

**Math 2 Unit 8 Worksheet 1**  
**Properties of Exponents**

**Name:** \_\_\_\_\_  
**Date:** \_\_\_\_\_ **Per:** \_\_\_\_\_

[1-3] Expand and evaluate.

1.  $4^3$

2.  $2^5$

3.  $3^4$

[4-6] Rewrite each expression using only one base. You do not need to work out the final answer.

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

5.  $11^4 \cdot 11 \cdot 11^2$

6.  $5^7 \cdot 5^{-4} \cdot 5^2$

[7-21] Simplify each expression.

7.  $(7a^2)(3a^4)$

8.  $(-4xy^2)(15x^4y^5)$

9.  $4k(7j^2k^3)$

10.  $b^2c \cdot a^2b^5c^3 \cdot a^4c^7$

11.  $12m^5(m^{-3}n^5)$

12.  $(6p^2q)(-4p^2q^4)$

13.  $(a^2)^4$

14.  $(k^{-1})^{-3}$

15.  $(2x)^4$

16.  $(5z^5)^0$

17.  $(5^2h^3)^2$

18.  $(3x^2y)^5$

19.  $(7g^4h^0)^3$

20.  $4jk^2(2j^4)^3$

21.  $(-6a^2b)^2(-3b)$

[22-30] Simplify each expression. Write the final answer using only positive exponents.

22.  $\frac{w^8}{w^3}$

23.  $\frac{x^8y^6}{x^2y^4}$

24.  $\frac{a^3b^7}{a^9b^4}$

25.  $\left(\frac{m}{n}\right)^3$

26.  $\frac{y^3}{y^{10}}$

27.  $\left(\frac{xy^7}{x^5y^3}\right)^3$

28.  $7x^{-1}$

29.  $(2x)^{-1}$

30.  $-3x^{-2}$

[31-32] True or False.

31. Is  $(y^m)^n = (y^n)^m$  a true statement? Pick values for  $y$ ,  $m$  and  $n$  to show your answer is correct.

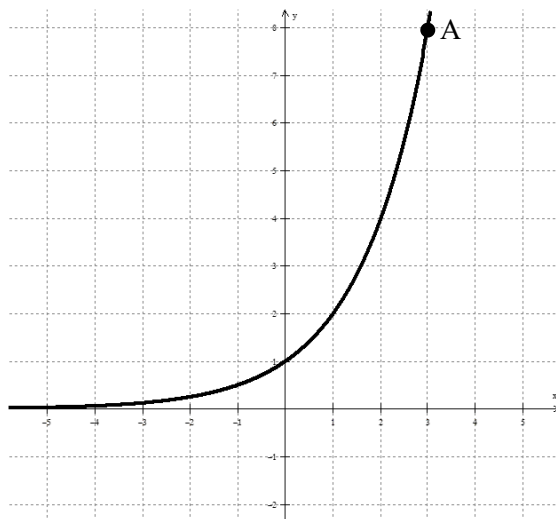
32. Is  $x^4x^3 = (x^4)^3$  a true statement? Pick values for  $x$  to show your answer is correct.

**Math 2 Unit 8 Worksheet 2**  
**Rational Exponents**

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

1.  $y = 2^x$  is graphed to the right. Complete the table and label points B, C, D, E, F from the table onto the graph.

	$x$	$y = 2^x$
Point A	3	8
Point B	2	
Point C	1	
Point D	$\frac{1}{2}$	
Point E	0	
Point F	-1	



[2-4] Write the expression in radical form.

2.  $k^{\frac{3}{2}}$

3.  $3^{\frac{2}{5}}$

4.  $x^{\frac{1}{3}}$

[5-7] Write the expression in exponential form.

5.  $\sqrt{2x}$

6.  $\sqrt[3]{f^2}$

7.  $\sqrt[4]{5x^3}$

[8-19] Evaluate the expression.

