

Practice

Do Now: Simplify each expression.

1)

Which statement best describes the solutions of a two-variable equation?

- (1) The ordered pairs must lie on the graphed equation.
- (2) The ordered pairs must lie near the graphed equation.
- (3) The ordered pairs must have $x = 0$ for one coordinate.
- (4) The ordered pairs must have $y = 0$ for one coordinate.

2) Completely simplify:

$$\sqrt[3]{24x^6y^7}$$

$$\sqrt[3]{8} \sqrt[3]{3} \sqrt[3]{x^6} \sqrt[3]{y^6} \sqrt[3]{y}$$

$$2 \sqrt[3]{3} x^2 y^2 \sqrt[3]{y}$$

$$\boxed{2x^2y^2\sqrt[3]{3y}}$$

3)

The expression $(x + a)^2 + 5(x + a) + 4$ is equivalent to

- ~~(1)~~ $(a + 1)(a + 4)$ no x
- ~~(2)~~ $(x + 1)(x + 4)$ no a
- (3) $(x + a + 1)(x + a + 4)$
- ~~(4)~~ $x^2 + a^2 + 5x + 5a + 4$ no 2ax

$$(x+a)(x+a) + 5x + 5a + 4$$

$$x^2 + ax + ax + a^2 + 5x + 5a + 4$$

$$x^2 + 2ax + a^2 + 5x + 5a + 4$$

4)

The expression $\sqrt[4]{81x^8y^6}$ is equivalent to

- (1) $3x^2y^{\frac{3}{2}}$
- (2) $3x^4y^2$
- (3) $9x^2y^{\frac{3}{2}}$
- (4) $9x^4y^2$

$$\sqrt[4]{81} \sqrt[4]{x^8} \sqrt[4]{y^6}$$

$$3x^2y^{6/4}$$

$$3x^2y^{3/2}$$

5) Completely simplify the following expression:

$$\sqrt{4\sqrt{3}} = 2\sqrt{3}$$

$$\left(\frac{9}{1}\right)^{3/2} = (\sqrt{9})^3 = (3)^3 = 27$$

$$\frac{(3 - \sqrt{12})}{\left(\frac{1}{9}\right)^{-3/2} - \sqrt{3}}$$

$$\frac{(3 - 2\sqrt{3})(27 + \sqrt{3})}{(27 - \sqrt{3})(27 + \sqrt{3})} = \frac{81 + 3\sqrt{3} - 54\sqrt{3} - 2(3)}{729 + 27\sqrt{3} - 27\sqrt{3} - 3}$$

$$\frac{75 - 51\sqrt{3}}{726} = \boxed{\frac{25 - 17\sqrt{3}}{242}}$$

Completely simplify each radical expression.

1) $\sqrt[5]{243a^{15}b^{24}c^{98}}$

$$\sqrt[5]{243} \sqrt[5]{a^{15}} \sqrt[5]{b^{24}} \sqrt[5]{b^4} \sqrt[5]{c^{95}} \sqrt[5]{c^3}$$

$$3a^3b^4\sqrt[5]{b^4}c^{19}\sqrt[5]{c^3}$$

$$\boxed{3a^3b^4c^{19}\sqrt[5]{b^4c^3}}$$

2) $-\sqrt{343x^8y^9} - 2\sqrt{112x^8y^9} + 10\sqrt{700x^9y^8}$

$$-\sqrt{49}\sqrt{7}\sqrt{x^8}\sqrt{y^9}\sqrt{y} - 2\sqrt{16}\sqrt{7}\sqrt{x^8}\sqrt{y^8}\sqrt{y} + 10\sqrt{100}\sqrt{7}\sqrt{x^8}\sqrt{y^8}$$

$$-7x^4y^4\sqrt{7y} - 8x^4y^4\sqrt{7y} + 100x^4y^4\sqrt{7x}$$

$$\boxed{-15x^4y^4\sqrt{7y} + 100x^4y^4\sqrt{7x}}$$

3) $(x - \sqrt{10})(x + \sqrt{54})$

$$x^2 + x\sqrt{54} - x\sqrt{10} - \sqrt{540}$$

$$x^2 + x\sqrt{9}\sqrt{6} - x\sqrt{10} - \sqrt{36}\sqrt{15}$$

$$\boxed{x^2 + 3x\sqrt{6} - x\sqrt{10} - 6\sqrt{15}}$$

$$\sqrt{4}\sqrt{3} = 2\sqrt{3}$$

4) $\frac{-\sqrt{12}+5}{-3+\sqrt{32}}$ $\sqrt{16}\sqrt{2} = 4\sqrt{2}$

$$\frac{(-2\sqrt{3}+5)(-3-4\sqrt{2})}{(-3+4\sqrt{2})(-3-4\sqrt{2})}$$

$$\frac{6\sqrt{3} + 8\sqrt{6} - 15 - 20\sqrt{2}}{9 + 12\sqrt{2} - 12\sqrt{2} - 16(2)}$$

$$\frac{6\sqrt{3} + 8\sqrt{6} - 15 - 20\sqrt{2}}{-23}$$

$$\boxed{\frac{-6\sqrt{3} - 8\sqrt{6} + 15 + 20\sqrt{2}}{23}}$$

5)

