Complex Numbers and Quadratic Equation Unit Test Review

1) a) -4 ← integers, rational, real, complex

b) 3.001 ← rational, real, complex

c) $\sqrt{-18} = i\sqrt{18}$ ← imaginary, complex

d) 8 ← natural, whole, integers, rational, real, complex

e) 0 ← whole, integers, rational, real, complex

2) $\sqrt{450} = \sqrt{225 \cdot 2}$

$= \sqrt{225} \cdot \sqrt{2}$

$= 15 \cdot \sqrt{2}$

Move Simplified ←

$\sqrt{25 \cdot 18}$

$= \sqrt{25} \cdot \sqrt{18}$

$= 5 \cdot \sqrt{18}$

$= 5 \cdot 3\sqrt{2}$

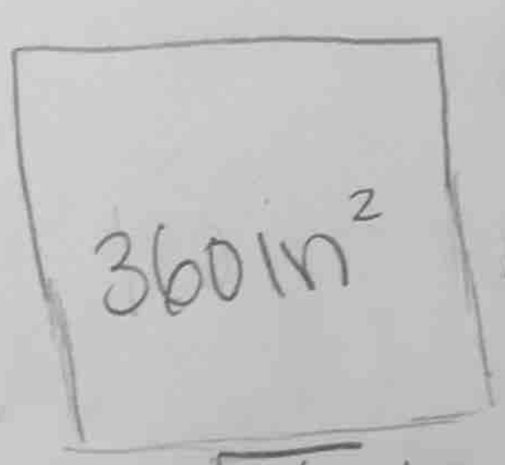
$= 15\sqrt{2}$

$\sqrt{18} = \sqrt{9 \cdot 2}$

$= \sqrt{9} \cdot \sqrt{2}$

$= 3 \cdot \sqrt{2}$

3)



1st way $= \sqrt{360}$

2nd way $= \sqrt{36 \cdot 10}$ ← Most Simplified

$= \sqrt{36} \cdot \sqrt{10}$

$= 6 \cdot \sqrt{10}$

3rd way $= \sqrt{40 \cdot 9}$

$= \sqrt{40} \cdot \sqrt{9}$

$= \sqrt{40} \cdot 3$

4) $5\sqrt{-6} \cdot 2\sqrt{-14}$

$= 5\sqrt{-1 \cdot 6} \cdot 2\sqrt{-1 \cdot 14}$

$= 5\sqrt{-1} \cdot \sqrt{6} \cdot 2\sqrt{-1} \cdot \sqrt{14}$ ← $\sqrt{-1} = i$

$= 5i\sqrt{6} \cdot 2i\sqrt{14}$

$= (5 \cdot 2) \cdot (i \cdot i) \cdot (\sqrt{6} \cdot \sqrt{14})$

$= 10 i^2 \sqrt{6 \cdot 14}$ ← $i^2 = -1$

$= 10(-1)\sqrt{84}$ ←

$= -10(2\sqrt{21})$

$= -20\sqrt{21}$

** $\sqrt{84} = \sqrt{4} \cdot \sqrt{21}$

$= 2\sqrt{21}$

5) $7\sqrt{-2} + 3\sqrt{-18}$

$\sqrt{-1} = i$ → $7\sqrt{-1} \cdot \sqrt{2} + 3\sqrt{-1}\sqrt{18}$

$7i\sqrt{2} + 3i\sqrt{9}\sqrt{2}$

$7i\sqrt{2} + 3i \cdot 3 \cdot \sqrt{2}$

$7i\sqrt{2} + 9i\sqrt{2}$

$16\sqrt{2}i$

6) $i^{34} \longrightarrow \frac{34}{4} = 8.5 \approx 8 \text{ r } (2) = -1$

** remember: $i^n = \begin{cases} 1 \text{ if remainder is 0} & (\_.0) \\ i \text{ if remainder is 1} & (\_.25) \\ -1 \text{ if remainder is 2} & (\_.5) \\ -i \text{ if remainder is 3} & (\_.75) \end{cases}$

7) $(2+3i)+(-3+i)$

$=(2+-3)+(3i+i)$

$=-1+4i$

8) $(2+3i)-(-3+i)$

$=(2--3)+(3i-i)$

$=5+2i$

Combine like terms!
real #'s and imaginary #'s.

9) $(2+3i)(-3+i)$

$=-6-9i+2i-3$

$=-9-7i$

	2	$+3i$
-3	-6	$-9i$
i	$2i$	$3i^2$

$3i^2$
$3(-1)$
$=-3$

10) $x^2+6x+17=0$

$-17 \quad -17$

$x^2+6x=-17$

$+9 \quad +9$

$x^2+6x+9=-8$

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

$x+3=\pm\sqrt{-8}$

$x+3=\pm i\sqrt{8}$

$-3 \quad -3$

$\boxed{x=-3\pm i\sqrt{8}}$

$\left(\frac{b}{2}\right)^2=\left(\frac{6}{2}\right)^2=(3)^2=9$

$\left(x+\frac{b}{2}\right)^2=\left(x+\frac{6}{2}\right)^2$

$=(x+3)^2$

$\sqrt{-8}=\sqrt{-1\cdot 8}=\sqrt{-1}\cdot\sqrt{8}$

$=i\sqrt{8}$

*Simplified even more

$x=-3\pm i\sqrt{4\cdot 2}$

$x=-3\pm i\sqrt{4}\cdot\sqrt{2}$

$x=-3\pm 2\sqrt{2}i$

11) $\frac{2x^2-8x+6}{2}=\frac{0}{2}$

$\frac{2x^2}{2}-\frac{8x}{2}+\frac{6}{2}=\frac{0}{2}$

$x^2-4x+3=0$

$-3\quad -3$

$x^2-4x=-3$

$+4\quad +4$

$x^2-4x+4=-1$

$\sqrt{(x-2)^2}=\sqrt{1}$

$x-2=\pm\sqrt{1}$

$+2\quad +2$

$x=2\pm 1$

$x=2+1$
$=3$

$x=2-1$
$=1$

$\left(\frac{b}{2}\right)^2=\left(\frac{-4}{2}\right)^2=(-2)^2=4$

$(x+\frac{b}{2})^2=(x+\frac{-4}{2})^2$
$=(x-2)^2$

12) $7x^2-2x+9=0$ $\quad a=7,\ b=-2,\ c=9$

* Quadratic formula:

$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$

$x=\frac{-(-2)\pm\sqrt{(-2)^2-4(7)(9)}}{2(7)}$

$x=\frac{2\pm\sqrt{4-252}}{14}$

$x=\frac{2\pm\sqrt{-248}}{14}$

$\sqrt{-248}=\sqrt{-1\cdot 248}=\sqrt{-1}\cdot\sqrt{248}$
$=i\cdot\sqrt{248}$

$\boxed{x=\frac{2\pm i\sqrt{248}}{14}}$

* Simplified even more...

$x=\frac{2\pm i\sqrt{4\cdot 62}}{14}$

$x=\frac{2\pm 2\sqrt{62}i}{14}$

$x=\frac{1}{7}\pm\frac{\sqrt{62}i}{7}$