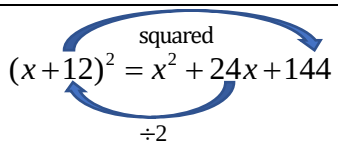
Warm-Up

Expand the squares of binomials below: (The first one was done for you)

1. $(x+1)^2$	$(x+1)^2 = (x+1)(x+1) = x^2+2x+1$
2. $(x-5)^2$	
3. $(x+3)^2$	
4. $(x-\frac{3}{2})^2$	
5. $(x+h)^2$	



Identify the perfect square:

6. $x^2-20x+100 = (x+\quad)^2$

7. $x^2+16x+64 = (x+\quad)^2$

Assume the quadratics below are perfect squares. Fill in the missing numbers:

8. $x^2+\square x+9$

9. $x^2+12x+\square$

10. $x^2-14x+\square$

11. $x^2+3x+\square$

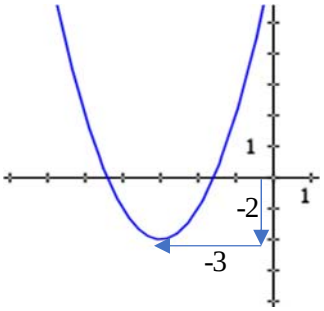
Now, what happens if you are walking down a dark alley, and someone comes up to you and says that you have to graph the quadratic function $f(x) = x^2+6x+7$, or else. Since I care about you and want you to live, I'll show you how to graph such a quadratic before you come across such a vile person.

Student: **Thanks, Mrs. Bailey… but what does this have to do with completing the square?**

Mrs. Bailey**: How dare you question my methods! No candy for you.**

We should know how to graph $f(x) = (x+3)^2-2$

This is a parabola shifted left 3 and down 2, which means that the **vertex** is at (-3,-2).



How can we get $f(x) = x^2+6x+7$ to look like $f(x) = (x+\square)^2+\square$?

What if we complete the square?

Student: **But, Mrs. Bailey, completing the square only works for equations. It won't work here.**

Mrs. Bailey: **Lies! Lies and Slander!**

Seriously, though. It would be nice if that 7 was a 9. So, we could sneak a 9 into the equation, then sneak it out. I will show you.

$$\begin{aligned} f(x) &= x^2 + 6x + 7 \\ &= x^2 + 6x + 9 - 9 + 7 \\ &= (x^2 + 6x + 9) - 9 + 7 \\ &= (x+3)^2 - 2 \end{aligned}$$

We call this form of the quadratic **vertex form.**

What if there is a number in front of the x^2 term?

No worries. We will do an example like that, too!

Example: Graph the quadratic $f(x) = 2x^2 + 6x - 7$

Solution: Before we complete the square, we factor out the 2.

$f(x) = 2x^2 + 6x - 7$

$= 2(x^2 + 3x - \frac{7}{2})$ Factored out 2 from every term

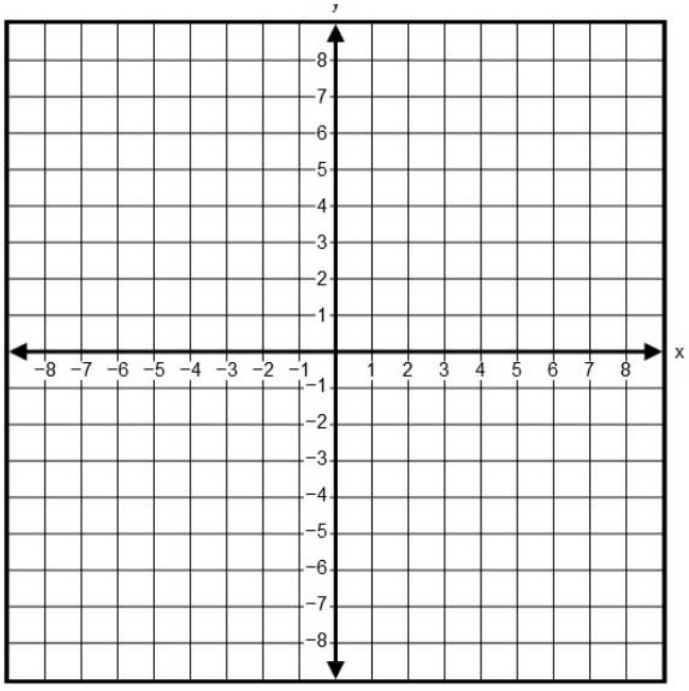
$= 2(x^2 + 3x + \square - \square - \frac{7}{2})$ Be sneaky

$= 2\left([x + \frac{3}{2}]^2 + \square\right)$ Identify the perfect square and add the leftovers

$= 2(x + \square)^2 + \square$ Distribute the two through the outer parentheses ONLY.

Vertex:

Vertical Stretch:

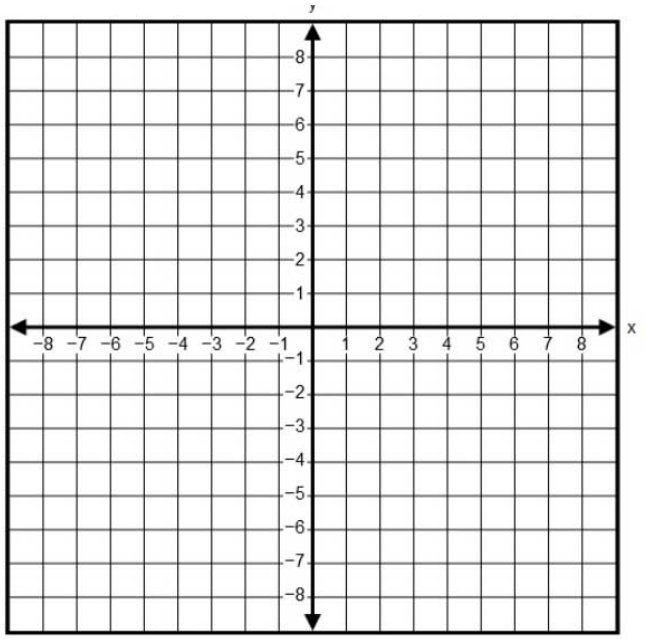


From your homework:

p.343 #13: Graph the quadratic $f(x) = 2x^2 - 8x + 3$

Vertex:

Vertical Stretch:



p.343 #15: Graph the quadratic $f(x) = -x^2 - 2x + 8$

Vertex:

Vertical Stretch: