Powers of 2

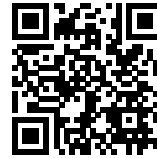## How fast can rumors spread by word of mouth?

If you tell 2 friends, and they tell 2 friends, and so on, how fast can a rumor spread just by word of mouth?

1. Watch the following two commercials and compare the two videos in terms of powers of 2.

   https://youtu.be/DKUZx1Nk4yY Faberge shampoo commercial

   https://youtu.be/JA7CKvoKEmE Wayne's World parody

2. Let's first calculate some powers of 2 to warm up.

$$2^1 \ = \ \underline{\hspace{2cm}}$$

$$2^2 \ = \ 2 \cdot 2 \ = \ \underline{\hspace{2cm}}$$

$$2^3 \ = \ 2 \cdot 2 \cdot 2 \ = \ \underline{\hspace{2cm}}$$

$$2^4 \ = \ \underline{\hspace{3cm}} \ = \ \underline{\hspace{2cm}}$$

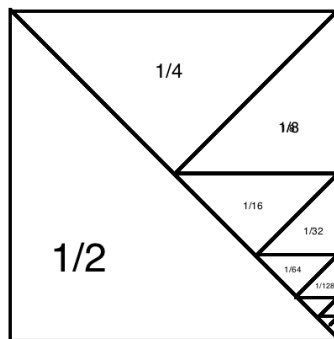$$2^5 \ = \ \underline{\hspace{3cm}} \ = \ \underline{\hspace{2cm}}$$

3. City College has about 16000 students*. How many iterations of "telling" need to occur before the entire student body hears the rumor?

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4. If each cycle took one hour, then in _____ hours, the whole school would know. What if each cycle took 15 minutes? Is this surprising?

5. Discuss with a neighbor how social media would affect the spread of rumors. Any personal experiences you can share?

Powers of ½

We have just seen how quickly powers of 2 can grow. Now we will do a hands-on activity that goes in the opposite direction — powers of $1/2$. Your instructor will give your group a square piece of paper with scissors and tape. Try to construct the following image using the materials given. Label each piece with the correct power of 2. For instance, $1/2$ is $(1/2)^1$ and $1/4$ is $(1/2)^2$

6. How many powers of $1/2$ were you able to physically create?

7. Where would you encounter powers of $1/2$ in real life?

Powers of 10

We will now watch two powers of 10 videos: http://www.eamesoffice.com/education/powers-of-ten-2/[†]

†

Name: _____

Homework Exercises

1. Find the following powers of 10 or missing exponent.

10^1	10
10^2	$10 \cdot 10 = 100$
10^3	$10 \cdot 10 \cdot 10 = 1000$
10^4	
10^5	
10^6	
$10^{\boxed{}}$	$1,000,000,000$
$10^{\boxed{}}$	$10,000,000,000,000$

2. Do you notice any pattern or relationship between the exponent and the number of zeroes?

3. How many seconds are in one minute?

4. If you could say two numbers in one second, how many numbers could you say in one minute? (Show the setup of your calculation.)

5. How many minutes are in one hour?

6. If you could say two numbers in one second, how many numbers could you say in one hour? (Show the setup of your calculation.)

7. How many hours would you need to count to one billion? (Show the setup of your calculation.)

8. Why would it take 4 to 5 days to count to one billion? (Show the setup of your calculation.)

9. How long would it take to count to one billion if you said 2 numbers every second? Can you realistically say 2 large numbers in one second?