Completing the square can be used to solve all quadratic equations with exact value.

Perfect Square polynomials : $y = (ax)^2 + 2ax(b) + b^2 = (ax+b)^2$

Given: $y = 4x^2 + 16x + 6$

step 1: Move the constant. $y - 6 = 4x^2 + 16x$

Step 2: Factor out the lead coefficient. $y - 6 = 4(x^2 + 4x)$

Easier to factor when lead coefficient = 1

Step 3:
a. Take half the x coefficient. $1/2\,(4) = 2$
b. Square it. $2^2 = 4$
c. Put it inside parenthesis. $y - 6 = 4(x^2 + 4x + 2^2)$
d. Balance equation. $y - 6 + 4(4) = 4(x^2 + 4x + 2^2)$
(Add the same amount)

Step 4: Express the polynomial in binomial form

$$y - 6 + 4(4) = 4(x + 2)^2$$

Step 5: Simplify:

$$y - 6 + 16 = 4(x + 2)^2$$
$$y + 10 = 4(x + 2)^2$$

Step 6: Solve for roots:

$$y = 0$$
$$0 + 10 = 4(x + 2)^2$$
$$10/4 = (x + 2)^2$$

$$\pm\frac{\sqrt{10}}{\sqrt{4}} = x + 2$$

$$-2 \pm \frac{\sqrt{10}}{2} = x + 2 - 2$$

$$-2 \pm \frac{\sqrt{10}}{2} = x$$