Warm-up - Simplify

① $\dfrac{5x^{2}y^{1}}{15x^{3}y^{-1}}$

$\frac{5}{15} \div 5 \div 5$

$\frac{1}{3}$

$\dfrac{1y^{2}}{3x}$

② $\dfrac{32x^{3}y^{4}}{24x^{-3}y^{-2}}$ $\div 8$ $\div 8$

$\dfrac{4y^{6}}{3}$

③ $(2^{1}x^{5}y^{-3})^{-3}$

$2^{-3}x^{-15}y^{9}$

$\dfrac{y^{9}}{2^{3}x^{15}}$

6.1 Rational Exponents

Rational Number - Any # $\frac{a}{b}$, $b \neq 0$

Ex. $8 = \frac{8}{1}$

$\frac{5}{1}\left(\frac{1}{7}\right) = \frac{5 \cdot 1}{1 \cdot 7} = \frac{5}{7}$

Rational Exponents - Fractions in exponents

$a^3 = a \cdot a \cdot a$

$a^{\frac{3}{2}} = ?$

$a^{\frac{m}{n}} = \left(\sqrt[n]{a}\right)^m$

The 'm'

Called the power, exponent

$(2^3)^4 = 2^{3 \cdot 4} = 2^{12}$

The 'n'

Called the root, radical, index

$\sqrt{9} = 3$ $\quad \sqrt[2]{9^1} = 9^{\frac{1}{2}}$ exp / index

$\sqrt[3]{8} = 2$ $\quad \sqrt[3]{8^1} = 2^{\frac{1}{3}}$ exp / index

* Roots & exponents are inverses like add/sub & mult/div

① $16^{\frac{3}{4}}$

$\left(\sqrt[2]{16}\right)^3$

$\downarrow$

$(4)^3$

$4 \cdot 4 \cdot 4$

$16 \cdot 4$

64

$10 \cdot 4$

$6 \cdot 4$

40 or 24

② $4^{\frac{7}{2}}$

$\left(\sqrt[2]{4}\right)^7$

$\downarrow$

$(2)^7$

$2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$

$8 \cdot 8 \cdot 64 \cdot 2$

128

③ $8^{\frac{2}{3}}$

$\left(\sqrt[3]{8}\right)^2$

$(2)^2$

4

$\sqrt[3]{x}$	x
1	1
8	2
27	3
64	4
125	5
216	6
343	7
512	8
729	9

$\sqrt[4]{x}$	x
1	1
16	2
81	3
256	4

$a^{-3} = \frac{1}{a^3}$

Homework

(5) $4^{\frac{5}{2}}$

$(\sqrt{4})^5 = 2^5 = 32$

(6) $9^{-\frac{1}{2}}$

$= \frac{1}{9^{\frac{1}{2}}} = \frac{1}{\sqrt{9}} = \frac{1}{3}$

(7) $81^{\frac{3}{4}}$

$(\sqrt[4]{81})^3 = 3^3 = 27$

(8) $1^{\frac{7}{8}}$

$(\sqrt[8]{1})^7 = 1$

(10) $64^{-\frac{2}{3}}$

$= \frac{1}{64^{\frac{2}{3}}} = \frac{1}{(\sqrt[3]{64})^2}$

$64^{\frac{1}{2}} = 4$

$= \frac{1}{16}$

(11) $\left(\sqrt[4]{16}\right)^5$

$= 2^5$

$= 32$