# M10C - Exp + Rad. Ls4 Worksheet

1. a) $16^{\frac{1}{2}} = \sqrt{16} = \boxed{4}$

b) $100^{\frac{1}{2}} = \sqrt{100} = \boxed{10}$

c) $8^{\frac{1}{3}} = \sqrt[3]{8} = \boxed{2}$

d) $64^{\frac{1}{3}} = \sqrt[3]{64} = \boxed{4}$

e) $(-8)^{\frac{1}{3}} = \sqrt[3]{-8} = \boxed{-2}$

f) $\left(\frac{1}{4}\right)^{\frac{1}{2}} = \sqrt{\frac{1}{4}} = \boxed{\frac{1}{2}}$

g) $\left(\frac{49}{144}\right)^{\frac{1}{2}} = \sqrt{\frac{49}{144}} = \boxed{\frac{7}{12}}$

h) $\left(\frac{8}{27}\right)^{\frac{1}{3}} = \sqrt[3]{\frac{8}{27}} = \boxed{\frac{2}{3}}$

2. a) $50^{\frac{1}{2}} = \sqrt{50} = \sqrt{25}\cdot\sqrt{2} = \boxed{5\sqrt{2}}$

b) $48^{\frac{1}{2}} = \sqrt{48} = \sqrt{16}\cdot\sqrt{3} = \boxed{4\sqrt{3}}$

c) $500^{\frac{1}{2}} = \sqrt{500} = \sqrt{100}\cdot\sqrt{5} = \boxed{10\sqrt{5}}$

d) $16^{\frac{1}{3}} = \sqrt[3]{16} = \sqrt[3]{8}\cdot\sqrt[3]{2} = \boxed{2\sqrt[3]{2}}$

e) $81^{\frac{1}{3}} = \sqrt[3]{81} = \sqrt[3]{27}\cdot\sqrt[3]{3} = \boxed{3\sqrt[3]{3}}$

f) $(-40)^{\frac{1}{3}} = \sqrt[3]{-40} = \sqrt[3]{-8}\cdot\sqrt[3]{5} = \boxed{-2\sqrt[3]{5}}$

3. a) $9^{\frac{3}{2}} = \left(\sqrt{9}\right)^3 = 3^3 = \boxed{27}$

b) $64^{\frac{2}{3}} = \left(\sqrt[3]{64}\right)^2 = 4^2 = \boxed{16}$

c) $(-27)^{\frac{4}{3}} = \left(\sqrt[3]{-27}\right)^4 = (-3)^4 = \boxed{81}$

d) $\left(\frac{27}{8}\right)^{\frac{2}{3}} = \left(\sqrt[3]{\frac{27}{8}}\right)^2 = \left(\frac{3}{2}\right)^2 = \boxed{\frac{9}{4}}$

e) $\left(\frac{-27}{64}\right)^{\frac{2}{3}} = \left(\sqrt[3]{\frac{-27}{64}}\right)^2 = \left(\frac{-3}{4}\right)^2 = \boxed{\frac{9}{16}}$

f) $\left(\frac{4}{25}\right)^{\frac{3}{2}} = \left(\sqrt{\frac{4}{25}}\right)^3 = \left(\frac{2}{5}\right)^3 = \boxed{\frac{8}{125}}$

4. a) $3^{\frac{1}{2}} \cdot 3^{\frac{3}{2}} = 3^{\frac{1}{2}+\frac{3}{2}}$
$= 3^{\frac{4}{2}}$
$= 3^2$
$= \boxed{9}$

b) $\sqrt[3]{7} \cdot 7^{\frac{2}{3}} = 7^{\frac{1}{3}} \cdot 7^{\frac{2}{3}}$
$= 7^{\frac{3}{3}}$
$= 7^1$
$= \boxed{7}$

c) $\frac{8^{\frac{5}{2}}}{8^{\frac{1}{2}}} = 8^{\frac{5}{2}-\frac{1}{2}}$
$= 8^{\frac{4}{2}}$
$= 8^2$
$= \boxed{64}$

d) $\frac{4^{\frac{5}{6}}}{4^{\frac{1}{3}}} = 4^{\frac{5}{6}-\frac{1}{3}}$
$= 4^{\frac{5}{6}-\frac{2}{6}}$
$= 4^{\frac{3}{6}}$
$= 4^{\frac{1}{2}}$
$= \sqrt{4}$
$= \boxed{2}$