For $x \neq 0$, which expressions are equivalent to one divided by the sixth root of x ?

$$= \frac{x^{1/6}}{x^{1/3}}$$

I. $\frac{\sqrt[6]{x}}{\sqrt[3]{x}}$ II. $\frac{x^{1/6}}{x^{1/3}}$ III. $x^{-1/6}$

$$\frac{1}{\sqrt[6]{x}} = \frac{1}{x^{1/6}} = x^{-1/6}$$

(1) I and II, only

(2) I and III, only

(3) II and III, only

(4) I, II, and III

$$x^{1/6} - \frac{1}{3} = x^{1/6} - \frac{2}{6} = x^{-1/6}$$

6)

Given $y > 0$, the expression $\sqrt{3x^2y} \cdot \sqrt[3]{27x^3y^2}$ is equivalent to

(1) $81x^5y^3$

(2) $3^{1.5}x^2y$

(3) $3^{\frac{5}{2}}x^2y^{\frac{5}{3}}$

(4) $3^{\frac{3}{2}}x^2y^{\frac{7}{6}}$

$(3x^2y)^{\frac{1}{2}}$
 $3^{\frac{1}{2}}xy^{\frac{1}{2}}$

$(27x^3y^2)^{\frac{1}{3}}$
 $27^{\frac{1}{3}}xy^{2/3}$
 $3xy^{2/3}$

$(3^{\frac{1}{2}}xy^{\frac{1}{2}})(3xy^{2/3}) = 3^{\frac{3}{2}}x^2y^{\frac{7}{6}}$

7)

Which expression is **not** equivalent to $-4x^3 + x^2 - 6x + 8$?

(1) $x^2(-4x + 1) - 2(3x - 4)$

(3) $-4x^3 + (x - 2)(x - 4)$

(2) $x(-4x^2 - x + 6) + 8$

(4) $-4(x^3 - 2) + x(x - 6)$

$-4x^3 - x^2 + 6x + 8$

$-4x^3 + 8 + x^2 - 6x$
 $-4x^3 + x^2 - 6x + 8$

8)

Maria orders T-shirts for her volleyball camp. Adult-sized T-shirts cost \$6.25 each and youth-sized T-shirts cost \$4.50 each. Maria has \$550 to purchase both adult-sized and youth-sized T-shirts. If she purchases 45 youth-sized T-shirts, determine algebraically the maximum number of adult-sized T-shirts she can purchase.

let $a =$ number of adult sized t-shirts

$6.25a + 4.50(45) = 550$

$6.25a + 202.5 = 550$
 $-202.5 \quad -202.5$

$6.25a = 347.5$
 $\frac{6.25a}{6.25} = \frac{347.5}{6.25}$

$a = 55.6$

55 adult-sized T-shirts

9)

State whether the product of $\sqrt{3}$ and $\sqrt{9}$ is rational or irrational. Explain your answer.

$\sqrt{3} \cdot \sqrt{9} = \sqrt{27}$

$\sqrt{27}$ is irrational because it is a non-terminating and non-repeating number

10) Determine whether the following statement is true or false. Explain your reasoning.

I found $9^8 = 43,046,721$, therefore the eighth root of 43,046,721 must be 9.

True because the inverse operation of raising a number to the eighth power is taking the eighth root of a number.

11) If $a \geq |b|$, which of the following is the solution statement for a when $b = -8$?

- A. $x \leq 8$
- B. $x \geq 8$
- C. $x \leq -8$ or $x \geq 8$
- D. $-8 \leq x \leq 8$
- E. a is a real number

$$a \geq |-8|$$

$$a \geq 8$$

Solve each of the following equations and inequalities.

12) $-\frac{1}{2}|4x + 1| - 22 \geq 10$

$+22 \quad +22$

$-\frac{1}{2}|4x + 1| \geq 32$

$|4x + 1| \leq -64$



13) $-12 = \frac{-2|x-9|}{3}$

$-36 = \frac{-2|x-9|}{-2}$

$18 = |x-9|$

$x-9 = 18$
 $+9 \quad +9$

$x = 27$

$x-9 = -18$
 $+9 \quad +9$

$x = -9$

Check:

$-12 = \frac{-2|27-9|}{3}$

$-12 = -12 \checkmark$

$-12 = \frac{-2|-9-9|}{3}$

$-12 = -12 \checkmark$

14) $|\frac{2}{7}x + 4| - 2 < 30$

$|\frac{2}{7}x + 4| < 32$

$\frac{2}{7}x + 4 < 32$

$\frac{2}{7}x + 4 > -32$

$\frac{2}{7}x < 28$

$x < 98$

$\frac{2}{7}x > -36$

$x > -126$

$-126 < x < 98$



15) $\frac{-|x-12|}{4} + 19 < 14$

$-\frac{|x-12|}{4} < -5$

$|x-12| > 20$

$x-12 > 20$
 $+12 \quad +12$

$x > 32$

$x-12 < -20$
 $+12 \quad +12$

$x < -8$

$(-\infty, -8) \cup (32, \infty)$



16) Bryan's hockey team is purchasing jerseys. The company charges \$250 for a onetime set-up fee and \$23 for each printed jersey. Write an expression to represent the total cost of x jerseys printed for the team.

$$23x + 250$$

17)

The owner of a landscaping business wants to know how much time, on average, his workers spend mowing one lawn. Which is the most appropriate rate with which to calculate an answer to his question?

- (1) lawns per employee (3) employee per lawns
 (2) lawns per day (4) hours per lawn

18) Is the product of $\frac{3}{\sqrt{81+3\sqrt{60.5}}}$ and $\frac{-13}{\sqrt{1.5}}$ rational or irrational? Explain your answer and show all of your work.

$$\left(\frac{3}{9 + 3\sqrt{60.5}} \right) \left(\frac{-13}{\sqrt{1.5}} \right) = \frac{-39}{9\sqrt{1.5} + 3\sqrt{90.75}}$$

The product is irrational because it is a non-terminating and non-repeating number.

19)

The formula $a = \frac{v_f - v_i}{t}$ is used to calculate acceleration as the change in velocity over the period of time.

Solve the formula for the final velocity, v_f , in terms of initial velocity, v_i , acceleration, a , and time, t .

$$(t) a = \frac{v_f - v_i}{t} (t)$$

$$at = v_f - v_i$$

$$+v_i \qquad \qquad +v_i$$

$$v_f = at + v_i$$

Completely simplify each expression.

$$20) \left(\frac{625x^{28}y^{-11}z^{-1/4}}{16y^{-8}z^{3/4}} \right)^{-1/4}$$

$$\left(\frac{625x^{28}y^{-3}z^{-1}}{16} \right)^{-1/4}$$

$$\left(\frac{625}{16} \right)^{-1/4} x^{-7} y^{3/4} z^{1/4}$$

$$\frac{2}{5} x^{-7} \sqrt[4]{y^3} \sqrt[4]{z}$$

$$\frac{2\sqrt[4]{y^3z}}{5x^7}$$

$$21) \sqrt[3]{64x^{28}y^{90}z^{72}}$$

$$\sqrt[3]{64} \sqrt[3]{x^{27}} \sqrt[3]{x} \sqrt[3]{y^{90}} \sqrt[3]{z^{72}}$$

$$4x^9 \sqrt[3]{x} y^{30} z^{24}$$

$$\boxed{4x^9 y^{30} z^{24} \sqrt[3]{x}}$$

$$22) \frac{\left(\frac{1}{4}\right)^{-3/2} - (8)^{3/2}}{(81)^{3/4} - (2)^{5/2}}$$

$$(4)^{3/2} = (\sqrt{4})^3 = 2^3 = 8$$

$$\sqrt{8^3} = \sqrt{512} = \sqrt{256} \sqrt{2} = 16\sqrt{2}$$

$$\sqrt[4]{81}^3 = (3)^3 = 27$$

$$\sqrt{2^5} = \sqrt{32} = \sqrt{16} \sqrt{2} = 4\sqrt{2}$$

$$\frac{(8 - 16\sqrt{2})(27 + 4\sqrt{2})}{(27 - 4\sqrt{2})(27 + 4\sqrt{2})}$$

$$\frac{216 + 32\sqrt{2} - 432\sqrt{2} - 64(2)}{729 + 108\sqrt{2} - 108\sqrt{2} - 16(2)}$$

$$\boxed{\frac{88 - 400\sqrt{2}}{697}}$$

23)

A student is in the process of solving an equation. The original equation and the first step are shown below.

