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Problem Solving Set A - Chapter 2

Bronze:

a) $h(x) = 2x - x^2$

$h(x) = -x^2 + 2x$

$h(x) = -1(x^2 - 2x)$

$h(x) = -1[(x-1)^2 - 1]$

$h(x) = -(x-1)^2 + 1$

$h(x) = \underline{1 - (x-1)^2}$

b) $1 - (x-1)^2 = 0$

$1 = (x-1)^2$

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

$\pm 1 = x - 1$

$x = 2$ or $x = 0$

$\therefore$ 2m

Silver:

a) 114 represents the height the stone was thrown at

b) i) $114 + 10.4x - 5.2x^2$

$-5.2x^2 + 10.4x + 114$

$-5.2(x^2 - 2x) + 114$

$\therefore 114 - 5.2(x^2 - 2x)$

ii) $-5.2[(x-1)^2 - 1] + 114$

$-5.2(x-1)^2 + 5.2 + 114$

$\therefore 119.2 - 5.2(x-1)^2$

c) i) $119.2 - 5.2(x-1)^2 = 0$

$119.2 = 5.2(x-1)^2$

$\frac{119.2}{5.2} = (x-1)^2$

$\frac{298}{13} = (x-1)^2$

$\pm\sqrt{\frac{298}{13}} = x - 1$

$\pm 4.79 = x - 1$

$x = 5.79$

OR

$x = -3.79$

$\therefore$ distance = 5.79m

Gold:

a) 125 represents the initial height of the stone above ground level.

b) $h(x) = -4.5x^2 + 12.75x + 125$

$h(x) = -4.5(x^2 - 17/6\,x) + 125$

$h(x) = -4.5[(x - 17/12)^2 - 289/144] + 125$

$h(x) = -4.5(x - 17/12)^2 + 289/32 + 125$

$h(x) = -4.5(x - 17/12)^2 + 4289/32$

when $x = 17/12$

$y = 4289/32 = \underline{134\ (3sf)\ m}$ → maximum height

c) $-4.5x^2 + 12.75x + 125$

↳ using quadratic formula $\dfrac{-(12.75) \pm \sqrt{(12.75)^2 - 4(-4.5)(125)}}{2(-4.5)}$

$\underline{x = 6.87}$ OR $x = -4.04$

Distance $= \sqrt{(6.87)^2 + (125)^2}$

$= \underline{125\ (3sf)\ m}$