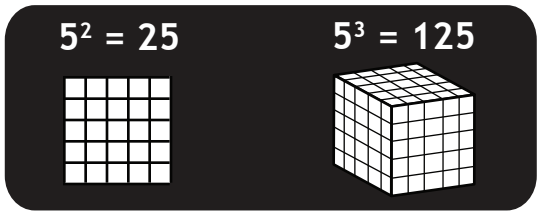


Numbers, Radicals, and Exponents

LESSON THREE - *Squares*, *Cubes*, *and Roots*

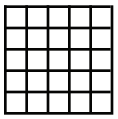
Lesson Notes

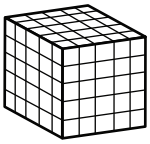
Introduction Perfect Squares, Perfect Cubes, and Roots.

a) What is a perfect square? Draw the first three perfect squares.

b) What is a perfect cube? Draw the first three perfect cubes.

Numbers, Radicals, and Exponents
LESSON THREE - *Squares, Cubes, and Roots*
Lesson Notes

$5^2 = 25$ 

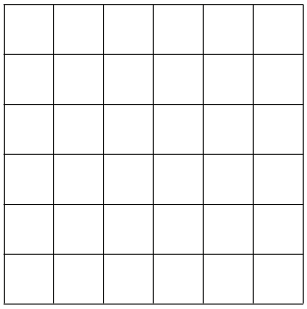
$5^3 = 125$ 

c) Complete the table showing all perfect squares and perfect cubes up to 10. The first three are completed for you.

Number	Perfect Square	Perfect Cube
1	$1^2 = 1$	$1^3 = 1$
2	$2^2 = 4$	$2^3 = 8$
3	$3^2 = 9$	$3^3 = 27$

d) What is a square root? Find the square root of 36.

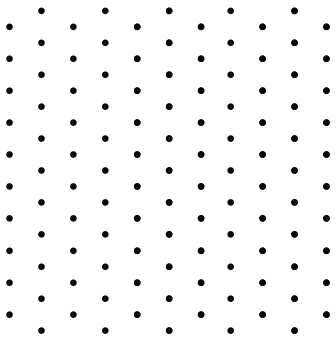
i) Using a geometric square.



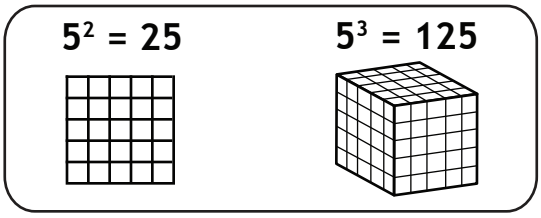
ii) Using the formula $A = s^2$

e) What is a cube root? Find the cube root of 125.

i) Using a geometric cube.



ii) Using the formula $V = s^3$



Numbers, Radicals, and Exponents

LESSON THREE - *Squares, Cubes, and Roots*

Lesson Notes

Example 1

Evaluate each power, without using a calculator.

a) 3^2

b) $(-3)^2$

c) -3^2

d) 3^3

e) $(-3)^3$

f) -3^3

Example 2

Evaluate each expression, without using a calculator.

a) $2(2)^3$

b) $-2(-4)^2$

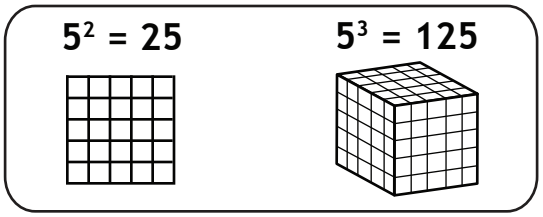
c) $1 - 5^2$

d) $\dfrac{1}{4^3}$

e) $\dfrac{1}{2^2 + 2^3}$

f) $\dfrac{5(-2)^3}{-2^2}$

Numbers, Radicals, and Exponents
LESSON THREE - *Squares, Cubes, and Roots*
Lesson Notes



Example 3 Evaluate each root using a calculator.

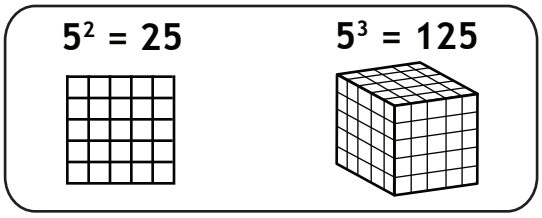
a) $\sqrt{8}$ b) $\sqrt{-8}$ c) $\sqrt[3]{8}$ d) $\sqrt[3]{-8}$

e) What happens when you evaluate $\sqrt[4]{-8}$ and $\sqrt[5]{-8}$?
Is there a pattern as to when you can evaluate the root of a negative number?

