19. $SA = 0.096m^{0.7}$ let $m = 40$

$= 0.096(40)^{0.7}$

17. $h = 35d^{2/3}$

$= 35(3.2)^{2/3}$

12. d) $0.36^{1.5} = \left(\frac{36}{100}\right)^{\frac{15}{10}} = \left(\frac{9}{25}\right)^{3/2} = \left(\sqrt[3]{\frac{9}{25}}\right)^{3}$

$= \left(\frac{3}{5}\right)^{3} = \frac{27}{125}$

4.5 Negative Exponents and Reciprocals

Recall again: $\dfrac{(x^a)}{(x^b)} = x^{a-b}$

$* \; 3^{-2} = 3^{0-2} = \dfrac{3^0}{3^2} = \dfrac{1}{3^2} = \dfrac{1}{9}$

N.B. answers are positive

$x^0 = 1$

$(\;\smiley\;)^0 = 1$

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

$3^{5-5} = 3^0$

Check: $2^{-2} = 0.25$ *also* $2^{-2} = \dfrac{1}{2^2} = \dfrac{1}{4}$

same

* If x is a non-zero number and n is a rational number then,

$$x^{-n} = \dfrac{1}{x^n}$$ and $$\dfrac{1}{x^{-n}} = x^n$$

always give answers with positive exponents

ex.

a) 5^{-2}

$= \dfrac{1}{5^2}$

$= \dfrac{1}{25}$

b) 1000^{-2}

$= \dfrac{1}{1000^2}$

$= \dfrac{1}{1\,000\,000}$

c) $\dfrac{1}{3^{-4}} = 3^4$

$= 81$

d) $4^{-1/2}$

$= \dfrac{1}{4^{1/2}}$

$= \dfrac{1}{\sqrt{4}} = \dfrac{1}{2}$

e) $(-27)^{-1/3}$

$= \dfrac{1}{(-27)^{1/3}}$

$= \dfrac{1}{\sqrt[3]{-27}} = \dfrac{1}{-3}$

f) $16^{-3/4} = \dfrac{1}{16^{3/4}}$

$= \dfrac{1}{\left(\sqrt[4]{16}\right)^3}$

$= \dfrac{1}{2^3} = \dfrac{1}{8}$

g) $27^{-2/3}$

$= \dfrac{1}{27^{2/3}}$

$= \dfrac{1}{\left(\sqrt[3]{27}\right)^2}$

$= \dfrac{1}{3^2} = \dfrac{1}{9}$

h) $\left(\dfrac{2}{5}\right)^{-3}$

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

$= \dfrac{1}{\frac{8}{125}} = 1 \div \dfrac{8}{125} = 1 \times \dfrac{125}{8} = \dfrac{125}{8}$

* A nice shortcut

$$\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^{n}$$

if $a \neq 0$
$b \neq 0$

ex. Simplify

a) $\left(\dfrac{25}{36}\right)^{-1/2}$

$= \left(\dfrac{36}{25}\right)^{1/2}$

$= \sqrt{\dfrac{36}{25}}$

$= \dfrac{6}{5}$

b) $(0.04)^{-3/2} = \left(\dfrac{4}{100}\right)^{-3/2}$

$= \left(\dfrac{100}{4}\right)^{3/2}$

$= (25)^{3/2}$

$= \left(\sqrt{25}\right)^{3}$

$= 5^{3} = 125$

$0.6 = \dfrac{6}{10} = \dfrac{3}{5}$

c) $32^{-0.6} = \dfrac{1}{32^{0.6}}$

$= \dfrac{1}{32^{3/5}}$

$= \dfrac{1}{\left(\sqrt[5]{32}\right)^{3}}$

$= \dfrac{1}{(2)^{3}} = \dfrac{1}{8}$

homefun: pg. 233 #(3-8)ace, 9, 10, 13, 14, 16, 18, 20

and review pg. 236 #1-8 I will not check