive Property**

$a(b + c) = ab + ac$ . Multiply the outside factor by EACH term inside. Remember: distributing a negative flips signs!

*Example: Expand:  $3(x + 4)$   $3 * x + 3 * 4 = 3x + 12$*

Step 1: Expand:  $-2(x - 5)$

- A)  $-2x - 10$
- B)  $-2x + 10$
- C)  $2x - 10$
- D)  $-2x + 5$

Step 2: Simplify:  $4(2x + 3) - 5$

- A)  $8x + 7$
- B)  $8x + 12$
- C)  $8x - 2$
- D)  $6x + 7$

Step 3: Solve:  $3(x + 2) = 18$

- A)  $x = 6$
- B)  $x = 4$
- C)  $x = 5$
- D)  $x = 3$

Work Space:

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## Problem 5 — Combining Like Terms

### CONCEPT | Combining Like Terms

Like terms have the same variable AND exponent. Add/subtract their coefficients only. Constants combine with constants.

*Example: Simplify:  $4x + 2y - x + 3y$  Combine x-terms:  $3x$ . Combine y-terms:  $5y$ . Answer:  $3x + 5y$*

Step 1: Simplify:  $6a - 3 + 2a + 7$

- A)  $8a + 4$
- B)  $4a + 10$
- C)  $8a - 10$
- D)  $4a + 4$

Step 2: Simplify:  $5x^2 + 3x - 2x^2 + x$

- A)  $3x^2 + 4x$
- B)  $7x^2 + 4x$
- C)  $3x^2 + 2x$
- D)  $7x^2 + 2x$

Step 3: Simplify:  $-(2x - 4) + 3x$

- A)  $x + 4$
- B)  $x - 4$
- C)  $5x + 4$
- D)  $5x - 4$

Work Space:

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## Problem 6 — Inequalities

### CONCEPT | Inequalities

Solve like equations BUT: FLIP the inequality sign when multiplying or dividing by a NEGATIVE number!

*Example: Solve:  $-3x < 12$  Divide by  $-3$  (FLIP!):  $x > -4$*

Step 1: Solve:  $2x - 1 > 5$

- A)  $x > 3$
- B)  $x > 2$
- C)  $x < 3$
- D)  $x > 6$

Step 2: Solve:  $-4x \geq 20$

- A)  $x \geq -5$
- B)  $x \leq -5$
- C)  $x \geq 5$
- D)  $x \leq 5$

Step 3:  $x < 2$  on a number line shows:

- A) Open circle at 2, arrow left
- B) Open circle at 2, arrow right
- C) Closed circle at 2, arrow left
- D) Closed circle at 2, arrow right

Work Space:

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## Problem 7 — Integer Operations

### CONCEPT | Integer Operations

Same signs: add and keep sign. Different signs: subtract, keep sign of larger absolute value.  $(-)(-)=(+)$   $(+)(-)=(-)$

Example:  $(-3) \times (-4) + (-2) = 12 + (-2) = 10$

Step 1: Calculate:  $-7 + (-5)$

- A) 2
- B) -12
- C) 12
- D) -2

Step 2: Calculate:  $(-6) \times 4 \div (-3)$

- A) -8
- B) 8
- C) -72
- D) 72

Step 3: Calculate:  $(-2)^3 - (-5)$

- A) -3
- B) -13
- C) 3
- D) 13

Work Space:

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## Problem 8 — Fractions & Mixed Numbers

### CONCEPT | Fractions & Mixed Numbers

Add/subtract: find LCD. Multiply: multiply straight across. Divide: multiply by the reciprocal (flip the second fraction).

*Example:  $2/3 + 1/4$ : LCD = 12.  $8/12 + 3/12 = 11/12$*

Step 1:  $(3/5) \times (10/9) = ?$

- A)  $2/3$
- B)  $1/3$
- C)  $5/3$
- D)  $30/45$

Step 2:  $2 \text{ and } 1/2 - 1 \text{ and } 3/4 = ?$

- A)  $3/4$
- B)  $1 \text{ and } 1/4$
- C)  $1 \text{ and } 3/4$
- D)  $1/4$

Step 3:  $(5/8)$  divided by  $(1/4) = ?$

- A)  $5/32$
- B)  $5/2$
- C)  $8/20$
- D)  $2 \text{ and } 1/2$

Work Space:

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## Problem 9 — Percentages

### CONCEPT | Percentages

Find part: multiply % x whole. Find %: (part/whole) x 100. % Change: (new - old)/old x 100.

*Example: What is 30% of 80?  $0.30 \times 80 = 24$*

Step 1: What is 15% of 60?

- A) 9
- B) 12
- C) 15
- D) 6

Step 2: Price drops from \$40 to \$32. What is the % decrease?

- A) 20%
- B) 25%
- C) 8%
- D) 80%

Step 3: 18 is what percent of 72?

- A) 4%
- B) 25%
- C) 18%
- D) 54%

Work Space:

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## Problem 10 — Exponent Rules

### CONCEPT | Exponent Rules

Product:  $a^m * a^n = a^{(m+n)}$ . Quotient:  $a^m / a^n = a^{(m-n)}$ . Power:  $(a^m)^n = a^{(mn)}$ . Zero:  $a^0 = 1$ .

Example: Simplify:  $x^3 * x^4$  Add exponents:  $x^{(3+4)} = x^7$

Step 1: Simplify:  $2^3 * 2^4$

- A)  $2^{12}$
- B)  $2^7$
- C)  $4^7$
- D)  $2^1$

Step 2: Simplify:  $x^8 / x^3$

- A)  $x^{24}$
- B)  $x^{11}$
- C)  $x^5$
- D)  $x^2$

Step 3: Simplify:  $(3^2)^3$

- A)  $3^5$
- B)  $3^6$
- C)  $3^8$
- D)  $9^5$

Work Space:

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## ■ Geometry

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## Problem 11 — Area of Triangles

### CONCEPT | Area of Triangles

$A = (1/2) \times \text{base} \times \text{height}$ . The height **MUST** be perpendicular to the base — not the slanted side!

*Example: Base = 10 cm, height = 6 cm  $A = (1/2)(10)(6) = 30 \text{ cm}^2$*

Step 1: Area of triangle: base 8 m, height 5 m.

- A)  $20 \text{ m}^2$
- B)  $40 \text{ m}^2$
- C)  $13 \text{ m}^2$
- D)  $80 \text{ m}^2$

Step 2: Area =  $36 \text{ cm}^2$ , base = 9 cm. Find height.

- A) 4 cm
- B) 8 cm
- C) 3 cm
- D) 6 cm

Step 3: Right triangle with legs 6 cm and 8 cm. Find area.

- A)  $48 \text{ cm}^2$
- B)  $24 \text{ cm}^2$
- C)  $14 \text{ cm}^2$
- D)  $28 \text{ cm}^2$

Work Space:

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## Problem 12 — Pythagorean Theorem

### CONCEPT | Pythagorean Theorem

In a right triangle:  $a^2 + b^2 = c^2$ , where  $c$  is the hypotenuse (longest side, opposite the right angle).

*Example: Legs 3 and 4:  $3^2 + 4^2 = 9 + 16 = 25$ , so  $c = \sqrt{25} = 5$*

Step 1: Right triangle with legs 5 and 12. Find hypotenuse.

- A) 13
- B) 17
- C) 11
- D)  $\sqrt{119}$

Step 2: 10 m ladder, base 6 m from wall. How high does it reach?

- A) 8 m
- B) 4 m
- C)  $\sqrt{136}$  m
- D) 6 m

Step 3: Is a triangle with sides 7, 24, 25 a right triangle?

- A) Yes,  $7^2 + 24^2 = 25^2$
- B) No, doesn't satisfy theorem
- C) Yes, because  $7+24 > 25$
- D) Cannot determine

Work Space:

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### Problem 13 — Circle: Area & Circumference

**CONCEPT | Circle: Area & Circumference**

$A = \pi * r^2$  (area inside the circle)  $C = 2 * \pi * r$  (distance around the circle)

*Example: Radius = 5:  $A = \pi(25) \approx 78.5$ ,  $C = 10*\pi \approx 31.4$*

Step 1: Area of circle with radius 7. ( $\pi \approx 3.14$ )

- A) 43.96
- B) 153.86
- C) 78.5
- D) 21.98

Step 2: Circle has circumference  $20*\pi$ . Find the radius.

- A)  $r = 20$
- B)  $r = 40$
- C)  $r = 10$
- D)  $r = 5$

Step 3: Pizza with diameter 14 in. Find area. ( $\pi \approx 3.14$ )

- A)  $43.96 \text{ in}^2$
- B)  $153.86 \text{ in}^2$
- C)  $615.44 \text{ in}^2$
- D)  $87.92 \text{ in}^2$

Work Space:

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## Problem 14 — Volume of Rectangular Prism

### CONCEPT | Volume of Rectangular Prism

$V = \text{length} \times \text{width} \times \text{height}$ . Volume measures the 3D space inside the shape. Units are cubed (e.g.,  $\text{cm}^3$ ).

*Example:  $l = 5, w = 3, h = 4: V = 5 \times 3 \times 4 = 60 \text{ units}^3$*

Step 1: Volume:  $l = 6 \text{ cm}, w = 4 \text{ cm}, h = 3 \text{ cm}$ .

- A)  $72 \text{ cm}^3$
- B)  $54 \text{ cm}^3$
- C)  $52 \text{ cm}^3$
- D)  $84 \text{ cm}^3$

Step 2: Volume =  $120 \text{ m}^3, l = 5 \text{ m}, w = 4 \text{ m}$ . Find height.

- A)  $h = 24 \text{ m}$
- B)  $h = 6 \text{ m}$
- C)  $h = 3 \text{ m}$
- D)  $h = 8 \text{ m}$

Step 3: Cube with side length  $4 \text{ cm}$ . Find volume.

- A)  $16 \text{ cm}^3$
- B)  $48 \text{ cm}^3$
- C)  $64 \text{ cm}^3$
- D)  $12 \text{ cm}^3$

Work Space:

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## Problem 15 — Angle Relationships

### CONCEPT | Angle Relationships

Supplementary: sum = 180 degrees. Complementary: sum = 90 degrees. Vertical angles: equal. Triangle angles: sum = 180 degrees.

*Example: Supplement of 65 degrees:  $180 - 65 = 115$  degrees*

Step 1: Supplementary angles. One is 73 degrees. Find the other.

- A) 17 deg
- B) 107 deg
- C) 117 deg
- D) 27 deg

Step 2: Triangle has angles 45 and 80 degrees. Find the third.

- A) 45 deg
- B) 55 deg
- C) 65 deg
- D) 125 deg

Step 3: Vertical angles:  $(3x + 10)$  and  $(5x - 20)$  degrees. Find  $x$ .

- A)  $x = 15$
- B)  $x = 5$
- C)  $x = 10$
- D)  $x = 20$

Work Space:

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## Problem 16 — Perimeter of Polygons

### CONCEPT | Perimeter of Polygons

Perimeter = sum of ALL side lengths. Rectangle:  $P = 2(l + w)$ . Regular polygon:  $P = n \times s$ .

*Example: Rectangle  $l = 8$ ,  $w = 3$ :  $P = 2(8 + 3) = 22$*

Step 1: Rectangle:  $l = 12$  cm,  $w = 5$  cm. Find perimeter.

- A) 34 cm
- B) 60 cm
- C) 17 cm
- D) 120 cm

Step 2: Regular hexagon, perimeter = 48 m. Find each side.

- A) 6 m
- B) 8 m
- C) 12 m
- D) 288 m

Step 3: Triangle sides 7, 9, 11 cm. Same-perimeter square's side?

- A) 6.75 cm
- B) 9 cm
- C) 7 cm
- D) 27 cm

Work Space:

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## Problem 17 — Similar Triangles & Scale Factor

### CONCEPT | Similar Triangles & Scale Factor

Similar triangles (~) have equal corresponding angles and proportional corresponding sides. Scale factor = ratio of any pair of corresponding sides.

*Example: Sides 3,4,5 and 6,8,10: scale factor =  $6/3 = 2$*

Step 1: Triangle A: sides 4, 6, 8. B is similar, shortest side = 6. Find longest side of B.

- A) 10
- B) 12
- C) 9
- D) 16

Step 2: Widths 5 and 15 (similar). Smaller length = 8. Find larger length.

- A) 24
- B) 16
- C) 40
- D) 12

Step 3: Map scale: 2 cm = 50 km. Cities 7 cm apart. Actual distance?

- A) 175 km
- B) 150 km
- C) 14 km
- D) 350 km

Work Space:

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### Problem 18 — Surface Area of Rectangular Prism

**CONCEPT | Surface Area of Rectangular Prism**

$SA = 2(lw + lh + wh)$ . There are 3 pairs of identical opposite faces. Add all 6 faces.

*Example:  $l = 3, w = 4, h = 2$ :  $SA = 2(12 + 6 + 8) = 52$*

Step 1: SA:  $l = 5, w = 3, h = 2$  cm.

- A)  $62 \text{ cm}^2$
- B)  $30 \text{ cm}^2$
- C)  $31 \text{ cm}^2$
- D)  $60 \text{ cm}^2$

Step 2: Cube with side 4 cm. Find surface area.

- A)  $64 \text{ cm}^2$
- B)  $96 \text{ cm}^2$
- C)  $48 \text{ cm}^2$
- D)  $24 \text{ cm}^2$

Step 3:  $SA = 94 \text{ cm}^2, l = 5, w = 3$ . Find  $h$ .

- A)  $h = 4$  cm
- B)  $h = 2$  cm
- C)  $h = 7$  cm
- D)  $h = 3$  cm

Work Space:

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## Problem 19 — Coordinate Plane: Distance & Midpoint

### CONCEPT | Coordinate Plane: Distance & Midpoint

Distance:  $d = \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}$ . Midpoint:  $M = ((x_1+x_2)/2, (y_1+y_2)/2)$ .

Example: Points  $(1,2)$  and  $(4,6)$ :  $d = \sqrt{9+16} = 5$ ,  $M = (2.5, 4)$

Step 1: Distance between  $(0,0)$  and  $(6,8)$ .

- A) 10
- B) 14
- C)  $\sqrt{28}$
- D) 7

Step 2: Midpoint of  $(2, 5)$  and  $(8, 1)$ .

- A)  $(5, 3)$
- B)  $(10, 6)$
- C)  $(3, 2)$
- D)  $(6, 4)$

Step 3: Midpoint of A and  $B(10, 4)$  is  $(6, 3)$ . Find A.

- A)  $(2, 2)$
- B)  $(4, 2)$
- C)  $(8, 1)$
- D)  $(16, 6)$

Work Space:

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## Problem 20 — Interior Angles of Polygons

### CONCEPT | Interior Angles of Polygons

Sum of interior angles of n-sided polygon:  $(n - 2) \times 180$  degrees. Each angle of a REGULAR polygon:  $\text{sum} / n$ .

*Example: Hexagon (6 sides):  $(6-2) \times 180 = 720$  degrees*

Step 1: Sum of interior angles of a pentagon.

- A) 360 deg
- B) 540 deg
- C) 720 deg
- D) 900 deg

Step 2: Regular octagon. Find each interior angle.

- A) 112.5 deg
- B) 135 deg
- C) 144 deg
- D) 150 deg

Step 3: Interior angles sum to 1440 deg. How many sides?

- A) 8
- B) 9
- C) 10
- D) 12

Work Space:

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## ■ Ratio & Graph

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## Problem 21 — Unit Rate & Proportions

### CONCEPT | Unit Rate & Proportions

Ratio: comparison of two quantities. Unit rate: denominator = 1. Proportion: two equal ratios. Cross-multiply to solve.

*Example:  $3/4 = x/12 \Rightarrow$  Cross-multiply:  $4x = 36$ ,  $x = 9$*

Step 1: Car travels 150 miles in 3 hours. Unit rate (mph)?

- A) 30
- B) 45
- C) 50
- D) 60

Step 2: Solve:  $x/6 = 5/2$

- A)  $x = 15$
- B)  $x = 60$
- C)  $x = 3$
- D)  $x = 12$

Step 3: Oranges: \$3 for 6. Cost of 10 oranges?

- A) \$4.50
- B) \$5.00
- C) \$6.00
- D) \$5.50

Work Space:

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## Problem 22 — Reading Bar Graphs

### CONCEPT | Reading Bar Graphs

Bar graphs compare categories. Key skills: reading values, comparing bars, calculating totals, differences, and percentages of totals.

*Example: If Bar A = 40 and Bar B = 25, then A is 15 more, and A is  $(15/25) \times 100 = 60\%$  more than B.*

Step 1: Monthly sales: Jan=\$400, Feb=\$600, Mar=\$500. Q1 total?

- A) \$1400
- B) \$1500
- C) \$1200
- D) \$1000

Step 2: February sales as % of Q1 total (from above)?

- A) 40%
- B) 33%
- C) 50%
- D) 45%

Step 3: How much more did February earn than January?

- A) \$100
- B) \$200
- C) \$400
- D) \$600

Work Space:

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### Problem 23 — Line Graphs & Rate of Change

#### CONCEPT | Line Graphs & Rate of Change

Rate of change =  $(y_2 - y_1) / (x_2 - x_1)$ . Flat line = no change (rate = 0). Steeper line = faster change.

*Example: Temp: 20C at 8am, 30C at 12pm. Rate =  $(30-20)/4 = 2.5$  deg/hour.*

Step 1: Plant height: Week 1=4 cm, Week 3=10 cm. Growth rate per week?

- A) 2 cm/wk
- B) 3 cm/wk
- C) 6 cm/wk
- D) 5 cm/wk

Step 2: Line decreases from 80 to 20 over 6 months. Avg monthly decrease?

- A) -15
- B) -10
- C) -12
- D) -8

Step 3: A flat (horizontal) line on a graph means the value is:

- A) Increasing
- B) Decreasing
- C) Not changing
- D) Undefined

Work Space:

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## Problem 24 — Slope of a Line

### CONCEPT | Slope of a Line

Slope ( $m$ ) = rise/run =  $(y_2 - y_1)/(x_2 - x_1)$ . Positive = up, Negative = down, Zero = horizontal, Undefined = vertical.

Example: Points  $(1,2)$  and  $(3,8)$ :  $m = (8-2)/(3-1) = 6/2 = 3$

Step 1: Slope through  $(2, 3)$  and  $(6, 11)$ .

- A)  $m = 2$
- B)  $m = 1/2$
- C)  $m = 4$
- D)  $m = 8$

Step 2: Line through  $(0, 5)$  and  $(4, 5)$ . What is the slope?

- A)  $m = 1$
- B)  $m = 0$
- C)  $m = 5$
- D) Undefined

Step 3: Line A: slope  $3/4$ . Which Line B is steeper?

- A) slope  $2/3$
- B) slope  $5/4$
- C) slope  $3/5$
- D) They are equal

Work Space:

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### Problem 25 — Pie Charts (Circle Graphs)

#### CONCEPT | Pie Charts (Circle Graphs)

A pie chart shows parts of a whole (= 100% = 360 deg). Sector angle =  $(\%) / 100 \times 360$  deg.

*Example: 25% category: angle =  $0.25 \times 360 = 90$  degrees*

Step 1: Sports 40%, Music 30%, Art 20%, Other 10%. Sports+Music = ?

- A) 50%
- B) 60%
- C) 70%
- D) 80%

Step 2: Sector angle for Sports (40%)?

- A) 40 deg
- B) 144 deg
- C) 90 deg
- D) 80 deg

Step 3: Total budget \$500. How much goes to Art (20%)?

- A) \$20
- B) \$100
- C) \$200
- D) \$50

Work Space:

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## Problem 26 — Ratios & Equivalent Ratios

### CONCEPT | Ratios & Equivalent Ratios

Ratio  $a:b$ . Equivalent ratios: multiply or divide both parts by the same nonzero number. Simplify by finding GCF.

*Example:  $3:4 \Rightarrow$  multiply both by 5  $\Rightarrow 15:20$  (equivalent ratio)*

Step 1: Which ratio is equivalent to 2:5?

- A) 4:12
- B) 6:15
- C) 4:10
- D) 6:10

Step 2: Simplify the ratio 36:48.

- A) 4:6
- B) 3:4
- C) 6:8
- D) 12:16

Step 3: Recipe: 2 cups flour to 3 cups sugar. For 5x recipe, sugar?

- A) 10 cups
- B) 12 cups
- C) 15 cups
- D) 8 cups

Work Space:

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## Problem 27 — Scatter Plots & Correlation

### CONCEPT | Scatter Plots & Correlation

Positive correlation: both variables increase together. Negative: one up, one down. No correlation: no pattern. Strong = points near a line.

*Example: Height vs shoe size: positive correlation (both tend to increase together).*

Step 1: As temperature rises, ice cream sales rise. This is a \_\_\_ correlation.

- A) Negative
- B) No
- C) Positive
- D) Undefined

Step 2: Which scatter plot shows the STRONGEST correlation?

- A) Points spread randomly
- B) Points closely follow a line
- C) Points form a curve
- D) Points in one corner

Step 3: As a car ages, its value decreases. This is a \_\_\_ correlation.

- A) Positive
- B) No
- C) Undefined
- D) Negative

Work Space:

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## Problem 28 — Mean, Median, Mode, Range

### CONCEPT | Mean, Median, Mode, Range

Mean = sum / count. Median = middle value (sort first). Mode = most frequent. Range = max - min.

