State the vertex.

$y = (x-6)^2 - 1$

$y=x^2-6x-1$

Complete the following:

$(x+7)(x+7)$

$x^2+7x+7x+49$

$x^2+14x+49$

$(x-3)(x-3)$

$x^2-3x-3x+9$

x^2-6x+9

$(x-4)(x-4)$

$x^2-4x-4x+16$

$x^2-8x+16$

$(x-4)^2$

What do you notice?

x^2+14x

x^2-6x

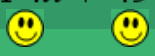
x^2-8x

What do you notice?

$(x+7)(x+7)$

$x^2+7x+7x+49$

$x^2+14x+49$



$(x-3)(x-3)$

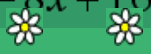
$x^2-3x-3x+9$

x^2-6x+9

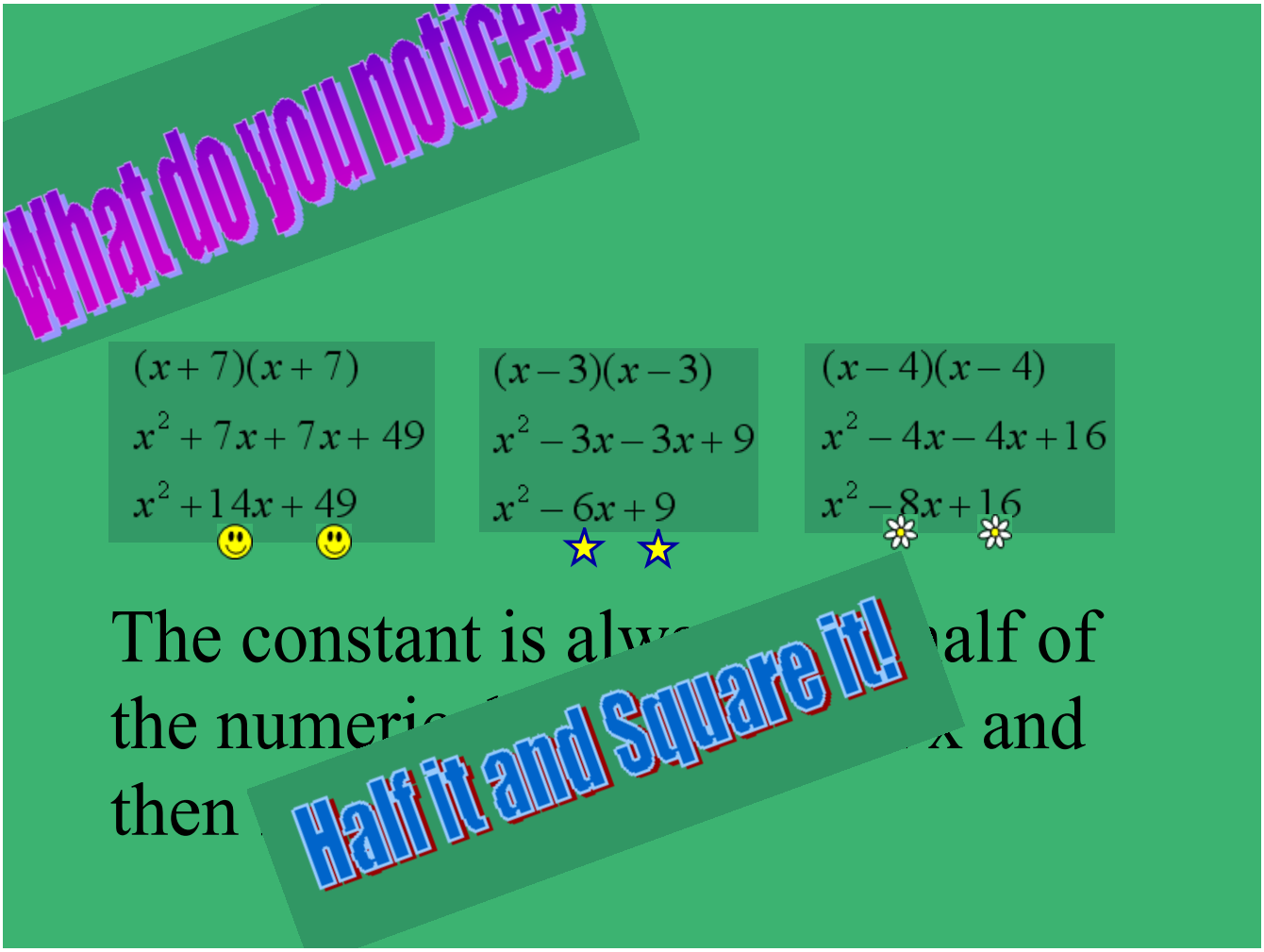
$(x-4)(x-4)$

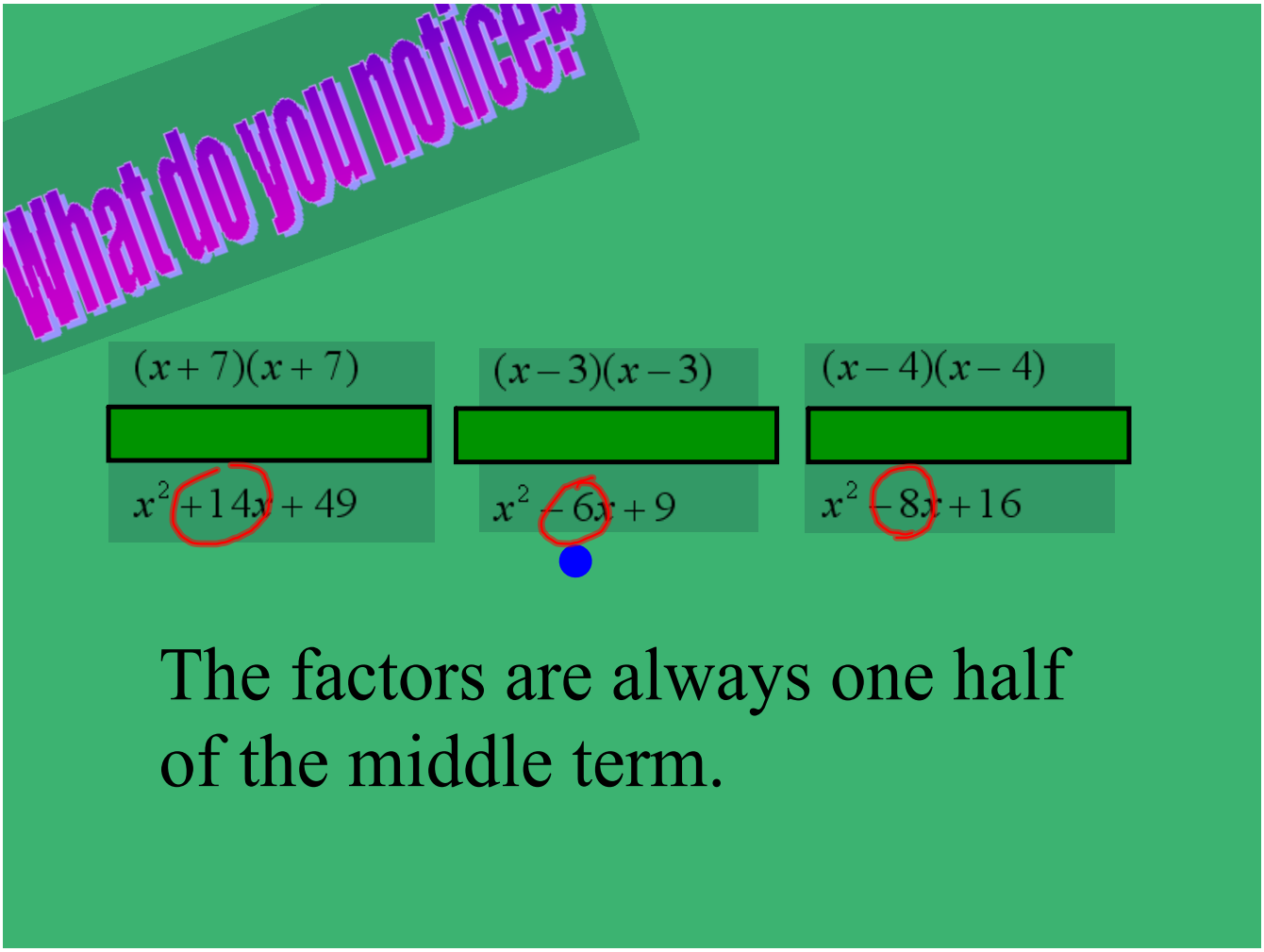
$x^2-4x-4x+16$

$x^2-8x+16$



The constant is always one half of the numerical coefficient of x and then squared.


What do you notice?
$(x+7)(x+7)$
$x^2+7x+7x+49$
$x^2+14x+49$
$(x-3)(x-3)$
$x^2-3x-3x+9$
x^2-6x+9
$(x-4)(x-4)$
$x^2-4x-4x+16$
$x^2-8x+16$
The constant is alw alf of
the numeri x and
then
Half it and Square it!


What do you notice?
$(x+7)(x+7)$
$x^2+14x+49$
$(x-3)(x-3)$
x^2-6x+9
$(x-4)(x-4)$
$x^2-8x+16$
The factors are always one half of the middle term.

Half it and Square it!

Complete the square.

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

$x^2 + 2x \underline{+1} = (x \underline{+1})(x \underline{+1})$

$x^2 - 8x \underline{+16} = (x \underline{-4})(x \underline{-4})$ ∴

Many
Quadratic functions
appear in general form:

$$y = ax^2 + bx + c$$

Although you can graph the function in general form, using a table of values, it is much easier to graph a quadratic equation in standard form.

$$y = a(x+h)^2 + k$$

To make the transition
from general to standard form
we use a procedure called
"completing the square".

Example:

$y = x^2 - 6x + 5$

$y - 5 = x^2 - 6x$

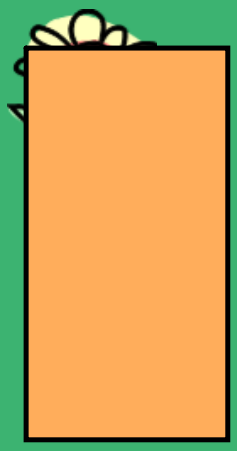
STEPS:

Separate the constant from the terms with the x by moving it to the other side of the equation.

Example:

$y - 5 = x^2 - 6x$

Determine what is to be added to $(x^2 - 6x)$ to make it a perfect square trinomial.



$$\left(\frac{6}{2}\right)^2$$

$$(3)^2$$

$$9$$

Use the numerical coefficient of "x", which is 6.

Half it and Square it!

Example:

$y-5+9=x^2-6x+9$

Add the new number to each side of the equation.

This will balance the equation

Example:

$y-5+9=x^2-6x+9$

$y+4=(x-3)(x-3)$

Factor the right side of the equation and simplify the left.

$y=(x-3)^2-4$

Rearrange the equation for y. (Y must be by itself!)

$y=x^2-6x+5$

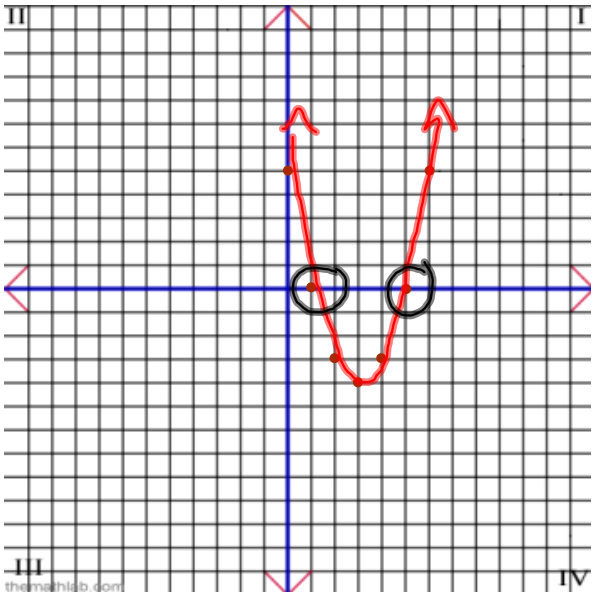
$y=(x-3)^2-4$

Vertex :

SF:

Dir:

Look for the roots !!



