

College Algebra Student Self-Assessment of Mathematics (SSAM) Answer Key

1. Multiply $(2x - 3)(x^2 - 5x + 1)$

Use the distributive property to remove the parentheses

$$(2x - 3)(x^2 - 5x + 1)$$

$$(2x)(x^2) + (2x)(-5x) + (2x)(1) + (-3)(x^2) + (-3)(-5x) + (-3)(1)$$

$$2x^3 + (-10x^2) + 2x + -3x^2 + 15x + (-3)$$

$$(2x^3 + (-13x^2) + 2x + 15x + (-3))$$

$$2x^3 - 13x^2 + 17x + (-3)$$

2. Simplify $\frac{32x^{-4}y^3}{4x^{-5}y^8}$ and write your answer as an expression without negative exponents.

$$\frac{32x^{-4}y^3}{4x^{-5}y^8}$$

These are multiplied together

$$= \frac{32}{4} \cdot \frac{x^{-4}}{x^{-5}} \cdot \frac{y^3}{y^8}$$

Rewrite them using the multiplication symbol

$$= 8 \cdot x^{-4-(-5)} \cdot y^{3-8}$$

Now divide. The rules of exponents say to subtract exponents when you are dividing

$$= 8 \cdot x^1 \cdot y^{-5}$$

$$= 8xy^{-5}$$

Write the answer without negative exponents

$$\frac{8x}{y^5}$$

3. Multiply and write the product in simplest form: $\frac{x^2-4x+4}{x-3} \cdot \frac{2x-6}{x^2-4}$

You should factor first

$$\frac{x^2-4x+4}{x-3} \cdot \frac{2x-6}{x^2-4}$$

Factor numerator and denominator

$$\frac{(x-2)(x-2)}{(x-3)} \cdot \frac{2(x-3)}{(x-2)(x+2)}$$

Multiply across the top and then across the bottom

$$\frac{(x-2)(x-2)2(x-3)}{(x-3)(x-2)(x+2)}$$

Look for common factors that will cancel out

$$\frac{(x-2)\cancel{(x-2)}2\cancel{(x-3)}}{\cancel{(x-3)}\cancel{(x-2)}(x+2)}$$

$$\frac{2(x-2)}{(x+2)}$$

4. Solve for X: $a = \frac{x-b}{y}$

$$a = \frac{x-b}{y}$$

Multiply by y to get rid of fraction OR cross multiply

$$(ay) = \left(\frac{x-b}{y}\right)$$

Need to have x by itself

$$ay = x - b$$

Add b to both sides

$$ay + b = x$$

5. Find an equation for the line parallel to $y = 3x + 1$ that goes through the point $(0, 5)$.

The slope-intercept form of a linear equation is written $y = mx + b$.

A line is parallel to another line if they never intersect, that is, if the two slopes are equal. Therefore, the slope 'm' of the parallel line is equal to 3.

So we have $y = 3x + b$. We must now find the y-intercept 'b'. To do this, we substitute the known point $(0, 5)$ into the equation $y = 3x + b$, and solve for 'b'.

$$\begin{aligned} y &= mx + b \\ y &= 3x + b \\ 5 &= 3(0) + b \\ 5 &= 0 + b \\ 5 &= b \end{aligned}$$

Now substitute the $b=5$ back into the equation $y = 3x + b$ to find the equation of the parallel line

$$y = 3x + 5$$

6. Solve the following equation by factoring: $2n^2 + 5n - 12 = 0$. Check your answer.

You should factor first.

$$2n^2 + 5n - 12 = 0$$

$$(2n - 3)(n + 4) = 0$$

$$2n - 3 = 0$$

$$2n - 3 + 3 = 0 + 3$$

$$2n = 3$$

$$\frac{n}{2} = \frac{3}{2}$$

$$n = \frac{3}{2}$$

Factor the trinomial

The exponent is a hint that there are 2 possible solutions

and $n + 4 = 0$ Set both factors equal to zero and solve both

$n + 4 - 4 = 0 - 4$ Get the variable by itself

$$n = -4$$

The answer is $n = \frac{3}{2}$ and $n = -4$

You must check your answer by substituting both values of n back into the original equation

$$\text{Check: } 2n^2 + 5n - 12 = 0$$

$$2n^2 + 5n - 12 = 0$$

$$2\left(\frac{3}{2}\right)^2 + 5\left(\frac{3}{2}\right) - 12 = 0$$

$$2(-4)^2 + 5(-4) - 12 = 0$$

$$2\left(\frac{9}{4}\right) + 5\left(\frac{3}{2}\right) - 12 = 0$$

$$2(16) + (-20) - 12 = 0$$

$$\frac{18}{4} + \frac{15}{2} - 12 = 0$$

$$32 + (-20) - 12 = 0$$

$$\frac{18}{4} + \frac{30}{4} - 12 = 0$$

$$12 - 12 = 0$$

$$\frac{48}{4} - 12 = 0$$

$$0 = 0$$

$$12 - 12 = 0$$

$$0 = 0$$

7. Simplify and then if appropriate, write in radical notation: $(3a^{5/6})(8a^{2/3})$

Remember: when multiplying you add the exponents. In order to add fractions, you must have a common denominator.

