Pre-Calculus 11 Ch# 5 Test Review. Name: KEY

1. Convert each mixed radical to an entire radical.

a) $8\sqrt{5}$

$= \sqrt{8 \cdot 8 \cdot 5}$

$= \sqrt{320}$

b) $-2\sqrt[5]{3}$

$= -\sqrt[5]{2^5 \cdot 3} = -\sqrt[5]{96}$

c) $3y^3\sqrt{7}$

$= \sqrt{3^2 \cdot y^6 \cdot 7}$

$= \sqrt{63y^6}$

d) $-3z(\sqrt[3]{4z})$ $= -\sqrt[3]{3^3 z^3 4z}$

$= -\sqrt[3]{108z^4}$

2. Convert each entire radical to a mixed radical in simplest form.

a) $\sqrt{72}$ $= \sqrt{36 \cdot 2}$

$= 6\sqrt{2}$

b) $3\sqrt{40}$ $= 3\sqrt{4 \cdot 10}$

$= 6\sqrt{10}$

c) $\sqrt{27m^2}$, $m \geq 0$

$= \sqrt{9 \cdot 3m^2}$

$= 3m\sqrt{3}$

d) $\sqrt[3]{80x^5y^6}$ $= \sqrt[3]{8 \cdot 10x^5y^6}$

$= 2xy^2\sqrt[3]{10x^2}$

3. Simplify

a) $-\sqrt{13} + 2\sqrt{13}$

$= \sqrt{13}$

b) $4\sqrt{7} - 2\sqrt{112}$ $= 4\sqrt{7} - 8\sqrt{7}$

$= -4\sqrt{7}$

c) $-\sqrt[3]{3} + \sqrt[3]{24}$

$= -\sqrt[3]{3} + 2\sqrt[3]{3} = \sqrt[3]{3}$

4. Simplify radicals and collect like terms. State any restrictions on the values for the variables.

a) $4\sqrt{45x^3} - \sqrt{27x} + 17\sqrt{3x} - 9\sqrt{125x^3}$ $= 12x\sqrt{5x} - 3\sqrt{3x} + 17\sqrt{3x} - 45x\sqrt{5x}$

$= \underline{14\sqrt{3x} - 33x\sqrt{5x}}$; $\boxed{x \geq 0}$

b) $\frac{2}{5}\sqrt{44a} + \sqrt{144a^3} - \frac{\sqrt{11a}}{2}$ $= \frac{4}{5}\sqrt{11a} + 12a\sqrt{a} - \frac{1}{2}\sqrt{11a}$

$= \underline{\frac{3}{10}\sqrt{11a} + 12a\sqrt{a}}$; $\boxed{a \geq 0}$

5. Order the following numbers from least to greatest: $3\sqrt{7}$, $\sqrt{65}$, $2\sqrt{17}$, 8

$\sqrt{63}$, $\sqrt{65}$, $\sqrt{68}$, $\sqrt{64}$

* $= 3\sqrt{7}$, 8, $\sqrt{65}$, $2\sqrt{17}$

6 Multiply. Express each product as a radical in simplest form.

a) $\sqrt{2}(\sqrt{6})$

$= \sqrt{12} = 2\sqrt{3}$

b) $(-3f\sqrt{15})(2f^3\sqrt{5})$

$= -6f^4\sqrt{15 \cdot 5} = \underline{-30f^4\sqrt{3}}$

c) $(\sqrt[4]{8})(3\sqrt[4]{18})$ $= 3\sqrt[4]{4 \cdot 2 \cdot 2 \cdot 9} = \underline{6\sqrt[4]{9}}$

7 Multiply and simplify. Identify any restrictions on the values for the variable in part c).

a) $(2 - \sqrt{5})(2 + \sqrt{5})$

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

$= \boxed{-1}$

b) $(5\sqrt{3} - \sqrt{8})^2$ $= 25(3) - 10\sqrt{24} + 8$

$= 83 - 20\sqrt{6}$

c) $(a + 3\sqrt{a})(a + 7\sqrt{4a})$ $= a^2 + 7a\sqrt{4a} + 3a\sqrt{a} + 21\sqrt{4a^2}$

$= a^2 + 14a\sqrt{a} + 3a\sqrt{a} + 42a$

$= a^2 + 17a\sqrt{a} + 42a$; $\boxed{a \geq a}$

8. Rationalize each denominator.

a) $\frac{\sqrt{6}}{\sqrt{12}} = \sqrt{\frac{\cancel{6}\,1}{\cancel{12}\,2}}$

$= \frac{1}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \boxed{\frac{\sqrt{2}}{2}}$

b) $\frac{-1}{\sqrt[3]{25}} \cdot \frac{\sqrt[3]{5}}{\sqrt[3]{5}}$

$= \boxed{\frac{-\sqrt[3]{5}}{5}}$

c) $-4\sqrt{\frac{2a^2}{9}}$, $a \geq 0$

$= \boxed{\frac{-4a}{3}\sqrt{2}}$

d) $\frac{-2}{4-\sqrt{3}} \cdot \frac{4+\sqrt{3}}{4+\sqrt{3}}$

$= \frac{-8-2\sqrt{3}}{16-3} = \boxed{\frac{-8-2\sqrt{3}}{13}}$

e) $\frac{\sqrt{7}}{2\sqrt{5}-\sqrt{7}} \cdot \frac{2\sqrt{5}+\sqrt{7}}{2\sqrt{5}+\sqrt{7}}$

