W2 –Solving Quadratics by Completing the Square Unit 5
MPM2D
Jensen

1) Solve each equation by completing the square. Round answers to 2 decimal places where necessary.

a) $x^2 + 14x - 38 = 0$

$(x^2+14x+49-49)-38=0$

$(x^2+14x+49)-49-38=0$

$(x+7)^2-87=0$

$(x+7)^2=87$

$x+7=\pm\sqrt{87}$

$x=-7\pm\sqrt{87}$

$x_1\simeq -16.33$ $x_2\simeq 2.33$

b) $x^2 + 6x - 59 = 0$

$(x^2+6x+9-9)-59=0$

$(x^2+6x+9)-9-59=0$

$(x+3)^2-68=0$

$(x+3)^2=68$

$x+3=\pm\sqrt{68}$

$x=-3\pm\sqrt{68}$

$x_1\simeq -11.25$ $x_2\simeq 5.25$

c) $x^2 + 14x - 51 = 0$

$(x^2+14x+49-49)-51=0$

$(x^2+14x+49)-49-51=0$

$(x+7)^2-100=0$

$(x+7)^2=100$

$x+7=\pm\sqrt{100}$

$x+7=\pm 10$

$x+7=10$ $x+7=-10$

$x_1=3$ $x_2=-17$

d) $x^2 - 12x + 11 = 0$

$(x^2-12x+36-36)+11=0$

$(x^2-12x+36)-36+11=0$

$(x-6)^2-25=0$

$(x-6)^2=25$

$x-6=\pm\sqrt{25}$

$x-6=\pm 5$

$x-6=5$ $x-6=-5$

$x_1=11$ $x_2=1$

e) $x^2 + 6x + 8 = 0$

$(x^2+6x+9-9)+8=0$

$(x^2+6x+9)-9+8=0$

$(x+3)^2-1=0$

$(x+3)^2=1$

$x+3=\pm\sqrt{1}$

$x+3=1$ $x+3=-1$

$x_1=-2$ $x_2=-4$

f) $x^2 - 12x + 23 = 0$

$(x^2-12x+36-36)+23=0$

$(x^2-12x+36)-36+23=0$

$(x-6)^2-13=0$

$(x-6)^2=13$

$x-6=\pm\sqrt{13}$

$x=6\pm\sqrt{13}$

$x_1\simeq 2.39$ $x_2\simeq 9.61$

g) $x^2 - 6x = -91$

$(x^2-6x+9-9) = -91$

$(x^2-6x+9)-9 = -91$

$(x-3)^2 = -82$

$x-3 = \pm\sqrt{-82}$

∞ no real solutions

h) $8x^2 + 16x = 42$

$8(x^2+2x) = 42$

$8(x^2+2x+1-1) = 42$

$8(x^2+2x+1)-8 = 42$

$8(x+1)^2 = 50$

$(x+1)^2 = \frac{50}{8}$

$x+1 = \pm\sqrt{\frac{25}{4}}$

$x+1 = \frac{5}{2}$ $\quad$ $x+1 = -\frac{5}{2}$

$x = \frac{3}{2}$ $\quad$ $x = -\frac{7}{2}$

i) $4x^2 + 4x + 36 = 0$

$4(x^2+x+9) = 0$

$x^2+x+9 = 0$

$(x^2+x+\frac{1}{4}-\frac{1}{4}) = -9$

$(x^2+x+\frac{1}{4})-\frac{1}{4} = -9$

$(x+\frac{1}{2})^2 = -\frac{35}{4}$

$x+\frac{1}{2} = \pm\sqrt{\frac{-35}{4}}$

∞ no real solutions

j) $3x^2 + 5x - 4 = 0$

$3(x^2+\frac{5}{3}x)-4 = 0$

$3(x^2+\frac{5}{3}x+\frac{25}{36}-\frac{25}{36}) = 4$

$3(x^2+\frac{5}{3}x+\frac{25}{36})-\frac{25}{12} = 4$

$3(x+\frac{5}{6})^2 = \frac{73}{12}$

$(x+\frac{5}{6})^2 = \frac{73}{36}$

$x+\frac{5}{6} = \pm\sqrt{\frac{73}{36}}$

$x+\frac{5}{6} = \sqrt{\frac{73}{36}}$ $\quad$ $x+\frac{5}{6} = -\sqrt{\frac{73}{36}}$

$x \simeq 0.59$ $\quad$ $x \simeq -2.26$

Answers

1)a) $x = -16.33, 2.33$ **b)** $x = -11.25, 5.25$ **c)** $x = -17, 3$ **d)** $x = 1, 11$ **e)** $x = -4, -2$ **f)** $x = 2.39, 9.61$
g) no real solutions **h)** $x = -\frac{7}{2}, \frac{3}{2}$ **i)** no real solutions **j)** $x = -2.26, 0.59$