5.1 Multiplying Powers with the Same Base (M2 10.1)

- Multiplying Powers
  - You can use a property of exponents to multiply powers with the same base.
  - A product of powers with the same base can be re-written using one exponent.
    - Ex: $3^4 * 3^2 = (3 \cdot 3 \cdot 3 \cdot 3) \cdot (3 \cdot 3) = 3^6$
  - In general, an the product of powers with the same base can be written using variables:

$$a^m * a^n = a^{m+n}$$ ← add exponents same base

- Ex: What is each expression written using each base only once?
  - $12^4 * 12^3 = 12^{4+3} = 12^7$
  - $(-5)^{-2}(-5)^7 = (-5)^{-2+7} = (-5)^5$

- Multiplying Powers in Algebraic Expressions
  - When variable factors have more than one base, be careful to combine only those powers with the same base.
  - Expressions should always be given with positive exponents.

$$xa^{-n} = \frac{x}{a^n}$$ switch sign, put term in denominator

- Ex: What is the simplified form of each expression?
  - $4z^5 * 9z^{-12} = (4 \cdot 9)(z^5 \cdot z^{-12})$
    $= 36z^{5+-12} = 36z^{-7} = \frac{36}{z^7}$
  - $2a' * 9a^4 * 3a^2 = (2 \cdot 9 \cdot 3)(a \cdot a^4 \cdot a^2)$
    $= 54a^{1+4+2} = 54a^7$

- Multiplying with Scientific Notation
  - You can use the property for multiplying powers with the same base to multiply numbers written in scientific notation
    - Scientific notation: $a * 10^b$ where $1 \leq |a| < 10$
    - Ex: At 20°C, one cubic meter of water has a mass of about $9.98 * 10^5$g. Each gram of water contains about $3.34 * 10^{22}$ molecules of water. About how many molecules of water does the droplet of water shown below contain?

$(1.13 \cdot 10^{-7} m^3)(9.98 \cdot 10^5 g/m^3)(3.34 \cdot 10^{22} molec./g)$

$V = 1.13 \times 10^{-7} m^3$

$= (1.13 \cdot 9.98 \cdot 3.34) \cdot 10^{-7+5+22}$

$= 37.7 \cdot 10^{20+1} = \boxed{3.77 \cdot 10^{21}}$

- Simplifying Expressions written with Rational Exponents
  - Exponents can also be expressed as fractions. Fractional exponents are called rational exponents.
  - Recall that $3^2 = 3 * 3 = 9$. You can write the same expression using rational exponents: $9^{\frac{1}{2}} = 3$
  - In general, $a^{\frac{1}{m}} = b$ means that b multiplied as a factor m times equals a.
    - Ex: Simplify the expression $\left(2a^{\frac{2}{3}} * 3b^{\frac{1}{4}}\right)\left(a^{\frac{1}{3}} * 5b^{\frac{1}{2}}\right)$

$= (2 \cdot 3 \cdot 5)(a^{2/3} \cdot a^{1/3})(b^{1/4} \cdot b^{1/2})$

$= 30\, a^{3/3}\, b^{3/4}$

$= \boxed{30ab^{3/4}}$

    - Ex: Simplify the expression $\left(8b^{\frac{2}{3}} * 9t^{\frac{1}{5}}\right)\left(8b^{\frac{5}{3}} * 9t^{\frac{3}{5}}\right)$

$(8 \cdot 9 \cdot 8 \cdot 9)\,(b^{2/3} \cdot b^{5/3})\,(t^{1/5} \cdot t^{3/5})$

$\boxed{5184\, b^{7/3}\, t^{4/5}}$

5.2 Power Rule (M2 10.2)

- Simplifying a Power Raised to a Power
  - You can use properties of exponents to simplify a power raised to a power or a product raised to a power.

$$(x^5)^2 = x^5 * x^5 = x^{5+5} = x^{5*2} = x^{10}$$

  - To raise a power to a power, multiply the exponents.

$$(a^m)^n = a^{mn}$$

where $a \neq 0$ and m and n are rational numbers

  - Ex: Simplify
    - $(5^4)^2 = 5^{4 \cdot 2} = \boxed{5^8}$
    - $\left(p^{\frac{2}{3}}\right)^{\frac{1}{2}} = p^{\frac{2}{3} \cdot \frac{1}{2}} = \boxed{p^{1/3}}$

