

MATH 106 Intermediate Algebra Self-Assessment Answer Key

1. Find the value of $3x - 4y$ if $x = -2$ and $y = 5$

	To find the value, substitute the given values in for x and y
$3x - 4y$	Substitute (-2) for x and (5) for y
$3(-2) - 4(5)$	When you multiply a positive number and a negative number, the answer is always negative
	When you multiply 2 positive numbers or 2 negative numbers, the answer is always positive
$(-6) - (20)$	Remember when you subtract numbers, you are really "adding the opposite"
$(-6) + (-20)$	(-6) plus "the opposite of" 20
(-26)	Hint: Visualize a negative sign as backing up. If you back up 6 steps and then back up 20 more steps, you have backed up 26 steps. Caution: This is not quite true as distance is always positive. You cannot really go a negative distance.

2. Last December, the temperature on a certain day rose from (-7) degrees Fahrenheit to 5 degrees above zero Fahrenheit. How much did the temperature rise altogether that day?

If you cannot solve this problem, try drawing a picture. This asks you to "find the distance between the two temperatures". Remember, distance is always positive.

$(5) - (-7)$	Add the opposite
$(5) + (7)$	the opposite of (-7) is $(+7)$
12 degrees	Always label your answer if possible

3. Without a calculator calculate: $24 \div \frac{3}{4} - 2 \cdot 4$

Order of operations is important. PEMDAS: Parentheses, Exponents, Multiply/Divide (whichever comes first), Add/Subtract (whichever comes first)

$24 \div \frac{3}{4} - 2 \cdot 4$	Division first
$24 \cdot \frac{4}{3} - 2 \cdot 4$	To divide fractions, you multiply by the reciprocal (copy-dot-flip)

$$\frac{24 \cdot 4}{3} - 2 \cdot 4 \quad \text{To multiply fractions, multiply straight across the top then straight across the bottom}$$

$$\frac{96}{3} - 2 \cdot 4$$

$$32 - 2 \cdot 4 \quad \text{Order of operations calls for multiplication before subtraction}$$

$$32 - 8 \quad \text{Subtract (Add the opposite } 32 + (-8))$$

$$24$$

4. What is the slope and y-intercept of the graph? Graph the equation.

$$y = 2x + 3$$

The equation is in slope-intercept form $y = mx + b$ where m is the slope and b is the y-intercept

Slope = 2; y-intercept = 3

5. What is the slope of the line that goes through the points (1, 4) and (-1, -2)?

Hint: plot the points and connect the dots then count "rise" over "run" OR use the formula

which is also $\frac{\text{rise}}{\text{run}} = \frac{\Delta y}{\Delta x}$ which stands for $\frac{\text{the change in } y}{\text{the change in } x}$

OR the difference between the y-values divided by the difference between the x-values $\frac{y_2 - y_1}{x_2 - x_1}$

OR subtract the y-values, subtract the x-values then divide y by x

$$\frac{y_2 - y_1}{x_2 - x_1} = \frac{4 - (-2)}{1 - (-1)} \quad \text{Substitute the x and y values in}$$

$$\frac{4 + (2)}{1 + (1)} \quad \text{Add the opposite}$$

$$\frac{6}{2} = 3 \quad \text{The slope is 3}$$

6. A 42-inch wire is to be cut into two pieces. One piece must be exactly twice as long as the other piece. How long should the shorter piece be?

Hint: Draw a picture.

Let the smallest piece = x

Let the bigger piece be twice as long as x (or 2x)

Together the pieces must be 42 inches.

$x + 2x = 42$ Set up the equation using what you know

$3x = 42$ Combine like terms

$\frac{3x}{3} = \frac{42}{3}$ Get x by itself (divide both sides by 3)

$x = 14$ in. The shorter piece is 14 inches the longer piece is 28

Check: One piece is 14 in. and the other is twice 14 = 28 in. Together $14 + 28 = 42$ inches✓

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

$2(x-3) = 3x + 5$ Order of operations: PEMDAS

$2x - 2(3) = 3x + 5$ Use the distributive property to remove parentheses

$2x - 2x - 6 = 3x - 2x + 5$ Get variables on same side of equal sign (Subtract 2x from each side)

$-6 + (-5) = x + 5 - 5$ Move constants to same side of equal sign (Add opposite)

$(-11) = x$

Check: $2(x-3) = 3x + 5$

$2(-11 - 3) = 3(-11) + 5$

$2(-11 + -3) = -33 + 5$

$-28 = -28$ ✓

8. Multiply: $3x^2(5x^3 - 2x + 7)$ What is the numerical coefficient of the first term? 15
What is the numerical coefficient of the second term? -6
What is the numerical coefficient of the third term? 21
What is the degree of the first term? 5

What is the degree of the second term? 3

What is the degree of the third term? 2

$$3x^2(5x^3 - 2x + 7)$$

Use the distributive property to remove parentheses

$$15x^5 - 6x^3 + 21x^2$$

You add the exponents when multiplying

A numerical coefficient is the number in front of the variable

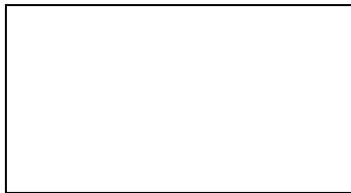
The degree is the power or exponent

Hint: If you cannot remember if you are adding or multiplying the exponents, write the whole thing out without exponents.

