Warm-Up:

1) Simplify i^{102}. $= i^2 = -1$

2) Multiply $(5 + 2i)(3 + 7i)$

$15 + 35i + 6i + \cancel{14i^2}$ $\;-14(-1)$

$1 + 41i$

3) Simplify $\dfrac{(3 + 5i)}{6 + 8i} \dfrac{(6-8i)}{6-8i} = \dfrac{18 - 24i + 30i \cancel{- 40i^2}}{36 \cancel{- 64i^2}}$ $\;+40(-1)$ $\;(-1)$ $\;+64$

$$\frac{58 + 6i}{100} = \frac{29 + 3i}{50}$$

48, 40, 24

24) $\sqrt{\dfrac{192}{121}} = \dfrac{\sqrt{192}}{\sqrt{121}} = \dfrac{\sqrt{64}\sqrt{3}}{11}$

$\dfrac{8\sqrt{3}}{11}$

40) $\dfrac{4i}{3+i} \cdot \dfrac{3-i}{3-i} = \dfrac{12i \cancel{- 4i^2}}{9 \cancel{- i^2}}$ $\;+4(-1)$ $\;+1$

$\dfrac{12i + 4}{10}$ $\quad \dfrac{6i + 2}{5}$

$\dfrac{2}{7} + \dfrac{3}{7} = \dfrac{5}{7} = \dfrac{2+3}{7}$

48) $(2m+5) + (1-n)i = -2 + 4i$

$2m + 5 = -2$

$\dfrac{2m}{2} = \dfrac{-7}{2}$

$m = \dfrac{-7}{2}$

$\dfrac{(1-n)i}{i} = \dfrac{4i}{i}$

$1 - n = 4$

$-n = 3$

$n = -3$

Section 5-5: Completing the Square

1) $(x - 2)^2$

2) $(x + 3)^2$

3) $(x - 4)^2$

Compare the coefficient of the term to the first degree in your answers for numbers 1 -3 to the constant in the original expression.

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

2) $(x + 3)^2 = x^2 + 6x + 9$

3) $(x - 4)^2 = x^2 - 8x + 16$

Other examples:

$(x + 1)^2 = x^2 + 2x + 1$ $\qquad$ $(x - 9)^2 = x^2 - 18x + 81$

What pattern do you see? How do you get from the coefficient in the expanded expression to the constant in the original expression?

Now, compare the constant in the original expression to the constant term in your answers for 1-3.

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

2) $(x + 3)^2 = x^2 + 6x + 9$

3) $(x - 4)^2 = x^2 - 8x + 16$

Other examples:

$(x + 1)^2 = x^2 + 2x + 1$ $\qquad$ $(x - 9)^2 = x^2 - 18x + 81$

What pattern do you see? How do you get from the constant in the original expression to the constant term in the ending expression?

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

2) $(x + 3)^2 = x^2 + 6x + 9$

3) $(x - 4)^2 = x^2 - 8x + 16$

Other examples:

$(x + 1)^2 = x^2 + 2x + 1$ $\qquad$ $(x - 9)^2 = x^2 - 18x + 81$

Describe a way to get from:

A: the coefficient of the first degree terms to the constant in the original expression.

B: then to the constant in the ending expression.

To complete the square, take the number in front of x, divide by 2, then square it.

The method you came up with is called completing the square.
Use this method to help with these next few problems.

a) $x^2 + 6x + \underline{9} = (x + \underline{3})^2$

b) $x^2 - 10x + \underline{25} = (x - \underline{5})^2$

c) $x^2 - 11x + \underline{\frac{121}{4}} = (x - \underline{\frac{11}{2}})^2$

Examples:
Complete the square.
4) $x^2 + 12x + 36 = (x + 6)^2$

5) $x^2 - 16x + 64 = (x - 8)^2$

Examples:
Solve for the variable by completing the square.

6) $x^2 + 8x + 23 = 0$

$\left(\frac{8}{2}\right)^2 = 16$

$x^2 + 8x + 16 = -23 + 16$

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

$x + 4 = \pm i\sqrt{7}$

$-4 \quad -4$

$x = -4 \pm i\sqrt{7}$

7) $9x^2 - 9x + 2 = 0$

$\left(\frac{-1}{2}\right)^2 = \frac{1}{4}$

$\frac{9x^2}{9} - \frac{9x}{9} = \frac{-2}{9}$

$x^2 - x + \frac{1}{4} = \frac{-2}{9} + \frac{1}{4}\cdot\frac{9}{9} = \frac{-8}{36} + \frac{9}{36}$

$\sqrt{\left(x - \frac{1}{2}\right)^2} = \pm\sqrt{\frac{1}{36}}$

$x - \frac{1}{2} = \pm\frac{1}{6}$

$+\frac{1}{2} \quad +\frac{1}{2}$

$x = \frac{1}{2} \pm \frac{1}{6}$

$x = \frac{3}{6} \pm \frac{1}{6}$

$x = \frac{4}{6}, \frac{2}{6}$

$x = \frac{2}{3}, \frac{1}{3}$

Examples:
Solve for the variable by completing the square.

~~8)~~ $x^2 + 6x + 5 = 0$

9) $4x^2 - 16x + 3 = 0$

$\frac{4x^2}{4} - \frac{16x}{4} = \frac{-3}{4}$

$x^2 - 4x + 4 = \frac{-3}{4} + \frac{4}{1}\cdot\frac{4}{4} \quad \frac{-3}{4} + \frac{16}{4}$

$\sqrt{(x-2)^2} = \pm\sqrt{\frac{13}{4}}$

$x - 2 = \pm\frac{\sqrt{13}}{2}$

$+2 \quad +2$

$x = 2 \pm \frac{\sqrt{13}}{2}$

$x = \frac{4}{2} \pm \frac{\sqrt{13}}{2}$

$x = \frac{4 \pm \sqrt{13}}{2}$

Homework: pg. 273-275 #24-40 even, 57, 58, 66, 67