

Vocabulary: Radical, Index, Radicand, Rationalize, Conjugate, Imaginary Number, Complex Number, nth Root, Rational Exponent

Skill
1 - Simplify and perform basic operations (+, -, *, ÷) with radicals.
2 - Perform basic operations with imaginary numbers (+, -, *, ÷)
3 - Solve Equations with radicals
4 - Rewrite an expression given in radical form to rational exponent form and vice-versa
5 - Evaluate Expressions with nth roots and rational exponents.
6 - Solve Equations with rational exponents.

Skill 1 - Perform the indicated operations with the following radicals. Be sure to simplify your answer completely.

1) $(2\sqrt{6})^2$ $2^2 (\sqrt{6})^2$ $4 * 6$ $\boxed{24}$	2) $4\sqrt{18} \cdot 2\sqrt{-5}$ $\underline{8\sqrt{90}}$ $8\sqrt{9} * \sqrt{10}$ $8 * 3\sqrt{10}$ $\boxed{24\sqrt{10}}$	3) $\sqrt[3]{9} \cdot \sqrt[3]{3}$ $\sqrt[3]{27}$ $\boxed{3}$	4) $\sqrt[3]{108}$ $\sqrt[3]{27} \sqrt[3]{4}$ $\boxed{3\sqrt[3]{4}}$
5) $12\sqrt{5} + 7\sqrt{5}$ $\boxed{19\sqrt{5}}$	6) $2\sqrt{32} + 4\sqrt{8}$ $2\sqrt{16}\sqrt{2} + 4\sqrt{4}\sqrt{2}$ $2 * 4\sqrt{2} + 4 * 2\sqrt{2}$ $8\sqrt{2} + 8\sqrt{2}$ $\boxed{16\sqrt{2}}$	7) $\sqrt[3]{4} + 5 \cdot \sqrt[3]{4}$ $\boxed{6\sqrt[3]{4}}$	8) $\sqrt[4]{\frac{32}{2}}$ $\sqrt[4]{16}$ $\boxed{2}$
9) $\frac{6\sqrt{6}}{\sqrt{12}}$ $\frac{6\sqrt{1}}{\sqrt{2}} = \frac{6}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$ $\frac{6\sqrt{2}}{2} = \boxed{3\sqrt{2}}$	10) $\frac{\sqrt{5}}{\sqrt{8}} = \frac{\sqrt{5}}{\sqrt{4}\sqrt{2}}$ $\frac{\sqrt{5}}{2\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$ $\frac{\sqrt{10}}{4}$ $\boxed{\frac{\sqrt{10}}{4}}$	11) $\frac{4\sqrt{3}}{5+\sqrt{2}} \cdot \frac{5-\sqrt{2}}{5-\sqrt{2}}$ $\frac{20\sqrt{3} - 4\sqrt{6}}{25 - 5\sqrt{2} + 5\sqrt{2} - 2}$ $\boxed{\frac{20\sqrt{3} - 4\sqrt{6}}{23}}$	12) $\frac{\sqrt{15} + \sqrt{3}}{\sqrt{15} - \sqrt{3}} \cdot \frac{\sqrt{15} + \sqrt{3}}{\sqrt{15} + \sqrt{3}}$ $\frac{15 + \sqrt{45} + \sqrt{45} + 3}{15 + \sqrt{45} - \sqrt{45} - 3}$ $\frac{18 + 2\sqrt{45}}{12} = \frac{18 + 6\sqrt{5}}{12}$ $\boxed{\frac{3 + \sqrt{5}}{2}}$

Skill 2 - Perform the indicated operations with the following complex numbers. Be sure to simplify your answer completely.

<p>1) $(1+i) + (2-6i)$</p> $\boxed{3-5i}$	<p>2) $(1+i) - (2-6i)$</p> $1+i-2+6i$ $\boxed{-1+7i}$	<p>3) $-2i(4+2i)$</p> $-8i-4i^2$ $-8i-4(-1)$ $\boxed{4-8i}$	<p>4) $(5-2i)(1+3i)$</p> $5+15i-2i-6i^2$ $5+13i-6i^2$ $5+13i-6(-1)$ $\boxed{11+13i}$
<p>5) $(5+i)^2$</p> $(5+i)(5+i)$ $25+5i+5i+i^2$ $25+10i+(-1)$ $\boxed{24+10i}$	<p>6) $\frac{5}{3-2i} \cdot \frac{(3+2i)}{(3+2i)}$</p> $\frac{15+10i}{9+6i-6i-4i^2} = \frac{15+10i}{9-4(-1)}$ $\frac{15+10i}{9+4} = \boxed{\frac{15+10i}{13}}$	<p>7) $\frac{(3+i)(-2-i)}{(-2+i)(-2-i)}$</p> $\frac{-6-3i-2i-i^2}{4+2i-2i-i^2} = \frac{-6-5i-(-1)}{4-(-1)}$ $\frac{-5-5i}{5} = \boxed{-1-i}$	

Skill 3 - Solve each equation. Be sure to give your answer in simplified radical form.

<p>1) $2x^3 = 512$</p> $\sqrt[3]{x^3} = \sqrt[3]{256}$ $x = \sqrt[3]{64} \sqrt[3]{4}$ $\boxed{x = 4\sqrt[3]{4}}$	<p>2) $\sqrt[4]{(x-7)^4} = \sqrt[4]{256}$</p> $x-7 = \pm 4$ $x = 7 \pm 4$ $x = 7+4, 7-4$ $\boxed{x = 11, 3}$	<p>3) $x^2 - 2 = -18$</p> $\sqrt{x^2} = \sqrt{-16}$ $\boxed{x = \pm 4i}$
<p>4) $\sqrt{(x+1)^2} = \sqrt{80}$</p> $x+1 = \pm 4\sqrt{5}$ $\boxed{x = -1 \pm 4\sqrt{5}}$	<p>5) $\sqrt[5]{(x-3)^5} = \sqrt[5]{-32}$</p> $x-3 = -2$ $\boxed{x = 1}$	<p>6) $3x^3 - 2 = 574$</p> $3x^3 = 576$ $x^3 = 192$ $x = \sqrt[3]{64} \sqrt[3]{3}$ $\boxed{x = 4\sqrt[3]{3}}$

* +/- for even indices!

Skill 4a - If the expression is given in radical form, change it to rational exponent form. If the expression is given in rational exponent form, change it to radical form. You do not have to simplify.

1) $(\sqrt[3]{4})^5$ $4^{5/3}$	2) $(\sqrt{6})^3$ $6^{3/2}$	3) $15^{-\frac{1}{3}}$ $\frac{1}{15^{1/3}} \rightarrow \frac{1}{\sqrt[3]{15}}$	4) $\sqrt[5]{10}$ $10^{1/5}$	5) $\frac{3}{7^2}$ $(\sqrt{7})^3$	6) $(-5)^{\frac{3}{5}}$ $(\sqrt[5]{-5})^3$
--------------------------------------	-----------------------------------	--	------------------------------------	---	--

Skill 4b - For #1 - 4, simplify the expression WITHOUT using a calculator.
For #5 and 6, find the approximate value of expression to the nearest hundredths.

1) $125^{\frac{4}{3}}$ $(\sqrt[3]{125})^4$ 5^4 625	2) $(-32)^{-\frac{3}{5}}$ $(\sqrt[5]{-32})^3$ $\frac{1}{(-2)^3} = \frac{1}{-8}$	3) $(\sqrt[4]{81})^3$ 3^3 27	4) $(\sqrt{8})^3$ $(2\sqrt{2})^3$ $8 \cdot 2\sqrt{2}$ $16\sqrt{2}$	5) $(\sqrt[3]{-13})^4$ 30.57	6) $\frac{3}{9^5}$ 3.74
--	--	---	--	--------------------------------------	---------------------------------

Skill 5 - Simplify each expression completely.