- Simplifying an Expression with Powers
  - Use the order of operations when you simplify an exponential expression.
    - Ex: What is the simplified form of $y^3\left(y^{\frac{5}{2}}\right)^{-2}$ $= y^3 \cdot y^{-\frac{10}{2}}$

$$y^3 \cdot y^{-5} = y^{-2} = \boxed{\frac{1}{y^2}}$$

    - Ex: What is the simplified form of $x^2(x^6)^{-4}$

$$x^2 \cdot x^{6 \cdot -4} = x^2 \cdot x^{-24} = x^{-22} = \boxed{\frac{1}{x^{22}}}$$

- Simplifying a Product Raised to a Power
  - You can use repeated multiplication to simplify an expression like $\left(4m^{\frac{1}{2}}\right)^3$.

$$\left(4m^{\frac{1}{2}}\right)^3 = 4m^{\frac{1}{2}} * 4m^{\frac{1}{2}} * 4m^{\frac{1}{2}}$$
$$= 4 * 4 * 4 * m^{\frac{1}{2}} * m^{\frac{1}{2}} * m^{\frac{1}{2}}$$
$$= 4^3 m^{\frac{3}{2}}$$
$$= 64m^{\frac{3}{2}}$$

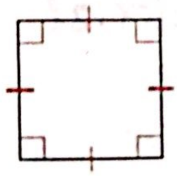
- To raise a product to a power, raise each factor to the power and multiply.

$$(ab)^m = a^m b^m$$

where $a \neq 0$, $b \neq 0$, and m is a rational number

  - Ex: $(3x)^4 = 3^4 x^4 = \boxed{81x^4}$

  - Ex: What is a simplified expression for the area of the square shown?



$5x^3$

$A = (5x^3)^2 = 5^2 x^{3 \cdot 2}$

$= 5^2 x^6 = \boxed{25x^6}$

- Simplifying an expression with Products
  - What is the simplified form of $\left(n^{\frac{1}{2}}\right)^{10} \left(4mn^{-\frac{2}{3}}\right)^3$?

$n^{10/2} \cdot 4^3 m^3 n^{-2}$

$= 4^3 m^3 n^5 n^{-2} = \boxed{64m^3n^3}$

  - What is the simplified form of $(6ab)^3(5a^{-3})^2$?

$6^3 a^3 b^3 \cdot 5^2 a^{-6}$

$= 5^2 \cdot 6^3 \cdot a^3 \cdot a^{-6} \cdot b^3$

$= 25 \cdot 216 \cdot a^{-3} b^3$

$= 5400 a^{-3} b^3$

$= \boxed{\dfrac{5400b^3}{a^3}}$

- Raising a Number in Scientific Notation to a Power
  - You can use the property of raising a product to a power to solve problems involving scientific notation.

$$(a * 10^m)^n = a^n * 10^{mn}$$

  - Ex: The expression $\frac{1}{2}mv^2$ gives the kinetic energy, in joules, of an object with a mass of m kg traveling at a speed of v meters per second. What is the kinetic energy of an experimental unmanned jet with a mass of $1.3 * 10^3 kg$ traveling at a speed of about $3.1 * 10^3 m/s$?

$m = 1.3 \times 10^3$ kg

$V = 3.1 \times 10^3$ m/s

$E = \frac{1}{2}(1.3 \times 10^3)(3.1 \times 10^3)^2$

$= \frac{1}{2}(1.3 \times 10^3)(3.1^2 \times 10^{3 \cdot 2})$

$= \left(\frac{1}{2} \cdot 1.3 \cdot 3.1^2\right) \times 10^{3+6}$

$= \boxed{6.2 \times 10^9 \text{ J}}$

5.3 Quotient Rule (M2 10.3)

- Dividing Algebraic Expressions
  - You can use properties of exponents to divide powers with the same base.
    - Shown with repeated multiplication:

$$\frac{4^5}{4^3} = \frac{4*4*\cancel{4}*\cancel{4}*\cancel{4}}{\cancel{4}*\cancel{4}*\cancel{4}} = 4^2$$

    - To divide powers with the same base, subtract the exponents.

exp. of numerator − exp. of denominator

$$\frac{a^m}{a^n} = a^{m-n}$$

where $a \neq 0$ and m and n are rational numbers

- Ex: What is the simplified form of each expression?

$$\frac{2^6}{2^2} = 2^{6-2} = \boxed{2^4}$$

$$\frac{y^{\frac{3}{4}}}{y^{\frac{1}{2}}} = y^{\frac{3}{4}-\frac{1}{2}} = y^{\frac{3}{4}-\frac{2}{4}} = \boxed{y^{1/4}}$$

$$\frac{x^4y^{-1}z^8}{x^4y^{-5}z} = x^{4-4}y^{-1-(-5)}z^{8-1} = x^0y^4z^7 = \boxed{y^4z^7}$$

- Dividing Numbers in Scientific Notation
  - The property of dividing powers can be used to divide numbers in scientific notation.
    - Ex: Population density describes the number of people per unit area. During one year, the population of Angola was $1.21 * 10^7$ people. The area of Angola is $4.81 * 10^5$ mi². What was the population density of Angola that year?

$$\text{pop D} = \frac{1.21 \times 10^7 \text{ people}}{4.81 \times 10^5 \text{ mi}^2} = \frac{1.21}{4.81} \times 10^{7-5} = 0.252 \times 10^{2-1}$$

$$= 2.52 \times 10^1 \text{ people/mi}^2$$

$$= \boxed{25.2 \text{ people/mi}^2}$$

- Raising a Quotient to a Power
  - You can use repeated multiplication to simplify a quotient raised to a power.

$$\left(\frac{x}{y}\right)^3 = \frac{x}{y} * \frac{x}{y} * \frac{x}{y} = \frac{x * x * x}{y * y * y} = \frac{x^3}{y^3}$$

  - To raise a quotient to a power, raise the numerator and the denominator to the power and simplify.

$$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$$

where $a \neq 0$, $b \neq 0$, and n is a rational number

    - Ex: What is the simplified form of $\left(\frac{z^{\frac{2}{3}}}{5}\right)^3$?

$$= \frac{(z^{2/3})^3}{5^3} = \boxed{\frac{z^2}{125}}$$

    - Ex: What is the simplified form of $\left(\frac{a^{\frac{3}{4}}}{a^5}\right)^4$?

$$= \frac{(a^{3/4})^4}{(a^5)^4} = \frac{a^3}{a^{20}} = a^{3-20} = a^{-17} = \boxed{\frac{1}{a^{17}}}$$

- Simplifying an Exponential Expression
  - Recall that negative exponents Flip fractions.

$$\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^n$$

for all rational numbers a and b, and positive integers n.

    - Ex: What is the simplified form of $\left(\frac{2x^6}{y^4}\right)^{-3}$?

$$= \left(\frac{y^4}{2x^6}\right)^3 = \frac{(y^4)^3}{(2x^6)^3} = \frac{y^{12}}{2^3 x^{18}} = \boxed{\frac{y^{12}}{8x^{18}}}$$

5.4 Simplifying Radicals (M1 5.8)

- Removing Perfect-Square Factors
  - A radical expression is an expression that contains a radical.
    - The radicand has no perfect-square factors other than 1.
    - The radicand contains no fractions
    - No radicals appear in the denominator of a fraction
  - Simplified vs. Not Simplified Radicals
    - Simplified: $3\sqrt{5}$ $\quad 9\sqrt{x}$ $\quad \frac{\sqrt{2}}{4}$
    - Not Simplified: $3\sqrt{12}$ $\quad \sqrt{\frac{x}{2}}$ $\quad \frac{5}{\sqrt{7}}$
  - Multiplication Property of Square Roots
    - For $a \geq 0$ and $b \geq 0$, $\sqrt{ab} = \sqrt{a} * \sqrt{b}$
    - Can be used to simplify radicals by removing perfect-square factors.
      - Ex: What is the simplified form of $\sqrt{160}$?

        $= \sqrt{16} \cdot \sqrt{10}$

        $= \boxed{4\sqrt{10}}$
      - Ex: What is the simplified form of $\sqrt{72}$?

        $= \sqrt{9} \cdot \sqrt{8}$

        $= 3\sqrt{4 \cdot 2} = 3\sqrt{4} \cdot \sqrt{2} = \boxed{6\sqrt{2}}$
- Removing Variable Factors
  - Sometimes, you can simplify radical expressions that contain variables
  - A variable with an even exponent is a perfect square. $\sqrt{n^6} = n^3$
  - A variable with an odd exponent is the product of a perfect square and the variable. (i.e. $n^3 = n^2 * n$)
    - Ex: What is the simplified form of $\sqrt{54n^7}$?

