Simple Quadratic Equations

Example Problems

EXAMPLE 1: Solve the following equation for x,

$$x^2 = 49.$$

SOLUTION: To find the answer to the equation we need to find the square root of both sides of the equation,

$$\sqrt{x^2} = \sqrt{49},$$

the LHS simplifies and for the RHS we can evaluate the square root,

$$x = \pm 7.$$

Note here that the $\pm$ is important since $7^2 = 49$ and $(-7)^2 = 49$ so we use it to indicate that $x = -7$ or 7.

EXAMPLE 2: Solve the following equation for x,

$$3x^2 - 19 = 56.$$

SOLUTION: In order to simplify the LHS, we first will remove the -19 since it is the last operation performed on x. We can do this by adding 19 to both sides

$$\begin{aligned} 3x^2 - 19 + 19 &= 56 + 19, \\ 3x^2 &= 75. \end{aligned}$$

Next we will divide both sides by 3,

$$\begin{aligned} 3x^2 \div 3 &= 75 \div 3, \\ x^2 &= 25, \end{aligned}$$

and finally square root both sides,

$$\begin{aligned} \sqrt{x^2} &= \sqrt{25}, \\ x &= \pm 5. \end{aligned}$$

EXAMPLE 3: Solve the following equation for x,

$$\frac{x^2 - 12}{4} = 13.$$

SOLUTION: To simplify the LHS first we need to notice that the numerator of the fraction has implicit brackets,

$$\frac{(x^2 - 12)}{4} = 13,$$

which means that we first need to multiply both sides by 4,

$$\begin{aligned} \frac{x^2 - 12}{4} \times 4 &= 13 \times 4, \\ x^2 - 12 &= 52, \end{aligned}$$

then we add 12 and square root

$$\begin{aligned} x^2 - 12 + 12 &= 52 + 12, \\ x^2 &= 64, \\ \sqrt{x^2} &= \sqrt{64}, \\ x &= \pm 8. \end{aligned}$$

Question Bank

1. Solve the following equations.

   (a) $x^2 = 9$
   (b) $x^2 = 1$
   (c) $x^2 = 441$
   (d) $x^2 = 169$
   (e) $x^2 = 0$
   (f) $x^2 = 200$

2. Solve the following equations.

   (a) $5x^2 = 45$
   (b) $13x^2 = 637$
   (c) $-3x^2 = -27$
   (d) $x^2 + 14 = 95$
   (e) $x^2 - 17 = 47$
   (f) $x^2 - 256 = -87$
   (g) $x^2 - 36 = 0$
   (h) $\dfrac{x^2}{3} = 27$
   (i) $\dfrac{x^2}{4} = 25$
   (j) $\dfrac{x^2}{28} = \dfrac{9}{7}$
   (k) $\dfrac{x^2}{52} = 3.25$
   (l) $\dfrac{-x^2}{4} = -16$

3. Solve the following equations for x.

   (a) $5x^2 + 14 = 59$
   (b) $3x^2 - 270 = 162$
   (c) $7x^2 - 53 = -25$
   (d) $2x^2 + 42 = 140$
   (e) $\dfrac{x^2}{8} - 13 = -11$
   (f) $\dfrac{x^2}{6} + 25 = 49$
   (g) $\dfrac{x^2}{12} + 15.25 = 22$
   (h) $\dfrac{x^2}{64} + \dfrac{15}{4} = 6$

4. Solve the following equations for x.

   (a)

Answers

1. (a) $x = \pm 3$
   (b) $x = \pm 1$
   (c) $x = \pm 21$
   (d) $x = \pm 13$
   (e) $x = 0$
   (f) $x = \pm 14.14$ ($x = \pm 10\sqrt{2}$ as an exact value)

2. (a) $x = \pm 3$
   (b) $x = \pm 7$
   (c) $x = \pm 3$
   (d) $x = \pm 9$
   (e) $x = \pm 8$
   (f) $x = \pm 13$
   (g) $x = \pm 6$
   (h) $x = \pm 9$
   (i) $x = \pm 10$
   (j) $x = \pm 6$
   (k) $x = \pm 13$
   (l) $x = \pm 8$

3. (a) $x = \pm 3$
   (b) $x = \pm 12$
   (c) $x = \pm 2$
   (d) $x = \pm 7$
   (e) $x = \pm 4$
   (f) $x = \pm 12$
   (g) $x = \pm 9$
   (h) $x = \pm 12$

4. (a)