35) $$\frac{\frac{1}{\sqrt{2}}\cdot\frac{\sqrt{2}}{\sqrt{2}}}{\frac{8}{\sqrt{3}}\cdot\frac{\sqrt{3}}{\sqrt{3}}+2} = \frac{\frac{\sqrt{2}}{2}}{\frac{8\sqrt{3}}{3}+2\cdot\frac{3}{3}} = \frac{\frac{\sqrt{2}}{2}}{\frac{8\sqrt{3}}{3}+\frac{6}{3}}$$

$$\frac{\frac{\sqrt{2}}{2}}{\frac{8\sqrt{3}+6}{3}} = \frac{\sqrt{2}}{2}\cdot\frac{3}{8\sqrt{3}+6} = \frac{3\sqrt{2}}{16\sqrt{3}+12}\cdot\frac{16\sqrt{3}-12}{16\sqrt{3}-12} = \frac{48\sqrt{6}-36\sqrt{2}}{256(3)-144}$$

$$\frac{48\sqrt{6}-36\sqrt{2}}{624} = \frac{24\sqrt{6}-18\sqrt{2}}{312} = \frac{12\sqrt{6}-9\sqrt{2}}{156}$$

$$= \boxed{\frac{4\sqrt{6}-3\sqrt{2}}{52}}$$

Solve for x:

a) $x+3=5+3$

$x=5$

don't have to actually solve.
recognize that they're both <u>something</u> $+3$

b) $\sqrt{x}=\sqrt{7}$

$x=7$

c) $x+\sqrt{3}=8+\sqrt{3}$

$x=8$

E – Equality of Surds

If $a + b\sqrt{k} = c + d\sqrt{k}$ then $a = c$ and $b = d$.

($\sqrt{k}$ is irrational and a, b, c and d are rational)

Examples:

1. Solve for x and y given that they are rational:

→ Fractions
→ decimals that end
→ Radicals that simplify to whole #'s

(a) $x + y\sqrt{2} = 8 - 3\sqrt{2}$

Rational
$x = 8$

Irrational
$y\sqrt{2} = -3\sqrt{2}$
$y = -3$

Irrational
$\pi, e, \sqrt{2}$, etc
* Radicals that don't simplify $\sqrt{2}, \sqrt{7}$, etc.

(c) $\left(x+y\sqrt{3}\right)\left(1-2\sqrt{3}\right)=-26+8\sqrt{3}$

get this by itself because it has the variables

$$\frac{(x+y\sqrt{3})\cancel{(1-2\sqrt{3})}}{\cancel{1-2\sqrt{3}}} = \frac{-26+8\sqrt{3}}{1-2\sqrt{3}} \cdot \frac{1+2\sqrt{3}}{1+2\sqrt{3}}$$

$$x+y\sqrt{3} = \frac{-26-52\sqrt{3}+8\sqrt{3}+16(3)}{1-4(3)}$$

$$x+y\sqrt{3} = \frac{22-44\sqrt{3}}{-11}$$

$$x + y\sqrt{3} = -2 + 4\sqrt{3}$$

$\boxed{x = -2}$

Rational

$y\sqrt{3} = 4\sqrt{3}$ } irrational part.

$\boxed{y = 4}$

(b) $$\frac{(x+y\sqrt{2})\cancel{(4-\sqrt{2})}}{\cancel{4-\sqrt{2}}} = \frac{-3\sqrt{2}}{4-\sqrt{2}} \cdot \frac{4+\sqrt{2}}{4+\sqrt{2}}$$

$$x+y\sqrt{2} = \frac{-12\sqrt{2} - 3(2)}{16-2}$$

$$x+y\sqrt{2} = \frac{-12\sqrt{2} - 6}{14}$$

$$\underbrace{x+y\sqrt{2}}_{\text{two terms}} = \frac{-6\sqrt{2} - 3}{7}$$

need to separate into two terms

$$\underbrace{x}_{\text{rational}} + \underbrace{y\sqrt{2}}_{\text{irrational}} = \underbrace{\frac{-6\sqrt{2}}{7}}_{\text{irrational}} - \underbrace{\frac{3}{7}}_{\text{rational}}$$

$$\boxed{x = -\frac{3}{7}}$$

$$y\sqrt{2} = \frac{-6\sqrt{2}}{7}$$

$$\boxed{y = -6/7}$$

2. Find rationals a and b such that $(a+3\sqrt{2})(2-\sqrt{2}) = 2 + b\sqrt{2}$.

* can't get variables together easily so expand.

$$(a+3\sqrt{2})(2-\sqrt{2}) = 2+b\sqrt{2}$$

$$\underbrace{2a}_{R} \underbrace{-a\sqrt{2}}_{I} \underbrace{+6\sqrt{2}}_{I} \underbrace{-3(2)}_{R} = \underbrace{2}_{R} + \underbrace{b\sqrt{2}}_{I}$$

$$2a-6 -a\sqrt{2}+6\sqrt{2} = 2+b\sqrt{2}$$

$$2a-6=2$$
$$2a=8$$
$$a=4$$

$$-a\sqrt{2}+6\sqrt{2}=b\sqrt{2}$$
$$-4\sqrt{2}+6\sqrt{2}=b\sqrt{2}$$
$$2\sqrt{2}=b\sqrt{2}$$

$$2=b$$

HW: Pg 76 #1-3ab, 4