8.  $16^{\frac{3}{4}}$

9.  $25^{\frac{3}{2}}$

10.  $256^{\frac{3}{4}}$

11.  $64^{\frac{1}{6}}$

12.  $64^{\frac{5}{6}}$

13.  $64^{\frac{5}{6}}$

14.  $16^{-\frac{3}{2}}$

15.  $27^{-\frac{2}{3}}$

16.  $(-8)^{\frac{1}{3}}$

17.  $(-27)^{\frac{2}{3}}$

18.  $(64)^{-\frac{1}{2}}$

19.  $(-125)^{\frac{4}{3}}$

[20-23] Simplify. Leave answer in simplified radical form when necessary. All variables represent positive numbers.

20.  $(25x^2)^{\frac{1}{2}}$

21.  $(8x^4)^{\frac{1}{2}}$

22.  $2^{\frac{3}{4}} \cdot 2^{\frac{5}{4}}$

23.  $3^{\frac{1}{5}} \cdot 3^{\frac{3}{10}}$

[20-23] Simplify. Leave answer in simplified radical form when necessary.

24.  $5^{\frac{1}{6}} \cdot 5^{\frac{1}{4}}$

25.  $7^{\frac{1}{2}} \cdot \sqrt[2]{7^3}$

26.  $3^{\frac{2}{9}} \cdot \sqrt[3]{3^2}$

27.  $\sqrt[5]{x^{\frac{1}{4}}}$

**Math 2 Unit 8 Worksheet 3**  
**Simplify Exponential Expressions**

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

[1-6] Use exponents to fill in the blanks.

1.  $x^3 \cdot x^{\square} = x^7$

2.  $x^4 \cdot x^{\square} = x^{12}$

3.  $5^2 \cdot 5^{\square} = 5^{11}$

4.  $a^{\square} \cdot a^4 = 1$

5.  $x^{12} \cdot x^{\square} = x^5$

6.  $x^{\square} \cdot x^8 = x^2$

[7-10] Find the value of x.

7.  $\sqrt[4]{15^3} \cdot \sqrt[4]{15^6} = 15^{\frac{x}{4}}$

8.  $\sqrt[3]{25^2} \cdot 25^{\frac{4}{3}} = 25^x$

9.  $\frac{7^{\frac{4}{3}}}{\sqrt[9]{7^6}} = 7^{\frac{x}{3}}$

10.  $\frac{5^{\frac{4}{3}}}{\sqrt[6]{5^2}} = 5^x$

[11-16] Simplify each expression. Write the final answer using only positive exponents.

11.  $(2x)^{-3}$

12.  $2x^{-3}$

13.  $\frac{(3m)^4}{(6m)^2}$

14.  $\frac{6xy^{-1}}{-2x^{-2}y^{-1}}$

15.  $\frac{21m^{\frac{5}{4}}}{3m^{\frac{1}{4}}}$

16.  $\left(\frac{3x^4}{2y^5}\right)^{-3}$

17.  $\frac{3x^{-5}y^{-2}}{21x^{-8}y^{-9}}$

18.  $\frac{-8w^{-9}x^3}{w^{-2}x^2}$

19.  $\frac{-7a^3b^{-8}}{28a^{-7}b^{-12}}$

20.  $\frac{3n^2(5^0)}{4n^3}$

21.  $\left(\frac{2m^4}{m^2}\right)^{-4}$

22.  $\left(\frac{9t^{\frac{2}{3}}}{4t}\right)^3$

23.  $\frac{(3m^{\frac{1}{2}})^3}{(9m)^{\frac{1}{2}}}$

24.  $\frac{(6x^{\frac{1}{3}})^2 \cdot (2x^{\frac{5}{3}})}{(8x)^{\frac{1}{3}}}$

25.  $\frac{7^{\frac{5}{2}}}{\sqrt{7}}$

26.  $\frac{8^{\frac{7}{3}}}{\sqrt[6]{8^4}}$

27.  $\frac{\sqrt[8]{6^2}}{\sqrt[4]{6}}$

28.  $7^{\frac{5}{6}} \cdot \sqrt[3]{7^2}$

**Math 2 Unit 8 Worksheet 4**  
**Simplifying Radical Expressions**

**Name:** \_\_\_\_\_  
**Date:** \_\_\_\_\_ **Per:** \_\_\_\_\_

[1-21] Express in simplest radical form. All variables represent positive numbers.

1.  $\sqrt{20}$

2.  $\sqrt{63}$

3.  $\sqrt{50m^3n}$

4.  $\sqrt{72a^4b^6}$

5.  $\sqrt{225k^5}$

6.  $5\sqrt{160m^8}$

7.  $\sqrt[3]{40d^8}$

8.  $\sqrt[3]{500m^3}$

9.  $\sqrt[3]{216a^9b^7c^5}$

10.  $\sqrt{12} \cdot \sqrt{30}$

11.  $3\sqrt{5} \cdot 4\sqrt{8}$

12.  $7\sqrt{48} \cdot \sqrt{27}$

13.  $\sqrt{4x} \cdot \sqrt{8x^3}$

14.  $12\sqrt{21a^2b^5} \cdot \sqrt{56a^3b^3}$

15.  $\sqrt{3} + \sqrt{3}$

16.  $\sqrt{5} + 6\sqrt{5}$

17.  $2\sqrt{7} + \sqrt{63}$

18.  $\sqrt{12} + \sqrt{48}$

19.  $\sqrt{72} - \sqrt{50} + 7\sqrt{2}$

20.  $(-9 + 5\sqrt{3}) - (4 + 7\sqrt{3})$

21.  $(5 - 3\sqrt{7}) + (-7 + 8\sqrt{7})$

[22-30] Rationalize and simplify each expression.

22.  $\frac{1}{\sqrt{3}}$

23.  $\frac{2}{\sqrt{5}}$

24.  $\frac{\sqrt{14}}{\sqrt{7}}$

25.  $\frac{\sqrt{20}}{\sqrt{15}}$

26.  $\sqrt{\frac{3}{4}}$

27.  $\sqrt{\frac{25}{6}}$

28.  $\sqrt{\frac{2}{18}}$

29.  $\frac{\sqrt{14}}{2\sqrt{5}}$

30.  $\frac{\sqrt{15}}{9\sqrt{5}}$



**Math 2 Unit 8 Worksheet 5**  
**Rational and Irrational Numbers**

**Name:** \_\_\_\_\_  
**Date:** \_\_\_\_\_ **Per:** \_\_\_\_\_

[1-27] Simplify radical expressions, then circle **R** for rational answers and **Ir** for Irrational answers.

1.  $-\frac{1}{4} + \frac{2}{5}$  \_\_\_\_\_ R Ir      2.  $2\sqrt{5} + 6\sqrt{5}$  \_\_\_\_\_ R Ir

3.  $5\sqrt{13} - 7\sqrt{13}$  \_\_\_\_\_ R Ir      4.  $4\sqrt{11} + \sqrt{11}$  \_\_\_\_\_ R Ir

5.  $(3 + 6\sqrt{17}) + (4 + 2\sqrt{17})$  \_\_\_\_\_ R Ir      6.  $2\sqrt{6} + 7\sqrt{3}$  \_\_\_\_\_ R Ir

7.  $(3 + 7\sqrt{2}) - (-5 + 7\sqrt{2})$  \_\_\_\_\_ R Ir      8.  $2 + 8\sqrt{6} - 2 + \sqrt{6}$  \_\_\_\_\_ R Ir

9.  $-\frac{3}{5} \cdot \frac{4}{9}$  \_\_\_\_\_ R Ir      10.  $3\sqrt{7} \cdot 2\sqrt{7}$  \_\_\_\_\_ R Ir

