

Math Worksheet

Pre-Algebra (10 Topics) + Geometry (10 Topics) | 20 Core Problems

Name: _____ Date: _____ Score: _____ / 20

INSTRUCTIONS

1. Read each concept and example carefully before attempting the problems.
2. Each topic has 3 practice problems. Circle your answer (A, B, C, or D).
3. Show your work in the space provided below each problem.
4. All 3 problems must be correct to master a topic!

SECTION 1: PRE-ALGEBRA (Questions 1 - 10)

1 Order of Operations (PEMDAS)

Concept: Parentheses -> Exponents -> Mult/Div (left to right) -> Add/Sub (left to right)

Formula: P -> E -> M/D -> A/S

Example: Solve: $3 + 4 \times 2 - 1 \Rightarrow$ Multiply first: $4 \times 2 = 8 \Rightarrow 3 + 8 - 1 = 10$

Evaluate: $2 + 3 \times 4$

A) 20

B) 14

C) 17

D) 12

Work space:

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

A) 12

B) 16

C) 14

D) 8

Work space:

Evaluate: $18 / 3 + 2^2 \times 3$

A) 18

B) 24

C) 19

D) 22

Work space:

2 Integer Operations

Concept: Same signs: add & keep sign. Different signs: subtract, keep sign of larger. $(-) \times (-) = (+)$

Formula: $(-) \times (-) = (+)$ $(-) \times (+) = (-)$

Example: Evaluate: $-4 + (-6) \times 2 \Rightarrow -6 \times 2 = -12 \Rightarrow -4 + (-12) = -16$

Evaluate: $-8 + 3$

A) -5

B) 5

C) -11

D) 11

Work space:

Evaluate: $(-4) \times (-7)$

A) -28

B) 28

C) -11

D) 11

Work space:

Evaluate: $-3 \times 6 + 5$

A) -13

B) 13

C) -23

D) 23

Work space:

3 Fractions & Mixed Numbers

Concept: Add/Sub: find common denominator. Multiply: multiply top x top, bottom x bottom. Divide: flip second fraction and multiply.

Formula: $a/b \div c/d = a/b \times d/c$

Example: $2/3 + 1/4 \Rightarrow \text{LCD}=12 \Rightarrow 8/12 + 3/12 = 11/12$

Solve: $3/4 + 2/3$

A) $5/7$

B) $17/12$

C) $5/12$

D) $6/7$

Work space:

Solve: $\frac{5}{6} - \frac{1}{4}$

A) $\frac{4}{2}$

B) $\frac{7}{12}$

C) $\frac{4}{10}$

D) $\frac{2}{3}$

Work space:

Solve: $\frac{2}{3} \div \frac{4}{5}$

A) $\frac{8}{15}$

B) $\frac{5}{6}$

C) $\frac{10}{12}$

D) $\frac{3}{8}$

Work space:

4 Solving One-Step Equations

Concept: Isolate the variable using inverse operations on both sides.

Formula: $x + a = b \Rightarrow x = b - a$

Example: $x + 7 = 12 \Rightarrow x = 12 - 7 = 5$

Solve: $x - 9 = 4$

A) $x=5$

B) $x=13$

C) $x=-5$

D) $x=36$

Work space:

Solve: $3x = 21$

A) $x=18$

B) $x=63$

C) $x=7$

D) $x=24$

Work space:

Solve: $x/5 = 6$

A) $x=1.2$

B) $x=11$

C) $x=30$

D) $x=25$

Work space:

5 Solving Two-Step Equations

Concept: Reverse PEMDAS: first undo add/subtract, then undo multiply/divide.

Formula: $ax + b = c \Rightarrow x = (c - b) / a$

Example: $2x + 5 = 13 \Rightarrow 2x=8 \Rightarrow x=4$

Solve: $3x - 4 = 11$

A) $x=5$

B) $x=7/3$

C) $x=7$

D) $x=15$

Work space:

Solve: $2x + 9 = 1$

A) $x=5$

B) $x=-4$

C) $x=4$

D) $x=-5$

Work space:

Solve: $x/4 - 3 = 2$

A) $x=20$

B) $x=-4$

C) $x=5$

D) $x=2$

Work space:

6 Ratios & Proportions

Concept: A proportion says two ratios are equal. Solve using cross-multiplication.

Formula: $a/b = c/d \Rightarrow a \times d = b \times c$

Example: $3/4 = x/12 \Rightarrow 3 \times 12 = 4x \Rightarrow x=9$

Solve: $5/8 = x/24$

A) $x=10$

B) $x=15$

C) $x=19$

D) $x=12$

Work space:

Map scale: 1 cm = 50 km. Distance for 7 cm?

A) 350 km

B) 57 km

C) 43 km

D) 7 km

Work space:

Solve: $(x+2)/5 = 4/2$

A) $x=8$

B) $x=10$

C) $x=12$

D) $x=6$

Work space:

7 Percentages

Concept: Percent means per hundred. Part = (Percent/100) x Whole. Percent change = (change/original) x 100.

