Honors Algebra II
Rational Exponent Mini Unit
Spring 2021

Date	Topic/Assignment
Thursday March 25	Multiplication of Like Bases Power of a Product Power of a Quotient Pages 1 and 2
Friday March 26	Help Session 10:30-11:30 am
Monday March 29	Quotients with Like Bases Zero Exponent Negative Exponent Rewriting Radicals and Rational Exponents Evaluate without a calculator Pages 3 and 4
Tuesday March 30	Rationalizing Denominator Practice Pages 5 and 6
Wednesday March 31	Help Session 10:30 – 11:30
Thursday April 1	**QUIZ** Page 7
Friday April 2	Practice Page 8
Monday April 12	Practice Page 9
Tuesday April 13	Practice Page 10
Wednesday April 14	Practice Page 11
Thursday April 15	**TEST**
Friday April 16	Help Session 10:30 – 11:30 am

GSE Algebra II
Rational Exponents WS Packet

Name_____
Date_____ Period_____

For each of the following, apply the given rule. If more than one rule applies, apply all that are appropriate. Write all answers in simplest radical form unless otherwise specified.

Multiplication of Like Bases: $b^x \cdot b^y = b^{x+y}$

1. $5^2 \cdot 5^4$	**2.** $2^3 \cdot 2^6$	**3.** $x^7 \cdot x$	**4.** $x^3(x^2)$
5. $5^{1/2} \cdot 5^{3/2}$	**6.** $2^{3/4} \cdot 2^{1/4}$	**7.** $x^{8/5} \cdot x^{2/5}$	**8.** $x^{3/2}(x^{5/2})$
9. $5^{1/3} \cdot 5^{3/2}$	**10.** $2^{3/4} \cdot 2^{1/2}$	**11.** $x^{8/5} \cdot x^{3/4}$	**12.** $x^{3/2}(x^{5/3})$

Power of a Power: $\left(b^x\right)^y = b^{xy}$

1. $\left(5^2\right)^6$	**2.** $\left(2^3\right)^2$	**3.** $\left(x^7\right)^2$	**4.** $\left(y^5\right)^5$
5. $\left(5^2\right)^{1/6}$	**6.** $\left(2^3\right)^{1/2}$	**7.** $\left(x^{7/2}\right)^2$	**8.** $\left(y^{1/5}\right)^{1/2}$
9. $\left(5^{3/2}\right)^{1/6}$	**10.** $\left(2^{3/4}\right)^{1/2}$	**11.** $\left(x^{7/2}\right)^{2/7}$	**12.** $\left(y^{1/5}\right)^{5/2}$

Power of a Product: $(ab)^x = a^x b^x$

1. $(5x)^2$	**2.** $(xy)^3$	**3.** $(16y)^2$	**4.** $(25 \cdot 64)^{1/2}$
5. $(5x)^{1/2}$	**6.** $(xy)^{1/3}$	**7.** $(16y)^{1/2}$	**8.** $(8 \cdot 27)^{1/3}$
9. $(125x)^{1/3}$	**10.** $((a)(b))^5$	**11.** $(25 \cdot w)^{3/2}$	**12.** $(81 \cdot 16)^{1/4}$

Power of a Quotient: $\left(\frac{a}{b}\right)^x = \frac{a^x}{b^x}$

1. $\left(\frac{x}{5}\right)^2$	**2.** $\left(\frac{x}{y}\right)^3$	**3.** $\left(\frac{y}{16}\right)^2$	**4.** $\left(\frac{25}{64}\right)^{1/2}$
5. $\left(\frac{5}{x}\right)^{1/2}$	**6.** $\left(\frac{x}{y}\right)^{1/3}$	**7.** $\left(\frac{y}{16}\right)^{1/2}$	**8.** $\left(\frac{8}{27}\right)^{1/3}$
9. $\left(\frac{x}{125}\right)^{1/3}$	**10.** $\left(\frac{64}{x}\right)^{1/2}$	**11.** $\left(\frac{w}{25}\right)^{3/2}$	**12.** $\left(\frac{81}{16}\right)^{1/4}$

