

Practice Exercise Sheet 2 - Solutions
Topic 2: Quadratic Equations

1. **Determine whether solutions exist for each of the following quadratic equations. Where they do find the solution(s).**

Firstly determine whether solutions exist using the following criteria:

$$b^2 - 4ac > 0 \quad \text{Two solutions}$$

$$b^2 - 4ac = 0 \quad \text{One solution}$$

$$b^2 - 4ac < 0 \quad \text{No solution}$$

Secondly find the solution where possible using the formula:

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

(i) $x^2 - 2x = 0$

$$a=1, b=-2, c=0$$

$$b^2 - 4ac = (-2)^2 - 4(1)(0) = 4 > 0 \quad \text{two solutions exist}$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{2 \pm \sqrt{4}}{2(1)} = \frac{2 \pm 2}{2}$$

$$x = \frac{2+2}{2} = 2$$

$$x = \frac{2-2}{2} = 0$$

(ii) $(3x - 6)(x + 1) = 0$

Multiply out the quadratic

$$3x^2 - 3x - 6 = 0$$

Divide across by 3

$$x^2 - x - 2 = 0$$

$$a=1, b=-1, c=-2$$

$$b^2 - 4ac = (-1)^2 - 4(1)(-2) = 9 > 0 \quad \text{two solutions exist}$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{1 \pm \sqrt{9}}{2(1)} = \frac{1 \pm 3}{2}$$

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

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