Intermediate Algebra
Chapter 6 Test Review

1. Evaluate:

$25^{\frac{1}{2}}$	$8^{\frac{4}{3}}$
$25^{\frac{1}{2}}$ $= \sqrt{25}$ $= \sqrt{(5)(5)}$ $= 5$	$8^{\frac{4}{3}}$ $= \left(8^{\frac{1}{3}}\right)^4$ $= \left(\sqrt[3]{8}\right)^4$ $= \left(\sqrt[3]{(2)(2)(2)}\right)^4$ $= 2^4$ $= 16$

2. Simplify:

$\sqrt{24}$ $\sqrt{24}$ $= \sqrt{(2)(2)(2)(3)}$ $= 2\sqrt{6}$	$\sqrt[3]{80}$ $\sqrt[3]{80}$ $= \sqrt[3]{(2)(2)(2)(2)(5)}$ $= 2\sqrt[3]{10}$
$\sqrt[4]{48}$ $\sqrt[4]{48}$ $= \sqrt[4]{(2)(2)(2)(2)(3)}$ $= 2\sqrt[4]{3}$	

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3. Add or Subtract Radical Expressions:

$\sqrt{18}+5\sqrt{8}$	$4\sqrt[3]{24x^4}-2x\sqrt[3]{81x}$
$\sqrt{18}+5\sqrt{8}$ $=\sqrt{(2)(3)(3)}+5\sqrt{(2)(2)(2)}$ $=3\sqrt{2}+5\cdot 2\sqrt{2}$ $=3\sqrt{2}+10\sqrt{2}$ $=13\sqrt{2}$	$4\sqrt[3]{24x^4}-2x\sqrt[3]{81x}$ $=4\sqrt[3]{(2)(2)(2)(3)x^4}-2x\sqrt[3]{(3)(3)(3)(3)x}$ $=4\cdot 2x\sqrt[3]{3x}-2\cdot 3x\sqrt[3]{3x}$ $=8x\sqrt[3]{3x}-6x\sqrt[3]{3x}$ $=2x\sqrt[3]{3x}$

4. Multiply Radical Expressions:

$\left(\sqrt{x}-2\right)^2$	$\left(\sqrt{x}-\sqrt{y}\right)\left(\sqrt{x}+\sqrt{8y}\right)$
$\left(\sqrt{x}-2\right)^2$ $=\left(\sqrt{x}-2\right)\left(\sqrt{x}-2\right)$ $=\sqrt{x}\sqrt{x}+\sqrt{x}(-2)-2\sqrt{x}-2(-2)$ $=x-2\sqrt{x}-2\sqrt{x}+4$ $=x-4\sqrt{x}+4$	$\left(\sqrt{x}-\sqrt{y}\right)\left(\sqrt{x}+\sqrt{8y}\right)$ $=\left(\sqrt{x}-\sqrt{y}\right)\left(\sqrt{x}+\sqrt{(2)(2)(2)y}\right)$ $=\left(\sqrt{x}-\sqrt{y}\right)\left(\sqrt{x}+2\sqrt{2y}\right)$ $=\sqrt{x}\sqrt{x}+\sqrt{x}\left(2\sqrt{2y}\right)-\sqrt{y}\sqrt{x}-\sqrt{y}\left(2\sqrt{2y}\right)$ $=x+2\sqrt{2xy}-\sqrt{xy}-2\sqrt{2y^2}$ $=x+2\sqrt{2xy}-\sqrt{xy}-2y\sqrt{2}$
$\sqrt{3}\left(\sqrt{12}-\sqrt{20}\right)$	
$\sqrt{3}\left(\sqrt{12}-\sqrt{20}\right)$ $=\sqrt{3}\left(\sqrt{(2)(2)(3)}-\sqrt{(2)(2)(5)}\right)$ $=\sqrt{3}\left(2\sqrt{3}-2\sqrt{5}\right)$ $=\sqrt{3}\left(2\sqrt{3}\right)+\sqrt{3}\left(-2\sqrt{5}\right)$ $=2\sqrt{(3)(3)}-2\sqrt{(3)(5)}$ $=2(3)-2\sqrt{15}$ $=6-2\sqrt{15}$	

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5. Simplify:

$\frac{2}{\sqrt{3}}$ $\frac{2}{\sqrt{3}}$ $= \frac{2}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$ $= \frac{2\sqrt{3}}{3}$	$\frac{7}{\sqrt{5x}}$ $\frac{7}{\sqrt{5x}}$ $= \frac{7}{\sqrt{5x}} \cdot \frac{\sqrt{5x}}{\sqrt{5x}}$ $= \frac{7\sqrt{5x}}{5x}$
$\frac{1}{\sqrt[4]{2}}$ $\frac{1}{\sqrt[4]{2}}$ $= \frac{1}{\sqrt[4]{2}} \cdot \frac{\sqrt[4]{(2)(2)(2)}}{\sqrt[4]{(2)(2)(2)}}$ $= \frac{\sqrt[4]{8}}{2}$	

