

Quadratic Equations

Solve each equation by taking square roots.

1) $2b^2 + 5 = 205$

$2b^2 = 200$

$b^2 = 100$

$b = \pm 10$

2) $6x^2 + 6 = 78$

$6x^2 = 72$

$x^2 = 12$

$x = \pm\sqrt{12}$

$x = \pm 2\sqrt{3}$

3) $4n^2 + 4 = 132$

$4n^2 = 128$

$n^2 = 32$

$n = \pm\sqrt{32}$

$n = \pm 4\sqrt{2}$

4) $-5 - 3r^2 = -89$

$-3r^2 = -84$

$r^2 = 28$

$r = \pm\sqrt{28}$

$r = \pm 2\sqrt{7}$

Solve each equation by factoring.

5) $x^2 + x = 12$

$x^2 + x - 12 = 0$

$(x+4)(x-3) = 0$

$x = -4$

$x = 3$

6) $x^2 = -56 - 15x$

$x^2 + 15x + 56 = 0$

$(x+8)(x+7) = 0$

$x = -7$

$x = -8$

7) $x^2 = -4x$

$x^2 + 4x = 0$

$x(x+4) = 0$

$x = 0$

$x = -4$

8) $15n^2 = 14n + 8$

$15n^2 - 14n - 8 = 0$

$15n^2 - 20n + 6n - 8 = 0$

$5n(3n-4) + 2(3n-4) = 0$

$(5n+2)(3n-4) = 0$

$\frac{120}{-20+6}$

$n = -2/5$

$n = 4/3$

Solve each equation with the quadratic formula.

9) $7n^2 = 3n + 17$

$7n^2 - 3n - 17 = 0$

$n = \frac{3 \pm \sqrt{9 - 4(7)(-17)}}{2(7)}$

$n = \frac{3 \pm \sqrt{485}}{14}$

10) $11x^2 = 8$

$11x^2 - 8 = 0$

$x = \frac{0 \pm \sqrt{0 - 4(11)(-8)}}{2(11)}$

$x = \frac{\pm \sqrt{352}}{22} = \frac{\pm 4\sqrt{22}}{22} = \frac{\pm 2\sqrt{22}}{11}$

11) $-5x^2 + 20 = 0$

$x = \frac{0 \pm \sqrt{0 - 4(-5)(20)}}{2(-5)}$

$= \frac{\pm \sqrt{400}}{-10} = \frac{\pm 20}{-10} =$

$x = 2$

$x = -2$

12) $4b^2 - 36 = 0$

$b = \frac{0 \pm \sqrt{0 - 4(4)(-36)}}{2(4)}$

$= \frac{\pm \sqrt{576}}{8} = \frac{\pm 24}{8} =$

$x = 3$

$x = -3$

Solve each equation by completing the square.

13) $r^2 - 8r = -5$

$r^2 - 8r + 16 = -5 + 16$
 $(r-4)^2 = 11$
 $r-4 = \pm\sqrt{11}$
 $r = 4 \pm \sqrt{11}$

$b = -8 \quad \frac{1}{2}b = -4 \quad (\frac{1}{2}b)^2 = 16$

14) $k^2 + 4k = 21$

$k^2 + 4k + 4 = 21 + 4$
 $(k+2)^2 = 25$
 $k+2 = \pm 5$
 $k = 3 \quad k = -7$

$b = 4 \quad \frac{1}{2}b = 2 \quad (\frac{1}{2}b)^2 = 4$

15) $n^2 = -56 - 18n$

$n^2 + 18n + 81 = -56 + 81$
 $(n+9)^2 = 25$
 $n+9 = \pm 5$
 $n = -4 \quad n = -14$

9, 81

16) $x^2 + 96 = -20x$

$x^2 + 20x + 100 = -96 + 100$
 $(x+10)^2 = 4$
 $x+10 = \pm 2$
 $x = -8 \quad x = -12$

10, 100

17) $n^2 + 28 = 16n$

$n^2 - 16n + 64 = -28 + 64$
 $(n-8)^2 = 36$
 $n-8 = \pm 6$
 $n = 14 \quad n = 2$

-8, 64

18) $v^2 - 63 = 2v$

$v^2 - 2v + 1 = 63 + 1$
 $(v-1)^2 = 64$
 $v-1 = \pm 8$
 $v = 9 \quad v = -7$

-1, 1

19) $8m^2 + 16m = 64$

$m^2 + 2m + 1 = 8 + 1$
 $(m+1)^2 = 9$
 $m+1 = \pm 3$
 $m = +2, m = -4$

1, 1

20) $5b^2 = 10b + 69$

$5b^2 - 10b = 69$
 $b^2 - 2b + 1 = \frac{69}{5} + \frac{5}{5}$
 $(b-1)^2 = \frac{74}{5}$
 $b-1 = \pm \frac{\sqrt{74}}{\sqrt{5}}$
 $b = 1 \pm \frac{\sqrt{370}}{5}$
 $b = \frac{5 \pm \sqrt{370}}{5}$ *get a common denominator*

-1, 1

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

$v^2 + 2v + 1 = \frac{4}{3} + \frac{3}{3}$
 $(v+1)^2 = \frac{7}{3}$
 $v+1 = \pm \frac{\sqrt{21}}{3}$
 $v+1 = \pm \frac{\sqrt{21}}{3}$

1, 1

$v = 1 \pm \frac{\sqrt{21}}{3}$
 $v = \frac{-3 \pm \sqrt{21}}{3}$

22) $10x^2 = 20x + 30$

$x^2 - 2x + 1 = 3 + 1$
 $(x-1)^2 = 4$
 $x-1 = \pm 2$
 $x = 3 \quad x = -1$

-1, 1

23) $r^2 = r + 71$

$r^2 - r + \frac{1}{4} = 71 + \frac{1}{4}$
 $(r-\frac{1}{2})^2 = \frac{284}{4} + \frac{1}{4}$
 $(r-\frac{1}{2})^2 = \frac{285}{4}$
 $r-\frac{1}{2} = \pm \frac{\sqrt{285}}{2}$
 $r = \frac{1 \pm \sqrt{285}}{2}$

$-\frac{1}{2}, \frac{1}{4}$

24) $v^2 - 9v = 70$

$v^2 - 9v + \frac{81}{4} = 70 + \frac{81}{4}$
 $(v-\frac{9}{2})^2 = \frac{280}{4} + \frac{81}{4}$
 $(v-\frac{9}{2})^2 = \frac{361}{4}$
 $v-\frac{9}{2} = \pm \frac{19}{2}$
 $v = 14 \quad v = -5$

$-\frac{9}{2}, \frac{81}{4}$

25) $n^2 - 14 = -5n$

$n^2 + 5n + \frac{25}{4} = 14 + \frac{25}{4}$
 $(n+\frac{5}{2})^2 = \frac{56}{4} + \frac{25}{4}$
 $(n+\frac{5}{2})^2 = \frac{81}{4}$
 $n+\frac{5}{2} = \pm \frac{9}{2}$
 $n = 2$
 $n = -7$

$\frac{5}{2}, \frac{25}{4}$

26) $a^2 + 16 = 17a$

$a^2 - 17a + \frac{289}{4} = -16 + \frac{289}{4}$
 $(a-\frac{17}{2})^2 = \frac{-64}{4} + \frac{289}{4}$
 $(a-\frac{17}{2})^2 = \frac{225}{4}$
 $a-\frac{17}{2} = \pm \frac{15}{2}$
 $a = 16$
 $a = 1$

$-17\frac{1}{2}, \frac{289}{4}$

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

22) $10x^2 = 20x + 30$

23) $r^2 = r + 71$

24) $v^2 - 9v = 70$

25) $n^2 - 14 = -5n$

26) $a^2 + 16 = 17a$