$= \frac{2\sqrt{35}+7}{20-7} = \boxed{\frac{2\sqrt{35}+7}{13}}$

f) $\frac{18}{6+\sqrt{27m}} \cdot \frac{6-\sqrt{27m}}{6-\sqrt{27m}}$

$= \frac{108-18\sqrt{27m}}{36-27m}$

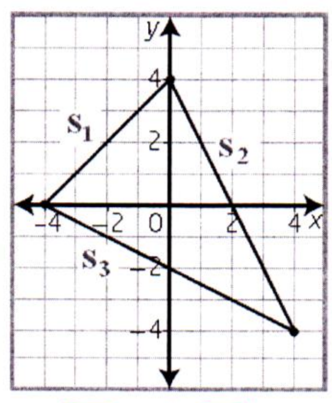
$= \frac{\cancel{9}(12-2\sqrt{27m})}{\cancel{9}(4-3m)} = \boxed{\frac{12-6\sqrt{3m}}{4-3m}}$

g) $\frac{a+\sqrt{b}}{a-\sqrt{b}} \cdot \frac{a+\sqrt{b}}{a+\sqrt{b}}$

$= \frac{a^2+2a\sqrt{b}+b}{a^2-b}$

$= \boxed{\frac{a^2+2a\sqrt{b}+b}{a^2-b}}$

9. What is the exact perimeter of the triangle?



$S_1 = \sqrt{4^2+4^2} = \sqrt{32} = 4\sqrt{2}$

$S_2 = \sqrt{4^2+8^2} = \sqrt{80} = 4\sqrt{5}$

$S_3 = \sqrt{4^2+8^2} = \sqrt{80} = 4\sqrt{5}$

Perimeter $= S_1 + S_2 + S_3 = 4\sqrt{2} + 4\sqrt{5} + 4\sqrt{5}$

$= 4\sqrt{2} + 8\sqrt{5}$

10. The area of a rectangle is 12 square units. The width is $(4 - \sqrt{2})$ units. Determine an expression for the length of the rectangle in simplest radical form.

$A = L \cdot W \rightarrow L = \frac{A}{W}$; $L = \frac{12}{4-\sqrt{2}} \cdot \frac{4+\sqrt{2}}{4+\sqrt{2}}$

$\boxed{\frac{24+6\sqrt{2}}{7}} = \frac{48+12\sqrt{2}}{14} = \frac{48+12\sqrt{2}}{16-2}$

11. Solve each radical equation. Determine any restrictions on the values for the variables.

a) $\left(\sqrt{5x-3}\right)^2 = \left(\sqrt{7x-12}\right)^2$

$5x - 3 = 7x - 12$

$9 = 2x$

$\boxed{\frac{9}{2} = x}$

restriction:

$5x - 3 \geq 0$

$5x \geq 3$

$x \geq \frac{3}{5}$

$7x - 12 \geq 0$

$7x \geq 12$

$x \geq \frac{12}{7}$

check.

$\sqrt{5\left(\frac{9}{2}\right) - 3} = \sqrt{7\left(\frac{9}{2}\right) - 12}$

$\sqrt{19.5} = \sqrt{19.5}$ ✓

b) $\left(\sqrt{y-3}\right)^2 = (y-3)^2$

restriction:

$y - 3 \geq 0$

$y \geq 3$

$y - 3 = y^2 - 6y + 9$

$0 = y^2 - 7y + 12$

$0 = (y-3)(y-4)$

$\boxed{y=3}$ or $\boxed{y=4}$

check

$\sqrt{3-3} = 3-3$ ✓

$\sqrt{4-3} = 4-3$ ✓

c) $\sqrt{7n+25} - n = 1$

restriction:

$7n + 25 \geq 0$

$7n \geq -25$

$n \geq \frac{-25}{7}$

$\left(\sqrt{7n+25}\right)^2 = (1+n)^2$

$7n + 25 = 1 + 2n + n^2$

$0 = n^2 - 5n - 24$

$0 = (n+3)(n-8)$

extraneous root. $\cancel{n=-3}$ or $\boxed{n=8}$

$\sqrt{-24+25} - (-3) \neq 1$

$\sqrt{56+25} - 8 = 1$ ✓

d) $\left(\sqrt{8 - \frac{m}{3}}\right)^2 = \left(\sqrt{3m} - 4\right)^2$

restriction.

$m \geq 0$;

$8 - \frac{m}{3} \geq 0$

$8 \geq \frac{m}{3}$

$24 \geq m$

$8 - \frac{m}{3} = 3m - 8\sqrt{3m} + 16$

$\left(8\sqrt{3m}\right)^2 = \left(\frac{10m}{3} + 8\right)^2$

$64(3m) = \frac{100}{9}m^2 + \frac{160}{3}m + 64$

$\left(192m = \frac{100}{9}m^2 + \frac{160}{3}m + 64\right) \cdot 9$

$0 = 100m^2 - 1248m + 576$

$= 4(25m^2 - 312m + 144)$

$0 = 4(25m - 12)(m - 12)$

$\boxed{m = 12}$ or $\cancel{m = \frac{12}{25}}$ extraneous root.

Do a check!