

2. Evaluate each power without a calculator. (6 marks)

a. 5^{-2}
 $= \frac{1}{5^2} = \frac{1}{25}$

b. 3^{-4}
 $= \frac{1}{3^4} = \frac{1}{81}$

c. $(-2)^{-2}$
 $= \frac{1}{(-2)^2} = \frac{1}{4}$

d. -2^{-2}
 $= -\frac{1}{2^2} = -\frac{1}{4}$

e. $\left(\frac{4}{5}\right)^{-2}$
 $= \left(\frac{4^{-2}}{5^{-2}}\right) = \frac{5^2}{4^2}$
or
 $\left(\frac{5}{4}\right)^2$

f. $\left(-\frac{1}{3}\right)^{-3} = \left(-\frac{3}{1}\right)^3$
 $= -\frac{27}{1}$
 $= -27$

3. Simplify. Express all answers with only positive exponents. (4 marks)

<p>a. $\left(\frac{x}{y}\right)^3 = \frac{x^3}{y^3}$</p>	<p>b. $\left(\frac{a^2}{b^4}\right)^{-3} = \frac{a^{-6}}{b^{-12}} = \frac{b^{12}}{a^6}$</p>
<p>c. $(xy)^7 = x^7 y^7$</p>	<p>d. $(a^3 b^4)^{-2} = a^{-6} b^{-8} = \frac{1}{a^6 b^8}$</p>

4. Simplify. Express all answers with only positive exponents. (4 marks)

<p>a. $a^{-2} b^5 = \frac{b^5}{a^2}$</p>	<p>b. $x^4 \cdot x^{-3} \cdot x^5 = x^{4+(-3)+5} = x^6$</p>
<p>c. $\frac{x^{-2}}{x^{-4}} = \frac{x^4}{x^2} = x^{4-2} = \boxed{x^2}$</p>	<p>d. $\frac{y^{-5}}{y^2} = y^{-5-2} = y^{-7} \text{ OR } \frac{1}{y^5 y^2} = \boxed{\frac{1}{y^7}}$</p>

5. Write as a single power with positive exponents. (2 marks)

a. $\left[\left(\frac{2}{7}\right)^3\right]^2$

$$\left(\frac{2}{7}\right)^6$$

b. $\left[\left(\frac{3}{5}\right)^{-2}\right]^2 = \left(\frac{3}{5}\right)^{-4}$

$$= \left(\frac{5}{3}\right)^4$$

Section Assignment 2.2 Part 3
Rational Exponents

1. Evaluate without using a calculator. (3 marks)

a. $27^{\frac{3}{3}} = 27^1$
 $= 27$

b. $27^{\frac{4}{3}}$
 $= (27^{\frac{1}{3}})^4$
 $= (\sqrt[3]{27})^4 = 3^4$

c. $27^{\frac{5}{3}}$
 $= (27^{\frac{1}{3}})^5$
 $= (\sqrt[3]{27})^5 = 3^5$

2. Write each radical as a power. (3 marks)

a. $\sqrt{6^3}$

$$= (6^3)^{1/2} = 6^{3/2}$$

b. $(\sqrt[4]{-2})^5$

$$= (-2^{1/4})^5$$
$$= (-2)^{5/4}$$

c. $\sqrt[3]{\left(\frac{4}{5}\right)^4}$

$$= \left[\left(\frac{4}{5}\right)^4\right]^{1/3}$$

$$= \left(\frac{4}{5}\right)^{4/3}$$

d. $\left(\sqrt{\frac{5}{8}}\right)^2$

$$= \left[\left(\frac{5}{8}\right)^{1/2}\right]^2$$

$$= \left(\frac{5}{8}\right)^{2/2} = \frac{5}{8}$$

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

$$= \left[\left(\frac{3}{4}\right)^4\right]^{1/3}$$

$$= \left(\frac{3}{4}\right)^{4/3}$$

f. $\sqrt[5]{(-4)^3}$

$$= \left[(-4)^3\right]^{1/5}$$

$$= (-4)^{3/5}$$

3. Arrange in order from least to greatest. (4 marks)

$$\left(\frac{1}{3}\right)^{\frac{5}{2}}, 3^2, 3^{\frac{5}{2}}, \sqrt[3]{3}$$

$$\sqrt[3]{3} = 3^{1/3}$$

$$\left(\frac{1}{3}\right)^{5/2} = \left(\frac{3}{1}\right)^{-5/2} = 3^{-5/2}$$

Order of smallest exponent to biggest

$$3^{-5/2}, 3^{1/3}, 3^2, 3^{5/2}$$

4. Simplify. Write your answers with positive exponents. (4 marks)

a. $x^{\frac{3}{2}} \cdot x^{\frac{5}{2}}$

$$= x^{\frac{3}{2} + \frac{5}{2}}$$

$$= x^{8/2}$$

$$= x^4$$

b. $x^{\frac{5}{2}} \div x^{\frac{1}{2}}$

$$= x^{\frac{5}{2} - \frac{1}{2}}$$

$$= x^{4/2}$$

$$= x^2$$

c. $\frac{-12x^{-3}y^{\frac{3}{2}}}{4x^2y^{\frac{1}{4}}}$

$$= \frac{-12}{4} \cdot \frac{x^{-3}y^{3/2}}{x^2y^{-1/4}}$$

$$= \frac{-12}{4} \cdot \frac{y^{3/2}y^{1/4}}{x^3x^2}$$

$$= -3 \frac{y^{3/2+1/4}}{x^{3+2}}$$

$$= \boxed{\frac{-3y^{7/4}}{x^5}}$$

$$\begin{aligned} &\left(\begin{array}{l} \times 2 \\ \rightarrow \end{array} \right) \frac{3}{2} + \frac{1}{4} \\ &\frac{6}{4} + \frac{1}{4} = \frac{7}{4} \end{aligned}$$

d. $\left(\frac{-27x^9}{y^{12}z^{\frac{1}{3}}}\right)^{\frac{1}{3}}$

$$= \frac{-27^{1/3} x^{9 \cdot 1/3}}{y^{12 \cdot 1/3} z^{-1/3 \cdot 1/3}}$$

$$= \frac{-3x^3}{y^{12/3} z^{-1/9}}$$

$$= \frac{-3x^3}{y^4 z^{-1/9}}$$

$$= \boxed{\frac{-3x^3 z^{1/9}}{y^4}}$$

5. Simplify. Write your answers with positive exponents. (6 marks; 2 marks each)

a. $\frac{3m^2n^3z}{6m^{-1}n^2z^2} \left(\frac{m^3n}{2z} \right)^0$

$\begin{matrix} 3 \cdot 0 & 0 \\ m & n \\ \hline 2^0 & 2^0 \\ \hline = \frac{1 \cdot 1}{1 \cdot 1} = 1 \end{matrix}$

b. $\left(\frac{2x^2}{7} \right)^2 \cdot \left(\frac{y}{2b^3} \right)^3$

$\left(\frac{2^2x^4}{7^2} \right) \cdot \left(\frac{y^3}{2^3b^9} \right)$

c. $\left(\frac{x^{-7}y^7}{x^{-9}y^{10}} \right)^{-3}$

$\frac{x^{21}y^{-21}}{x^{27}y^{-30}} = x^{21-27} \cdot y^{-21-(-30)} = x^{-6}y^9 = \frac{y^9}{x^6}$

$$\frac{3m^2n^3z}{6m^{-1}n^2z^2} \cdot 1 = \frac{3m^2m^1n^3}{6n^2z^2}$$

$$= \frac{3m^3n^{3-2}z^{1-2}}{6} = \frac{1}{2} m^3 n^1 z^{-1}$$

$$= \boxed{\frac{m^3n}{2z}}$$

$$= \frac{2^2 x^4 y^3}{7^2 \cdot 2^3 b^9}$$

$$= \frac{4x^4y^3}{49 \cdot 4b^9} = \frac{4}{96} \frac{x^4y^3}{b^9} = \boxed{\frac{x^4y^3}{49b^9}}$$

$$= x^{-6}y^9 = \boxed{\frac{y^9}{x^6}}$$