      $= \sqrt{9 \cdot 6 \cdot m^6 \cdot m}$

      $= \sqrt{9m^6} \cdot \sqrt{6m} = \boxed{3m^3\sqrt{6m}}$
    - Ex: What is the simplified form of $-m\sqrt{80\,m^9}$?

      $= -m\sqrt{4m^8}\,\sqrt{20m}$

      $= -m \cdot 2m^4\sqrt{4 \cdot 5m}$

      $= -2m^5\sqrt{4}\,\sqrt{5m}$

      $= -2m^5 \cdot 2\sqrt{5m}$

      $= \boxed{-4m^5\sqrt{5m}}$
- Multiplying Two Radical Expressions
  - What is the simplified form of $2\sqrt{7t} * 3\sqrt{14t^2}$?

    $= 2 \cdot 3 \cdot \sqrt{7t} \cdot \sqrt{14t^2}$

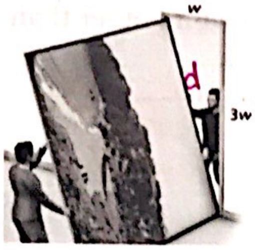
    $= 6\sqrt{7 \cdot 7 \cdot 2 \cdot t^2 \cdot t}$

    $= 6\sqrt{49t^2}\,\sqrt{2t}$

    $= 6 \cdot 7t\sqrt{2t}$

    $= \boxed{42t\sqrt{2t}}$

- Writing a Radical Expression
  - A rectangular door in a museum is three times as tall as it is wide. What is a simplified expression for the maximum length of a painting that fits through the door?



$d^2 = w^2 + (3w)^2$

$d^2 = w^2 + 9w^2$

$d^2 = 10w^2$

$d = \sqrt{10w^2} = \sqrt{w^2}\sqrt{10}$ $\boxed{d = w\sqrt{10}}$

- Simplifying Fractions within Radicals
  - Division Property of Square Roots
    - For $a \geq 0$ and $b > 0$, $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$
    - When a radicand has a denominator that is a perfect square, it is easier to apply the division property of square roots first, and then simplify the numerator and denominator of the result.
      - Ex: What is the simplified form of $\sqrt{\frac{64}{49}}$?

$= \frac{\sqrt{64}}{\sqrt{49}} = \boxed{\frac{8}{7}}$

      - Ex: What is the simplified form of $\sqrt{\frac{8x^3}{50x}}$?

$= \sqrt{\frac{4x^2}{25}} = \frac{\sqrt{4x^2}}{\sqrt{25}} = \boxed{\frac{2x}{5}}$

- Rationalizing Denominators
  - When a radicand in the denominator is not a perfect square, you may need to rationalize the denominator to remove the radical.
  - Multiply both the numerator and the denominator by the same radical expression.
    - Ex: What are the simplified forms of $\frac{\sqrt{3}}{\sqrt{7}}$ and $\frac{\sqrt{7}}{\sqrt{8n}}$?

$\frac{\sqrt{3}}{\sqrt{7}} \cdot \frac{\sqrt{7}}{\sqrt{7}} = \boxed{\frac{\sqrt{21}}{7}}$

$\frac{\sqrt{7}}{\sqrt{8n}} \cdot \frac{\sqrt{8n}}{\sqrt{8n}} = \frac{\sqrt{56n}}{8n} = \frac{\sqrt{4} \cdot \sqrt{14n}}{8n}$

$= \frac{2\sqrt{14n}}{8n} = \boxed{\frac{\sqrt{14n}}{4n}}$

Name: ______

5.5 Rational Exponents and Radicals (M2 10.4)

Obj.: **I will be able to convert between radical form and exponential form of powers with rational exponents. I will be able to apply radical expressions to real-world situations.**

- Finding Roots
  - You can use rational exponents to represent radicals.
    - In a radical expression, $\sqrt[n]{a}$,
      - "a" is the radicand
      - "n" is the index
        - Gives the degree of the root.
        - If no index is listed, it is assumed to be 2, meaning square root.
    - You can simplify radical expressions by finding like factors.
      - Ex: What is the simplified form of each expression?

$\sqrt[3]{125} = \sqrt[3]{5\cdot5\cdot5} = \boxed{5}$

$\sqrt[4]{16} = \sqrt[4]{2\cdot2\cdot2\cdot2} = \boxed{2}$

- Converting to Radical Form
  - You can also write expressions that have rational exponents, like $\frac{2}{3}$, in radical form.
    - If the n^{th} root of a is a real number, and m and n are positive integers, then

$$a^{\frac{1}{n}} = \sqrt[n]{a} \quad and \quad a^{\frac{m}{n}} = \sqrt[n]{a^m} = (\sqrt[n]{a})^m$$

    - Ex: What is $12a^{\frac{2}{3}}$ in radical form?

$= 12\cdot\sqrt[3]{a^2}$

not part of radicand b/c not part of base

    - Ex: What is $(64a)^{\frac{4}{5}}$ in radical form?

$= (32\cdot2a)^{4/5}$

$= 32^{4/5}(2a)^{4/5}$

$= (2^5)^{4/5}(2a)^{4/5}$

$= 2^4(2a)^{4/5} = 16\sqrt[5]{(2a)^4}$

- Converting to Exponential Form
  - Ex: What is $\sqrt[5]{b^3}$ in exponential form?

$= \boxed{b^{3/5}}$

  - Ex: What is $\sqrt[3]{27d^5}$ in exponential form?

$= (27d^5)^{1/3}$

$= 27^{1/3}d^{5/3} = \boxed{3d^{5/3}}$

Name: ______________________

- Using a Radical Expression
  - You can estimate the metabolic rate of living organisms based on body mass using Kleiber's law. The formula $R = 73.3\sqrt[4]{M^3}$ relates metabolic rate R measured in Calories per day to body mass M measured in kilograms. What is the metabolic rate of a dog with a body mass of 18kg?

$R = 73.3\sqrt[4]{M^3}$

$M = 18$

$R = 73.3(M)^{3/4}$

$= 73.3(18)^{3/4}$

$\boxed{R = 640.6 \text{ calories/day}}$

  - A company that manufactures memory chips for digital cameras uses the formula $c = 120\sqrt[3]{n^2} + 1300$ to determine the cost, c, in dollars, of producing n chips. How much will it cost to produce 250 chips?

$C = 120n^{2/3} + 1300$

$n = 250$

$C = 120(250)^{2/3} + 1300$

$\boxed{C = \$6062.20}$

  - Carbon-14 is present in all living organisms and decays at a predictable rate. To estimate the age of an organism, archaeologists measure the amount of carbon-14 remaining after 5000 years can be found using the formula $A = A_0(2.7)^{-\frac{3}{5}}$, where A_0 is the initial amount of carbon-14 in the sample that is tested. How much carbon-14 is left in a 5000-year-old sample that originally contained $7.0 * 10^{-12}$ grams of carbon-14?

$A = A_0(2.7)^{-3/5}$

$A_0 = 7.0 \times 10^{-12}$

$A = (7.0 \times 10^{-12})(2.7)^{-3/5}$

$\boxed{A = 3.9 \times 10^{-12} g}$

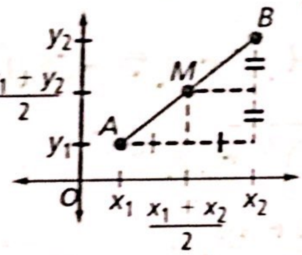
Name: ____________________

5.6 Pythagorean Theorem, Midpoint & Distance (M1 7.6)
Obj.: I will be able to find the midpoint, endpoint, or distance of a line segment.

- Finding the Midpoint
  - On a number line, the coordinate of the midpoint is the average (or mean) of the coordinates of the endpoints.

A = a
B = b
M = $\frac{a+b}{2}$

  - In the coordinate plane, the coordinates of the midpoint are the average of the x-coordinates and the average of the y-coordinates of the endpoints.



A = (x_1, y_1)
B = (x_2, y_2)
M = $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

    - Ex: $\overline{AB}$ has endpoints at -4 and 9. What is the coordinate of its midpoint?

$\frac{-4+9}{2} = \boxed{\frac{5}{2}}$

    - Ex: $\overline{EF}$ has endpoints $E(7,5)$ and $F(2,-4)$. What are the coordinates of its midpoint M?

$\left(\frac{7+2}{2}, \frac{5+(-4)}{2}\right) = \boxed{\left(\frac{9}{2}, \frac{1}{2}\right)}$

or

(7,5)
(2,-4)
$\left(\frac{9}{2}, \frac{1}{2}\right) = \boxed{\left(\frac{9}{2}, \frac{1}{2}\right)}$

- Finding the Endpoint
  - When you know the midpoint and the endpoint of a segment, you can use the Midpoint Formula to find the other endpoint.
    - Ex: The midpoint of $\overline{CD}$ is $M(-2,1)$. One endpoint is $C(-5,7)$. What are the coordinates of the other endpoint D?

$-2 = \frac{-5+x}{2}$ $\quad 1 = \frac{7+y}{2}$

$-4 = -5+x$ $\quad 2 = 7+y$

$1 = x$ $\quad -5 = y$ $\quad \boxed{(1,-5)}$

or

(-2, 1)
• 2 • 2
(-4, 2)
− (-5, 7)
$\boxed{(1,-5)}$

    - Ex: The midpoint of $\overline{AB}$ has coordinates $(4,-9)$. Endpoint A has coordinates $(-3,-5)$. What are the coordinates of B?

$4 = \frac{-3+x}{2}$ $\quad -9 = \frac{-5+y}{2}$

$8 = -3+x$ $\quad -18 = -5+y$

$11 = x$ $\quad -13 = y$

$\boxed{(11,-13)}$

or

(4, -9) • 2
= (8, -18)
+ (+3, +5)
$\boxed{(11,-13)}$

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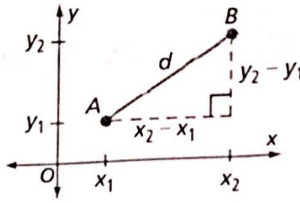
Name: ______________________

- Finding Distance
  - Recall that the Pythagorean Theorem states that for any right triangle with hypotenuse c and legs a and b, $a^2 + b^2 = c^2$.
  - The distance between two points $A(x_1, y_1)$ and $B(x_2, y_2)$ is

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$



- Ex: What is the distance between $U(-7,5)$ and $V(4,-3)$? Round to the nearest tenth.

$d = \sqrt{(-7-4)^2 + (5-(-3))^2}$

$= \sqrt{(-11)^2 + (8)^2}$

$= \sqrt{121+64}$

$= \boxed{\sqrt{185}} = \boxed{13.6}$

or

$(-7, 5)$
$-(4, -3)$
$(-11, 8)^2$
$(121+64)$
$\boxed{=\sqrt{185}} = \boxed{13.6}$

- Ex: $\overline{SR}$ has endpoints $S(-2,14)$ and $R(3,-1)$. What is SR to the nearest tenth?

$d = \sqrt{(-2-3)^2 + (14-(-1))^2}$

$= \sqrt{(-5)^2 + (15)^2}$

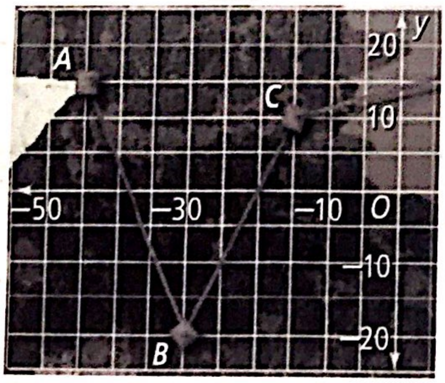
$= \sqrt{25+225}$

$= \sqrt{250} = \boxed{15.8}$

or

$(-2, 14)$
$-(3, -1)$
$(-5, 15)^2$
$25 + 225$
$= \sqrt{250}$
$= \boxed{15.8}$

- Applying Distance
  - On a zip-line course, you are harnessed to a cable that travels through the treetops. You start at Platform A and zip to each of the other platforms. How far did you travel from Platform B to Platform C? Each grid unit represents 5m.



