Powers Module
Lesson 2: Laws of Exponents

Mathematics 9B – Worksheet

1. Multiply each of the following. Express your answer as a single power.

    a. $2^3 \cdot 2^4$

    b. $(-3)^2 \cdot (-3)^6$

    c. $12^4 \cdot 12^7 \cdot 12^5$

    d. $x^3 \cdot x^2 \cdot x^1$

    e. $-7^5 \cdot 7^6 \cdot 7^7$

    f. $b^{40} \cdot b^{70}$

    g. $(-5)^6 \cdot (-5)^8$

    h. $6^2 \cdot 6^3 \cdot 6^4 \cdot 6^5$

2. Divide each of the following. Express your answer as a single power.

    a. $12^9 \div 12^6$

    b. $(-7)^5 \div (-7)^3$

    c. $a^{15} \div a^{11}$

    d. $21^{10} \div 21^6$

    e. $4^5 \div 4^4$

    f. $-8^{17} \div 8^{12}$

    g. $(2^{16} \div 2^{10}) \div (2^5 \div 2^2)$

    h. $x^{14} \div x^8$

3. Simplify each of the following and then evaluate.

a. $2^{13} \div 2^{10}$

b. $(-4)^2 \bullet (-4)^3 \div (-4)^4$

c. $\dfrac{8^5 \bullet 8^7}{8^4 \bullet 8^6}$

d. $\dfrac{(-3)^{35} \bullet (-3)^8}{(-3)^{41}}$

e. $\dfrac{6^3 \bullet 3^7 \bullet 6^0 \bullet 3^2 \bullet 6^4 \bullet 3^1}{6^4 \bullet 3^4 \bullet 6^3 \bullet 3^3 \bullet 3^2}$

4. Evaluate each of the following. Use the power rules when possible.

a. $2^4 \div 2^3$

b. $2^4 - 2^3$

c. $\dfrac{8^2 + 6^2}{10}$

d. $\dfrac{5^4 \bullet 5^2}{5^3 \bullet 5^2}$

e. $(-4)^{12} \div (-4)^{11} \bullet (-4)^2$

f. 2^0

g. -12^0

h. $(-12)^0$

i. $25^0 \bullet 25^{18} \div 25^7 \div 25^{10}$

5. Which of the following is equal to 5?

$(2 \bullet 3)^2$ $3 + 2^2$ $2^3 - 1$ $3^2 - 2^2$ $(3 + 2)^2$

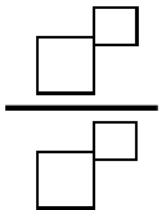
6. Simplify each of the following and then evaluate.

   a. $4^{15} \div 4^{9} \bullet 4^{7} \div 4^{11} \div 4^{0}$

   b. $(-2)^{0} \bullet (-2)^{8} \div (-2)^{6}$

   c. $\dfrac{6^{9} \bullet 6^{0}}{6^{5} \bullet 6^{3}}$

7. Fill in the boxes using only the digits 1, 2, 3, 4, 5, 6, 7, 8, 9 at most once to make the largest value possible.



8. Here are two ways to write 24 as a product of two powers, with at least one of the exponents greater than 1:

$$24 = 3^{1} \bullet 2^{3}$$

$$24 = 2^{2} \bullet 6^{1}$$

   a. Find two powers that have a product of 48, with at least one exponent greater than 1. How many different pairs of powers can you find?

   b. Find two powers that have a product of 96, with at least one exponent greater than 1. How many different pairs of powers can you find?

Answers

1. a. 2^7 b. $(-3)^8$ c. 12^{16} d. x^6 e. -7^{18}
   f. b^{110} g. $(-5)^{14}$ h. 6^{14}
2. a. 12^3 b. $(-7)^2$ c. a^4 d. 21^4 e. 4
   f. -8^5 g. 2^3 h. x^6
3. a. 8 b. –4
   c. 64 d. 9
   e. 3
4. a. 2 b. 8
   c. 10 d. 5
   e. –64 f. 1
   g. –1 h. 1
   i. 25
5. a. 36 b. 7 c. 7 d. 5 e. 25
6. a. 16 b. 4 c. 6
7. See the answer key for some possible solutions.
8. a. $2^4 \cdot 3^1 = 48$, $2^3 \cdot 6^1 = 48$, $2^2 \cdot 12^1 = 48$, $4^2 \cdot 3^1 = 48$
   b. $2^5 \cdot 3^1 = 96$, $2^4 \cdot 6^1 = 96$, $2^3 \cdot 12^1 = 96$, $2^2 \cdot 24^1 = 96$, $4^2 \cdot 6^1 = 96$