

Name: \_\_\_\_\_  
Date: \_\_\_\_\_

$3^4$  means  $3 \times 3 \times 3 \times 3$

We read it: 3 to the power 4, or  
3 to the 4th power.

We say 3 is the base, and 4 is the  
exponent.

$5^2 = \underline{\quad \times \quad}$ . 5 is the \_\_\_\_\_.

$2^5 = \underline{\quad \times \quad}$ . 5 is the \_\_\_\_\_.

$5^2 = 2^5$  (True or False?)

### Powers of 2

$$2^0 = \underline{\quad}$$

$$2^1 = \underline{\quad}$$

$$2^2 = \underline{\quad}$$

$$2^3 = \underline{\quad}$$

$$2^4 = \underline{\quad}$$

$$2^5 = \underline{\quad}$$

$$2^6 = \underline{\quad}$$

$$2^7 = \underline{\quad}$$

$$2^8 = \underline{\quad}$$

$$2^9 = \underline{\quad}$$

$$2^{10} = \underline{\quad}$$

$$2^{11} = \underline{\quad}$$

$$2^{12} = \underline{\quad}$$

$$2^{13} = \underline{\quad}$$

$$2^{14} = \underline{\quad}$$

$$2^{15} = \underline{\quad}$$

$$2^{16} = \underline{\quad}$$

$$2^{17} = \underline{\quad}$$

$$2^{18} = \underline{\quad}$$

$$2^{19} = \underline{\quad}$$

$$2^{20} = 1,048,576$$

$$2^3 \times 2^8 = 2^{\square}$$

$$2^7 \times 2 = 2^{\square}$$

$$2 \times 2^{19} = \underline{\quad}$$

Use the powers of 2 to build numbers by addition.

For example:  $35 = 34 + 1$  is incorrect because 34 is not a power of 2, but  $35 = 32 + 2 + 1$  is correct.

You are not allowed to use any power of 2 more than once.

For example:  $12 = 8 + 2 + 2$  is incorrect because 2 was used twice, but  $12 = 8 + 4$  is correct.

Which numbers can be built this way?  
Which numbers can't? Experiment and find out.

Herbie would like some advice about how to build a number this way. Can you write a paragraph to explain it to him?

Adding them:

$$2^0 + 2^1 = \underline{\hspace{2cm}}$$

$$2^0 + 2^1 + 2^2 = \underline{\hspace{2cm}}$$

$$2^0 + 2^1 + 2^2 + 2^3 = \underline{\hspace{2cm}}$$

$$2^0 + \dots + 2^4 = \underline{\hspace{2cm}}$$

$$2^0 + \dots + 2^5 = \underline{\hspace{2cm}}$$

$$2^0 + \dots + 2^6 = \underline{\hspace{2cm}}$$

$$2^0 + \dots + 2^7 = \underline{\hspace{2cm}}$$

$$2^0 + \dots + 2^8 = \underline{\hspace{2cm}}$$

$$2^0 + \dots + 2^{19} = \underline{\hspace{2cm}}$$

$$2^0 + \dots + 2^{20} = \underline{\hspace{2cm}}$$

$$2^0 + \dots + 2^n = \underline{\hspace{2cm}}$$

Do you notice a pattern? Explain it:

Multiplying them:

$$2^2 \times 2^3 = \boxed{\hspace{1cm}} = 2^{\square}$$

$$2^0 \times 2^5 = \underline{\hspace{1cm}} = 2^{\square}$$

$$2^1 \times 2^4 = \underline{\hspace{1cm}} = 2^{\square}$$

$$2^3 \times 2^3 = \underline{\hspace{1cm}} = 2^{\square}$$

$$2^3 \times 2^1 = \underline{\hspace{1cm}} = 2^{\square}$$

$$2^3 \times 2^4 = \underline{\hspace{1cm}} = 2^{\square}$$

$$2^5 \times 2^5 = \underline{\hspace{1cm}} = 2^{\square}$$

$$1,024 \times 1024 = \underline{\hspace{2cm}}$$

$$2^m \times 2^n = \underline{2^{\square}}$$

Do you notice a pattern? Explain it: