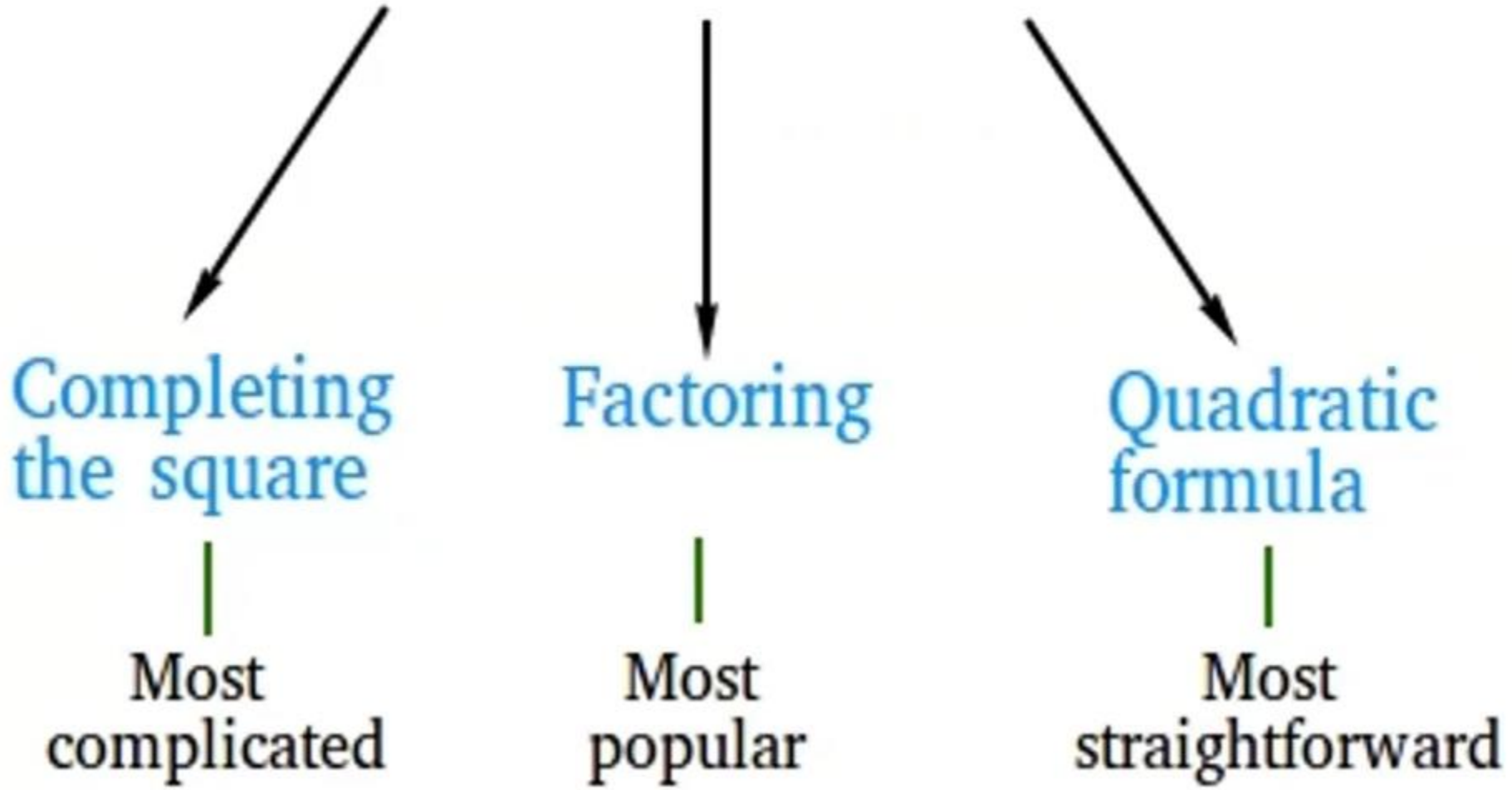
QUADRATIC EQUATION

Quadratic Equation

An equation whose heights power of unknown is TWO is called quadratic equation.

$$e.g \quad aX^2 + bx + c = 0$$

Ways to solve quadratic equations



COMPLETING SQUARE METHOD

$ax^2 + bx + c = 0$

Step No. 1 Transferring constant to right hand side

$ax^2 + bx = - c$

Step No. 2 Eliminating the co-efficient of X^2

$$\frac{a}{a}x^2 + \frac{b}{a}x = \frac{-c}{a}$$

$$x^2 + \frac{b}{a}x = \frac{-c}{a}$$

Step No. 3 Dividing Co-efficient of X by 2 and adding the square of it on both sides

$$x^2 + \frac{b}{a}x + (\frac{b}{2a})^2 = \frac{-c}{a} + (\frac{b}{2a})^2$$

$$(x + \frac{b}{2a})^2 = \frac{-c}{a} + \frac{b^2}{4a^2}$$

$$(x + \frac{b}{2a})^2 = \frac{-4ac+b^2}{4a^2}$$

$$(x + \frac{b}{2a})^2 = \frac{-4ac+b^2}{4a^2}$$

Taking square root on both sides

$$\sqrt{(x + \frac{b}{2a})^2} = \sqrt{\frac{-4ac+b^2}{4a^2}}$$

$$(x + \frac{b}{2a}) = \pm\sqrt{\frac{-4ac+b^2}{4a^2}}$$

Transferring $\frac{b}{a}$ to right hand side

$$x = -\frac{b}{2a} \pm \sqrt{\frac{-4ac+b^2}{4a^2}}$$

$$x = -\frac{b}{2a} \pm \frac{\sqrt{-4ac+b^2}}{2a}$$

$$x = \frac{b \pm \sqrt{-4ac + b^2}}{2a}$$

$2x^2 + 3x + 1 = 0$

Step No. 1 Transferring constant to right hand side

$2x^2 + 3x = -1$

Step No. 2 Eliminating the co-efficient of X^2

$$\frac{2}{2}x^2 + \frac{3}{2}x = \frac{-1}{2}$$

$$x^2 + \frac{3}{2}x = \frac{-1}{2}$$

Step No. 3 Dividing Co-efficient of X by 2 and adding the square of it on both sides

$$x^2 + \frac{3}{2}x + \left(\frac{3}{4}\right)^2 = -\frac{1}{2} + \left(\frac{3}{4}\right)^2$$

$$\left(x + \frac{3}{4}\right)^2 = -\frac{1}{2} + \frac{9}{16}$$

$$\left(x + \frac{3}{4}\right)^2 = \frac{-8+9}{16}$$

$$(x+\frac{3}{4})^2 = \frac{-8+9}{16}$$

$$(x+\frac{3}{4})^2 = \frac{1}{16}$$

Taking square root on both sides

$$\sqrt{(x+\frac{3}{4})^2} = \sqrt{\frac{1}{16}}$$

$$(x+\frac{3}{4}) = \pm\sqrt{\frac{1}{16}}$$

Transferring $\frac{3}{4}$ to right hand side

$$x = -\frac{3}{4} \pm \frac{1}{4}$$

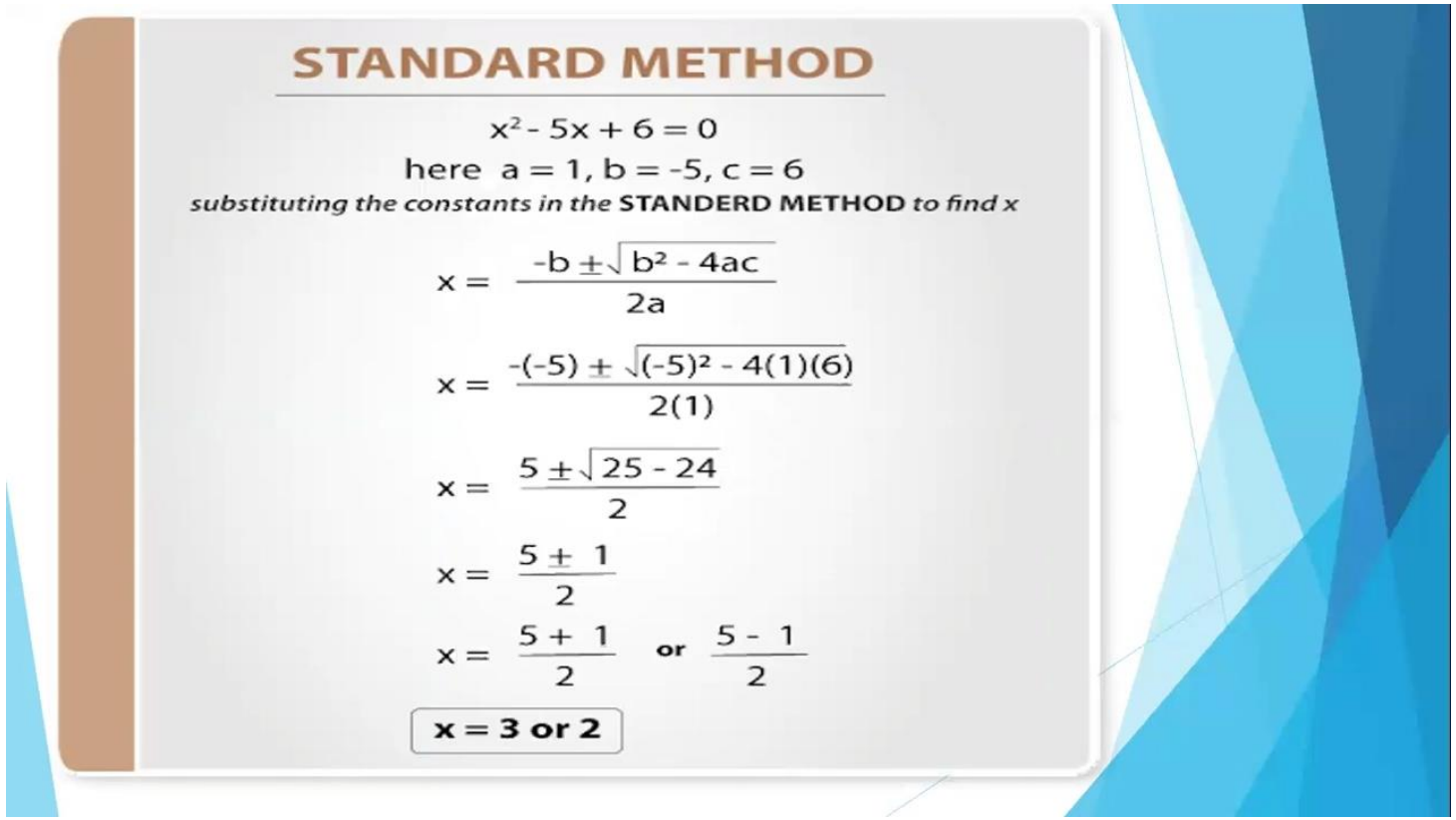
$$x = \frac{-3 \pm 1}{4}$$

$$x = \frac{-3 \pm 1}{4}$$

$$x = \frac{-3-1}{4} = \frac{-4}{4} = -1\,, \qquad x = \frac{-3+1}{4} = \frac{-2}{4} = \frac{-1}{2}$$

So solution set is $\{-1, \frac{-1}{2}\}$

FORMULA METHOD
(Quadratic Formula)


STANDARD METHOD
$x^2 - 5x + 6 = 0$
here $a = 1, b = -5, c = 6$
substituting the constants in the STANDERD METHOD to find x
$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
$x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(1)(6)}}{2(1)}$
$x = \frac{5 \pm \sqrt{25 - 24}}{2}$
$x = \frac{5 \pm 1}{2}$
$x = \frac{5 + 1}{2}$ or $\frac{5 - 1}{2}$
x = 3 or 2

$$2x^2 - 8x - 24 = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(-8) \pm \sqrt{(-8)^2 - 4(2)(-24)}}{2(2)}$$

$$x = \frac{8 \pm \sqrt{64 - (-192)}}{4}$$

$$x = \frac{8 \pm \sqrt{256}}{4}$$

$$x = \frac{8 \pm 16}{4} = 2 \pm 4$$

$$x = 6, -2$$