B(−30, −20)

C(−15, 10)

$d = \sqrt{(-30-(-15))^2 + (-20-10)^2}$

$= \sqrt{(-15)^2 + (-30)^2}$

$= \sqrt{225+900}$

$= \sqrt{1125}$

$\underbrace{1125}_{5 \quad 225}$

$= \sqrt{225}\sqrt{5}$

$= \boxed{15\sqrt{5}}$

$= \boxed{33.5}$

$(-30, -20)$
$-(-15, 10)$
$(-15, -30)^2$
$225 + 900$
$= 1125$
$\sqrt{1125}$
$= \boxed{15\sqrt{5}}$
$= \boxed{33.5}$

Name: ______________________

5.7 Square Root Equations (M3 6.5)
Obj.: I will be able to use properties of radicals to solve simple radical equations.

- Solving a Square Root Equation
  - A radical equation is an equation that has a variable in the radicand or a variable with a rational exponent.
  - If the radical has index 2, the equation is a square root equation.
  - To solve a radical equation, isolate the radical on one side of the equation. Then raise each side to the power suggested by the index.
    - Ex: What is the solution of $3+\sqrt{2x-3}=8$?

$3+\sqrt{2x-3}=8$
$-3 \qquad -3$
$(\sqrt{2x-3}=5)^2$

$2x+(-3)=25$
$+3 \qquad +3$
$2x=28$
$\boxed{x=14}$

    - Ex: What is the solution of $3\sqrt{x}+3=15$?

$3\sqrt{x}+3=15$
$-3 \quad -3$
$\frac{3\sqrt{x}}{3}=\frac{12}{3}$
$(\sqrt{x}=4)^2$
$\boxed{x=16}$

    - Ex: What is the solution of $(\sqrt{4x+1}=5)^2$

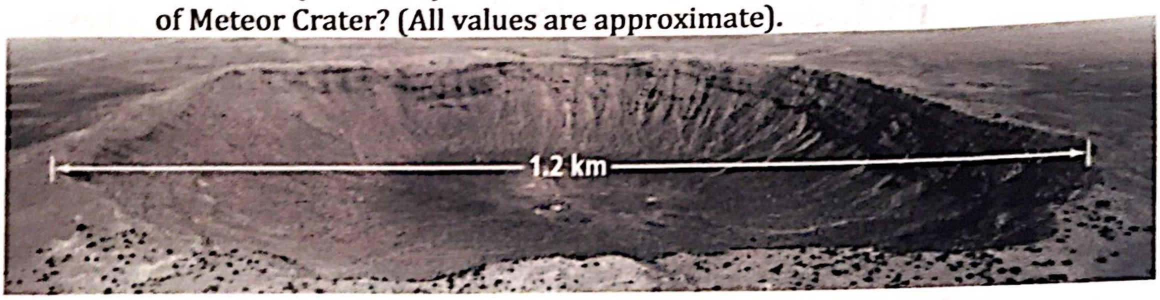
$4x+1=25$
$4x=24$
$\boxed{x=6}$

    - Ex: What is the solution of $\sqrt{2x+3}-7=0$

$+7 \quad +7$
$(\sqrt{2x+3}=7)^2$
$2x+3=49$
$2x=46$
$\boxed{x=23}$

Name: ______________________

- Using Radical Equations
  - For Meteor Crater in Arizona, the formula $d = 2\sqrt[3]{\frac{V}{0.3}}$ relates the diameter d of the rim (in meters) to the volume V (in cubic meters). What is the volume of Meteor Crater? (All values are approximate).



d=1.2 km
= 1200m

$$\frac{1200}{2} = \frac{2\sqrt[3]{\frac{V}{0.3}}}{2}$$

$$\left(600 = \sqrt[3]{\frac{V}{0.3}}\right)^3$$

$$2.16*10^8 = \frac{V}{0.3}$$

$$\boxed{6.48*10^7 = V}$$

  - The formula $\frac{\pi d^2 v}{4} = Q$ models the diameter of a pipe where Q is the maximum flow of water in a pipe, and v is the velocity of the water. What is the diameter of a pipe that allows a maximum flow of $30ft^3/min$ of water flowing at a velocity of 400 ft/min? Round your answers to the nearest inch.

$Q = 30 \frac{ft^3}{min}$

$V = 400\, ft/min$

$d = ?$

$$\frac{\pi d^2 (400)}{4} = 30$$

$$\frac{100\pi d^2}{100\pi} = \frac{30}{100\pi}$$

$$\sqrt{d^2} = \sqrt{\frac{30}{100\pi}}$$

$$d = \sqrt{\frac{30}{100\pi}}$$

$$d = 0.09549\,ft \times \frac{12\,in}{1\,ft}$$

$$\boxed{d = 1\text{ in}}$$