Formula: Percent = (Part / Whole) x 100

Example: 30% of 80 $\Rightarrow 0.30 \times 80 = 24$

What is 45% of 200?

A) 45

B) 90

C) 100

D) 9

Work space:

18 is what percent of 72?

A) 4%

B) 18%

C) 25%

D) 40%

Work space:

Shirt costs \$40, 20% off. Sale price?

A) \$8

B) \$20

C) \$32

D) \$48

Work space:

8 Exponents & Square Roots

Concept: b^n = multiply b by itself n times. Square root: the number that multiplied by itself gives n.

Formula: $b^m \times b^n = b^{(m+n)}$ $\sqrt{a^2} = a$

Example: $3^2 + \sqrt{16} = 9 + 4 = 13$

Evaluate: 2^5

A) 10

B) 16

C) 32

D) 25

Work space:

Simplify: $\sqrt{144}$

A) 12

B) 14

C) 11

D) 72

Work space:

Evaluate: $3^2 \times 2^3$

A) 48

B) 72

C) 36

D) 54

Work space:

9 Graphing & Slope

Concept: Slope = rise/run = $(y_2 - y_1) / (x_2 - x_1)$. Positive slope goes up-right; negative goes down-right.

Formula: $m = (y_2 - y_1) / (x_2 - x_1)$

Example: Points (1,2) and (4,8): $m = (8-2)/(4-1) = 6/3 = 2$

Slope between (0,0) and (3,6)

A) 1/2

B) 3

C) 2

D) 6

Work space:

Slope between (2,5) and (6,3)

A) 2

B) -1/2

C) -2

D) 1/2

Work space:

Slope=3, passes (1,4). Find y when x=3.

A) y=10

B) y=7

C) y=12

D) y=6

Work space:

10 Inequalities

Concept: Solve like equations, BUT flip the inequality sign when multiplying or dividing by a negative!

Formula: $-ax > b \Rightarrow x < -b/a$ (FLIP!)

Example: $-2x < 8 \Rightarrow$ Divide by -2 , FLIP $\Rightarrow x > -4$

Solve: $x + 5 > 12$

A) $x > 7$

B) $x > 17$

C) $x < 7$

D) $x < 17$

Work space:

Solve: $-3x \leq 15$

A) $x \leq 5$

B) $x \geq -5$

C) $x \leq -5$

D) $x \geq 5$

Work space:

Solve: $2x - 4 < 10$

A) $x < 7$

B) $x < 3$

C) $x > 7$

D) $x < 14$

Work space:

SECTION 2: GEOMETRY (Questions 11 - 20)

11 Area of Triangles & Rectangles

Concept: Rectangle: $A = l \times w$. Triangle: $A = (1/2) \times \text{base} \times \text{height}$. Height is always perpendicular to base!

Formula: $A(\text{rect}) = l \times w$ $A(\text{triangle}) = (1/2) \times b \times h$

Example: Triangle: base=10, height=6 $\Rightarrow A = 0.5 \times 10 \times 6 = 30$ sq. units

Area of rectangle: length=9, width=5

A) 28

B) 40

C) 45

D) 14

Work space:

Area of triangle: base=8, height=7

A) 56

B) 28

C) 15

D) 42

Work space:

Triangle: area=24, base=6. Find height.

A) $h=4$

B) $h=6$

C) $h=8$

D) $h=10$

Work space:

12 Perimeter & Circumference

Concept: Perimeter = total distance around a shape. Circumference = perimeter of circle. $C = 2(\pi)r$.

Formula: $P(\text{rect}) = 2(l+w)$ $C = 2(\pi)r$ ($\pi \sim 3.14$)

Example: Circumference: $r=5 \Rightarrow C = 2 \times 3.14 \times 5 = 31.4$ units

Perimeter of rectangle: $l=12, w=7$

A) 38

B) 84

C) 19

D) 42

Work space:

Circumference of circle: diameter=10 ($\pi \sim 3.14$)

A) 31.4

B) 62.8

C) 15.7

D) 78.5

Work space:

Square has perimeter 36. Find side length.

A) 6

B) 9

C) 12

D) 18

Work space:

13 Area of Circles

Concept: Area = $\pi \times r^2$. If given diameter d , then radius $r = d/2$.

Formula: $A = \pi \times r^2$ ($\pi \sim 3.14$)

Example: Radius=4 $\Rightarrow A = 3.14 \times 4^2 = 3.14 \times 16 = 50.24$ sq. units

Area of circle: radius=3 ($\pi \sim 3.14$)

A) 18.84

B) 28.26

C) 9.42

D) 56.52

Work space:

Area of circle: diameter=10 ($\pi \sim 3.14$)

A) 78.5

B) 31.4

C) 314

D) 62.8

Work space:

Circle area=50.24. Find radius. ($\pi \sim 3.14$)

A) $r=3$

B) $r=4$

C) $r=5$

D) $r=6$

Work space:

14 Pythagorean Theorem

Concept: In a right triangle: $a^2 + b^2 = c^2$. The hypotenuse (c) is opposite the right angle.

Formula: $a^2 + b^2 = c^2$ (c = hypotenuse)

Example: $a=3, b=4 \Rightarrow c^2 = 9+16 = 25 \Rightarrow c = 5$

Find hypotenuse: $a=5, b=12$

A) $c=13$

B) $c=17$

C) $c=11$

D) $c=15$

Work space:

Hypotenuse=10, one leg=6. Find other leg.

A) $b=8$

B) $b=4$

C) $b=6$

D) $b=10$

Work space:

Ladder 13 ft, foot 5 ft from wall. Height?

A) 12 ft

B) 8 ft

C) 10 ft

D) 14 ft

Work space:

15 Volume of 3D Shapes

Concept: Rectangular Prism: $V = l \times w \times h$. Cylinder: $V = \pi \times r^2 \times h$.

Formula: $V(\text{prism}) = B \times h$ $V(\text{cylinder}) = \pi \times r^2 \times h$

Example: Box $4 \times 3 \times 5$: $V = 4 \times 3 \times 5 = 60$ cubic units

Volume of rectangular prism: $6 \times 4 \times 3$

A) 72

B) 36

C) 48

D) 60

Work space:

Volume of cylinder: $r=2$, $h=7$ ($\pi \sim 3.14$)

A) 87.92

B) 44

C) 28

D) 56

Work space:

Cube has volume 125. Find side length.

A) $s=5$

B) $s=25$

C) $s=4$

D) $s=6$

Work space:

16 Angles: Types & Relationships

Concept: Acute < 90 , Right = 90, Obtuse > 90 . Complementary: $\text{sum}=90$. Supplementary: $\text{sum}=180$. Vertical angles are equal!

Formula: Complementary: $a+b=90$ Supplementary: $a+b=180$

Example: Two supplementary angles, one is 65 \Rightarrow other = $180-65 = 115$ degrees

Complementary angle to 37 degrees

A) 53

B) 143

C) 63

D) 47

Work space:

Supplement of 112 degrees

A) 68

B) 248

C) 78

D) 88

Work space:

Vertical angles: $(3x+10)$ and $(5x-6)$. Find x .

A) $x=8$

B) $x=10$

C) $x=6$

D) $x=4$

Work space:

17 Triangles: Angles & Types

Concept: Sum of interior angles of a triangle = 180 degrees. Equilateral: all sides equal. Isosceles: 2 equal sides.

Formula: Angle A + Angle B + Angle C = 180 degrees

Example: Angles 50 and 70 degrees => Third = $180 - 50 - 70 = 60$ degrees

Triangle angles: 45 and 85 degrees. Find third.

A) 50

B) 60

C) 70

D) 80

Work space:

Isosceles: base angles each 65. Vertex angle?

A) 50

B) 65

C) 70

D) 130

Work space:

Right triangle with 37 degree angle. Other acute angle?

A) 53

B) 143

C) 37

D) 90

Work space:

18 Coordinate Geometry

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

Formula: $d = \sqrt{(\Delta x)^2 + (\Delta y)^2}$

Example: (1,1) to (4,5): $d = \sqrt{9+16} = \sqrt{25} = 5$ units

Distance from (0,0) to (6,8)

A) 10

B) 12

C) 14

D) 7

Work space:

Midpoint of (2,4) and (8,10)

A) (5,7)

B) (6,7)

C) (4,6)

D) (3,5)

Work space:

Distance from (1,3) to (4,7)

A) 5

B) 6

C) 7

D) 4

Work space:

19 Surface Area

Concept: Surface area = total area of all faces. Cube: $SA = 6s^2$. Rectangular Prism: $SA = 2(lw + lh + wh)$.

Formula: $SA(\text{cube}) = 6s^2$ $SA(\text{prism}) = 2(lw+lh+wh)$

Example: Cube side=4: $SA = 6 \times 4^2 = 96$ sq. units

Surface area of cube with side 5

A) 125

B) 150

C) 25

D) 75

Work space:

SA of rectangular prism: $l=4$, $w=3$, $h=2$

A) 52

B) 48

C) 24

D) 72

Work space:

Cube has surface area 54. Find side.

A) $s=3$

B) $s=6$

C) $s=9$

D) $s=4$

Work space:

20 Similarity & Scale

Concept: Similar figures have the same shape. Corresponding angles are equal, sides are in the same ratio (scale factor).

Formula: $\text{Side1} / \text{Side2} = \text{Scale Factor}$

Example: Sides 6 and 9 are corresponding \Rightarrow Scale factor = $9/6 = 3/2$

Similar rects: first 4x6. Second twice as large. Longer side?

A) 8

B) 10

C) 12

D) 16

Work space:

Triangle A: sides 3,4,5. Triangle B: longest side=15. Find shortest.

A) 6

B) 9

C) 12

D) 15

Work space:

Similar triangles: bases 8 and 12. First height=6. Find second height.

A) 8

B) 9

C) 10

D) 12

Work space:

ANSWER SHEET

Q#	1	2	3	4	5	6	7	8	9	10
Ans										
Q#	11	12	13	14	15	16	17	18	19	20
Ans										

Total Score: _____ / 20 | Time: _____ | Date: _____