**Quadratic Functions in Vertex Form**

A **quadratic function** can be written in different forms.

Ex : Standard form $y=ax^{2}+bx+c$ ex : $f\left(x\right)=3x^{2}-5x+1$
 Factored form $y=a(x-x\_{1})(x-x\_{2})$ ex : $g\left(x\right)=2(x-1)(x+3)$

The **Vertex Form** looks like : $y=a\left(x-p\right)^{2}+q$

Ex : $y=2\left(x-3\right)^{2}+5$ 🡪 $a= , p= , q= $

 $y=\left(x+1\right)^{2}+3$ 🡪 $a= , p= , q=$

 $y=\frac{1}{2}\left(x-3\right)^{2}-2$ 🡪 $a= , p= , q=$

When a quadratic function is in Vertex Form, $p$ **and** $q$ **are the coordinates of the vertex.**

Ex : $y=2\left(x-3\right)^{2}+5$ 🡪 vertex :$ $

 $y=\left(x+1\right)^{2}+3$ 🡪 vertex :$ $

 $y=\frac{1}{2}\left(x-3\right)^{2}-2$ 🡪 vertex :$ $

Coefficient $a$ still tells us the direction of the opening and its “speed”.



Example 1 : $y=\left(x+1\right)^{2}+3$

Example 2 : $y=2\left(x-3\right)^{2}-5$



From the vertex, you can use the “speed of opening” compared to the reference quadratic function of a table of values (choosing preferably one side of the vertex)…

**Note** : If you know the sign of $q$ and the direction of opening $(a)$,
 you can easily know the number of $x$-intercepts

 Ex : If $a>0$ and $q>0$,

 If $a>0$ and $q<0$,

**Determining an equation of a parabola** :
If you can see the coordinates of the vertex on a graph, the easiest is to use the vertex form:



**Hwk : p 157 # 4, 7, 8, 9, 12, 15, 16, 18, 20 + 21**