

Algebra 2

Radicals and Exponents Review Guide

Name:

Hour:

Level 1:

Find the measure of x.

1. Simplify: $m^4 p^7 \cdot m \cdot p^{-3} m^{10}$
 Multiplying
 add exponents
 $m^{4+1+10} p^{7+(-3)}$
 $m^{15} p^4$

2. Simplify: $\frac{x^{17} y^2}{x^{10} y^3}$
 Dividing
 Subtract exponents
 Variables with negative exponents move
 $\frac{x^{17-10} y^{2-3}}{1}$
 $\frac{x^7}{y}$
 exponent became positive

3. Rewrite and simplify: $27^{\frac{1}{3}}$
 denominator is index of radical
 $\sqrt[3]{27}$
 3
 $\sqrt[3]{3 \cdot 3 \cdot 3}$
 Fractional exponent means radical

4. Simplify: $\sqrt{121x^{14}y^4}$
 Square root \rightarrow need groups of 2
 $\sqrt{11 \cdot 11 \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot y \cdot y \cdot y \cdot y}$
 $11x^7 y^2$
 even root
 odd exponents need absolute value bars
 $(121x^{14}y^4)^{\frac{1}{2}}$
 $121^{\frac{1}{2}} x^{\frac{14}{2}} y^{\frac{4}{2}}$
 $11x^7 y^2$

5. $\sqrt[4]{x} = 4$
 exponents undo radicals, radicals undo exponents
 $(\sqrt[4]{x})^4 = (4)^4$
 $x = 256$
 $x^{\frac{1}{4}} = 4$
 $x^{\frac{1}{4} \cdot 4} = 4^4$
 $x = 256$

6. $x^3 = 512$
 $\sqrt[3]{x^3} = \sqrt[3]{512}$ or $(x^{\frac{1}{3}})^3 = 512$
 $x^{\frac{1}{3} \cdot 3} = 8$
 $x = 8$ and 2 imaginary
 exponent is 3, need 3 solutions, fill in with pairs of imaginary

Level 2:

7. Simplify: $4m^6 p^{17} \cdot -m \cdot (2p^3 m^{10})^0$
 Multiplying
 multiply #s
 Add exponents
 exponent of 0 = 1
 $4m^6 p^{17} \cdot -1 \cdot m^0 \cdot (2^0 p^3 m^{10})^0$
 $4 \cdot -1 \cdot 1 \cdot m^6 \cdot p^{17}$
 $-4m^6 p^{17}$

8. Simplify: $\frac{21x^{-7}y^2x^{15}}{3x^{10}y^{-3}}$
 Dividing
 Divide #s
 subtract exponents
 $\frac{21y^2x^{15}y^3}{3x^7x^{10}}$
 $\frac{7y^5}{x^2}$
 $\frac{21}{3} y^{2+3} x^{15-17}$
 $\frac{7}{3} y^5 \cdot x^{-2}$

9. Rewrite and simplify: $256^{\frac{3}{4}}$
 watch for the need of double negative
 Denom. is index
 Numerator is exponent outside
 $(\sqrt[4]{256})^3$
 $(4)^3$
 64 or $4 \cdot 4 \cdot 4$

10. Simplify: $\sqrt[3]{343x^{15}y^8}$

Cube root \rightarrow need groups of 3
 $\sqrt[3]{7 \cdot 7 \cdot 7 \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot y \cdot y \cdot y \cdot y \cdot y \cdot y}$
 $7x^5 y^2 \sqrt[3]{y^2}$
 No absolute value bars for odd root

11. $\sqrt[3]{x} + 3 = 15$
 must get variable w/ radical or exponent alone!
 $\sqrt[3]{x} = 12$
 $(\sqrt[3]{x})^3 = (12)^3$
 $x = 1728$

12. $6x^4 = 486$
 $\sqrt[4]{6x^4} = \sqrt[4]{486}$
 $x = +3$ and 2 imaginary
 When you take even root to solve an equation, need 2 answers + and -

Level 3:

(Product) exponent Distribute & multiply exponents

$3^3 = 3 \cdot 3 \cdot 3 = 27 \text{ not } 9$

13. Simplify:

(Product) fewer multiply exponents distribute

$$\frac{(-2m^5p^{17})^3 \cdot m}{(-5p^{-3}m^{10})^2 \cdot z^3}$$

$$\frac{(-2)^3 m^{15} p^{51} \cdot m^1}{(-5)^2 p^{-6} m^{20} \cdot z^3}$$

$$\frac{(-2)^3 = -2 \cdot -2 \cdot -2 = -8}{(-5)^2 = -5 \cdot -5 = 25}$$

$$\frac{m^{18+1-20} p^{51-6} z^{1-6}}{25m}$$

14. Simplify: $\left(\frac{3x^{-7}y^2x^{15}}{15x^{10}y^{-3}}\right)^2$

Simplify inside () first
 Divide (reduce) fraction

$$\left(\frac{3}{15} x^{-7+15} y^{2-(-3)}\right)^2$$

$$\left(\frac{1}{5} x^{-2} y^5\right)^2$$

$$\frac{1^2 \cdot x^{-4} y^{10}}{25 x^4 \cdot 25 y^4}$$

15. Rewrite and simplify:

both
 $-81^{\frac{3}{4}}$ and $81^{-\frac{3}{4}}$ and $-81^{-\frac{3}{4}}$
 neg not in ()
 $-(4\sqrt[4]{81})^3$
 $-(3)^3$
 -27
 neg exponent \rightarrow fraction
 $\frac{1}{81^{\frac{3}{4}}}$
 $\frac{1}{(4\sqrt[4]{81})^3}$
 $\frac{1}{(3)^3} \rightarrow \frac{1}{27}$