11.  $5\sqrt{3} \cdot 2\sqrt{3}$  \_\_\_\_\_ R Ir      12.  $-2\sqrt{5} \cdot 7\sqrt{3}$  \_\_\_\_\_ R Ir

13.  $4\sqrt{12} \cdot 2\sqrt{3}$  \_\_\_\_\_ R Ir      14.  $4\sqrt{6} \cdot \sqrt{8}$  \_\_\_\_\_ R Ir

15.  $3\sqrt{7} \cdot 6\sqrt{14}$  \_\_\_\_\_ R Ir      16.  $7\sqrt{5} \cdot 2\sqrt{5}$  \_\_\_\_\_ R Ir

17.  $\frac{7\sqrt{75}}{\sqrt{3}}$  \_\_\_\_\_ R Ir      18.  $\frac{3\sqrt{10}}{7\sqrt{5}}$  \_\_\_\_\_ R Ir

[19-25] Based on the work you completed in problems 1-18, make the following conjectures.

19. What can you say about the sum of any two rational numbers?

20. What can you say about the sum of a rational and irrational number?

21. What can you say about the product of any two rational numbers?

22. What can you say about the product of a rational and irrational number?

23. Can the sum of two irrational numbers be rational?

Give an example:

24. Can the product of two irrational numbers be rational?

Give an example:

25. From the numbers: 5, 6,  $2\sqrt{6}$ ,  $2 - \sqrt{6}$ ,  $\sqrt{5}$ ,  $\sqrt{6}$ , choose two numbers that when you:

a. multiply them, it is rational, AND when you add the same two numbers, it is irrational. \_\_\_\_\_

b. multiply them, it is irrational, AND when you add the same two numbers, it is irrational. \_\_\_\_\_

[26-29] Simplify and determine whether each expression is **equivalent** to  $8x^{\frac{5}{4}}$ . Check the appropriate box.

		Yes	No
26.	$16^{\frac{3}{4}} x^{\frac{5}{4}}$		
27.	$16x^{\frac{5}{4}}$		
28.	$8\sqrt[4]{x^5}$		
29.	$\sqrt[4]{8x^5}$		

**Math 2 Unit 8 Review Worksheet**

No Calculators Allowed

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

Date: \_\_\_\_\_ Per: \_\_\_\_\_

[1-4] Simplify each expression.

1.  $(7 + 2\sqrt{3}) + (8 - \sqrt{3})$

2.  $(3 + 2\sqrt{13}) - (2 - 4\sqrt{13})$

3.  $(10 + 5\sqrt{7}) - (-4 - 2\sqrt{7})$

4.  $(5 + 2\sqrt{5}) - (-3 - 7\sqrt{5})$

5. Complete the table. Simplify each expression and check the appropriate box for Rational or Irrational numbers.

	Simplified Expression	Rational	Irrational
$(2\sqrt{3} + 5) - (2\sqrt{3} - 2)$			
$17\sqrt{5} + 3\sqrt{5}$			
$\sqrt{100} + 4$			
$\sqrt{16} \cdot 14$			
$\sqrt{7} \cdot \sqrt{4}$			

6. Provide a counter example for the following statements:

a. The sum of 2 irrational square root numbers is Always irrational.b. The product of 2 irrational square root numbers is Always irrational.c. The sum of 2 irrational cube root numbers is Always irrational.d. The product of 2 irrational cube root numbers is Always irrational.

7. From the numbers: 3, 5,  $\sqrt{3}$ ,  $\sqrt{5}$ ,  $3\sqrt{5}$ ,  $3 - \sqrt{5}$ , choose two numbers that when you:
- multiply them, it is rational, AND when you add the same two numbers, it is irrational. \_\_\_\_\_
  - multiply them, it is irrational, AND when you add the same two numbers, it is irrational. \_\_\_\_\_

[8-31] Simplify each expression. Write the final answer using only positive exponents.

