Homework: # 1-27
CHALLENGE: #16, 29-38

7-5 Part 2

* Write an expression in fractional exponents to radical form.

$$a^{\frac{1}{n}} = \sqrt[n]{a^1} \text{ or } (\sqrt[n]{a})^1$$

$$a^{\frac{m}{n}} = \sqrt[n]{a^m} \text{ or } (\sqrt[n]{a})^m$$

* $x^{\frac{1}{2}} = \sqrt[2]{x^1}$

* $15x^{\frac{3}{4}} = 15\sqrt[4]{x^3}$

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

$25^{\frac{1}{2}}x^1$

$\sqrt[2]{25} \cdot x$

$5 \cdot x$

$5x$

* $(27x^3)^{\frac{1}{3}}$

$\sqrt[3]{27} \cdot x$

$3x$

challenge!

* $(64a)^{\frac{4}{5}}$

$64^{\frac{4}{5}}a^{\frac{4}{5}}$

$(\sqrt[5]{64})^4 \cdot \sqrt[5]{a^4}$ → Can you find a factor of 64 that when taken to the 5th root is perfect?

$(\sqrt[5]{32 \cdot 2})^4 \cdot \sqrt[5]{a^4}$

$(\sqrt[5]{32})^4 \cdot (\sqrt[5]{2})^4 \cdot \sqrt[5]{a^4}$

$(2)^4 \cdot (\sqrt[5]{2})^4 \cdot \sqrt[5]{a^4}$

$16 \cdot (\sqrt[5]{2a})^4$

$16\sqrt[5]{(2a)^4}$

* Write an expression in radical form to fractional exponent (exponential form).

* $\sqrt[3]{x} = x^{\frac{1}{3}}$

* $\sqrt[4]{y^2} = y^{\frac{2}{4}} = y^{\frac{1}{2}}$

* $\sqrt{16a} = 16^{\frac{1}{2}}a^{\frac{1}{2}}$

  $4a^{\frac{1}{2}}$

* $\sqrt[3]{125d^2}$

  $\sqrt[3]{125} \cdot d^{\frac{2}{3}}$

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

* $\sqrt{(2m)^4} = \sqrt{2^4m^4}$

  $\sqrt{16m^4}$

  $\sqrt{16} \cdot \sqrt{m^4}$

  $4m^2$

* All algebraic expressions can be written in either exponential form or radical form. (**NOT** both)

Try more... Got it #3 on pg. 450

A) $\sqrt[3]{s^2} = s^{\frac{2}{3}}$

B) $12\sqrt[3]{x^4} = 12x^{\frac{4}{3}}$

C) $\sqrt{(4y)^5} = \sqrt{4^5} \cdot \sqrt{y^5}$

$\sqrt{1024} \cdot \sqrt[2]{y^5}$

$32y^{\frac{5}{2}}$

D) $\sqrt[4]{256a^8}$

$\sqrt[4]{256} \cdot \sqrt[4]{a^8}$

$4 \cdot a^{\frac{8}{4}}$

$4a^2$

* Write an expression in radical form to fractional exponent (exponential form).

* All algebraic expressions can be written in either exponential form or radical form. (NOT both)

Name ______________________________ Class ____________ Date ____________

7-5 Practice

Form G

Rational Exponents and Radicals

Directions: Calculators Allowed. Show all your work. Remember do not use any decimals or fractions as your coefficients, instead simplify the radicals using perfect squares and cubes.

What is the value of each expression?

1. $\sqrt[3]{64}$
2. $\sqrt[3]{125}$
3. $\sqrt[5]{32}$
4. $\sqrt{100}$
5. $\sqrt[4]{1}$
6. $\sqrt{225}$
7. $\sqrt[3]{729}$
8. $\sqrt{289}$
9. $\sqrt[3]{243}$

Write each expression in radical form.

