

1. The town decides to build a rectangular fence around a playground. The playground without the fence measures 60 m by 40 m; however after the building of the fence, the area gets **doubled**. The designers put the fence around the playground with a uniform distance. Calculate the distance between the playground and the fence.

Let  $x$  represent the distance between the playground and fence.

$$(60+2x)(40+2x) = 4800$$

$$2400 + 120x + 80x + 4x^2 - 4800 = 0$$

$$4x^2 + 200x - 2400 = 0$$

$$x^2 + 50x - 600 = 0$$

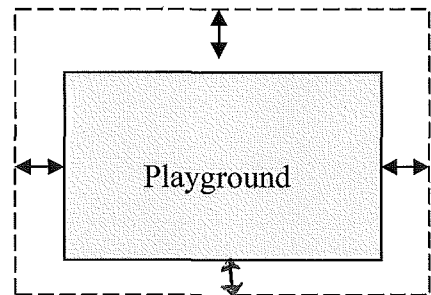
$$(x+60)(x-10) = 0$$

$$x = -60 \quad x = 10$$

↓

inadmissible

∴ The distance was 10 m.



initial area = 2400  
doubled area = 4800

2. A factory is to be built on lot that measures 90 m by 70 m. A lawn of uniform width and with an area of 1300 m<sup>2</sup> must surround the factory. What dimensions must the factory have? (Note that the lot is the factory plus the lawn)

Initial area =  $(90)(70) = 6300 \text{ m}^2$   
New area =  $6300 - 1300 = 5000 \text{ m}^2$

$$(90-2x)(70-2x) = 5000$$

$$6300 - 180x - 140x + 4x^2 - 5000 = 0$$

$$4x^2 - 320x + 1300 = 0$$

$$x^2 - 80x + 325 = 0$$

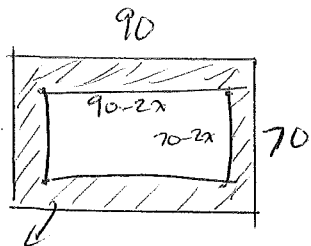
$$x = \frac{80 \pm \sqrt{50^2 - 4(1)(325)}}{2(1)} = \frac{80 \pm \sqrt{500}}{2} = \frac{80 \pm 71.41}{2}$$

$$x_1 = \frac{80 + 71.41}{2} = 75.7$$

↓  
inadmissible

$$x_2 = \frac{80 - 71.41}{2} = 4.3$$

∴ Dimensions of the factory:  $L = 90 - 2x = 81.4 \text{ m}$   
 $W = 70 - 2x = 61.4 \text{ m}$



Shaded = 1300

Let  $x$  represent the width of the lawn.

3. George owns a business that sells parts for electronic game systems. The profit function for his business can be modelled by the equation:  $P(x) = -0.5x^2 + 8x - 24$ , where  $x$  is the quantity sold, in thousands, and  $P(x)$  is the profit in thousands of dollars.

a. How many parts must George sell in order for his business to break even?  $P(x) = 0$

$$-0.5x^2 + 8x - 24 = 0$$

$$x^2 - 16x + 48 = 0$$

$$(x-12)(x-4) = 0$$

$$x = 12 \text{ or } 4$$

↳ You may use the quadratic formula !!

∴ 4000 or 12000 items must be sold for business to break even

b. How many parts must George sell in order for his business to make \$7000?  $P(x) = 7$

$$-0.5x^2 + 8x - 24 = 7$$

$$-0.5x^2 + 8x - 31 = 0$$

$$x^2 - 16x + 62 = 0$$

$$x_1 = (8 + \sqrt{2})1000 \doteq 9414$$

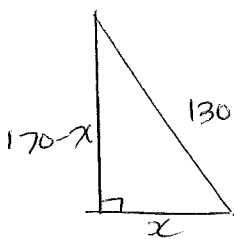
$$x_2 = (8 - \sqrt{2})1000 \doteq 6585$$

$$x = \frac{16 \pm \sqrt{(16)^2 - 4(1)(62)}}{2}$$

$$= \frac{16 \pm \sqrt{8}}{2} = 8 \pm \sqrt{2}$$

∴ George must sell 9414 or 6585 parts in order to make \$7000 profit.

4. A right triangle has a perimeter of 300 cm. Its hypotenuse is 130 cm. What are the lengths of the other sides?



$$a^2 + b^2 = c^2$$

$$x^2 + (170-x)^2 = 130^2$$

$$x^2 + 28900 - 340x + x^2 = 16900$$

$$2x^2 - 340x + 12000 = 0$$

$$x^2 - 170x + 6000 = 0$$

$$(x-120)(x-50) = 0$$

$$x = 120 \text{ or } x = 50$$

∴ The lengths of the other sides are 120 cm and 50 cm.

