

16. Michelle will load and unload the dishwasher every day of the week. In return her parents will pay her 2 cents for the first week, and twice as much as the previous week thereafter. Use the expression 2^w to determine her weekly rate of pay, where w represents the number of weeks. How much will she earn, in dollars, in week 7, week 25? [Value 2]

$$2^w \leftarrow \# \text{ of week}$$

$$2^7 = 128 \text{¢} = \$1.28$$

$$2^{25} = 335544.32$$

Section 2.4

Exponent Laws I

Write each expression as a product [Repeated multiplication] and then evaluate:

	Product[repeated multiplication]	Evaluate	Single Power
1) $3^2 \times 3^2$	$3 \times 3 \times 3 \times 3$	81	3^4
2) $2^2 \times 2^5$	$2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$	128	2^7
3) $(-5)^2 \times (-5)^4$	$-5 \times -5 \times -5 \times -5 \times -5 \times -5$	15625	$(-5)^6$

Do you notice anything???



Exponent Law for a Product of Powers

To multiply powers with the same base, add the exponents.

$$a^m \times a^n = a^{m+n}$$



* * * must be the same base * * *

$$4^2 \times 4^3 = 4^{2+3}$$

$$4 \times 4 \times 4 \times 4 \times 4 \rightarrow 4^5 \leftarrow \text{single power}$$

IT'S THE LAW

1. Write as a single power.
2. Evaluate

1) $7^2 \times 7^4$

7^{2+4}
 7^6 ← single power
 Evaluate
 117 649

2) $(-2)^5 \times (-2)^3$

$(-2)^{5+3}$
 $(-2)^8$
 →
 256

3) $4^5 \times 4^1$

4^{5+1}
 4^6
 . 4096

Write as a repeated multiplication

	Repeated Multiplication	Evaluate	Single Power
1) $\frac{2^6}{2^2}$	$\frac{\cancel{2} \times \cancel{2} \times 2 \times 2 \times 2 \times 2}{\cancel{2} \times \cancel{2}}$	16	2^4

2) $\frac{7^6}{7^4}$	$\frac{\cancel{7} \times \cancel{7} \times \cancel{7} \times \cancel{7} \times 7 \times 7}{\cancel{7} \times \cancel{7} \times \cancel{7} \times \cancel{7}}$	= 49	7^2
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c) $\frac{(-5)^7}{(-5)^3}$	$= \frac{\cancel{(-5)} \times \cancel{(-5)} \times \cancel{(-5)} \times \cancel{(-5)} \times \cancel{(-5)} \times \cancel{(-5)} \times (-5)}{\cancel{(-5)} \times \cancel{(-5)} \times \cancel{(-5)}}$	625	$(-5)^4$
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d) $\frac{2^4}{2^4}$	$= \frac{\cancel{2} \times \cancel{2} \times \cancel{2} \times \cancel{2}}{\cancel{2} \times \cancel{2} \times \cancel{2} \times \cancel{2}}$	1	2^0
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$\frac{(-4)^2}{(-4)^2}$	$\frac{(-4) \times (-4)}{(-4) \times (-4)}$	= 1	$(-4)^0$
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Exponent Law for a Quotient of Powers

[dividing]

To divide powers with the same base, subtract the exponents.

$$a^m \div a^n = a^{m-n}$$

*** The base must be the same! ***

$$\begin{array}{l} 5^4 \div 5^3 = 5^{4-3} = 5^1 \\ \frac{5^6}{5^3} \div 5^{6-3} = 5^3 \end{array} \left. \vphantom{\begin{array}{l} 5^4 \div 5^3 \\ \frac{5^6}{5^3} \div 5^{6-3} \end{array}} \right\} \text{single power}$$

Express as a **single power** then **evaluate**

$$a) \frac{5^8}{5^2} = 5^{8-2} = 5^6$$

Single power = 5^6
 Evaluate = 15625

$$b) \frac{(-2)^3}{(-2)^0} = (-2)^{3-0} = (-2)^3 = -8$$

$$c) 8^7 \div 8^4 = 8^{7-4} = 8^3$$

8^3 ← single power
 Evaluate = 512

Express as a single power.

$$a) 3^2 \times 3^4 \div 3^3 = 3^{2+4-3} = 3^3 \leftarrow \begin{array}{l} \text{single} \\ \text{power} \end{array}$$

$$b) (-4)^8 \div (-4)^3 \times (-4)^2 = (-4)^{8-3+2} = (-4)^7$$

Express as a single power:

1. $3^4 \times 3^6 \div 3^2$

$$3^{4+6-2}$$
$$3^8$$

2. $\frac{3^8 \times 3^9 \times 3^1}{3^4 \times 3^2}$

$$\frac{3^{8+9+1}}{3^{4+2}}$$

$$\frac{3^{18}}{3^6} = 3^{12}$$

PAGE 76-77

[Page 476
Answers]

Questions 4, 5, 7, 8

#4.
a) $5^5 \times 5^4$
 5^{5+4}
 5^9

#5.a) $4^5 \div 4^3$
 4^{5-3}
 4^2

#7, #8. a) $3^4 \times 3^9 \div 3^{11}$
 3^{4+9-11}