Math 10

Section 4.1

Square Roots and Cube Roots

Focus:

1. To be able to determine the square root of a perfect square.
2. To be able to determine the cube root of a perfect cube.
3. To be able to solve problems involving square roots or cube roots.

Curricular Competencies:

A2: I can explore, analyze and apply mathematical ideas

What patterns can you see?

Perfect Squares	Prime Factorization	Square Root		Perfect Cubes	Prime Factorization	Cube Root
1		$\sqrt{1} = 1$		1		$\sqrt[3]{1} = 1$
4	2 x 2	$\sqrt{4} = 2$		8	2 x 2 x 2	$\sqrt[3]{8} = 2$
9	3 x 3	$\sqrt{9} = 3$		27	3 x 3 x 3	$\sqrt[3]{27} = 3$
16	2 x 2 x 2 x 2	$\sqrt{16} = 4$		64	2 x 2 x 2 x 2 x 2 x 2	$\sqrt[3]{64} = 4$
25	5 x 5	$\sqrt{25} = 5$		125	5 x 5 x 5	$\sqrt[3]{125} = 5$
36	2 x 2 x 3 x 3	$\sqrt{36} = 6$		216	2 x 2 x 2 x 3 x 3 x 3	$\sqrt[3]{216} = 6$
.				.		
100	2 x 2 x 5 x 5	$\sqrt{100} = 10$		1000	2 x 2 x 2 x 5 x 5 x 5	$\sqrt[3]{1000} = 10$
.				.		
144	2 x 2 x 2 x 2 x 3 x 3	$\sqrt{144} = 12$		1728	2 x 2 x 2 x 2 x 2 x 2 x 3 x 3 x 3	$\sqrt[3]{1728} = 12$

Thus $\sqrt{49}$ = 7 because 7x7

And $\sqrt[3]{729}$ = 9 because 9x9x9

9 x 9 x 9

3x3 x 3x3 x 3x3

2 groups of 3

A perfect square is the product of two equal factors

A perfect cube is the product of 3 equal factors

How can prime factorization be used to determine if a number is a perfect square?

check for groups of two

How can prime factorization be used to determine if a number is a perfect cube?

check for groups of three

Can numbers be perfect squares and perfect cubes? yes. 64 $\sqrt{64} = 8$ 8^2 $\sqrt[3]{64} = 4$ 4^3

Perfect Squares and Cubes

Which of the following numbers is a perfect square? A perfect cube? Neither? Justify using prime factorization and a calculator.

Number	Prime Factorization	Calculator	Perfect Square	Perfect Cube
512	$2 \cdot 256$ $2 \cdot 2 \cdot 128$ $2 \cdot 2 \cdot 2 \cdot 64$ $2 \cdot 2 \cdot 2 \cdot 2 \cdot 32$ $2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 16$ $2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$ $2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 4 \cdot 4$	$\sqrt{512} \approx 22.63$ $\sqrt[3]{512} = 8$	no.	yes
300	$2 \cdot 150$ $2 \cdot 3 \cdot 50$ $2 \cdot 2 \cdot 3 \cdot 25$ $2 \cdot 2 \cdot 3 \cdot 5 \cdot 5$	/	no	no
729	$9 \cdot 9 \cdot 9$ $3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3$	/	yes	yes

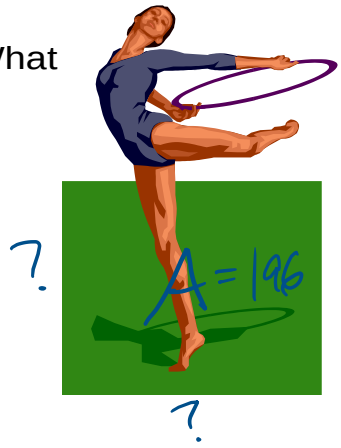
Examples

Determine the answers to the following. Use a calculator only when appropriate.

-4^2	-16	-4^3	-64	$(-3)^2$	9
$(-5)^3$	-125	$\left(\frac{3}{5}\right)^3$ $\frac{3^3}{5^3}$	$\frac{27}{125}$	$\frac{27}{\sqrt{81}}$	$\frac{27}{9} = 3$
$\sqrt{25x^2}$	$5x$	$\sqrt{1625}$	≈ 40.31	$\sqrt{\frac{36}{25}}$	$\frac{6}{5}$
$\sqrt[3]{\frac{27}{8}}$	$\frac{3}{2}$	$\sqrt[3]{27125}$	≈ 30.05	$\sqrt[3]{125x^3}$	$5x$
$\frac{6}{\sqrt[3]{8}}$	$\frac{6}{2} = 3$	$\sqrt[3]{27d^3}$	$3d$	$\sqrt[3]{27000}$	30

A floor mat for gymnastics is a square with an area of 196 m^2. What is its side length?

$\sqrt{196} = 14\ m$



The volume of a cube is 512 in^3. What is the surface area of the cube?

$\sqrt[3]{512} = 8\ in$

$SA = 6s^2$

$= 6(8)^2$

$= 2304\ in^2$

$= 384\ in^2$

The surface area of a sugar cube is 13.5 cm^2. What is the volume of the cube?

$SA = 6s^2$

$\frac{13.5}{6} = \frac{6s^2}{6}$

$\sqrt{2.25} = \sqrt{s^2}$

$s = 1.5\ cm$

$V = s^3$

$= 1.5^3$

$= 3.375\ cm^3$

$\approx 3.38\ cm^3$

assignment: p 158 1-4, 6, 8, 10, 14, 16, 18