UNIT 6 REVIEW

MPM2D1

a) $2x^2 - 5x = 0$

$x(2x-5) = 0$

$x = 0$ OR $2x - 5 = 0$

$x = 5/2$

b) $x^2 + 13x - 30 = 0$

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

$x - 2 = 0$ OR $x + 15 = 0$

$x = 2$ $\quad x = -15$

c) $8x^2 - 2x - 3 = 0$

$(2x+1)(4x-3) = 0$

$2x + 1 = 0 \quad 4x - 3 = 0$

$x = -1/2 \quad x = 3/4$

d) $x^2 - 81 = 0$

$(x+9)(x-9) = 0$

$x + 9 = 0$ OR $x - 9 = 0$

$x = -9 \quad x = 9$

2. a) $x^2 + 14x + 49 = 0$

$b^2 - 4ac$

$= (14)^2 - 4(1)(49)$

$= 0$

$\therefore$ 1 solution

b) $-2x^2 - 11 = 0$

$b^2 - 4ac$

$= 0^2 - 4(-2)(-11)$

$= -88$

$\therefore$ no solution

c) $x^2 - 7x - 10 = 0$

$b^2 - 4ac$

$= (-7)^2 - 4(1)(-10)$

$= 89$

$\therefore$ 2 solutions

3. a) $-3x^2 - 12x + 5 = 0$ $\quad a = -3 \quad b = -12 \quad c = 5$

$$x = \frac{12 \pm \sqrt{(-12)^2 - 4(-3)(5)}}{2(-3)}$$

$$x = \frac{12 \pm \sqrt{204}}{-6}$$

$$x = \frac{12 + 14.28}{-6} \quad \text{or} \quad x = \frac{12 - 14.28}{-6}$$

$x = -4.38$ $\qquad$ $x = 0.38$

b) $3x^2 + 2x + 1 = 0 \quad a = 3 \quad b = 2 \quad c = 1$

$$x = \frac{-2 \pm \sqrt{(2)^2 - 4(3)(1)}}{2(3)}$$

$$x = \frac{-2 \pm \sqrt{-8}}{-6}$$

$\therefore$ no solution

c) $4x^2 + 12x = -9$

$4x^2 + 12x + 9 = 0$

$$x = \frac{-12 \pm \sqrt{(12)^2 - 4(4)(9)}}{2(4)}$$

$$x = \frac{-12 \pm \sqrt{0}}{8}$$

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

REVIEW

4.

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

$$2x + 2y = 400$$
$$2x = 400 - 2y$$
$$x = 200 - y$$

$$A = xy$$
$$= (200-y)y$$
$$= 200y - y^2$$
$$= -y^2 + 200y$$
$$= -(y^2 - 200y) \quad \left[\tfrac{1}{2}(200)\right]^2 = (100)^2 = 10000$$
$$= -(y^2 - 200y)$$
$$= -(y^2 - 200y + 10000 - 10000)$$
$$= -(y^2 - 200y + 10000) + 10000$$
$$= -(y-100)^2 + 10000$$

↑ when max occurs ↑ max area

∴ The maximum area is 10000 m^2

Dimensions:

$y = 100m$ by $x = 200 - 100 = 100m$

5. Let x be # of \$1 increases.

Revenue = Price × # of People

$$= (11+1x)(400-20x)$$
$$= 4400 - 220x + 400x - 20x^2$$
$$= -20x^2 + 180x + 4400$$
$$= -20(x^2 - 9x) + 4400 \quad \left[\tfrac{1}{2}(-9)\right]^2 = (-4.5)^2 = 20.25$$
$$= -20(x^2 - 9x + 20.25 - 20.25) + 4400$$
$$= -20(x^2 - 9x + 20.25) + 405 + 4400$$
$$= -20(x-4.5)^2 + 4805$$

↑ when max occurs ↑ max revenue

Ticket Price $= 11 + 1x$
$= 11 + 1(4.5)$
$= \$15.50$

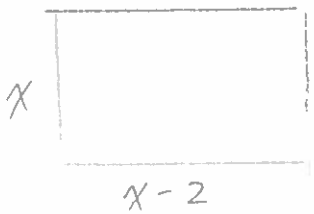
6. Let x be the first #
Let $x+2$ be the second #

$$x^2 + (x+2)^2 = 452$$
$$x^2 + (x+2)(x+2) - 452 = 0$$
$$x^2 + x^2 + 2x + 2x + 4 - 452 = 0$$
$$2x^2 + 4x - 448 = 0$$
$$2(x^2 + 2x - 224) = 0$$
$$2(x+16)(x-14) = 0$$
$$x+16 = 0 \text{ or } x-14 = 0$$
$$x = -16 \qquad x = 14$$

1 2 4 8 16
224 112 56 28 -14

∴ the integers are -16 and $-16+2 = -14$ or
14 and $14+2 = 16$

7.