10. $b^{\frac{3}{2}}$
11. $(36x)^{\frac{1}{2}}$
12. $25y^{\frac{1}{2}}$
13. $81s^{\frac{2}{3}}$
14. $(72b)^{\frac{1}{2}}$
15. $(125a)^{\frac{2}{3}}$
16. $(40x)^{\frac{1}{3}}$
17. $36t^{\frac{1}{4}}$
18. $(99r)^{\frac{1}{2}}$

Write each expression in exponential form.

19. $\sqrt[3]{b^4}$
20. $\sqrt{(3x)^4}$
21. $\sqrt[3]{125d^4}$
22. $\sqrt{49a}$
23. $\sqrt[3]{(64b)^2}$
24. $\sqrt[4]{256b^5}$
25. $\sqrt{144d^4}$
26. $\sqrt[3]{(27x)^2}$
27. $\sqrt{625a^5}$

28. You can use the formula $S = 10m^{\frac{2}{3}}$ to approximate the surface area S, in square centimeters, of a horse with mass m, in grams. What is the surface area of a horse with a mass of 4.5×10^5 grams? Round your answer to the nearest whole square centimeter.

Name ______________________ Class ____________ Date ____________

7-5 Practice (continued)

Form G

Rational Exponents and Radicals

Simplify each expression using the properties of exponents, and then write the expression in radical form.

29. $\left(a^{\frac{2}{3}}\right)\left(a^{\frac{2}{3}}\right)$

30. $b^{\frac{1}{3}}(ab)^{\frac{1}{2}}$

31. $\left(2x^{3}\right)\left(4x^{\frac{1}{3}}\right)$

32. $(27y)^{\frac{1}{3}}(64y)^{\frac{1}{3}}$

33. $(25x)^{\frac{1}{2}}\left(x^{\frac{1}{2}}\right)$

34. $(81s)^{\frac{1}{3}}s^{\frac{5}{6}}$

Write each expression in exponential form. Simplify when possible.

35. $\sqrt[3]{a^5}+\sqrt[3]{a}$

36. $5\sqrt[3]{b^4}-\sqrt[3]{b^4}$

37. $\sqrt[4]{81d^3}-\sqrt[3]{125d^4}$

38. $\sqrt[3]{(27x)^2}+\sqrt[4]{256x^2}$

39. To estimate the age of an organism, archaeologists measure the amount of carbon-14 left in its remains. The approximate amount of carbon-14 remaining after 5000 years can be found using the formula $A = A_0\,(2.7)^{-\frac{3}{5}}$, where A_0 is the initial amount of carbon-14 in the sample that is tested. How much carbon-14 is left in a sample that is 5000 years old and originally contained 5.0×10^{-3} grams of carbon-14? Write your answer in scientific notation.

40. Remember that the radius r of a sphere that has volume V is $r=\sqrt[3]{\frac{3V}{4\pi}}$. A ping-pong ball has a volume of about 2.045 in.^{3}. What is the approximate radius of a ping-pong ball? Use 3.14 for π. Round your answer to the nearest tenth.

41. Reasoning Show that $\sqrt[4]{a^2}=\sqrt{a}$ by rewriting $\sqrt[4]{a^2}$ in exponential form.

Name Key Class ______ Date ______

7-5 Practice

Form G

Rational Exponents and Radicals

Directions: Calculators Allowed. Show all your work. Remember do not use any decimals or fractions as your coefficients, instead simplify the radicals using perfect squares and cubes.

What is the value of each expression?

1. $\sqrt[3]{64}$ 4
2. $\sqrt[3]{125}$ 5
3. $\sqrt[5]{32}$ 2
4. $\sqrt{100}$ 10
5. $\sqrt[4]{1}$ 1
6. $\sqrt{225}$ 15
7. $\sqrt[3]{729}$ 9
8. $\sqrt{289}$ 17
9. $\sqrt[3]{243}$ $3\sqrt[3]{9}$

Write each expression in radical form.