e) $\left(5^{\frac{2}{3}}\right)^3 = 5^2$
$= \boxed{25}$

f) $\left(3^{\frac{3}{4}}\right)^{\frac{4}{3}} = 3^1$
$= \boxed{3}$

g) $(2^6 \cdot 3^2)^{\frac{1}{2}} = 2^3 \cdot 3^1$
$= 8 \cdot 3$
$= \boxed{24}$

h) $(\sqrt{3} \cdot \sqrt[3]{2})^6 = (3^{\frac{1}{2}} \cdot 2^{\frac{1}{3}})^6$
$= 3^3 \cdot 2^2$
$= 27 \cdot 4$
$= \boxed{108}$

i) $\left(\frac{6^4}{2^2}\right)^{\frac{1}{2}} = \frac{6^2}{2}$
$= \frac{36}{2}$
$= \boxed{18}$

j) $\left(\frac{3^{\frac{1}{2}}}{\sqrt[4]{5}}\right)^8 = \left(\frac{3^{\frac{1}{2}}}{5^{\frac{1}{4}}}\right)^8$
$= \frac{3^4}{5^2}$
$= \boxed{\frac{81}{25}}$

k) $\left(5^{\frac{1}{6}} \cdot 5^{\frac{5}{6}}\right)^6 = 5 \cdot 5^2$
$= 5^3$
$= \boxed{125}$

l) $\sqrt{\frac{2^5 \cdot 3^3}{2^3 \cdot 3}} = (2^2 \cdot 3^2)^{\frac{1}{2}}$
$= 2 \cdot 3$
$= \boxed{6}$

5. a) $3^{-2} = \frac{1}{3^2}$
$= \boxed{\frac{1}{9}}$

b) $2^{-4} = \frac{1}{2^4}$
$= \boxed{\frac{1}{16}}$

c) $6 \cdot 3^{-2} = 6 \cdot \frac{1}{3^2}$
$= 6 \cdot \frac{1}{9}$
$= \frac{6}{9}$
$= \boxed{\frac{2}{3}}$

d) $(-7)^{-2} = \frac{1}{(-7)^2} = \boxed{\frac{1}{49}}$

e) $\frac{1}{2^{-3}} = 2^3 = \boxed{8}$

f) $\frac{1}{4^{-2}} = 4^2 = \boxed{16}$

g) $\frac{3}{4^{-2}} = 3 \cdot 4^2 = 3 \cdot 16 = \boxed{48}$

h) $\frac{3^{-2}}{2^{-3}} = \frac{2^3}{3^2} = \boxed{\frac{8}{9}}$

i) $\left(\frac{1}{2}\right)^{-2} = 2^2 = \boxed{4}$

j) $\left(\frac{2}{3}\right)^{-3} = \left(\frac{-3}{2}\right)^3 = \boxed{\frac{-27}{8}}$

6. a) $8^5 \cdot 8^{-3} = 8^2 = \boxed{64}$

b) $5^{-2} \cdot 5^{-1} = 5^{-3} = \frac{1}{5^3} = \boxed{\frac{1}{125}}$

c) $2^{-3} \cdot 3^2 = \frac{1}{2^3} \cdot 9 = \boxed{\frac{9}{8}}$

d) $\frac{7^2}{7^{-1}} = 7^2 \cdot 7^1 = 7^3 = \boxed{343}$

e) $\frac{3^{-5}}{3^{-2}} = 3^{-3} = \frac{1}{3^3} = \boxed{\frac{1}{27}}$

f) $(2^{-2})^2 = 2^{-4} = \frac{1}{2^4} = \boxed{\frac{1}{16}}$

g) $(3^2)^{-1} = 3^{-2} = \frac{1}{3^2} = \boxed{\frac{1}{9}}$

h) $(2^{-3} \cdot 5)^{-2} = 2^6 \cdot 5^{-2} = 2^6 \cdot \frac{1}{5^2} = \boxed{\frac{64}{25}}$

i) $\left(\frac{1}{5^{-2}}\right)^{-1} = (5^2)^{-1} = 5^{-2} = \frac{1}{5^2} = \boxed{\frac{1}{25}}$

j) $\left(\frac{4^{-1}}{3^{-2}}\right)^{-2} = \frac{4^2}{3^4} = \boxed{\frac{16}{81}}$

k) $\left(\frac{6^2 \cdot 6^{-5}}{6^{-4}}\right)^{-2} = \left(\frac{6^{-3}}{6^{-4}}\right)^{-2} = (6)^{-2} = \frac{1}{6^2} = \boxed{\frac{1}{36}}$

l) $\left(\frac{3^{-2} \cdot 4^{-3}}{3 \cdot 4^{-4}}\right)^{-1} = (3^{-3} \cdot 4)^{-1} = 3^3 \cdot 4^{-1} = \boxed{\frac{27}{4}}$