Where the parabola cross the x-axis.

1.

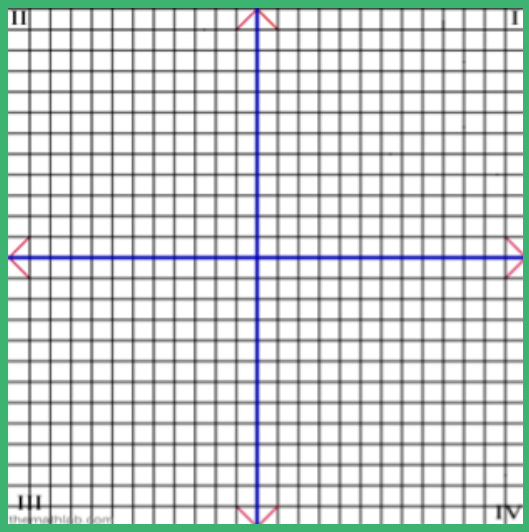
$$y = x^2 - 8x - 5$$

$+16$

$y + 5 = x^2 - 8x + 16$

$y + 21 = (x-4)(x-4)$

$y = (x-4)^2 - 21$

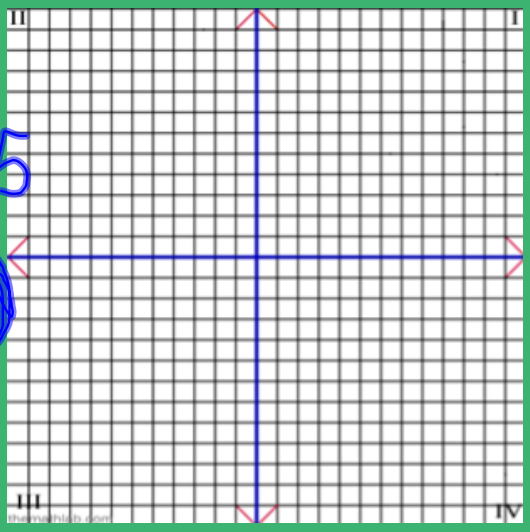


2. $y = x^2 + 10x + 2$

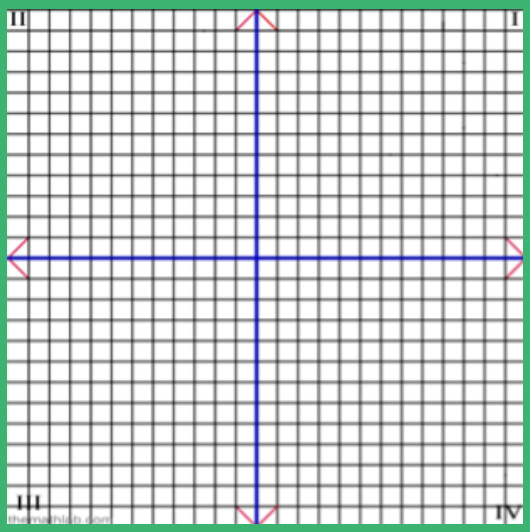
$y - 2 + 25 = x^2 + 10x + 25$

$y + 23 = (x+5)(x+5)$

$y = (x+5)^2 - 23$



3. $y = x^2 + 4x - 11$

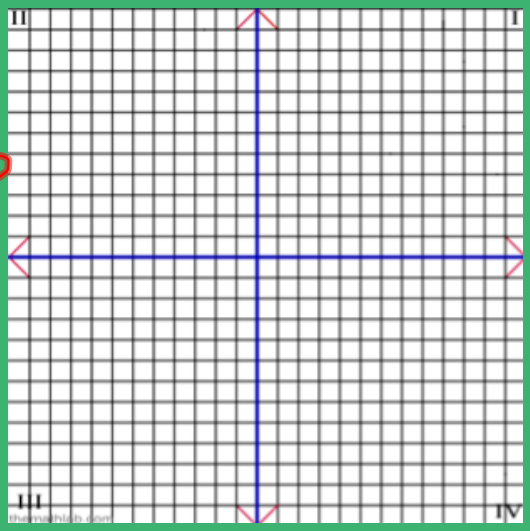


4. $y = x^2 - 12x$

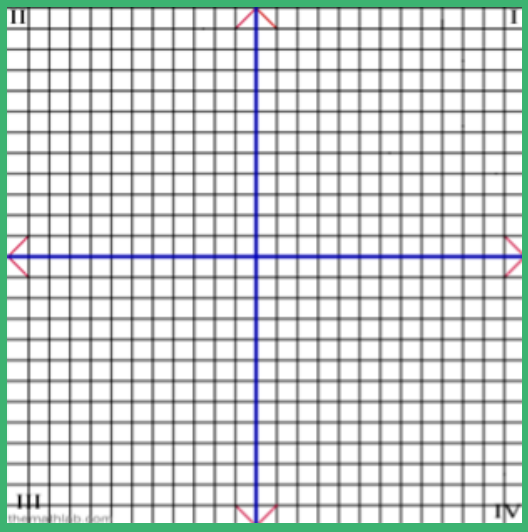