10. $b^{\frac{3}{2}}$ $\sqrt[2]{b^3}$
11. $(36x)^{\frac{1}{2}}$ $6\sqrt{x}$
12. $25y^{\frac{1}{2}}$ $25\sqrt{y}$
13. $81s^{\frac{2}{3}}$ $81\sqrt[3]{s^2}$
14. $(72b)^{\frac{1}{2}}$ $6\sqrt{2b}$
15. $(125a)^{\frac{2}{3}}$ $25\sqrt[3]{a^2}$
16. $(40x)^{\frac{1}{3}}$ $2\sqrt[3]{5x}$
17. $36t^{\frac{1}{4}}$ $36\sqrt[4]{t}$
18. $(99r)^{\frac{1}{2}}$ $3\sqrt{11r}$

Write each expression in exponential form.

19. $\sqrt[3]{b^4}$ $b^{\frac{4}{3}}$
20. $\sqrt{(3x)^4}$ $9x^2$
21. $\sqrt[3]{125d^4}$ $5d^{\frac{4}{3}}$
22. $\sqrt{49a}$ $7a^{\frac{1}{2}}$
23. $\sqrt[3]{(64b)^2}$ $16b^{\frac{2}{3}}$
24. $\sqrt[4]{256b^5}$ $4b^{\frac{5}{4}}$
25. $\sqrt{144d^4}$ $12d^2$
26. $\sqrt[3]{(27x)^2}$ $9x^{\frac{2}{3}}$
27. $\sqrt{625a^5}$ $25a^{\frac{5}{2}}$

28. You can use the formula $S = 10m^{\frac{2}{3}}$ to approximate the surface area S, in square centimeters, of a horse with mass m, in grams. What is the surface area of a horse with a mass of 4.5×10^5 grams? Round your answer to the nearest whole square centimeter.

$S = 10(4.5 \times 10^5)^{\frac{2}{3}}$

$S = 10(4.5^{\frac{2}{3}} \times 10^{\frac{10}{3}})$

$S \approx 58{,}723\ cm^2$

Name ______________________________ Class ______________ Date ______________

7-5 Practice (continued) — Form G

Rational Exponents and Radicals

Simplify each expression using the properties of exponents, and then write the expression in radical form.

29. $\left(a^{\frac{2}{3}}\right)\left(a^{\frac{2}{3}}\right)$ $\sqrt[3]{a^4}$

30. $b^{\frac{1}{3}}(ab)^{\frac{1}{2}}$ $\sqrt{a}\,\sqrt[6]{b^5}$

31. $\left(2x^3\right)\left(4x^{\frac{1}{3}}\right)$ $8\sqrt[3]{x^{10}}$

32. $(27y)^{\frac{1}{3}}(64y)^{\frac{1}{3}}$ $12\sqrt[3]{y^2}$

33. $(25x)^{\frac{1}{2}}\left(x^{\frac{1}{2}}\right)$ $5x$

34. $(81s)^{\frac{1}{3}}s^{\frac{5}{6}}$ $3\sqrt[3]{3}\,\sqrt[6]{s^7}$

Write each expression in exponential form. Simplify when possible.

35. $\sqrt[3]{a^5}+\sqrt[3]{a}$ $a^{\frac{5}{3}}+a^{\frac{1}{3}}$

36. $5\sqrt[3]{b^4}-\sqrt[3]{b^4}$ $4b^{\frac{4}{3}}$

37. $\sqrt[4]{81d^3}-\sqrt[3]{125d^4}$ $3d^{\frac{3}{4}}-5d^{\frac{4}{3}}$

38. $\sqrt[3]{(27x)^2}+\sqrt[4]{256x^2}$ $9x^{\frac{2}{3}}+4x^{\frac{1}{2}}$

39. To estimate the age of an organism, archaeologists measure the amount of carbon-14 left in its remains. The approximate amount of carbon-14 remaining after 5000 years can be found using the formula $A = A_0\,(2.7)^{-\frac{3}{5}}$, where A_0 is the initial amount of carbon-14 in the sample that is tested. How much carbon-14 is left in a sample that is 5000 years old and originally contained 5.0×10^{-3} grams of carbon-14? Write your answer in scientific notation.