Example 4 Evaluate each expression, without using a calculator.

a) $2\sqrt{49}+\sqrt{36}$ b) $\dfrac{\sqrt{25}-\sqrt[3]{8}}{3^2}$

c) $\dfrac{1-\sqrt{36}}{5(-2)^2}$ d) $\dfrac{3\sqrt[3]{27}-(-4)^2}{-3^2-(-1)^2}$



Numbers, Radicals, and Exponents

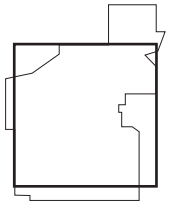
LESSON THREE - *Squares, Cubes, and Roots*

Lesson Notes

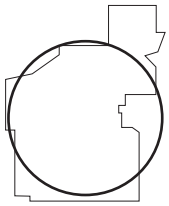
Example 5

The area of Edmonton is 684 km^2

a) If the shape of Edmonton is approximated to be a square, how wide is the city?



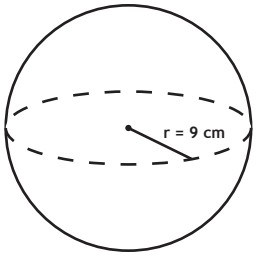
b) If the shape of Edmonton is approximated to be a circle, how wide is the city?



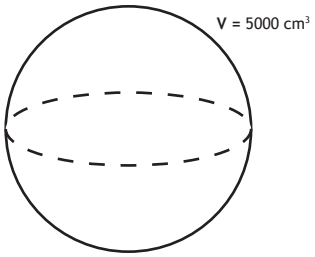
Example 6

The formula for the volume of a sphere is $V = \frac{4}{3}\pi r^3$

a) If a sphere has a radius of 9 cm, what is the volume?



b) If a sphere has a volume of approximately 5000 cm^3, what is the radius?



Numbers, Radicals, and Exponents
LESSON THREE - *Squares*, *Cubes*, *and Roots*
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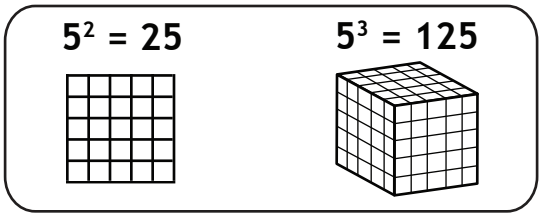
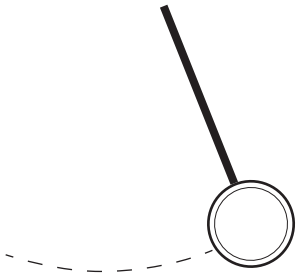


Example 7

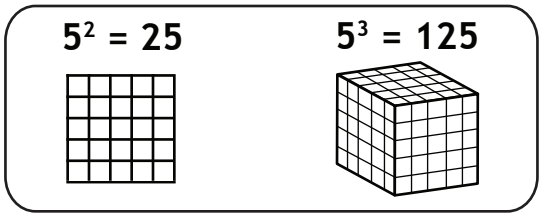
The amount of time, T, it takes for a pendulum to swing back and forth is called the period.

The period of a pendulum can be calculated with the formula: $T = 2\pi\sqrt{\frac{l}{9.8}}$



a) What is the period of the pendulum if the length, l, is 1.8 m?

b) What is the length of the pendulum if the period is 2.4 s?



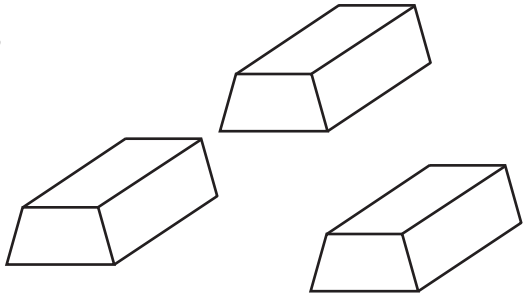
Numbers, Radicals, and Exponents

LESSON THREE - *Squares*, *Cubes*, *and Roots*

Lesson Notes

Example 8

The total volume of gold mined throughout history is approximately 8340 m^3.



a) If all the gold was collected, melted down, and recast as a cube, what would be the edge length?

b) If the density of gold is 19300 kg/m^3, what is the mass of the cube?

The density formula is $\text{density} = \frac{\text{mass}}{\text{volume}}$

c) In 2011, 1 kg of gold costs about $54 000. What is the value of all the gold ever extracted?