$y + 36 = x^2 - 12x + 36$

$y + 36 = (x-6)(x-6)$

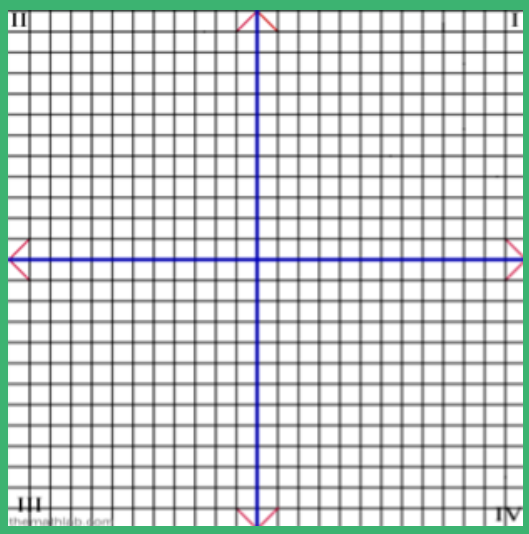
$y = (x-6)^2 - 36$



5. $y = x^2 + 7x - 1$



6. $y = x^2 - 5x + 2$



7. $y = 2x^2 - 12x + 5$

$y - 5 = 2x^2 - 12x$

$y - 5 + 18 = 2(x^2 - 6x + 9)$

$y + 13 = 2(x-3)(x-3)$

$y = 2(x-3)^2 - 13$

8. $y = 5x^2 + 40x - 1$

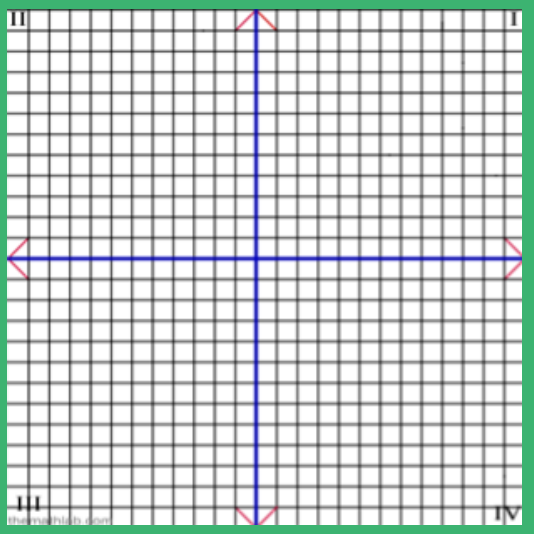
$y + 1 = 5x^2 + 40x$

$y + 1 + 80 = 5(x^2 + 8x + 16)$

$y + 81 = 5(x + 4)(x + 4)$

$y = 5(x + 4)^2 - 81$

9. $y = -5x^2 - 20x - 5$



10. $y = -2x^2 - 16x - 1$