16. Simplify: $\sqrt[3]{432f^3w^{14}x^{15}}$

Cube root \rightarrow groups of 3
 look for exponents divisible by 3

$$\sqrt[3]{2 \cdot 6 \cdot 6 \cdot 6 \cdot f^3 \cdot w^{12} \cdot w^2 \cdot x^{15}}$$

$$6 \cdot f^1 \cdot w^4 \cdot x^5 \cdot \sqrt[3]{2 \cdot w^2}$$

17. $4\sqrt[3]{x-8} = 44$

undo last undo 2nd undo 1st

$$\sqrt[3]{x-8} = \frac{44}{4} = 11$$

$$(x-8)^3 = 11^3$$

$$x-8 = 1331$$

$$x = 1339$$

18. $-2(3x)^2 - 5 = -77$

undo 1st undo 2nd undo 3rd undo 4th

$$-2(3x)^2 - 5 = -77$$

$$-2(3x)^2 = -72$$

$$\sqrt{(3x)^2} = \sqrt{36}$$

$$3x = 6 \text{ or } 3x = -6$$

$$x = 2 \text{ or } x = -2$$

Level 4:

19. Simplify:

Neg exponent Flip Fraction

$$\left(\frac{9}{5}\right)^{-2} \cdot 12 \cdot 30 \cdot 6^3 \cdot x^3 \cdot y^3$$

$$\frac{5^2 \cdot 6^3}{9^2} \cdot x^3 \cdot y^3$$

$$\frac{5 \cdot 400}{81} x^3 y^3$$

$$\frac{2000}{81} x^3 y^3$$

20. $\left(\frac{98x^{-8}y^{14}x^5}{2x^9y^{-4}}\right)^{\frac{1}{2}}$

Simplify inside 1st

$$\left(\frac{98}{2} x^{-8+5-9} y^{14-(-4)}\right)^{\frac{1}{2}}$$

$$(49 x^{-12} y^{18})^{\frac{1}{2}}$$

$$7 x^{-6} y^9$$

$$\frac{7y^9}{x^6}$$

21. Rewrite and simplify: $4ba^{\frac{2}{3}}(ab^{\frac{5}{6}})^{\frac{6}{5}}$

get denominator same to add Fraction exponents

$$4ba^{\frac{2}{3}} \cdot a^{\frac{5}{6}} \cdot b^{\frac{5}{6}}$$

$$4ba^{\frac{2}{3} + \frac{5}{6}} \cdot b^{\frac{5}{6}}$$

$$4b^{\frac{2}{3} + \frac{1}{2}} \cdot a^{\frac{4}{6} + \frac{5}{6}}$$

$$4b^{\frac{3}{2}} \cdot a^{\frac{9}{6}} \rightarrow 4b^{\frac{3}{2}} a^{\frac{3}{2}}$$

22. Simplify: $\sqrt[3]{375f^5x} \cdot \sqrt{f^{14}x^{13}}$

Turn into Fraction exponents

$$3^{\frac{1}{3}} \cdot 5^{\frac{5}{3}} \cdot f^{\frac{5}{3}} \cdot x^{\frac{1}{3}} \cdot f^{\frac{14}{2}} \cdot x^{\frac{13}{2}}$$

Simplify and add like base exponents

$$5 \cdot f^{1+7} \cdot x^6 \cdot 3^{\frac{1}{3}} \cdot x^{\frac{1}{3} + \frac{1}{2}} \cdot f^{\frac{21}{2}}$$

get a common denominator so they can go under same root

$$5 \cdot f^8 \cdot x^6 \cdot 3^{\frac{1}{3}} \cdot x^{\frac{2}{6}} \cdot f^{\frac{21}{2}}$$

$$5 \cdot f^8 \cdot x^6 \cdot \sqrt[6]{3^2 \cdot x^5 \cdot f^4}$$

23. $(2x+6)^{\frac{1}{4}} + 4 = 0$

undo 1st undo 2nd undo 3rd undo 4th

$$(2x+6)^{\frac{1}{4}} + 4 = 0$$

$$(2x+6)^{\frac{1}{4}} = -4$$

$$2x+6 = 256$$

$$2x = 250$$

$$x = 125$$

No Solution
 extraneous
 doesn't work when plugged in

24. What is your interest rate if your bank account earned \$1000 after 15 years when you put in \$200? Use: $1000 = 200(1+r)^{15}$

undo 1st undo 2nd undo 3rd

$$\frac{1000}{200} = \frac{200(1+r)^{15}}{200}$$

$$5^{\frac{1}{15}} = \sqrt[15]{5} = \sqrt[15]{(1+r)^{15}}$$

$$1.113 = 1+r$$

$$0.113 = r \rightarrow \text{rate: } 11.3\%$$

Turn into % move decimal 2x

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