

Created by T. Madas

QUADRATICS

Created by T. Madas

Question 1

Solve each of the following quadratic equations, by factorization.

a) $x^2 - 11x + 24 = 0$

$x = 3, 8$

b) $x^2 = 6x + 16$

$x = -2, 8$

c) $x^2 + 4x = 12$

$x = 2, -6$

d) $x^2 + 2x = 15$

$x = 3, -5$

e) $x^2 - 8x = 9$

$x = -1, 9$

f) $x^2 + 12 = 7x$

$x = 3, 4$

g) $x^2 + 16 = 8x$

$x = 4$

h) $x^2 = 28 - 3x$

$x = -7, 4$

Handwritten solutions for the quadratic equations in Question 1:

- a) $x^2 - 11x + 24 = 0$
 $(x-3)(x-8) = 0$
 $x = 3, 8$
- b) $x^2 = 6x + 16$
 $x^2 - 6x - 16 = 0$
 $(x+2)(x-8) = 0$
 $x = -2, 8$
- c) $x^2 + 4x = 12$
 $x^2 + 4x - 12 = 0$
 $(x+6)(x-2) = 0$
 $x = -6, 2$
- d) $x^2 + 2x = 15$
 $x^2 + 2x - 15 = 0$
 $(x+5)(x-3) = 0$
 $x = -5, 3$
- e) $x^2 - 8x = 9$
 $x^2 - 8x - 9 = 0$
 $(x-9)(x+1) = 0$
 $x = 9, -1$
- f) $x^2 + 12 = 7x$
 $x^2 - 7x + 12 = 0$
 $(x-4)(x-3) = 0$
 $x = 4, 3$
- g) $x^2 + 16 = 8x$
 $x^2 - 8x + 16 = 0$
 $(x-4)(x-4) = 0$
 $x = 4$ (double root)
- h) $x^2 = 28 - 3x$
 $x^2 + 3x - 28 = 0$
 $(x+7)(x-4) = 0$
 $x = -7, 4$

Question 2

Solve each of the following quadratic equations, by factorization.

a) $x^2 = 2x + 24$

$x = -4, 6$

b) $x^2 + 8x - 10 = 10$

$x = -10, 2$

c) $-x^2 + 11x + 26 = 0$

$x = -2, 13$

d) $30 - 13x - x^2 = 0$

$x = -15, 2$

e) $40 + 3x - x^2 = 0$

$x = -5, 8$

f) $(x+3)(x-6) = 2 - 2x$

$x = -4, 5$

g) $(x-2)(x+5) = 4x + 32$

$x = -6, 7$

h) $(4-x)(5-x) = 2(x+1)$

$x = 2, 9$

Handwritten solutions for the quadratic equations in Question 2:

- a) $x^2 = 2x + 24$
 $x^2 - 2x - 24 = 0$
 $(x+4)(x-6) = 0$
 $x = -4, 6$
- b) $x^2 + 8x - 10 = 10$
 $x^2 + 8x - 20 = 0$
 $(x+10)(x-2) = 0$
 $x = -10, 2$
- c) $-x^2 + 11x + 26 = 0$
 $0 = x^2 - 11x - 26$
 $0 = (x+2)(x-13)$
 $x = -2, 13$
- d) $30 - 13x - x^2 = 0$
 $0 = x^2 + 13x - 30$
 $0 = (x+15)(x-2)$
 $x = -15, 2$
- e) $40 + 3x - x^2 = 0$
 $x^2 - 3x - 40 = 0$
 $0 = (x+5)(x-8)$
 $x = -5, 8$
- f) $(x+3)(x-6) = 2 - 2x$
 $x^2 - 3x - 18 = 2 - 2x$
 $x^2 - 3x - 18 - 2 + 2x = 0$
 $x^2 - x - 20 = 0$
 $(x+4)(x-5) = 0$
 $x = -4, 5$
- g) $(x-2)(x+5) = 4x + 32$
 $x^2 + 3x - 10 = 4x + 32$
 $x^2 + 3x - 10 - 4x - 32 = 0$
 $x^2 - x - 42 = 0$
 $(x+6)(x-7) = 0$
 $x = -6, 7$
- h) $(4-x)(5-x) = 2(x+1)$
 $20 - 9x + x^2 = 2x + 2$
 $x^2 - 11x + 18 = 0$
 $(x-9)(x-2) = 0$
 $x = 2, 9$