- $(2x^2y^7)^3$
- $(-4x^4y^2)^2$
- $\left(\frac{3x^4}{y^2}\right)^{-2}$
- $(3x^{-3}k^4)(x^2k^3)^{-4}$
- $m^2k^{-3}(m^2k^{-4})^3$
- $x^{-4}y(x^3y^2)^{-2}$
- $(7x^2y^5)(x^{10})(-2y^{-10})^2$
- $5x^{-5}y^2(2x^{-14})^2$
- $z(y^{-5}z^7)^{-1}y^{-5}$
- $\frac{x^5y^4}{x^3y}$
- $\frac{a^5b^{-3}}{a^2b^{-5}}$
- $\frac{x^{-7}r^4}{x^{-2}r^{-3}}$
- $\frac{4m^2n^5p^{-3}}{2m^{-7}n^3p^{-8}}$
- $\frac{21x^7y^2z^{-4}}{7x^{-5}y^8z^{-9}}$
- $\frac{-20s^3t^{-2}v}{5s^2t^3v^{-3}}$
- $(3x^{\frac{2}{3}})^3$
- $(2x^{\frac{1}{3}})^6$
- $(4x^{\frac{1}{5}})^2$

26.  $64^{4/3}$

27.  $25^{3/2}$

28.  $125^{1/3}$

29.  $\frac{x^{\frac{3}{5}}}{\sqrt[10]{x^2}}$

30.  $\frac{x^{\frac{5}{2}}}{\sqrt[4]{x^2}}$

31.  $\frac{x^{\frac{4}{5}}}{\sqrt[10]{x^4}}$

[32-34] Write in exponential form.

32.  $\sqrt[5]{x^{\frac{3}{4}}}$

33.  $\sqrt[3]{x^{\frac{2}{4}}}$

34.  $\sqrt[4]{x^{\frac{6}{8}}}$

[35-37] Simplify and write in exponential form.

35.  $2^{\frac{2}{9}} \cdot \sqrt[3]{2^2}$

36.  $3^{\frac{5}{6}} \cdot \sqrt[3]{3}$

37.  $6^{\frac{4}{5}} \cdot \sqrt{6^3}$

[38-40] Complete the table. Write in simplified exponential and radical form.

Expression	Simplified Exponent Form	Simplified Radical Form
38. $(27x)^{\frac{2}{3}}$		
39. $(81x^3)^{\frac{3}{4}}$		
40. $(16x^5)^{\frac{3}{2}}$		

[41-43] Simplify and express answer in radical form.

41.  $8^{\frac{1}{6}} \cdot 8^{\frac{1}{4}}$

42.  $d^{\frac{2}{3}} \cdot d^{\frac{5}{3}}$

43.  $2^{\frac{1}{5}} \cdot 2^{\frac{1}{3}}$

[44-49] Write in exponential form, then solve for x.

44.  $\sqrt{16^3} \cdot \sqrt{16^{10}} = 16^{\frac{x}{2}}$

45.  $\sqrt[3]{64^7} \cdot \sqrt[3]{64^7} = 64^{\frac{x}{3}}$

46.  $\frac{8^{\frac{3}{2}}}{\sqrt[6]{8^4}} = 8^{\frac{x}{6}}$

47.  $\frac{7^{\frac{3}{4}}}{\sqrt[5]{7^2}} = 7^{\frac{x}{20}}$

48.  $\sqrt[6]{3^{\frac{1}{4}}} = 3^{\frac{1}{x}}$

49.  $\sqrt[3]{2^{\frac{1}{2}}} = 2^{\frac{1}{x}}$

50. Complete the table. Write an Equivalent Expression to the following in the form of  $a^m \cdot a^n$  and  $(a^n)^m$

	$a^m \cdot a^n$	$(a^n)^m$
$a^{14}$		
$x^{-12}$		
$p^{20}$		