

Completing the Square



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Homework Answers:

Notes 1st!

P. 202

$$22) -12 + 18i \quad 34) 26 + 13i \quad 53) \frac{10}{13} - \frac{15}{13}i$$

Pp. 217-219

4) $\{-2, -4\}$

17) $\{-1/3, 0, 2\}$

20) $\left\{-\frac{1}{3}, \pm 2\right\}$

22) a) $(-1, 0)(2, 0)$ b) $\{-1, 2\}$

25) a) $(-2, 0)(2, 0)$ b) $\{\pm 2\}$

112) The numbers are 12 and 6 or -6 and -12

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

factor 1:

$$\rightarrow 64x^3 - 1 = (4x - 1)(16x^2 + 4x + 1)$$

$$a = 4x, b = 1$$

factor 2:

$$27x^3 - 8 = (3x - 2)(9x^2 + 6x + 4)$$

$$112) x, x-6 = 72$$

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4 Ways to Solve Quadratics

$$ax^2 + bx + c = 0$$

1st → Take the Square Root of both sides

1. $x^2 - 144 = 0$

$$\sqrt{x^2} = \pm \sqrt{144}$$

$$x = \{ \pm 12 \}$$

$$i = \sqrt{-1}$$

2. $x^2 + 9 = 0$

$$\sqrt{x^2} = \pm \sqrt{-9} = \pm i \sqrt{9} =$$

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

3. $3x^2 = 7$

$$\sqrt{x^2} = \pm \sqrt{\frac{7}{3}}$$

$$x = \pm \frac{\sqrt{7}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} \left\{ \pm \frac{\sqrt{21}}{3} \right\}$$

2nd → Factoring (see Unit 2 Day 2 notes)

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3rd → Completing the SquareGeneral Form of a Quadratic: $ax^2 + bx + c = 0$

$$x^2 - 8x + 4 = 0$$

$$x^2 - 8x + \boxed{16} = -4 + \boxed{16}$$

$$(x - 4)(x - 4)$$

$$\sqrt{(x - 4)^2} = \sqrt{12}$$

$$x - 4 = \pm \sqrt{12}$$

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

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

$$\frac{6\sqrt{3}}{2\sqrt{3}}$$

$$\left(\frac{-8}{2}\right)^2 = (-4)^2$$

Steps:

1. Coefficient of x^2 must be 1
(÷ by "a" if necessary)2. Move constant to right hand side
(subtract "c" from both sides)3. a. Divide linear term by 2
b. Square it
c. Add to both sides(Add $\left(\frac{b}{2}\right)^2$ to both sides)

4. Factor both sides

(Looks like: $\left(x + \frac{b}{2}\right)^2 =$)5. Take square root of both sides
(Don't forget \pm)6. Solve for "x"
(2 cases)

$$m^2 = 12$$

$$\left(\frac{b}{2}\right)^2$$

left side

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Examples:

$$\left(\frac{b}{2}\right)^2 = \left(\frac{6}{2}\right)^2 = (3)^2$$

1. $c^2 + 6c = 31$

$$c^2 + 6c + \boxed{9} = 31 + \boxed{9}$$

$$\sqrt{(c+3)^2} = \pm\sqrt{40}$$

$$c+3 = \pm\sqrt{40}$$

$$c = \{-3 \pm 2\sqrt{10}\}$$

$$\left(\frac{b}{2}\right)^2 = \left(-\frac{2}{2}\right)^2 = (-1)^2 = 1$$

2. $x^2 - 2x + 7 = 0$

$$x^2 - 2x + \boxed{1} = -7 + \boxed{1}$$

$$\sqrt{(x-1)^2} = \pm\sqrt{-6}$$

$$x-1 = \pm i\sqrt{6}$$

$$x = \{1 \pm i\sqrt{6}\}$$

~~$$1 \pm \sqrt{6}i$$~~

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3. $x^2 - 3x - 5 = 0$

$$x^2 - 3x + \frac{9}{4} = \frac{5}{4} + \frac{9}{4}$$

$$\left(x - \frac{3}{2}\right)^2 = \frac{20}{4} + \frac{9}{4}$$

$$\left(x - \frac{3}{2}\right)^2 = \frac{29}{4}$$

$$x - \frac{3}{2} = \pm \frac{\sqrt{29}}{2}$$

$$x = \left\{ \frac{3}{2} \pm \frac{\sqrt{29}}{2} \right\}$$

4. $\frac{2x^2 - 8x + 5}{2} = 0$

$$x^2 - 4x + \frac{5}{2} = 0$$

$$x^2 - 4x + 4 = -\frac{5}{2} + \frac{8}{2}$$

$$\sqrt{(x-2)^2} = \pm\sqrt{\frac{3}{2}}$$

$$x-2 = \pm \frac{\sqrt{3}}{\sqrt{2}} = \pm \frac{\sqrt{6}}{2}$$

$$x = \left\{ 2 \pm \frac{\sqrt{6}}{2} \right\}$$

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5. $\frac{2a^2 - 10a - 7}{2} = 0$

$$a^2 - 5a + \frac{25}{4} = \left(\frac{7}{2}\right)^2 + \frac{25}{4}$$

$$\sqrt{\left(a - \frac{5}{2}\right)^2} = \sqrt{\frac{39}{4}}$$

$$a - \frac{5}{2} = \pm \frac{\sqrt{39}}{2}$$

$$a = \left\{ \frac{5}{2} \pm \frac{\sqrt{39}}{2} \right\}$$

$\left(\frac{b}{2}\right)^2 = \left(\frac{-5}{2}\right)^2 = \frac{25}{4}$

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4th → Quadratic Formula

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

Examples:

1. $y^2 - 7y + 9 = 0$

$$y = \frac{7 \pm \sqrt{49 - 4(1)(9)}}{2(1)}$$

$$y = \left\{ \frac{7 \pm \sqrt{13}}{2} \right\}$$

2. $x^2 + 2x + 2 = 0$

$$x = \frac{-2 \pm \sqrt{4 - 4(1)(2)}}{2(1)}$$

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

$$x = \frac{-2 \pm 2i}{2}$$

$$x = \{-1 \pm i\}$$

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Homework:

pg 217 - 218:

8, 12, 28 - 30, 32, 46, 48, 75

pg 37:

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Graded due Thursday!

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The Politician Puzzle

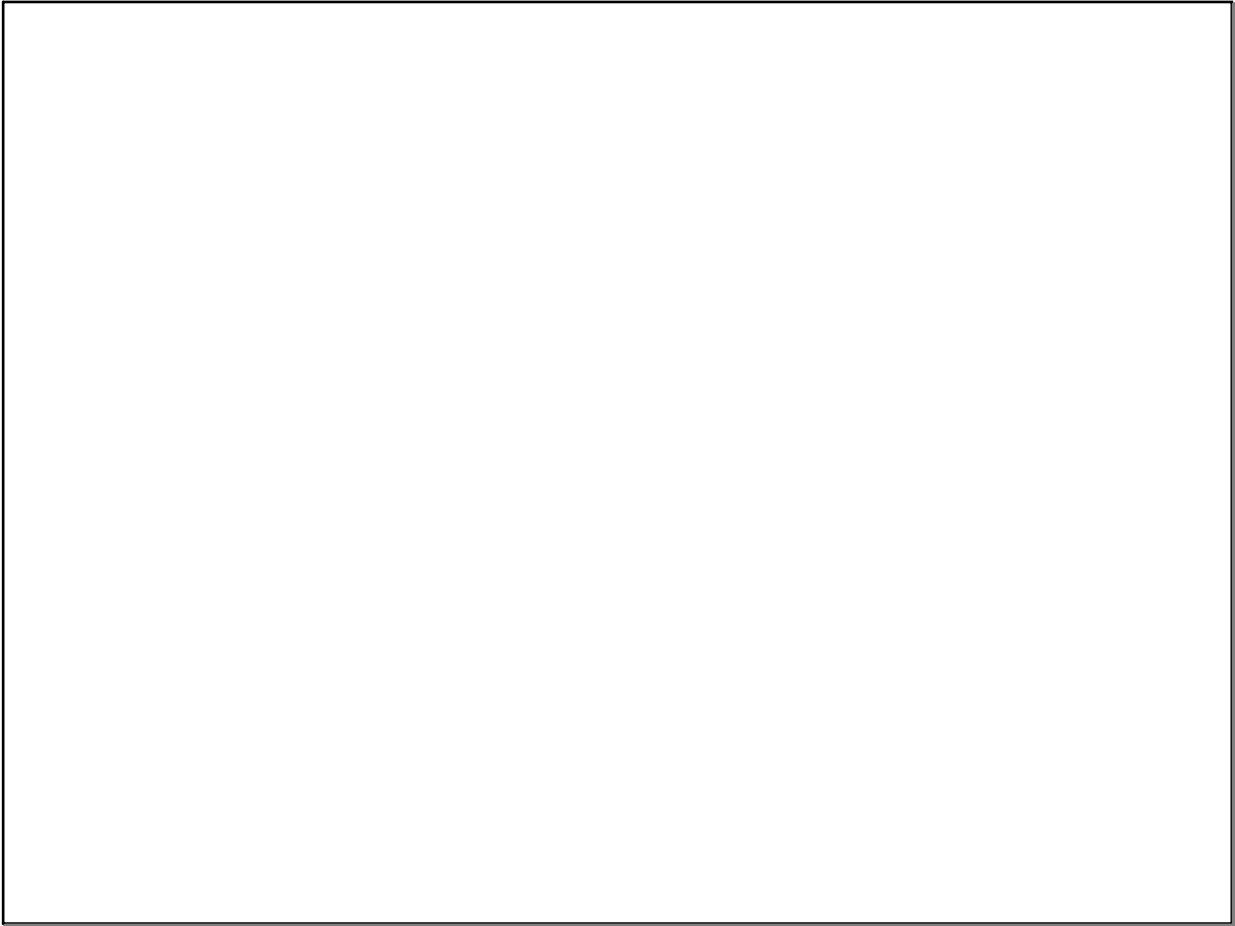
A certain convention had one hundred politicians. Each politician was either crooked or honest. We are given the following two facts:

- 1) At least one of the politicians was honest.
- 2) Given any two of the politicians, at least one of the two was crooked.

Can it be determined from these two facts how many of the politicians were honest and how many were crooked?

The Lady or the Tiger?, Raymond M. Smullyan

Oct 5-8:44 AM



Oct 13-11:26 AM