$\approx 2.8 \times 10^{-3}$ grams

40. Remember that the radius r of a sphere that has volume V is $r = \sqrt[3]{\frac{3V}{4\pi}}$. A ping-pong ball has a volume of about 2.045 in.^{3}. What is the approximate radius of a ping-pong ball? Use 3.14 for π. Round your answer to the nearest tenth.

≈ 0.8 in.

41. Reasoning Show that $\sqrt[4]{a^2}=\sqrt{a}$ by rewriting $\sqrt[4]{a^2}$ in exponential form.

$\sqrt[4]{a^2} = a^{\frac{2}{4}} = a^{\frac{1}{2}} = \sqrt[2]{a} = \sqrt{a}$

9) $\sqrt[3]{243} = \sqrt[3]{27} \cdot \sqrt[3]{9} = 3\sqrt[3]{9}$

10) $b^{\frac{3}{2}} = \sqrt[2]{b^3}$

11) $(36x^{\frac{1}{2}}) = 36^{\frac{1}{2}}x^{\frac{1}{2}}$

$\sqrt{36} \cdot \sqrt{x}$

$6\sqrt{x}$

12) $25y^{\frac{1}{2}} = 25\sqrt{y}$

13) $81s^{\frac{2}{3}} = 81\sqrt[3]{s^2}$

14) $(72b)^{\frac{1}{2}} = 72^{\frac{1}{2}}b^{\frac{1}{2}}$

$\sqrt{72} \cdot \sqrt{b}$

$\sqrt{36} \cdot \sqrt{2} \cdot \sqrt{b}$

$6\sqrt{2b}$

15) $(125a)^{\frac{2}{3}} = \sqrt[3]{125^2} \cdot \sqrt[3]{a^2}$ or

$25\sqrt[3]{a^2}$

16) $(40x)^{\frac{1}{3}} = 40^{\frac{1}{3}}x^{\frac{1}{3}}$

$\sqrt[3]{40} \cdot \sqrt[3]{x}$

$\sqrt[3]{8} \cdot \sqrt[3]{5} \cdot \sqrt[3]{x}$

$2\sqrt[3]{5x}$

17) $36t^{\frac{1}{4}} = 36\sqrt[4]{t}$

18) $(99r)^{\frac{1}{2}} = 99^{\frac{1}{2}}r^{\frac{1}{2}} = \sqrt{99 \cdot r}$

$\sqrt{9} \cdot \sqrt{11} \cdot \sqrt{r} = 3\sqrt{11r}$

(19) $b^{\frac{4}{3}}$ (20) $\sqrt{(3x)^4} = \sqrt{3^4x^4} = 3^{\frac{4}{2}} \cdot x^{\frac{4}{2}}$

$3^2 \cdot x^2$

$9x^2$

(21) $\sqrt[3]{125d^4} = \sqrt[3]{125}\ d^{\frac{4}{3}}$

$5d^{\frac{4}{3}}$

(22) $\sqrt{49a} = \sqrt{49}\ \sqrt{a}$

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

(24) $\sqrt[4]{256b^5} = \sqrt[4]{256} \cdot b^{\frac{5}{4}} = 4b^{\frac{5}{4}}$

(23) $\sqrt[3]{(64b)^2} = \sqrt[3]{64^2} \cdot \sqrt[3]{b^2}$

$\sqrt[3]{4096} \cdot b^{\frac{2}{3}}$

$16\ b^{\frac{2}{3}}$

25) $\sqrt{144d^4} = \sqrt{144} \cdot \sqrt{d^4} = 12d^2$

26) $\sqrt[3]{(27x)^2} = \sqrt[3]{27^2} \cdot \sqrt[3]{x^2}$

$\sqrt[3]{729} \cdot x^{\frac{2}{3}}$

$9x^{\frac{2}{3}}$

27) $\sqrt{625a^5} = \sqrt{625} \cdot \sqrt{a^4} \cdot \sqrt{a}$

$25a^2\sqrt{a}$

29) $\left(a^{\frac{2}{3}}\right)\left(a^{\frac{2}{3}}\right) = a^{\frac{2}{3}+\frac{2}{3}} = a^{\frac{4}{3}} = \sqrt[3]{a^4}$