*Example: Data: 3, 7, 7, 9, 4. Mean=6, Median=7, Mode=7, Range=6*

Step 1: Mean of: 12, 8, 15, 5, 10.

- A) 8
- B) 10
- C) 12
- D) 50

Step 2: Median of: 3, 7, 1, 9, 5.

- A) 7
- B) 5
- C) 4
- D) 3

Step 3: Mode of: 4, 4, 6, 8, 4, 9, 6.

- A) 6
- B) 4
- C) 9
- D) 8

Work Space:

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### Problem 29 — Graphing Linear Equations ( $y = mx + b$ )

**CONCEPT | Graphing Linear Equations ( $y = mx + b$ )**

$y = mx + b$ :  $m$  = slope,  $b$  =  $y$ -intercept (crosses  $y$ -axis here). Plot the  $y$ -intercept, then use slope = rise/run.

*Example:  $y = 2x + 3$ : slope=2,  $y$ -intercept=(0,3). Plot (0,3), go up 2 right 1.*

Step 1: Slope and  $y$ -intercept of  $y = -3x + 7$ ?

- A)  $m=7$ ,  $b=-3$
- B)  $m=-3$ ,  $b=7$
- C)  $m=3$ ,  $b=7$
- D)  $m=-7$ ,  $b=3$

Step 2: Which point is on  $y = 2x - 1$ ?

- A) (2, 2)
- B) (3, 5)
- C) (1, 3)
- D) (0, 2)

Step 3: Slope = 2, passes through (0, -4). Find  $y$  when  $x = 5$ .

- A)  $y = 6$
- B)  $y = 14$
- C)  $y = 1$
- D)  $y = -4$

Work Space:

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### Problem 30 — Proportional Relationships & Graphs

**CONCEPT | Proportional Relationships & Graphs**

Proportional:  $y = kx$  where  $k = y/x$  (constant). Graph is a straight line through the ORIGIN (0,0).

*Example: 3 gal = \$6:  $k = \$2/\text{gal}$ . Equation:  $y = 2x$  (cost vs gallons).*

Step 1:  $x: 1,2,3 \rightarrow y: 4,8,12$ . Constant of proportionality?

- A)  $k = 2$
- B)  $k = 3$
- C)  $k = 4$
- D)  $k = 8$

Step 2:  $y = 4x$ . Which graph shows this?

- A) Straight line through origin, steep positive slope
- B) Line with y-intercept 4
- C) Parabola through origin
- D) Horizontal line at  $y=4$

Step 3:  $x: 2,4,6 \rightarrow y: 5,9,13$ . Is this proportional?

- A) Yes,  $y$  increases with  $x$
- B) No,  $y/x$  is not constant
- C) Yes, graph is straight
- D) No,  $y$  is always odd

Work Space:

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## ANSWER KEY

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#1.1: A	#8.3: D	#16.2: B	#24.1: A
#1.2: A	#9.1: A	#16.3: A	#24.2: B
#1.3: A	#9.2: A	#17.1: B	#24.3: B
#2.1: A	#9.3: B	#17.2: A	#25.1: C
#2.2: C	#10.1: B	#17.3: A	#25.2: B
#2.3: B	#10.2: C	#18.1: A	#25.3: B
#3.1: A	#10.3: B	#18.2: B	#26.1: C
#3.2: B	#11.1: A	#18.3: A	#26.2: B
#3.3: B	#11.2: B	#19.1: A	#26.3: C
#4.1: B	#11.3: B	#19.2: A	#27.1: C
#4.2: A	#12.1: A	#19.3: A	#27.2: B
#4.3: B	#12.2: A	#20.1: B	#27.3: D
#5.1: A	#12.3: A	#20.2: B	#28.1: B
#5.2: A	#13.1: B	#20.3: C	#28.2: B
#5.3: A	#13.2: C	#21.1: C	#28.3: B
#6.1: A	#13.3: B	#21.2: A	#29.1: B
#6.2: B	#14.1: A	#21.3: B	#29.2: B
#6.3: A	#14.2: B	#22.1: B	#29.3: A
#7.1: B	#14.3: C	#22.2: A	#30.1: C
#7.2: B	#15.1: B	#22.3: B	#30.2: A
#7.3: A	#15.2: B	#23.1: B	#30.3: B
#8.1: A	#15.3: A	#23.2: B	
#8.2: A	#16.1: A	#23.3: C	