Ex: $x^2 = xx$ and $x^3 = xxx$ so altogether you have $xx \cdot xxx = xxxxx = x^5$

9. The length of a rectangular bed is 2 feet less than 2 times its width. Find the length of the bed if the perimeter is 32 feet.

Hint: Draw a picture



W = width

L = length

Let w = width

Let l = length

L is 2 feet less than 2 times w

$$L = 2w - 2$$

The perimeter is the distance around the outside so $P = w + w + L + L$

OR $P = 2w + 2L$

$$P = w + w + (2w - 2) + (2w - 2) \quad \text{OR} \quad P = 2w + 2L$$

$$32 = w + w + 2w - 2 + 2w - 2$$

$$32 = 2(w) + 2(2w - 2)$$

Check: $P = 2w + 2L$

$$32 = 6w - 4$$

$$32 = 2w + 4w - 4$$

$$P = 2(6) + 2(10)$$

$$32 + 4 = 6w - 4 + 4$$

$$32 = 6w - 4$$

$$P = 12 + 20$$

$$36 = 6w$$

$$32 + 4 = 6w - 4 + 4$$

$$P = 32 \text{ ft}$$

$$36/6 = 6w/6$$

$$36 = 6w$$

$$6 = w$$

$$36/6 = 6w/6$$

$$L = 2w - 2$$

$$6 = w$$

$$\begin{aligned} L &= 2(6) - 2 \\ &= 12 - 2 \\ &= 10 \text{ ft} \end{aligned}$$

$$\begin{aligned} L &= 2(6) - 2 \\ &= 12 - 2 \\ &= 10 \text{ ft} \end{aligned}$$

10. Simplify the expression: $\frac{1}{2} - \frac{3}{8} + (-5)$ leave your answer in fractional form

To add or subtract fractions, you must have a common denominator

8 is common to both denominators so change $\frac{1}{2}$ to 8^{th} s

$$\frac{1}{2} = \frac{4}{8} \quad \text{so}$$

$$\frac{4}{8} - \frac{3}{8} + (-5)$$

$$\frac{1}{8} + (-5) \quad \text{change } -5/1 \text{ to } 8^{\text{th}}$$

$$\frac{1}{8} + (-40/8) \quad \text{and then}$$

$$(-39/8)$$

11. Solve for B: $A = BC + D$

$$A - D = BC + D - D \quad \text{We are trying to get B by itself: Subtract the D from both sides}$$

$$A - D = BC \quad \text{Still trying to get B by itself: divide each side by C}$$

$$\frac{A-D}{C} = \frac{BC}{C}$$

$$\frac{(A-D)}{C} = B$$

12. Evaluate the algebraic expression $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ when $a = 2$, $b = -3$, and $c = -2$

$$\frac{-(-3) \pm \sqrt{(-3)^2 - 4(2)(-2)}}{2(2)} \quad \text{Substitute all values in and follow order of operations}$$

$$\frac{-(-3) \pm \sqrt{9 - (-16)}}{4}$$

$$\frac{3 \pm \sqrt{9+16}}{4} = \frac{3 \pm \sqrt{25}}{4} = \frac{3 \pm 5}{4} \quad \text{now there are 2 answers}$$

$$\frac{3+5}{4} = \frac{8}{4} = 2 \quad \text{and} \quad \frac{3-5}{4} = \frac{-2}{4} = -\frac{1}{2}$$

13. If 5 gallons of stain are needed to stain 2 wooden decks, how many gallons are needed for 5 decks?

5 gallons = 2 decks

? gallons = 5 decks

This is a proportion problem. Set it up by keeping like quantities in the same places: gallons to gallons and decks to decks

$$\frac{\text{gallons}}{\text{gallons}} = \frac{\text{decks}}{\text{decks}}$$

$$\frac{5 \text{ gallons}}{x \text{ gallons}} = \frac{2 \text{ decks}}{5 \text{ decks}}$$

$$\frac{5}{x} = \frac{2}{5} \quad \text{Solve by cross multiplying}$$

$$5(5) = x(2)$$

$$25 = 2x$$

$$25/2 = 2x/2$$

$$12.5 = x$$

12 ½ gallons

14. Simplify: $(5x^3y^4)^2$

$(5x^3y^4)^2$ means $(5x^3y^4)(5x^3y^4)$ now multiply

$$5 \cdot 5 \cdot x^3 \cdot x^3 \cdot y^4 \cdot y^4$$

$$25x^6y^8$$

15. Everything in the hardware store is on sale for a 25% discount. What would a hammer that was originally priced at \$16.95 cost on sale?

Discount means Less or subtract

Find 25% of the original cost and then subtract to find the sale price

\$16.95 (25%)

$\$16.95 (.25) = \$4.2375$ or \$4.24

$\$16.95 - \$4.24 = \$12.71$