Original: $3a + 6 = 2 - 5a + 7$

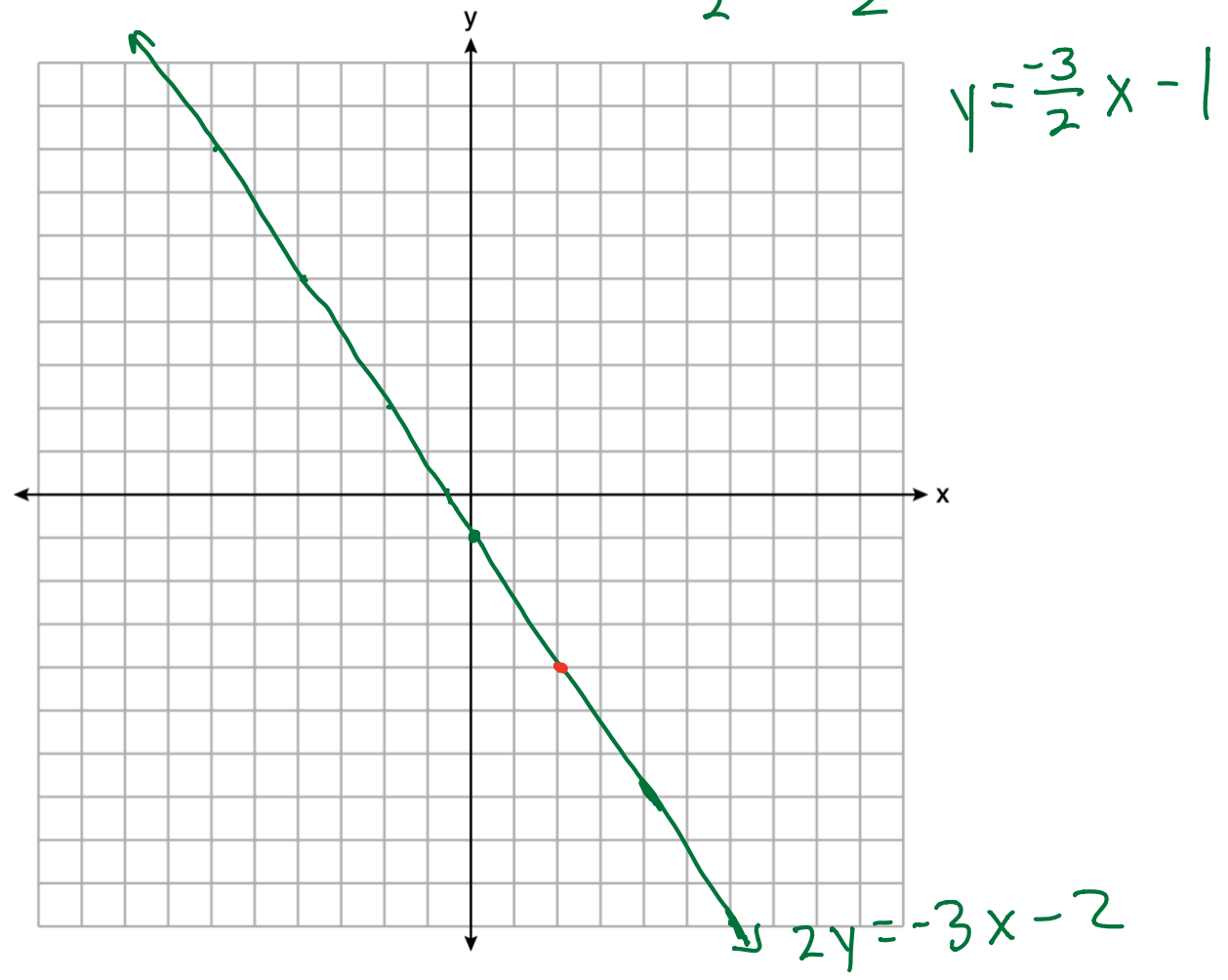
Step one: $3a + 6 = 2 + 7 - 5a$

Which property did the student use for the first step? Explain why this property is correct.

Commutative Property because the student rearranges $2 - 5a + 7$ to $2 + 7 - 5a$.

24)

On the set of axes below, graph the line whose equation is $\frac{2y}{2} = \frac{-3x - 2}{2}$.



This linear equation contains the point $(2, k)$. State the value of k .

$$k = -4$$

25)

Express $(3x - 4)(x + 7) - \frac{1}{4}x^2$ as a trinomial in standard form.

$$3x^2 + 21x - 4x - 28 - \frac{1}{4}x^2$$

$$\frac{11}{4}x^2 + 17x - 28$$

26)

For n and $p > 0$, is the expression $(p^2 n^{\frac{1}{2}})^8 \sqrt{p^5 n^4}$ equivalent to $p^{18} n^6 \sqrt{p}$? Justify your answer.

$$p^{16} n^4 \sqrt{p^4} \sqrt{p} \sqrt{n^4}$$

$$p^{16} n^4 p^2 \sqrt{p} n^2$$

$$p^{18} n^6 \sqrt{p}$$

27)

Is the product of two irrational numbers always irrational? Justify your answer.

No because π and $\frac{1}{\pi}$ are irrational
but $\pi(\frac{1}{\pi}) = 1$. One is not an
irrational number.