Quotients with Like Bases: $\frac{b^x}{b^y} = b^{x-y}$

1. $\left(\frac{x^2}{x^5}\right)$	2. $\left(\frac{x^3}{x}\right)$	3. $\left(\frac{m^7}{m^8}\right)$	4. $\frac{y}{y^2}$
5. $\frac{5^4}{5^2}$	6. $\frac{9^3}{9^5}$	7. $\frac{6^3}{6^{-1}}$	8. $\frac{x^3}{x^{-2}}$
9. $\frac{y^{-2}}{y^{-5}}$	10. $\frac{11^{4/5}}{11^{2/5}}$	11. $\frac{25^{3/2}}{25}$	12. $\frac{81^{3/4}}{81^{1/4}}$

Zero Exponent: $b^0 = 1$

1. x^0	2. 25^0	3. $(y)^0$	4. $(1)^0$

Negative Exponent: $b^{-x} = \frac{1}{b^x}$ or $\frac{1}{b^{-x}} = b^x$

1. x^{-3}	2. $25^{-1/2}$	3. $\left(\frac{1}{x}\right)^{-2}$	4. $\frac{7}{x^{-1}}$

Rewrite Radicals as Rational Exponents: $\sqrt[n]{b^x} = b^{x/n}$

1. $x^{2/3}$	**2.** $\sqrt{x^3}$	**3.** $\sqrt[4]{y}$	**4.** $x^{1/2}$
5. $\sqrt[5]{x^{15}}$	**6.** $\sqrt[3]{y^9}$	**7.** $\sqrt[5]{m^{20}}$	**8.** $\sqrt[8]{y^2}$
9. $b^{12/3}$	**10.** $y^{2/5}$	**11.** $w^{3/2}$	**12.** $m^{1/5}$

Evaluate Without a Calculator: 1st take root of the denominator, 2nd raise to numerator

1. $27^{1/3}$	**2.** $1000^{1/2}$	**3.** $16^{1/4}$	**4.** $1^{1/2}$
5. $81^{3/2}$	**6.** $81^{3/4}$	**7.** $32^{3/5}$	**8.** $25^{3/2}$
9. $49^{3/2}$	**10.** $8^{4/3}$	**11.** $121^{3/2}$	**12.** $625^{3/4}$

Rationalize a denominator

1. $\frac{5}{\sqrt{2}}$	**2.** $\frac{x}{\sqrt{3}}$	**3.** $\frac{x+2}{\sqrt{x}}$	**4.** $\frac{6}{\sqrt[3]{7}}$
5. $\frac{1}{\sqrt[3]{2}}$	**6.** $\frac{2}{\sqrt[3]{3}}$	**7.** $\frac{2}{\sqrt[4]{x}}$	**8.** $\frac{7}{\sqrt[3]{9}}$
9. $\frac{1}{\sqrt[8]{x^5}}$	**10.** $\frac{1}{2+\sqrt{3}}$	**11.** $\frac{5}{\sqrt{x}-1}$	**12.** $\frac{x}{\sqrt{x}+3}$

Multiple Rules Practice – Rewrite each in simplest radical form.

1. $4^2 \cdot 8^2$	**2.** $27^{1/4} \cdot 9^{1/4}$	**3.** $16^{2/3} \cdot 8^{1/2}$	**4.** $36^{1/2} \cdot 216^{1/2}$
5. $5^3 \cdot 25^2$	**6.** $3^3 \cdot 9$	**7.** $27^{1/4} \cdot 3^{1/4}$	**8.** $36^{1/2} \cdot 6^4$
9. $\left(\frac{125}{64}\right)^{-1/3}$	**10.** $\left(\frac{w^3}{32w}\right)^{2/5}$	**11.** $\left(\frac{y^5}{y^{1/2} \cdot y^{3/4}}\right)$	**12.** $\left(\frac{16c^{-8}d^3}{c^4d^5}\right)^{\frac{1}{2}}$
13. $\sqrt{\frac{40x^2}{x^{10}}}$	**14.** $\sqrt{\frac{25}{y^{12}}}$	**15.** $\sqrt[4]{\frac{162d^{21}}{2d^2}}$	**16.** $7\sqrt{3} - \sqrt{12}$
17. $2\sqrt{63} - 11\sqrt{28} + 5\sqrt{21}$	**18.** $15xy\sqrt[4]{9xy} - \sqrt[4]{9x^5y^5}$	**19.** $\left(81x^{8/3}y^4\right)^{3/4}$	**20.** $\left(4ab^3\right)^{3/2}$
21. $\left(\frac{a^{12}b^5}{27b^2}\right)^{-1/3}$	**22.** $\sqrt[5]{x^{20}} \cdot \sqrt[4]{x^{12}}$	**23.** $\sqrt{\sqrt[3]{x^4}}$	**24.** $\sqrt[3]{25} \cdot \sqrt[6]{25}$
25. $a^{2/3}b^{9/6}c^{3/2}$	**26.** $\frac{\sqrt[5]{y^{15}}}{\sqrt[5]{32y^8} \cdot \sqrt[5]{y^2}}$	**27.** $\left(\frac{125x^{1/3}y}{64x^{10/3}y^4}\right)^{-1/3}$	**28.** $\left(\frac{\sqrt{x^5}}{\sqrt{4x}}\right)^{1/2}$

Rational Exponents WS 1

Name _____

Express using rational exponents.

1. $\sqrt{14}$

2. $\sqrt[3]{8x^3y^6}$

3. $\sqrt{25a^3b^4}$

4. $\sqrt[4]{8x^3y^5}$

5. $\sqrt[3]{16a^5b^7}$

6. $\sqrt[6]{b^3}$

Express in simplest radical form.

7. $7^{\frac{1}{2}}$

8. $36^{\frac{1}{4}}$

9. $x^{\frac{3}{2}}y^{\frac{5}{2}}$

10. $4^{\frac{1}{3}}x^{\frac{2}{3}}y^{\frac{1}{3}}$

11. $x^{\frac{3}{4}}y^{\frac{1}{2}}$

12. $5^{\frac{1}{6}}x^{\frac{1}{2}}y^{\frac{1}{3}}$

Evaluate without using a calculator.

13. $9^{\frac{3}{2}}$

14. $16^{\frac{3}{4}}$

15. $9^{\frac{1}{3}} \cdot 9^{\frac{5}{3}}$

16. $343^{\frac{2}{3}}$

17. $16^{-\frac{3}{2}}$

18. $4^{\frac{3}{2}}$

19. $\sqrt[4]{81}$

20. $36^{\frac{3}{4}} \div 36^{\frac{1}{4}}$

Rational Exponents WS 2 Name _____

Write in simplest radical form:

1. $36^{-1/2}$

2. $\left(\frac{1}{8}\right)^{2/3}$

3. $\left(y^{1/3}\right)^{3/4}$

4. $\left(\frac{x^6y^{-9}}{8}\right)^{-1/3}$

5. $(25+144)^{1/2}$

6. $(64)^{5/6}$

7. $\sqrt[6]{x^9}$

8. $\sqrt[4]{49n^2}$

9. $\sqrt[8]{16}$

10. $\left(\frac{49}{81}\right)^{-1/2}$

11. $a^{5/6}b^{3/2}c^{7/3}$

12. $\sqrt[3]{4}\cdot\sqrt[6]{32}$

13. $\sqrt[3]{36}\cdot\sqrt[6]{36}$

14. $\left(6-\sqrt{3}\right)^2$

15. $\sqrt[3]{27w^9y^6}$

16. $y^{-1/2}$

17. $\frac{14}{7^{2/3}}$

18. $\left(x^{-3/8}\right)^{-4/9}$

19. $x^{3/4}\cdot y^{1/2}\cdot z$

20. $2\sqrt{48}-\sqrt{12}-3\sqrt{63}+\sqrt{112}$

Rational Exponents WS 3 Name _____

Write in simplest radical form:

1. $\sqrt[4]{16x^4y^2}$

2. $\sqrt[5]{p^{10}}$

3. $\sqrt[4]{81x^5y^8z^6}$

4. $\sqrt[3]{\frac{125}{64}}$

5. $\sqrt[3]{\frac{64}{27}}$

6. $\sqrt[3]{27w^9y^6}$

7. $32^{-\frac{2}{5}}$

8. $6\sqrt[3]{16}-2\sqrt[3]{54}$

9. $10\sqrt[3]{54}$

10. $9^{\frac{3}{2}}$

11. $\frac{1}{x^{-\frac{5}{4}}}$

12. $-(81)^{\frac{1}{4}}$

13. $\left(x^{\frac{1}{5}}\right)^{\frac{5}{2}}$

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

15. $\sqrt[3]{x^2}\cdot\sqrt[4]{x}$

16. $\frac{xy^{\frac{1}{2}}}{x^{\frac{3}{4}}y^{-2}}$

17. $\frac{\sqrt[3]{y^6}}{\sqrt[3]{27y}\cdot\sqrt[3]{y^{11}}}$

18. $\left(y\cdot y^{\frac{1}{4}}\right)^{\frac{4}{3}}$

19. $\left(y^3\right)^{\frac{1}{6}}$

20. $x^{\frac{1}{3}}\cdot x^{\frac{1}{5}}$

Rational Exponents WS 4 Name _____

Simplify.