30) $b^{\frac{1}{3}}(ab)^{\frac{1}{2}} = b^{\frac{1}{3}} \cdot a^{\frac{1}{2}} \cdot b^{\frac{1}{2}}$

$\left(b^{\frac{1}{3}+\frac{1}{2}}\right)a^{\frac{1}{2}}$

$\left(b^{\frac{2}{6}+\frac{3}{6}}\right)a^{\frac{1}{2}} = a^{\frac{1}{2}}b^{\frac{5}{6}}$

$\sqrt{a}\,\sqrt[6]{b^5}$

31) $(2x^3)(4x^{\frac{1}{3}})$

$8x^{3+\frac{1}{3}}$

$8x^{\frac{10}{3}} = 8\sqrt[3]{x^{10}}$

32) $(27y)^{\frac{1}{3}}(64y)^{\frac{1}{3}}$

$27^{\frac{1}{3}}y^{\frac{1}{3}}64^{\frac{1}{3}}y^{\frac{1}{3}}$

$\sqrt[3]{27} \cdot \sqrt[3]{64} \cdot y^{\frac{2}{3}}$

$3 \cdot 4 \cdot y^{\frac{2}{3}}$

$12y^{\frac{2}{3}}$

33) $(25x)^{\frac{1}{2}}(x^{\frac{1}{2}})$

$25^{\frac{1}{2}}x^{\frac{1}{2}}x^{\frac{1}{2}}$

$\sqrt[2]{25} \cdot x$

$5x$

35) $\sqrt[3]{a^5} + \sqrt[3]{a}$

$a^{\frac{5}{3}} + a^{\frac{1}{3}}$

* cannot combine - unlike terms

34) $(81s)^{\frac{1}{3}}s^{\frac{5}{6}}$

$81^{\frac{1}{3}}s^{\frac{1}{3}}s^{\frac{5}{6}}$

$\sqrt[3]{81} \cdot s^{\frac{2}{6}+\frac{5}{6}}$

$\sqrt[3]{27} \cdot \sqrt[3]{3} \cdot s^{\frac{7}{6}}$

$3\sqrt[3]{3} \cdot s^{\frac{7}{6}}$

$3\sqrt[3]{3}\,\sqrt[6]{s^7}$

$5\sqrt[3]{b^4} - \sqrt[3]{b^4}$ (unlike terms)

36) $4\sqrt[3]{b^4}$

$4b^{\frac{4}{3}}$

37) $\sqrt[4]{81d^3} - \sqrt[3]{125d^4}$

$\sqrt[4]{81}\sqrt[4]{d^3} - \sqrt[3]{125} \cdot \sqrt[3]{d^4}$

$3d^{\frac{3}{4}} - 5d^{\frac{4}{3}}$

38) $\sqrt[3]{(27x)^2} + \sqrt[4]{256x^2}$

$\left(\sqrt[3]{27x}\right)^2 + \sqrt[4]{256} \cdot \sqrt[4]{x^2}$

$\sqrt[3]{27^2} \cdot \sqrt[3]{x^2} + 4x^{\frac{2}{4}}$

$+ 4x^{\frac{1}{2}}$

$\sqrt[3]{27} \cdot \sqrt[3]{27} \cdot x^{\frac{2}{3}} +$

$3 \cdot 3 \cdot x^{\frac{2}{3}}$

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

39) $A = A_0(2.7)^{-\frac{3}{5}}$

$A = (5 \times 10^{-3})(2.7)^{-\frac{3}{5}}$

$A = \dfrac{5 \times 10^{-3}}{2.7^{\frac{3}{5}}}$ → $A = 2.8 \times 10^{-3}$ grams

40) $r = \sqrt[3]{\frac{3V}{4\pi}}$

$r = \sqrt[3]{\frac{3(2.045)}{4(3.14)}}$

$r = 0.8in$