$$(3a^{5/6})(8a^{2/3}) \quad \text{Multiply the constants then the variables}$$

$$(3)(8)(a^{5/6})(a^{2/3})$$

$$(24)(a^{5/6+2/3}) \quad \text{Find a common denominator}$$

$$24(a^{5/6+4/6}) \quad \text{Add exponents}$$

$$24a^{9/6} \quad \text{This is the answer, but it is not simplified}$$

$$24a^{3/2} \quad \text{Simplified now put in radical notation}$$

$$24\sqrt[2]{a^3} \quad \text{The power under the radical (3) cannot be bigger than the index (2)}$$

$$24\sqrt[2]{a^2}\sqrt[2]{a^1} \quad \text{The square root of a squared number becomes that number } \sqrt[2]{a^2} = a$$

$$24a\sqrt{a} \quad \text{Simplified number written in radical notation}$$

8. Find the slope, the x-intercept, and the y-intercept of the graph $2x + 4y = 7$

First put the *general form* of the equation into the *slope-intercept* form.

NOTE: There is more than one way to do this problem. Only one way is presented here.

$$2x + 4y = 7 \quad \text{To put in slope-intercept form, you need to get y by itself}$$

$$2x - 2x + 4y = 7 - 2x$$

$$4y = -2x + 7 \quad \text{Commutative property allows you to re-order}$$

$$\frac{4y}{4} = \frac{-2x}{4} + \frac{7}{4} \quad \text{Still trying to get y by itself}$$

$$y = -\frac{1}{2}x + \frac{7}{4} \quad \text{Now you can find the slope and y-intercept}$$

$$\text{Slope} = -1/2$$

$$\text{Y-intercept} = 7/4$$

To find the x- intercept, set $y = 0$ and solve for x

$$2x + 4y = 7$$

$$2x + 4(0) = 7$$

$$2x + 0 = 7$$

$$2x = 7$$

$$\frac{2x}{2} = \frac{7}{2}$$

$$x = \frac{7}{2} \quad \text{The x-intercept is } 7/2$$

9. Use the quadratic formula to solve: $x^2 + 2x - 1 = 0$. Leave your answer in simplified radical form.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \quad \text{Quadratic formula}$$

Remember: $ax^2 + bx + c = 0$ is standard form of a quadratic equation

Therefore: $a = 1$; $b = 2$; $c = (-1)$

$$x = \frac{-2 \pm \sqrt{(2)^2 - 4(1)(-1)}}{2(1)}$$

$$x = \frac{-2 \pm \sqrt{4 - (-4)}}{2}$$

$$x = \frac{-2 \pm \sqrt{4+4}}{2}$$

$$x = \frac{-2 \pm \sqrt{8}}{2} \quad \text{This has 2 solutions}$$

$$x = \frac{-2 + \sqrt{8}}{2} \quad \text{and} \quad x = \frac{-2 - \sqrt{8}}{2} \quad \text{These answers can be simplified}$$

$$x = \frac{-2 + \sqrt{8}}{2} \quad \text{and} \quad x = \frac{-2 - \sqrt{8}}{2}$$

$$x = \frac{-2 + \sqrt{4}\sqrt{2}}{2} = \frac{-2 + 2\sqrt{2}}{2}$$

$$x = -1 + \sqrt{2}$$

$$x = \frac{-2 - \sqrt{4}\sqrt{2}}{2} = \left(\frac{-2 - 2\sqrt{2}}{2} \right)$$

$$x = -1 - \sqrt{2}$$

10. Solve the inequality $1 \leq \frac{x-3}{2} < 3$ and graph the solution on a number line, then give your answer in interval notation.

$$1 \leq \frac{x-3}{2} < 3$$

Multiply by 2 to get rid of denominator

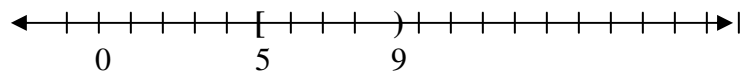
$$(2)1 \leq (2)\frac{x-3}{2} < (2)3$$

$$2 \leq x - 3 < 6$$

$$2 + 3 \leq x - 3 + 3 < 6 + 3 \quad \text{Add 3 to each to get } x \text{ by itself}$$

$$5 \leq x < 9 \quad \text{This is the solution}$$

Graph on a number line



Interval notation is $[5, 9)$.

11. The height h in feet of a rocket t seconds after launch is given by the equation:

$$h = 144t - 16t^2.$$

a) When will the rocket reach a height of 320 feet?

b) When will the rocket be back on the ground?

$$\text{a) } h = 144t - 16t^2$$

$$320 = 144t - 16t^2$$

$$-144t + 16t^2 + 320 = 0$$

$$16t^2 - 144t + 320 = 0$$

$$16(t^2 - 9t + 20) = 0$$

$$t^2 - 9t + 20 = 0$$

$$(t - 5)(t - 4) = 0$$

$$t - 5 = 0 \quad t - 4 = 0$$

Substitute height (h) into equation

Move all terms to one side of equal sign

Use commutative property to rearrange terms

Factor out common factor

Factor

Set both factors equal to zero and solve

$$t = 5$$

$$t = 4$$

There are two solutions

The rocket will reach a height of 320 feet after 4 seconds on its way up and again after 5 seconds on its way back down.

Ground level is 0 feet, so substitute 0 in for h and solve as you did in part a.

$$0 = 144t - 16t^2$$

$$16t^2 - 144t = 0$$

$$16t(9 - t) = 0 \quad 9 - t = 0$$

$$16t = 0 \quad -t = -9$$

$$t = 0 \quad t = 9$$

Use commutative property to rearrange order

Factor out common factor

Set both factors equal to zero and solve

Reject $t = 0$ because time does not stand still.

The rocket will be back on the ground after 9 seconds.

12. Write an equivalent expression with as many factors as possible removed from under the radical: $\sqrt{50x^6y^9}$

$$\sqrt{50x^6y^9} = \sqrt{50}\sqrt{x^6}\sqrt{y^9}$$

$$\sqrt{50}\sqrt{x^6}\sqrt{y^9} = \sqrt{25 \cdot 2 \cdot x^2 \cdot x^2 \cdot x^2 \cdot y^2 \cdot y^2 \cdot y^2 \cdot y^1}$$

$$\sqrt{25} \cdot \sqrt{2} \cdot \sqrt{x^2} \cdot \sqrt{x^2} \cdot \sqrt{x^2} \cdot \sqrt{y} \cdot \sqrt{y^2} \cdot \sqrt{y^2} \cdot \sqrt{y^2} \cdot \sqrt{y^1}$$

Remember: The square root of a squares number is that number. For example: $\sqrt[2]{4^2} = \sqrt[2]{16} = 4$

Therefore $\sqrt{x^2} = x$

$$5 \cdot \sqrt{2} \cdot x \cdot x \cdot x \cdot y \cdot y \cdot y \cdot y \cdot \sqrt{y}$$

$$5\sqrt{2} \cdot x^3y^4\sqrt{y}$$

$$5x^3y^4\sqrt{2y} \quad \text{Commutative property allows us to rearrange the order}$$

13. Rationalize the denominator. $\frac{5}{7-\sqrt{3}}$ Leave your answer in radical notation.

$$\frac{5}{7-\sqrt{3}} \cdot \frac{7+\sqrt{3}}{7+\sqrt{3}}$$

Multiply by the conjugate ($a - b$) and ($a + b$) are conjugates

$$\frac{5(7+\sqrt{3})}{49-3}$$

$$\frac{35+5\sqrt{3}}{46} \quad \text{Answer left in radical notation}$$

14. Multiply $(5 + \sqrt{2})(8 - \sqrt{2})$

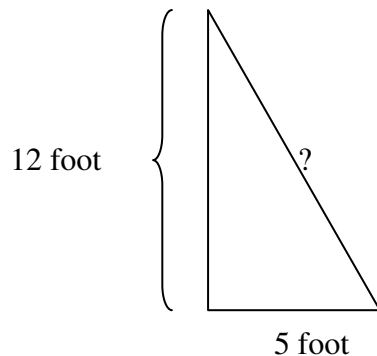
$$(5)(8) + (5)(-\sqrt{2}) + (\sqrt{2})(8) + (\sqrt{2})(-\sqrt{2}) \quad \text{Use the foil method or distributive property}$$

$$40 + (-5\sqrt{2}) + 8\sqrt{2} + (-2)$$

$$38 + 3\sqrt{2}$$

15. How long is a guy wire that reaches from the top of a 12 foot pole to a point on the ground 5 ft from the bottom of the pole?

Hint: Draw a picture.



When the pole meets the ground, a right angle is formed. Because this is a right triangle, the Pythagorean Theorem can be used to find the length of the guy wire.

$$\text{leg}^2 + \text{leg}^2 = \text{hypotenuse}^2$$

$$5^2 + 12^2 = c^2$$

$$25 + 144 = c^2$$

$$169 = c^2$$

$$13 = c \quad \text{The guy wire is 13 feet long}$$