Question 3

Solve each of the following quadratic equations, by factorization.

a) $(2x-3)(x+4) = x(x+6)$

b) $(x+2)(2x-7) = (x-2)(x+4)$

c) $(x+1)^2 = 4x+9$

d) $(x+5)(2x-1) = (x+1)(x+7)$

$x = -3, 4$, $x = -1, 6$, $x = -2, 4$, $x = -4, 3$

Handwritten solutions for the four quadratic equations:

a) $(2x-3)(x+4) = x(x+6)$
 $\Rightarrow 2x^2 + 5x - 12 = x^2 + 6x$
 $\Rightarrow 2x^2 + 5x - 12 - x^2 - 6x = 0$
 $\Rightarrow x^2 - x - 12 = 0$
 $\Rightarrow (x-4)(x+3) = 0$
 $\Rightarrow x = 4$ or $x = -3$

b) $(x+2)(2x-7) = (x-2)(x+4)$
 $\Rightarrow 2x^2 - 3x - 14 = x^2 + 2x - 8$
 $\Rightarrow 2x^2 - 3x - 14 - x^2 - 2x + 8 = 0$
 $\Rightarrow x^2 - 5x - 6 = 0$
 $\Rightarrow (x-6)(x+1) = 0$
 $\Rightarrow x = 6$ or $x = -1$

c) $(x+1)^2 = 4x+9$
 $\Rightarrow x^2 + 2x + 1 = 4x + 9$
 $\Rightarrow x^2 + 2x + 1 - 4x - 9 = 0$
 $\Rightarrow x^2 - 2x - 8 = 0$
 $\Rightarrow (x-4)(x+2) = 0$
 $\Rightarrow x = 4$ or $x = -2$

d) $(x+5)(2x-1) = (x+1)(x+7)$
 $\Rightarrow 2x^2 + 9x - 5 = x^2 + 8x + 7$
 $\Rightarrow 2x^2 + 9x - 5 - x^2 - 8x - 7 = 0$
 $\Rightarrow x^2 + x - 12 = 0$
 $\Rightarrow (x-3)(x+4) = 0$
 $\Rightarrow x = 3$ or $x = -4$

Question 4

Solve each of the following quadratic equations, by factorization.

a) $x(2x-11) = (x-4)(x+2)$

b) $(2x+3)(x+7) = (x+3)(x+9)$

c) $(2x+1)(x-2) = 2(x+5)$

d) $(x-1)(2x+3) = 2(x+6)$

$$\boxed{x=1,8}, \boxed{x=-6,1}, \boxed{x=-\frac{3}{2},4}, \boxed{x=-\frac{5}{2},3}$$

Question 5

Solve each of the following quadratic equations, by factorization.

a) $(2x+3)(4x-5) = (2x+5)(2x-1)$

b) $(3x+2)(6x-7) = (3x-2)(3x+4)$

c) $(3x+8)(6x+5) = (3x+4)(3x+10)$

d) $(x-6)(2x-7) = 2(x+1)$

$$\boxed{x = -1, \frac{5}{2}}, \boxed{x = -\frac{1}{3}, 2}, \boxed{x = -\frac{7}{3}, 0}, \boxed{x = \frac{5}{2}, 8}$$

Question 6

Solve each of the following quadratic equations, by completing the square.

a) $x^2 + 6x + 7 = 0$

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

b) $x^2 - 4x + 1 = 0$

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

c) $x^2 + 2x - 6 = 0$

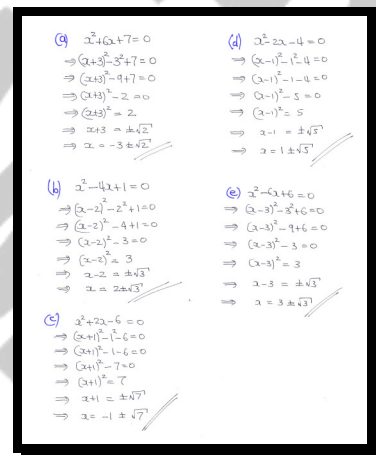
$x = -1 \pm \sqrt{7}$

d) $x^2 - 2x - 4 = 0$

$x = 1 \pm \sqrt{5}$

e) $x^2 - 6x + 6 = 0$

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



Handwritten solutions for the quadratic equations in Question 6:

a) $x^2 + 6x + 7 = 0$
 $\Rightarrow (x+3)^2 - 9 + 7 = 0$
 $\Rightarrow (x+3)^2 - 2 = 0$
 $\Rightarrow (x+3)^2 = 2$
 $\Rightarrow x+3 = \pm\sqrt{2}$
 $\Rightarrow x = -3 \pm \sqrt{2}$

b) $x^2 - 4x + 1 = 0$
 $\Rightarrow (x-2)^2 - 4 + 1 = 0$
 $\Rightarrow (x-2)^2 - 3 = 0$
 $\Rightarrow (x-2)^2 = 3$
 $\Rightarrow x-2 = \pm\sqrt{3}$
 $\Rightarrow x = 2 \pm \sqrt{3}$

c) $x^2 + 2x - 6 = 0$
 $\Rightarrow (x+1)^2 - 1 - 6 = 0$
 $\Rightarrow (x+1)^2 - 7 = 0$
 $\Rightarrow (x+1)^2 = 7$
 $\Rightarrow x+1 = \pm\sqrt{7}$
 $\Rightarrow x = -1 \pm \sqrt{7}$

d) $x^2 - 2x - 4 = 0$
 $\Rightarrow (x-1)^2 - 1 - 4 = 0$
 $\Rightarrow (x-1)^2 - 5 = 0$
 $\Rightarrow (x-1)^2 = 5$
 $\Rightarrow x-1 = \pm\sqrt{5}$
 $\Rightarrow x = 1 \pm \sqrt{5}$

e) $x^2 - 6x + 6 = 0$
 $\Rightarrow (x-3)^2 - 9 + 6 = 0$
 $\Rightarrow (x-3)^2 - 3 = 0$
 $\Rightarrow (x-3)^2 = 3$
 $\Rightarrow x-3 = \pm\sqrt{3}$
 $\Rightarrow x = 3 \pm \sqrt{3}$

Question 7

Solve each of the following quadratic equations, by completing the square.

a) $x^2 + 4x - 1 = 0$

$$x = -2 \pm \sqrt{5}$$

b) $x^2 - 8x + 14 = 0$

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

c) $x^2 - 2x - 1 = 0$

$$x = 1 \pm \sqrt{2}$$

d) $x^2 + 6x + 6 = 0$

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

e) $x^2 - 10x + 14 = 0$

$$x = 5 \pm \sqrt{11}$$

Question 8

Solve each of the following quadratic equations, by completing the square.

a) $x^2 - 6x - 1 = 0$

$$x = 3 \pm \sqrt{10}$$

b) $x^2 + 8x - 2 = 0$

$$x = -4 \pm 3\sqrt{2}$$

c) $x^2 - 8x - 2 = 0$

$$x = 4 \pm 3\sqrt{2}$$

d) $x^2 + 6x + 4 = 0$

$$x = -3 \pm \sqrt{5}$$

e) $x^2 - 4x = 14$

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

Question 9

Solve each of the following quadratic equations, by completing the square.

a) $x^2 + 10x + 5 = 0$

$$x = -5 \pm 2\sqrt{5}$$

b) $x^2 - 12x + 8 = 0$

$$x = 6 \pm 2\sqrt{7}$$

c) $x^2 + 8 = 8x$

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

d) $x^2 = 3 - 6x$

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

e) $x^2 - 4x = 23$

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

Question 10

Solve each of the following quadratic equations, by completing the square.

a) $x^2 = 4x + 8$

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

b) $x^2 + 4x = 14$

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

c) $x^2 + 14x + 25 = 0$

$$x = -7 \pm 2\sqrt{6}$$

d) $x^2 + 1 = 14x$

$$x = 7 \pm 4\sqrt{3}$$

e) $x^2 = 18x - 33$

$$x = 9 \pm 4\sqrt{3}$$