# What's Going On?

**Checking In**

**Minds on** Variable **to** an Exponent

**Action!** Variable **as** an Exponent

**Consolidation** This is how we do it!

**Learning Goal - I will be able to solve equations involving exponents.**

## Minds on

# Variable to an Exponent

$\pi r^2 h$

The volume of cylindrical storage container with volume 5000 cm$^3$ has a radius equal to its height. The volume, $V$, is related to the radius according to the equation $V = \pi r^3$.

Determine the radius and height of the container to the nearest tenth of a metre.

$V = \pi r^3$

$\frac{5000}{\pi} = \frac{\pi r^3}{\pi}$

$\sqrt[3]{r^3} = \sqrt[3]{1591.55}$

$r = 11.7$ cm

$h = 11.7$ cm

**Action!**

# Variable as an Exponent

Lena has inherited $1000. She decides to invest the money in an account that pays 7.5% interest per year, compounded annually. The amount of the account, *A*, can be determined using the equation $A = 1000(1.075)^n$, where *n* is the number of years the money is invested. Approximately how many years will it take Lena's money to double?

$A = 1000(1.075)^n$

$\frac{2000}{1000} = \frac{1000(1.075)^n}{1000}$

$2 = 1.075^n$

| n | $1.075^n$ |
|---|---|
| 5 | 1.44 |
| 10 | 2.06 |
| 9 | 1.92 |
| 9.5 | 1.99 |
| 9.6 | 2.00 |

It takes just over 9 and a half years to double!!

## Action!

# Guessin' and Checkin'

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## Action!

# Graphin' and Lookin'

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Graphed $A = 1000(1.075)^n$ as $y = 1000(1.075)^x$

and we graphed $A = 2000$ as $y = 2000$

Found POI

**Action!**

# Variable as an Exponent

The populations of two towns, Trenton and Belleville, are each described by an equation ~~described by an equation~~ relating population, *p*, in thousands, to time, *d*, in decades following the year 1950.

**Trenton: $p = 5 \times 2^d$**

**Belleville: $p = 3^d$**

a. Describe how the population in each town is changing.

Trenton: Doubling (base is 2)
Belleville: Tripling (base is 3)

b. What was the population of each town in 1950?

Trenton: 5000
Belleville: 1000
(use $x=0$)

c. When will the towns have the same population? What is the population?

## Action!

# Guessin' and Checkin'?

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**Trenton:** $p = 5 \times 2^d$

**Belleville:** $p = 3^d$

a. Describe how the population in each town is changing.

b. What was the population of each town in 1950?

c. When will the towns have the sae population? What is the population?

$5 \times 2^d = 3^d$

We can't find a common base!

## Action!

# Graphin' and Lookin'!

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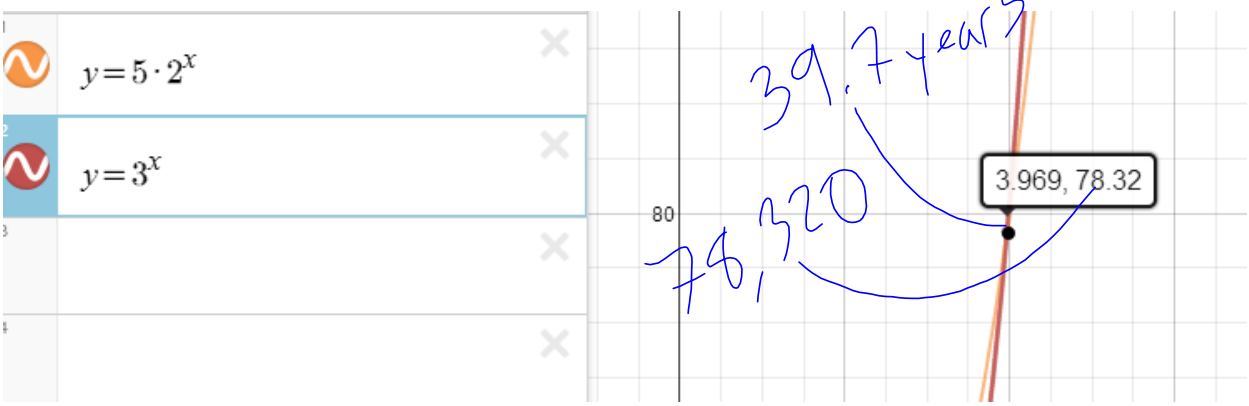

## Consolidation

This is how we do it!

To solve an equation where the variable is raised to an exponent, n, ...

$a.\ k^4 = 20$

$b.\ 750 = 6x^5$

$c.\ 200 = \frac{1}{3}\pi r^3$

## Consolidation

This is how we do it!

To solve an equation where the variable is an exponent, ...

$a.\ 2^x = 12$

$b.\ 3^n = 50$

$c.\ 5000 = 500(1.05)^t$

## Consolidation

This is how we do it!

To solve an equation with more than one exponential expression, ...

*a.* $4^{2(4x-2)} = 16^{2(3x+4)}$

*b.* $81^{3(x+1)} = 9^{2(x-1)}$

*c.* $2^{x} = 5^{x-4}$