Let x be the rectangle's length

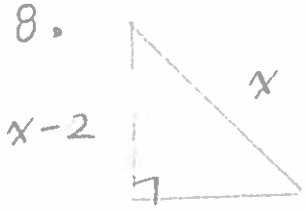
$$x(x-2) = 48$$
$$x^2 - 2x - 48 = 0$$

1 2 3 4 6
48 24 16 12 8

$$(x+6)(x-8) = 0$$
$$x = -6 \text{ or } x = +8$$
reject

∴ the dimensions are 8 m by $8-2 = 6$ m

8.



Let x be the hypotenuse
Then the second side is $(x-2)$
And the third side is $x-2-7 = (x-9)$

$x-2-7$
$= x-9$

$$(x-2)^2 + (x-9)^2 = x^2$$
$$(x-2)(x-2) + (x-9)(x-9) = x^2$$
$$x^2 - 2x - 2x + 4 + x^2 - 9x - 9x + 81 - x^2 = 0$$
$$x^2 - 22x + 85 = 0$$

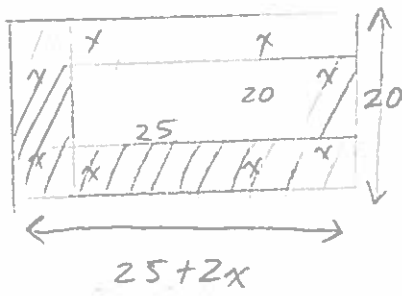
1 5
85 -5 -17

$$(x-5)(x-17) = 0$$
$$x-5 = 0 \text{ or } x-17 = 0$$
$$x = 5 \qquad x = 17$$

REJECT
too small
b/c third side
would be $5-9 = -4$

∴ the sides are
$x = 17$ cm
$x-2 = 17-2 = 15$ cm
$x-9 = 17-9 = 8$ cm

9.



Let x be the width of the border

Area of Border = Area of Photo

$(25+2x)(20+2x) - (25)(20) = (25)(20)$

$500 + 50x + 40x + 4x^2 - 500 - 500 = 0$

$4x^2 + 90x - 500 = 0$

$x = \frac{-90 \pm \sqrt{(90)^2 - 4(4)(-500)}}{2(4)}$

$= \frac{-90 \pm \sqrt{16100}}{8}$

$= \frac{-90 \pm 126.9}{8}$

$= \frac{36.9}{8}$ or $\frac{-216.9}{8}$

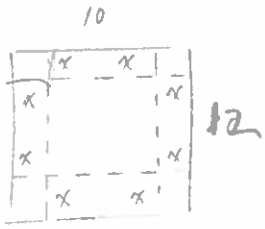
$= 4.6$ $= -27$ reject

: the outside dimensions

are $25+2(4.6) = 34.2\text{ cm}$

by $20+2(4.6) = 27.2\text{ cm}$

10.



Let x be the side of the square

$(10-2x)(12-2x) = 80$

$120 - 20x - 24x + 4x^2 - 80 = 0$

$4x^2 - 44x + 40 = 0$

$4(x^2 - 11x + 10) = 0$ $(-1, -10)$ $2, 5$

$4(x-1)(x-10)$

$x = 1$ or $x = 10$ reject

∴ the square should be 1 inch by 1 inch.

11. a) substitute $t = 1$

$h = -4.9(1)^2 + 24.5(1) + 1$

$= 20.6\text{ m}$

$\therefore$ the ball is 20.6 m high after 1 second

b) complete the square

$h = -4.9(t^2 - 5t) + 1$

$= -4.9(t^2 - 5t + 6.25 - 6.25) + 1$

$= -4.9(t^2 - 5t + 6.25) + 30.625 + 1$

$= -4.9(t - 2.5)^2 + 31.625$

$\therefore$ the maximum height is 31.6 m

c) maximum height occurs @ 2.5 seconds

d) substitute $h = 0$

$0 = -4.9t^2 + 24.5t + 1$

$t = \dfrac{-24.5 \pm \sqrt{(24.5)^2 - 4(-4.9)(1)}}{2(-4.9)}$

$= \dfrac{-24.5 \pm \sqrt{619.85}}{-9.8}$

$= \dfrac{-24.5 \pm 24.897}{-9.8}$

$= \dfrac{0.397}{-9.8}$ or $\dfrac{-49.397}{-9.8}$

reject ~~$= -0.04$~~ or 5.04

$\therefore$ the ball hits the ground @ 5.04 seconds