6. Simplify:

$\frac{1}{\sqrt{x}-2}$ $\frac{1}{\sqrt{x}-2}$ $= \frac{1}{\sqrt{x}-2} \cdot \frac{\sqrt{x}+2}{\sqrt{x}+2}$ $= \frac{\sqrt{x}+2}{x-4}$	$\frac{2}{\sqrt{3}-\sqrt{2}}$ $\frac{2}{\sqrt{3}-\sqrt{2}}$ $= \frac{2}{\sqrt{3}-\sqrt{2}} \cdot \frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}+\sqrt{2}}$ $= \frac{2\sqrt{3}+2\sqrt{2}}{3-2}$ $= \frac{2\sqrt{3}+2\sqrt{2}}{1}$ $= 2\sqrt{3}+2\sqrt{2}$

7. Solve:

$\sqrt{4x-1}=3$	$\sqrt{2x+13}=x+5$
$\sqrt{4x-1}=3$ $\left(\sqrt{4x-1}\right)^2=3^2$ $4x-1=9$ $4x=9+1$ $4x=10$ $x=\frac{10}{4}$ $x=\frac{5}{2}$	$\sqrt{2x+13}=x+5$ $\left(\sqrt{2x+13}\right)^2=(x+5)^2$ $2x+13=(x+5)(x+5)$ $2x+13=x^2+5x+5x+25$ $2x+13=x^2+10x+25$ $0=x^2+10x-2x+25-13$ $0=x^2+8x+12$ $0=(x+2)(x+6)$ $x+2=0 \quad x+6=0$ $x=-2 \qquad x=-6$ $answer: x=-2$

8. Solve radical equations with 2 radicals

$\sqrt{2x+5}-\sqrt{x+2}=1$

$\sqrt{2x+5}-\sqrt{x+2}=1$
$\sqrt{2x+5}=1+\sqrt{x+2}$
$\left(\sqrt{2x+5}\right)^2=\left(1+\sqrt{x+2}\right)^2$
$2x+5=(1+\sqrt{x+2})(1+\sqrt{x+2})$
$2x+5=1+\sqrt{x+2}+\sqrt{x+2}+x+2$
$2x+5=x+3+2\sqrt{x+2}$
$2x-x+5-3=2\sqrt{x+2}$
$x+2=2\sqrt{x+2}$
$(x+2)^2=\left(2\sqrt{x+2}\right)^2$
$(x+2)(x+2)=2^2\left(\sqrt{x+2}\right)^2$
$x^2+4x+4=4(x+2)$
$x^2+4x+4=4x+8$
$x^2+4x-4x+4-8=0$
$x^2-4=0$
$(x-2)(x+2)=0$
$x-2=0 \quad x+2=0$
$x=2 \qquad x=-2$

$\sqrt{3x-5}=2\sqrt{7x-20}$

$\sqrt{3x-5}=2\sqrt{7x-20}$
$\left(\sqrt{3x-5}\right)^2=\left(2\sqrt{7x-20}\right)^2$
$3x-5=2^2\left(\sqrt{7x-20}\right)^2$
$3x-5=4(7x-20)$
$3x-5=28x-80$
$3x-28x=-80+5$
$-25x=-75$
$\frac{-25x}{-25}=\frac{-75}{-25}$
$x=3$

9. Perform operations on complex numbers:

$(5+i)-(3+2i)$ $(5+i)-(3+2i)$ $5+i-3-2i$ $5-3+i-2i$ $2-i$	$(4+7i)+(1+8i)$ $(4+7i)+(1+8i)$ $4+7i+1+8i$ $4+1+7i+8i$ $5+15i$
$(4+i)(2-i)$ $(4+i)(2-i)$ $8-4i+2i-i^2$ $8-2i-i^2$ $8-2i-(-1)$ $8-2i+1$ $9-2i$	$\frac{4}{5-i}$ $\frac{4}{5-i}$ $\frac{4}{5-i}\cdot\frac{5+i}{5+i}$ $\frac{4(5+i)}{25-i^2}$ $\frac{20+4i}{25-(-1)}$ $\frac{20+4i}{26}$ $\frac{20}{26}+\frac{4}{26}i$ $\frac{10}{13}+\frac{2}{13}i$

$\frac{3+2i}{4+3i}$ $\frac{3+2i}{4+3i}\cdot\frac{4-3i}{4-3i}$ $\frac{12-9i+8i-6i^2}{16-9i^2}$ $\frac{12-i-6(-1)}{16-9(-1)}$ $\frac{12-i+6}{16+9}$ $\frac{18-i}{25}$ $\frac{18}{25}-\frac{1}{25}i$	

10. Miscellaneous problems with imaginary numbers:

Simplify: $\sqrt{-27}$ $\sqrt{-27}$ $\sqrt{(-1)(3)(3)(3)}$ $3i\sqrt{3}$	Simplify: i^{301} i^{301} $=i^{1}$ $=i$