

Indices Revision Worksheet

1) Evaluate each of the following without the use of a calculator.

a) $\sqrt{196}$

b) $\sqrt[3]{125}$

c) $\sqrt[5]{\frac{1}{32}}$

d) $\sqrt[4]{\left(\frac{16}{81}\right)}$

2) Rewrite each of the following in the radical form and hence evaluate the result without the use of a calculator.

a) $81^{\frac{1}{2}}$

b) $(-27)^{\frac{1}{3}}$

c) $16^{-\frac{1}{4}}$

d) $4^{1.5}$

e) $8^{-\frac{5}{3}}$

f) $(-1000)^{\frac{2}{3}}$

3) Simplify each of the following, expressing your answer in index form.

a) $\sqrt[4]{a}$

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

c) $(\sqrt[5]{c})^4$

d) $\frac{1}{\sqrt[6]{a}}$

e) $\frac{1}{\sqrt[8]{e^4}}$

f) $\frac{1}{(\sqrt[3]{f})^5}$

4) Simplify each of the following, expressing your answers in positive index form.

a) $5a^4 \times 3a^2 \div a^{-3}$

b) $-24b^{-6} \div (3b^{-3})^2$

c) $(3c)^0 \div (c^{-3}d^5)^{-2}$

d) $\frac{(4e^{-6}f^3)^2}{8e^{12}f^6}$

e) $(3g^{-3}h^{-1})^2 \times (-4g^3h^{-2})^2$

f) $(j^2k^{-1})^{-3} \times \left(\frac{j^2}{k^3}\right)^{-3}$

g) $\frac{(m^5n^3) \times (m^2)^{-2}}{(m^{-1}n)^2}$

h) $(5p)^3 - 10p \times 7p^2 + \frac{6}{p^{-3}}$

5) Simplify each of the following, expressing your answer in positive index form.

a) $\sqrt{a} \times \sqrt[3]{a}$

b) $\sqrt[3]{b^2} \div \sqrt[6]{b}$

c) $c^{\frac{5}{4}} \times c^{\frac{1}{2}} \div c^{-\frac{2}{5}}$

d) $d^{\frac{1}{10}} \div d^{-\frac{1}{5}} \times d^{-\frac{3}{2}}$

e) $(e^{-3}f^4)^{-\frac{1}{2}}$

f) $\left(g^{\frac{2}{3}}h^{-\frac{4}{5}}\right)^{\frac{3}{2}}$

6) Simplify each of the following, expressing your answer in positive index form.

a) $(a^{-2}b^3)^{\frac{1}{3}} \times (a^4b^{-5})^{\frac{1}{2}}$

b) $(c^{-3}d^{\frac{3}{5}})^{-2} \times (c^{\frac{4}{5}}d^{\frac{2}{5}})^5$

c) $\frac{\left(e^{\frac{1}{3}}f^{-\frac{1}{4}}\right)}{\left(e^2f^{-\frac{1}{3}}\right)^{-2}}$

d) $\left(\frac{g^{(-2)}h^2}{25}\right)^{-\frac{1}{2}}$

e) $(4j^4k)^{\frac{1}{2}} \div 2h^3k^{-\frac{1}{2}}$

f) $\left(m^3n^{-\frac{1}{4}}\right)^4 \div \sqrt[5]{32m^4n^{-8}}$

7) Simplify each of the following, expressing your answers in positive index form.

$$a) \left(\frac{x^{-4}y^7z^{-6}}{x^3y^9-1z^3} \right)^3 \times \left(\frac{x^5y^2z^{-6}}{x^{-3}y^{-5}z^4} \right)^{-4}$$

$$b) \left(\frac{x^3y^{-4}z^7}{x^{-5}y^2} \right)^3 \div \left(\frac{x^{-4}yz^{-5}}{x^7y^{-3}} \right)^{-2}$$

$$c) \frac{ab^n}{bc} \times \frac{c^nd}{cd} \div \frac{b^{n+2}}{c^{n+3}}$$

$$d) \frac{(a+b)^n}{bc^2} \div \frac{(a+b)^{n+3}}{abc}$$

Answer Key

1.

a) 14

b) 5

c) $\frac{1}{2}$

d) $\frac{2}{3}$

2.

a) $\sqrt{81}, 9$

b) $\sqrt[3]{-27}, -3$

c) $\frac{1}{\sqrt[4]{16}}, \frac{1}{2}$

d) $(\sqrt{4})^3, 8$

e) $\frac{1}{(\sqrt[3]{8})^5}, \frac{1}{32}$

f) $(\sqrt[3]{-1000})^2, 100$

3.

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

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

c) $c^{\frac{4}{5}}$

d) $d^{-\frac{1}{6}}$

e) $e^{-\frac{1}{2}}$

f) $f^{-\frac{5}{3}}$

4.

a) $15a^9$

b) $-2\frac{2}{3}$

c) $\frac{d^{10}}{c^6}$

d) $\frac{2}{e^{24}}$

e) $\frac{144}{h^6}$

f) $\frac{k^{12}}{j^{12}}$

g) m^3n

h) $61p^3$

5.

a) $a^{\frac{5}{6}}$

b) $b^{\frac{1}{2}}$

c) $c^{\frac{17}{10}}$

d) $\frac{1}{\frac{6}{d^5}}$

e) $\frac{\frac{3}{e^2}}{f^2}$

f) $\frac{\frac{g}{6}}{h^5}$

6.

a) $\frac{a^{\frac{4}{3}}}{b^{\frac{2}{3}}}$

b) $\frac{c^{10}}{d^{\frac{16}{5}}}$

c) $\frac{e^{\frac{11}{3}}}{f^{\frac{11}{12}}}$

d) $\frac{5g}{h}$

e) $\frac{j^2k}{h^3}$

f) $\frac{m^{\frac{56}{5}} n^{\frac{3}{5}}}{2}$

7.

a) $\frac{z^{13}}{x^{53}y^4}$

b) $\frac{x^2z^{11}}{y^{10}}$

c) $\frac{ac^{2n+1}}{b^3}$

d) $\frac{a}{c(a+b)^3}$