1) $\sqrt{24x^3y^6z^5}$ $\sqrt{4} \sqrt{6}$ $2xy^3z^2\sqrt{6xz}$ $2xy^3z^2\sqrt{6xz}$	2) $\sqrt[4]{9x^3y^4z^5}$ $yz^4\sqrt[4]{9x^3z}$	3) $(x^{\frac{2}{3}}y)^6$ $x^{14}y^6$ x^4y^6	4) $\sqrt[4]{\frac{x^8}{y^4}}$ $\frac{x^2}{y}$
5) $\sqrt[4]{3x} \cdot \sqrt[4]{27x^3}$ $\sqrt[4]{81x^4}$ $3x$	6) $\sqrt{45xyz} \cdot \sqrt{2y^3z^4}$ $\sqrt{90xy^4z^5}$ $\sqrt{9} \sqrt{10}$ $3y^2z^2\sqrt{10xz}$	7) $\frac{x}{x^{\frac{1}{3}}}$ $x^{\frac{2}{3}}$	8) $\sqrt[5]{\frac{486x}{2x^6}}$ $\sqrt[5]{\frac{243}{x^5}}$ $\frac{3}{x}$

Skill 6 - Solve each equation. Be sure to give your answer in simplest form.

<p>1)</p> $2x^{3/5} = 16$ $(x^{3/5})^{5/3} = (8)^{5/3}$ $x = (\sqrt[3]{8})^5$ $x = 2^5 = \boxed{32}$	<p>2)</p> $x^{4/3} + 9 = 25$ $(x^{4/3})^{3/4} = (16)^{3/4}$ $x = (\sqrt[4]{16})^3$ $x = 2^3$ $\boxed{x = 8}$	<p>3)</p> $(x+7)^{3/2} - 20 = 7$ $((x+7)^{3/2})^{2/3} = (27)^{2/3}$ $x+7 = (\sqrt[3]{27})^2$ $x+7 = 3^2$ $x+7 = 9$ $\boxed{x = 2}$
<p>4)</p> $4x^{3/4} = 108$ $(x^{3/4})^{4/3} = (27)^{4/3}$ $x = (\sqrt[3]{27})^4$ $x = 3^4$ $\boxed{x = 81}$	<p>5)</p> $(x-4)^{3/2} - 8 = 0$ $((x-4)^{3/2})^{2/3} = (8)^{2/3}$ $x-4 = (\sqrt[3]{8})^2$ $x-4 = 2^2$ $x-4 = 4$ $\boxed{x = 8}$	<p>6)</p> $2(2x+5)^{1/2} = 8$ $((2x+5)^{1/2})^2 = (4)^2$ $2x+5 = 16$ $2x = 11$ $\boxed{x = 11/2}$

Algebra Review - Factor each expression completely.

* GCF First!

<p>1)</p> $x^2 + 14x - 51$ $\boxed{(x+17)(x-3)}$ <div style="text-align: right; margin-right: 20px;"> $\begin{array}{r l} 1 & 51 \\ 3 & 17 \end{array}$ </div>	<p>2)</p> $4x^2 - 8x - 5$ $(4x^2 - 10x)(2x - 5)$ $2x(2x-5) + 1(2x-5)$ $\boxed{(2x-5)(2x+1)}$ <div style="text-align: right; margin-right: 20px;"> $\begin{array}{r l} -20 & \\ 1 & 26 \\ 2 & 10 \\ 4 & 5 \end{array}$ </div>	<p>3)</p> $4x^3 + 6x^2 - 4x$ $2x(x^2 + 3x - 2)$ $(2x)(2x^2 + 4x)(-x - 2)$ $\downarrow 2x(x+2) - 1(x+2)$ $\boxed{2x(x+2)(2x-1)}$ <div style="text-align: right; margin-right: 20px;"> $\begin{array}{r l} -4 & \\ 1 & 4 \\ 2 & 2 \end{array}$ </div>
<p>4)</p> $x^3 - 64 \quad a=x$ $b=4$ $(x-4)((x)^2 + 4x + (4)^2)$ $\boxed{(x-4)(x^2 + 4x + 16)}$	<p>5)</p> $(x^3 + 3x^2)(x-3)$ $x^2(x+3) - 1(x+3)$ $(x+3)(x^2-1)$ $\boxed{(x+3)(x-1)(x+1)}$	<p>6)</p> $x^4 - 5x^2 - 36$ $(x^2-9)(x^2+4)$ $(x-3)(x+3)(x^2+4)$ $\boxed{(x-3)(x+3)(x^2+4)}$ <div style="text-align: right; margin-right: 20px;"> $\begin{array}{r l} -36 & \\ 1 & 36 \\ 2 & 18 \\ 3 & 12 \\ 4 & 9 \\ 6 & 6 \end{array}$ </div>