

Solving Equations by Completing the Square

Solve each equation by completing the square.

1) $a^2 + 2a - 3 = 0$

$a^2 + 2a + 1 = 3 + 1$

$(a+1)^2 = 4$

$a+1 = \pm 2$

$a = -3, a = 1$

2) $a^2 - 2a - 8 = 0$

$a^2 - 2a + 1 = 8 + 1$

$\sqrt{(a-1)^2} = \sqrt{9}$

$a-1 = \pm 3$

$a = 4, a = -2$

3) $p^2 + 16p - 22 = 0$

$p^2 + 16p + 64 = 22 + 64$

$(p+8)^2 = 86$

$p+8 = \pm \sqrt{86}$

$p = -8 \pm \sqrt{86}$

4) $k^2 + 8k + 12 = 0$

$k^2 + 8k + 16 = -12 + 16$

$\sqrt{(k+4)^2} = \sqrt{4}$

$k+4 = \pm 2$

$k = -4 \pm 2$

$k = -2, -6$

5) $r^2 + 2r - 33 = 0$

$r^2 + 2r + 1 = 33 + 1$

$\sqrt{(r+1)^2} = \sqrt{34}$

$r+1 = \pm \sqrt{34}$

$r = -1 \pm \sqrt{34}$

6) $a^2 - 2a - 48 = 0$

$a^2 - 2a + 1 = 48 + 1$

$\sqrt{(a-1)^2} = \sqrt{49}$

$a-1 = \pm 7$

$a = 1 \pm 7$

$a = 8, -6$

7) $m^2 - 12m + 26 = 0$

$m^2 - 12m + 36 = -26 + 36$

$\sqrt{(m-6)^2} = \sqrt{10}$

$m-6 = \pm \sqrt{10}$

$m = 6 \pm \sqrt{10}$

8) $x^2 + 12x + 20 = 0$

$x^2 + 12x + 36 = -20 + 36$

$\sqrt{(x+6)^2} = \sqrt{16}$

$x+6 = \pm 4$

$x = -6 \pm 4$

$x = -10, -2$

9) $k^2 - 8k - 48 = 0$

$k^2 - 8k + 16 = 48 + 16$

$\sqrt{(k-4)^2} = \sqrt{64}$

$k-4 = \pm 8$

$k = 4 \pm 8$

$k = 12, -4$

10) $p^2 + 2p - 63 = 0$

$p^2 + 2p + 1 = 63 + 1$

$\sqrt{(p+1)^2} = \sqrt{64}$

$p+1 = \pm 8$

$p = -1 \pm 8$
 $p = 7, -9$

11) $m^2 + 2m - 48 = -6$

$m^2 + 2m + 1 = 42 + 1$

$\sqrt{(m+1)^2} = \sqrt{43}$

$m+1 = \pm \sqrt{43}$

$m = -1 \pm \sqrt{43}$

12) $p^2 - 8p + 21 = 6$

$p^2 - 8p + 16 = 6 + 16$

$\sqrt{(p-4)^2} = \sqrt{21}$

$p-4 = \pm \sqrt{21}$

$p = 4 + \sqrt{21}$
 $p = 4 - \sqrt{21}$

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2) $a^2 - 2a - 8 = 0$

$a^2 - 2a + 1 = 8 + 1$

$\sqrt{(a-1)^2} = \sqrt{9}$

$a-1 = \pm 3$

$a = 4, a = -2$

3) $p^2 + 16p - 22 = 0$

$p^2 + 16p + 64 = 22 + 64$

$(p+8)^2 = 86$

$p+8 = \pm \sqrt{86}$

$p = -8 \pm \sqrt{86}$

4) $k^2 + 8k + 12 = 0$

$k^2 + 8k + 16 = -12 + 16$

$\sqrt{(k+4)^2} = \sqrt{4}$

$k+4 = \pm 2$

$k = -4 \pm 2$

$k = -2, -6$

5) $r^2 + 2r - 33 = 0$

$r^2 + 2r + 1 = 33 + 1$

$\sqrt{(r+1)^2} = \sqrt{34}$

$r+1 = \pm \sqrt{34}$

$r = -1 \pm \sqrt{34}$

6) $a^2 - 2a - 48 = 0$

$a^2 - 2a + 1 = 48 + 1$

$\sqrt{(a-1)^2} = \sqrt{49}$

$a-1 = \pm 7$

$a = 1 \pm 7$

$a = 8, -6$

7) $m^2 - 12m + 26 = 0$

$m^2 - 12m + 36 = -26 + 36$

$\sqrt{(m-6)^2} = \sqrt{10}$

$m-6 = \pm \sqrt{10}$

$m = 6 \pm \sqrt{10}$

8) $x^2 + 12x + 20 = 0$

$x^2 + 12x + 36 = -20 + 36$

$\sqrt{(x+6)^2} = \sqrt{16}$

$x+6 = \pm 4$

$x = -6 \pm 4$

$x = -10, -2$

9) $k^2 - 8k - 48 = 0$

$k^2 - 8k + 16 = 48 + 16$

$\sqrt{(k-8)^2} = \sqrt{64}$

$k-8 = \pm 8$

$k = 8 \pm 8$

$k = 16, 0$

10) $p^2 + 2p - 63 = 0$

$p^2 + 2p + 1 = 63 + 1$

$\sqrt{(p+1)^2} = \sqrt{64}$

$p+1 = \pm 8$

$p = -1 \pm 8$
 $p = -9, 7$

11) $m^2 + 2m - 48 = -6$

$m^2 + 2m + 1 = 42 + 1$

$\sqrt{(m+1)^2} = \sqrt{43}$

$m+1 = \pm \sqrt{43}$

$m = -1 \pm \sqrt{43}$

12) $p^2 - 8p + 21 = 6$

$p^2 - 8p + 16 = -15 + 16$

$\sqrt{(p-4)^2} = \sqrt{1}$

$p-4 = \pm 1$

$p = 4+1 = 5$
 $p = 4-1 = 3$