1. $\sqrt[3]{-27a^3b^{12}}$
2. $\sqrt[3]{32}$
3. $\frac{2}{\sqrt{8}}$
4. $\sqrt[3]{\frac{9}{m^2}}$
5. $\frac{4}{\sqrt{5}-1}$
6. $\sqrt[4]{4a^2b^3}\cdot\sqrt[4]{4a^3b^4}$
7. $16^{\frac{3}{4}}$
8. $\sqrt[4]{\frac{8}{9a^3}}$
9. $7\sqrt{2}+4\sqrt{12}-\sqrt{50}$
10. $\left(3\sqrt{2}-\sqrt{3}\right)\left(3\sqrt{2}+\sqrt{3}\right)$
11. $\frac{2}{\sqrt{3}+\sqrt{6}}$
12. $\sqrt[3]{\frac{2}{3}}$
13. $\left(\frac{1}{27}\right)^{\frac{-2}{3}}$
14. $\sqrt{2}\cdot\sqrt[3]{2}$
15. $\frac{9}{3^{\frac{2}{3}}}$
16. $\sqrt[6]{81}$
17. $\left(x^{\frac{2}{3}}\right)^{\frac{3}{4}}$
18. $\frac{x^{\frac{2}{3}}y}{x^{-2}y^{\frac{3}{4}}}$
19. $(-8)^{-\frac{2}{3}}$
20. $\left(3^{\frac{1}{2}}\cdot 5^{\frac{2}{3}}\right)^{\frac{3}{2}}$
21. $\left(2^{\frac{1}{3}}\cdot 2^{\frac{3}{4}}\right)^{\frac{1}{2}}$
22. $\left(\left(5^{\frac{2}{3}}\right)^{\frac{1}{5}}\right)^2$
23. $\left(\frac{6^{1/2}}{6^{1/3}}\right)^{3/5}$
24. $\left(\frac{3^{1/2}}{12^{1/2}}\right)^3$
25. $\sqrt[4]{\sqrt[3]{\sqrt{4}}}$
26. $\sqrt{\frac{\sqrt{108}}{\sqrt{27}}}$
27. $\frac{x^{5/4}y^{2/3}}{xy}$
28. $\sqrt[3]{8x^6y^2z}+\sqrt[3]{27x^3y^2z}$
29. $\sqrt[3]{\frac{5}{y}+\sqrt{\frac{9}{y^2}}}$
30. $x^{3/4}\cdot y^{1/2}\cdot z$

10

Rational Exponents REVIEW
(NO CALCULATOR!)

Name_____

Students will ...Extend the properties of exponents to rational exponents. _____ **/ 30 points**

True or False. Write the entire word. (1 point each)

_____ 1. $3^{-2} = -9$ _____ 2. $2^4 \cdot 2^5 = 2^9$ _____ 3. $\frac{2}{x^{-3}} = 2x^3$

_____ 4. $\left(\frac{4}{a}\right)^{-1} = -4a$ _____ 5. $\left(a^9\right)^3 = a^{12}$ _____ 6. $\frac{x^2}{x^{-2}} = 1$

Rewrite using rational exponent notation. (1 point each)

7. $\sqrt{x^3}$ 8. $\sqrt[5]{2x^2y^4}$

Rewrite the expression using simplified radical notation. (1 point each)

9. $x^{\frac{3}{5}}$ 10. $a^{\frac{1}{3}}b^{\frac{1}{2}}$

Evaluate each expression. (2 points each)

11. $27^{2/3}$ 12. $\left(\frac{25}{64}\right)^{1/2}$ 13. $64^{-1/3}$ 14. $7^{\frac{1}{4}} \cdot 7^{\frac{7}{4}}$

Simplify each expression. Write each answer in the form of the original expression. (2 points each)

15. $\sqrt[4]{32x^5y^3}$ 16. $\sqrt[6]{m^3}$ 17. $\left(x^3\right)^{5/12}$

18. $\sqrt[3]{x} \cdot \sqrt[6]{x}$ 19. $\left(\frac{x^{-6}y^9}{27}\right)^{-1/3}$ 20. $\frac{y}{y^{\frac{3}{4}}}$

11