7. a) $16^{-\frac{1}{2}} = \frac{1}{16^{\frac{1}{2}}} = \frac{1}{\sqrt{16}} = \boxed{\frac{1}{4}}$

b) $49^{-\frac{1}{2}} = \frac{1}{49^{\frac{1}{2}}} = \frac{1}{\sqrt{49}} = \boxed{\frac{1}{7}}$

c) $(-8)^{-\frac{1}{3}} = \frac{1}{(-8)^{\frac{1}{3}}} = \frac{1}{\sqrt[3]{-8}} = \boxed{-\frac{1}{2}}$

d) $125^{-\frac{1}{3}} = \frac{1}{125^{\frac{1}{3}}} = \frac{1}{\sqrt[3]{125}} = \boxed{\frac{1}{5}}$

e) $\frac{1}{9^{-\frac{1}{2}}} = 9^{\frac{1}{2}} = \sqrt{9} = \boxed{3}$

f) $\frac{5}{64^{-\frac{1}{3}}} = 5 \cdot 64^{\frac{1}{3}} = 5\sqrt[3]{64} = 5 \cdot 4 = \boxed{20}$

g) $\left(\frac{1}{81}\right)^{-\frac{1}{2}} = 81^{\frac{1}{2}} = \sqrt{81} = \boxed{9}$

h) $\left(\frac{25}{144}\right)^{-\frac{1}{2}} = \left(\frac{144}{25}\right)^{\frac{1}{2}} = \sqrt{\frac{144}{25}} = \boxed{\frac{12}{5}}$

i) $\left(\frac{343}{216}\right)^{-\frac{1}{3}} = \left(\frac{216}{343}\right)^{\frac{1}{3}} = \sqrt[3]{\frac{216}{343}} = \boxed{\frac{6}{7}}$

j) $\frac{36^{-\frac{1}{2}}}{27^{-\frac{1}{3}}} = \frac{27^{\frac{1}{3}}}{36^{\frac{1}{2}}} = \frac{\sqrt[3]{27}}{\sqrt{36}} = \frac{3}{6} = \boxed{\frac{1}{2}}$

8. a) $9^{-\frac{3}{2}} = \frac{1}{9^{\frac{3}{2}}} = \frac{1}{\left(\sqrt{9}\right)^3} = \frac{1}{3^3} = \boxed{\frac{1}{27}}$

b) $27^{-\frac{4}{3}} = \frac{1}{27^{\frac{4}{3}}} = \frac{1}{\left(\sqrt[3]{27}\right)^4} = \frac{1}{3^4} = \boxed{\frac{1}{81}}$

c) $\frac{1}{4^{-\frac{5}{2}}} = 4^{\frac{5}{2}} = \left(\sqrt{4}\right)^5 = 2^5 = \boxed{32}$

d) $\frac{-2}{216^{-\frac{2}{3}}} = -2 \cdot 216^{\frac{2}{3}}$
$= -2\left(\sqrt[3]{216}\right)^2$
$= -2(6)^2$
$= -2(36)$
$= \boxed{-72}$

e) $\left(\frac{-8}{27}\right)^{-\frac{2}{3}} = \left(\frac{-27}{8}\right)^{\frac{2}{3}}$
$= \left(\sqrt[3]{\frac{-27}{8}}\right)^2$
$= \left(\frac{-3}{2}\right)^2$
$= \boxed{\frac{9}{4}}$

f) $\left(\frac{81}{16}\right)^{-\frac{3}{4}} = \left(\frac{16}{81}\right)^{\frac{3}{4}}$
$= \left(\sqrt[4]{\frac{16}{81}}\right)^3$
$= \left(\frac{2}{3}\right)^3$
$= \boxed{\frac{8}{27}}$

