

## Student Self-Assessment of Mathematics (SSAM) for Intermediate Algebra

### 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

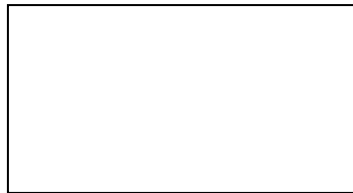
The degree is the power or exponent

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  $8^{\text{ths}}$

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

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

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

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

$$(-\frac{39}{8})$$

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  $c = -2$

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

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

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

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

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

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

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

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

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

$$25 = 2x$$

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

$$12.5 = x$$

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

$$\$16.95 (25\%)$$

$$\$16.95 (.25) = \$4.2375 \text{ or } \$4.24$$

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