1. State the restrictions.

a. $\sqrt{3x+7}$

$3x+7 \geq 0$
$3x \geq -7$
$x \geq -\frac{7}{3}$

b. $2\sqrt{5x^{12}y^5}$

$x \in R$
$y \geq 0$

c. $\frac{5}{\sqrt{x-3}}$

$x-3 > 0$
$x > 0$

2. Write each as an entire radical:

a. $14\sqrt{7}$

$\sqrt{14 \cdot 14 \cdot 7}$
$= \sqrt{1372}$

b. $4\sqrt[3]{11}$

$\sqrt[3]{4 \cdot 4 \cdot 4 \cdot 11}$
$\sqrt[3]{704}$

c. $3\sqrt[4]{5}$

$\sqrt[4]{3 \cdot 3 \cdot 3 \cdot 3 \cdot 5}$
$\sqrt[4]{405}$

3. Arrange the numbers in increasing order.

$4,\ 4\sqrt{2},\ \sqrt{15},\ 2\sqrt{5}$, and $\sqrt{27}$

$4,\ \sqrt{32},\ \sqrt{15},\ \sqrt{20},\ \sqrt{27}$
$\downarrow \quad \downarrow \quad \downarrow \quad \downarrow \quad \downarrow$
$4 \quad 5.7 \quad 3.9 \quad 4.5 \quad 5.2$

least to greatest
$\sqrt{15},\ 4,\ 2\sqrt{5},\ \sqrt{27},\ 4\sqrt{2}$

4. Completely simplify each of the following.

a. $2\sqrt{54}-\sqrt{48}+6\sqrt{24}+2\sqrt{300}$

$2\sqrt{9 \cdot 6} - \sqrt{16 \cdot 3} + 6\sqrt{4 \cdot 6} + 2\sqrt{100 \cdot 3}$
$2(3\sqrt{6}) - 4\sqrt{3} + 6(2\sqrt{6}) + 2(10\sqrt{3})$
$6\sqrt{6} - 4\sqrt{3} + 12\sqrt{6} + 20\sqrt{3}$
$18\sqrt{6} + 16\sqrt{3}$

b. $(3\sqrt{6}-2)^2$

$(3\sqrt{6}-2)(3\sqrt{6}-2)$
$9\sqrt{36} - 6\sqrt{6} - 6\sqrt{6} + 4$
$9 \cdot 6 - 12\sqrt{6} + 4$
$54 - 12\sqrt{6} + 4$
$58 - 12\sqrt{6}$

c. $\frac{3\sqrt{5}}{2\sqrt{8}} \cdot \frac{\sqrt{8}}{\sqrt{8}}$

$\frac{3\sqrt{40}}{2 \cdot 8} = \frac{3\sqrt{4 \cdot 10}}{16}$
$= \frac{3 \cdot 2\sqrt{10}}{16} = \frac{6\sqrt{10}}{16}$
$= \frac{3\sqrt{10}}{8}$

d. $\frac{9\sqrt{7}}{\sqrt{35}} = \frac{9}{\sqrt{5}}$

$= \frac{9}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}}$
$= \frac{9\sqrt{5}}{5}$

e. $\left(\frac{5\sqrt{10}-\sqrt{5}}{\sqrt{8}}\right) \cdot \frac{\sqrt{8}}{\sqrt{8}} = \frac{5\sqrt{80}-\sqrt{40}}{8}$

$= \frac{5 \cdot \sqrt{16 \cdot 5} - \sqrt{4 \cdot 10}}{8}$
$= \frac{5 \cdot 4\sqrt{5} - 2\sqrt{10}}{8}$
$= \frac{20\sqrt{5} - 2\sqrt{10}}{8}$
$= \frac{10\sqrt{5} - \sqrt{10}}{4}$

5. Perform the following operations and write in simplest radical form.

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a. $(2\sqrt{x}-5)(-3\sqrt{x}-1)$

$-6 \cdot x - 2\sqrt{x} + 15\sqrt{x} + 5$
$-6x + 13\sqrt{x} + 5$

c. $\frac{\sqrt{49a^4}}{\sqrt{7a^3}} = \sqrt{\frac{49a^4}{7a^3}} = \sqrt{7a}$

b. $6x\sqrt{x^5}(\sqrt{x}-3\sqrt{x^3})$

$6x\sqrt{x^6} - 18x\sqrt{x^8}$
$6x \cdot x^3 - 18x \cdot x^4$
$6x^4 - 18x^5$

6. Write in simplest radical form.

$\sqrt[3]{\ }$ ÷ by 3 on your variable

a. $4x^3y^2\sqrt{80x^3y^{12}}$

$4x^3y^2\sqrt{16\cdot5\cdot x^2\cdot x\cdot y^{12}}$

$4x^3y^2\cdot 4xy^6\sqrt{5x}$

$16x^4y^8\sqrt{5x}$

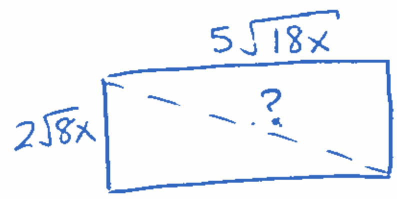
b. $2x^5y^3\sqrt[3]{40x^6y^2}$

$2x^5y^3\sqrt[3]{8\cdot5\,x^6y^2}$

$2x^5y^3\cdot 2x^2\sqrt[3]{5y^2}$

$4x^7y^3\sqrt[3]{5y^2}$

7. The width of a rectangle is $2\sqrt{8x}$ and the length is $5\sqrt{18x}$.



a. Determine the perimeter of the rectangle.

$2\sqrt{8x}+2\sqrt{8x}+5\sqrt{18x}+5\sqrt{18x}$

$4\sqrt{8x}+10\sqrt{18x}$

$4\cdot2\sqrt{2x}+10\cdot3\sqrt{2x}$

$=8\sqrt{2x}+30\sqrt{2x}$

$=38\sqrt{2x}$

b. Determine the area of the rectangle.

$2\sqrt{8x}\cdot5\sqrt{18x}$

$10\sqrt{144\cdot x^2}$

$=10\cdot12\cdot x$

$=120x$

c. Determine the length of the diagonal of the rectangle.

$a^2+b^2=c^2$

$(2\sqrt{8x})^2+(5\sqrt{18x})^2=c^2$

$4\cdot8x+25\cdot18x=c^2$

$32x+450x=c^2$

$c^2=482x$

$c=\sqrt{482x}$

8. Solve and check for extraneous roots.

a. $\sqrt[3]{x-6}=4$

$(\sqrt[3]{x-6})^3=4^3$

$x-6=64$

$x=70$

verify:

$\sqrt[3]{70-6}=4$

$\sqrt[3]{64}=4$

$4=4$ ✓

b. $\sqrt{y+4}-7=-2$ $+7$ $+7$

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

$y+4=25$

$y=21$

verify:

$\sqrt{21+4}-7=-2$

$\sqrt{25}-7=-2$

$5-7=-2$

$-2=-2$ ✓

c. $-8+\sqrt{2z+1}=3$ $+8$ $+8$

$(\sqrt{2z+1})^2=(11)^2$

$2z+1=121$

$\frac{2z}{2}=\frac{120}{2}$

$z=60$

verify:

$-8+\sqrt{2(60)+1}=3$

$-8+\sqrt{121}=3$

$-8+11=3$

$3=3$ ✓

9. For diamonds of comparable quality, the cost, C, in dollars, is related to the mass, m, in carats, by the formula $m=\sqrt{\frac{C}{700}}$, $C\geq0$. What would be the cost, in dollars, of a 2-carat diamond?

if $m=2$

$2=\sqrt{\frac{C}{700}}$

$(2)^2=\left(\sqrt{\frac{C}{700}}\right)^2$

$4=\frac{C}{700}$

$C=\$2800$