9. a) $4^2 \cdot 4^{-\frac{3}{2}} = 4^{2-\frac{3}{2}}$
$= 4^{\frac{4}{2}-\frac{3}{2}}$
$= 4^{\frac{1}{2}}$
$= \sqrt{4}$
$= \boxed{2}$

b) $9^{-\frac{1}{4}} \cdot 9^{-\frac{1}{4}} = 9^{-\frac{1}{4}-\frac{1}{4}}$
$= 9^{-\frac{2}{4}}$
$= 9^{-\frac{1}{2}}$
$= \frac{1}{\sqrt{9}}$
$= \boxed{\frac{1}{3}}$

c) $\frac{5^{-\frac{1}{2}}}{5^{\frac{1}{2}}} = 5^{-\frac{1}{2}-\frac{1}{2}}$
$= 5^{-1}$
$= \boxed{\frac{1}{5}}$

d) $\frac{16^{-1}}{16^{-\frac{5}{4}}} = 16^{-1+\frac{5}{4}}$
$= 16^{-\frac{4}{4}+\frac{5}{4}}$
$= 16^{\frac{1}{4}}$
$= \sqrt[4]{16}$
$= \boxed{2}$

e) $\left(6^{-\frac{2}{7}}\right)^7 = 6^{-2}$
$= \frac{1}{6^2}$
$= \boxed{\frac{1}{36}}$

f) $\left(2^{\frac{1}{2}} \cdot 3^{\frac{1}{4}}\right)^{-8} = 2^{-4} \cdot 3^{-2}$
$= \frac{1}{2^4} \cdot \frac{1}{3^2}$
$= \frac{1}{16} \cdot \frac{1}{9}$
$= \boxed{\frac{1}{144}}$

g) $\left(\frac{1}{144^{-\frac{1}{4}}}\right)^2 = \left(144^{\frac{1}{4}}\right)^2$
$= 144^{\frac{1}{2}}$
$= \sqrt{144}$
$= \boxed{12}$

h) $\left(\frac{4^{-6}}{3^{-9}}\right)^{\frac{1}{3}} = \frac{4^{-2}}{3^{-3}}$
$= \frac{3^3}{4^2}$
$= \boxed{\frac{27}{16}}$

i) $\left(\frac{5^6 \cdot 5^{-9}}{5^3}\right)^{\frac{1}{3}} = \left(\frac{5^{-3}}{5^3}\right)^{\frac{1}{3}}$
$= \left(5^{-6}\right)^{\frac{1}{3}}$
$= 5^{-2}$
$= \frac{1}{5^2}$
$= \boxed{\frac{1}{25}}$

j) $\left(\frac{6^{-1}\cdot 2^{\frac{1}{3}}}{6^{-\frac{1}{2}}\cdot 2^{-\frac{1}{2}}}\right)^{-6} = \frac{6^{6}\cdot 2^{-2}}{6^{3}\cdot 2^{3}}$

$= 6^{3}\cdot 2^{-5}$

$= 6^{3}\cdot\frac{1}{2^{5}}$

$= \frac{216}{32}$

$= \boxed{\frac{27}{4}}$

| | |
|---|---|
| 2 | 216 32 |
| 2 | 108 16 |
| 2 | 54 8 |
| | 27 4 |

k) $\frac{5^{-2}}{125^{\frac{1}{3}}} = \frac{5^{-2}}{\sqrt[3]{125}}$

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

$= 5^{-3}$

$= \frac{1}{5^{3}}$

$= \boxed{\frac{1}{125}}$

l) $\left(8^{\frac{2}{3}}\right)\left(16^{\frac{3}{2}}\right) = \left(\sqrt[3]{8}\right)^{2}\cdot\left(\sqrt{16}\right)^{3}$

$= 2^{2}\cdot 4^{3}$

$= 4\cdot 64$

$= \boxed{256}$

10. a) $4^{0} = \boxed{1}$ b) $\frac{1}{6^{0}} = \frac{1}{1}$

$= \boxed{1}$

c) $2\cdot 5^{0} = 2\cdot 1$

$= \boxed{2}$

d) $\left(\frac{35}{41}\right)^{0} = \boxed{1}$ e) $\left(\frac{4^{3}\cdot 4^{-\frac{3}{2}}}{5^{\frac{2}{3}}\cdot 7^{-5}}\right)^{0} = \boxed{1}$