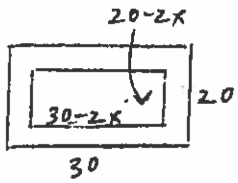
Solving Quadratic Word Problems
– A Random Mix –

1.



Let x be the uniform width.

$A_{matte} = A_{picture}$

$(30)(20) - (30-2x)(20-2x) = (30-2x)(20-2x)$

$600 - (600 - 60x - 40x + 4x^2) = 600 - 60x - 40x + 4x^2$

$600 - 600 + 60x + 40x - 4x^2 = 600 - 60x - 40x + 4x^2$

$0 = 8x^2 - 200x + 600$

$x = \dfrac{200 \pm \sqrt{(-200)^2 - 4(8)(600)}}{2(8)}$

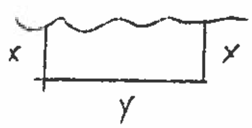
$x = \dfrac{200 \pm \sqrt{40000 - 19200}}{16}$

$x = \dfrac{200 \pm 144.22}{16}$

$x = 21.51$ (reject) or $x = 3.49$

$\therefore$ the width of the mat is 3.49cm

2.



Let x be the length of the rectangle.
Let y be the width.

$2x + y = 80$

$y = 80 - 2x$

$A = xy$

$A = x(80 - 2x)$

$A = (-2x^2 + 80x)$

$A = -2(x^2 - 40x)$ $\quad [\frac{1}{2}(-40)]^2 = (-20)^2 = 400$

$A = -2(x^2 - 40x + 400 - 400)$

$A = -2(x-20)^2 + 800$

$\therefore$ dimensions are $x = 20$ m

$y = 80 - 2x$

$y = 80 - 2(20)$

$y = 40$ m

and max area is $800\ m^2$

3. a) $h = (-16t^2 + 16t) + 480$

$h = -16(t^2 - t) + 480$ $\quad [\frac{1}{2}(-1)]^2 = (-0.5)^2 = 0.25$

$h = -16(t^2 - t + 0.25 - 0.25) + 480$

$h = -16(t - 0.5)^2 + 4 + 480$

$h = -16(t - 0.5)^2 + 484$

$\therefore$ it took Jason 0.5 sec to reach his maximum height

b) highest point reached is 484 ft

c) $0 = -16t^2 + 16t + 480$

$t = \dfrac{-16 \pm \sqrt{(16)^2 - 4(-16)(480)}}{2(-16)}$

$t = \dfrac{-16 \pm \sqrt{30976}}{}$

$t = \dfrac{-16 \pm 176}{-32}$

$t = -5$ (reject) or $t = 6$

$\therefore$ Jason hits the water at 6 sec.

4. Let x be the # of \$10 price decreases.

Revenue = # of Jackets × Price

$17600 = (90+3x)(200-10x)$

$17600 = 18000 - 900x + 1000x - 50x^2$

$0 = -50x^2 + 100x + 400$

$x = \dfrac{-100 \pm \sqrt{(100)^2 - 4(-50)(400)}}{2(-50)}$

$x = \dfrac{-100 \pm \sqrt{90000}}{-100}$

$x = \dfrac{-100 \pm 300}{-100}$

$x = -2$ or $x = 4$

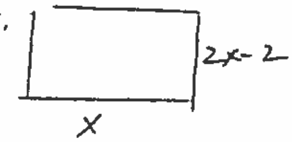
∴ price $= 200 - 10(-2)$

$= \$220$ or

$200 - 10(4)$

$= \$160$

5.



Let x be the width

Then $2x-2$ is the length.

$420 = x(2x-2)$

$0 = 2x^2 - 2x - 420$

$0 = 2(x^2 - x - 210)$

$0 = 2(x+14)(x-15)$

$x = -14$ or $x = 15$

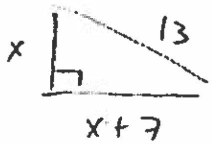
reject.

∴ dimensions are $x = 15$ m

by $2(15) - 2$

$= 28$m

6.



Let x be the length of one of the other sides.

Then $x+7$ is the length of the other side.

$x^2 + (x+7)^2 = 13^2$

$x^2 + (x+7)(x+7) = 169$

$x^2 + x^2 + 7x + 7x + 49 - 169 = 0$

$2x^2 + 14x - 120 = 0$

$2(x^2 + 7x - 60) = 0$

$2(x-5)(x+12) = 0$

$x = 5$ or $x = -12$

reject

∴ the dimensions are $x = 5$ cm

and $x+7$

$= 12$ cm

7. a) $h = -16t^2 + 64t + 8$

$3 = -16t^2 + 64t + 8$

$0 = -16t^2 + 64t + 5$

$t = \dfrac{-64 \pm \sqrt{(64)^2 - 4(-16)(5)}}{2(-16)}$

$t = \dfrac{-64 \pm \sqrt{4216}}{-32}$ 4416

$t = -0.03$ or $t = 4.03$

(reject) -0.08 4.08

∴ it took 4.03 for his grandson to catch the ball

b) $h = (-16t^2 + 64t) + 8$

$h = -16(t^2 - 4t) + 8$

$[\frac{1}{2}(-4)]^2 = (-2)^2 = 4$

$h = -16(t^2 - 4t + 4 - 4) + 8$

$h = -16(t^2 - 4t + 4) + 64 + 8$

$h = -16(t-2)^2 + 72$

∴ the maximum height is 72m