

### 3.1 WS Key

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2:10 PM

### 3.1 Using Exponents to Describe Numbers

#### Warm Up:

- Rewrite  $2^4 \times 2^3$  as repeated multiplication.  $2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$
- Rewrite  $(-5)(-5)(-5)(-5)$  as a power.  $(-5)^4$
- You start with one pencil and every day the number of pencils you have doubles. How many pencils do you have after three days? Day 1 = 1 Day 2 = 2 Day 3 = 4
- Rewrite  $(-4)^3$  as a repeated multiplication. Then, evaluate.  $(-4)(-4)(-4) = -64$

#### Assignment:

- Write each expression as a power. Then, evaluate if possible.

|                                                     | Power | Evaluate |
|-----------------------------------------------------|-------|----------|
| a) $6 \times 6$                                     | $6^2$ | 36       |
| b) $4 \times 4 \times 4$                            | $4^3$ | 64       |
| c) $9 \times 9 \times 9 \times 9 \times 9$          | $9^5$ | 59049    |
| d) $2 \times 2 \times 2 \times 2 \times 2 \times 2$ | $2^6$ | 64       |
| e) $b \times b \times b \times b$                   | $b^4$ |          |

- Write each expression as a power. Identify the base and the exponent in each power. Then, evaluate if possible.

|                                                              | Power   | Base | Exponent | Evaluate |
|--------------------------------------------------------------|---------|------|----------|----------|
| a) $5 \times 5 \times 5$                                     | $5^3$   | 5    | 3        | 125      |
| b) $1 \times 1 \times 1 \times 1 \times 1 \times 1 \times 1$ | $1^7$   | 1    | 7        | 1        |
| c) $7 \times 7 \times 7 \times 7 \times 7 \times 7$          | $7^6$   | 7    | 6        | 117 649  |
| d) 305                                                       | $305^1$ | 305  | 1        | 305      |
| e) $x \cdot x$                                               | $x^2$   | x    | 2        |          |

- Write each power as repeated multiplication. Then, evaluate.

|           | Repeated Multiplication                                | Evaluate  |
|-----------|--------------------------------------------------------|-----------|
| a) $6^3$  | $6 \times 6 \times 6$                                  | 216       |
| b) $2^5$  | $2 \times 2 \times 2 \times 2 \times 2$                | 32        |
| c) $3^4$  | $3 \times 3 \times 3 \times 3$                         | 81        |
| d) $10^6$ | $10 \times 10 \times 10 \times 10 \times 10 \times 10$ | 1 000 000 |
| e) $4^2$  | $4 \times 4$                                           | 16        |

4. Write each power as repeated multiplication. Then, evaluate.

|              | Repeated Multiplication                  | Evaluate |
|--------------|------------------------------------------|----------|
| a) $(-2)^4$  | $(-2)(-2)(-2)(-2)$                       | $16$     |
| b) $-2^4$    | $-1 \times 2 \times 2 \times 2 \times 2$ | $-16$    |
| c) $(-4)^3$  | $(-4)(-4)(-4)$                           | $-64$    |
| d) $-4^3$    | $-1 \times 4 \times 4 \times 4$          | $-64$    |
| e) $-(-6)^3$ | $-1 \times (-6)(-6)(-6)$                 | $-216$   |
| f) $-(-6)^4$ | $-1 \times (-6)(-6)(-6)(-6)$             | $-1296$  |
| g) $-a^3$    | $-1 \times a \times a \times a$          | $-a^3$   |
| h) $(-b)^4$  | $(-b)(-b)(-b)(-b)$                       | $b^4$    |

5. Complete the table.

| Repeated Multiplication                                              | Exponential Form | Value   |
|----------------------------------------------------------------------|------------------|---------|
| a) $(-3) \times (-3) \times (-3) \times (-3)$                        | $(-3)^4$         | $81$    |
| b) $(-2) \times (-2) \times (-2) \times (-2) \times (-2)$            | $(-2)^5$         | $-32$   |
| c) $(-6) \times (-6) \times (-6) \times (-6) \times (-6)$            | $(-6)^5$         | $-7776$ |
| d) $-1 \times 5 \times 5 \times 5$<br>$(-5) \times (-5) \times (-5)$ | $(-5)^3$ $-5^3$  | $-125$  |
| e) $(-y) \times (-y) \times (-y)$                                    | $(-y)^3$         | $-y^3$  |

6. Bacteria reproduce by splitting in two. If a single bacteria divides every 20 min, how many bacteria will a single bacteria produce after 8 h?

- a) Write the answer in exponential form.  $2^{24}$  In 20 mins the bacteria doubles
- b) Calculate the answer.  $16\ 777\ 216$
- c) What assumption did you make to answer the question?

In 20 minutes the bacteria doubles once 2

40 minutes

60 minutes

8 hours

doubles twice  $2 \times 2 = 4 = 2^2$

doubles 3 times  $2 \times 2 \times 2 = 8 = 2^3$

doubles  $8 \times 3 = 24$  times  $\therefore 2^{24}$

That none of the bacteria die  
and the pattern continues  
for 8 hours