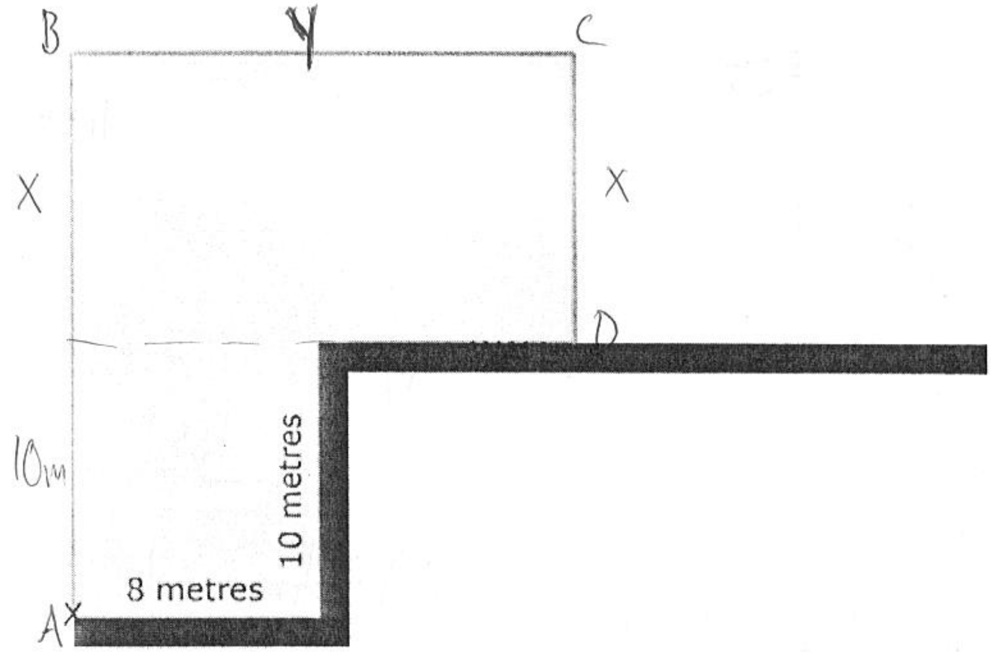
Name: ___________________________

A plot of land needs fencing to house some hens.
An existing red wall is to be used for the enclosure. The fencing will be attached at one end of the wall to the fence post marked **X**, as shown in the diagram:



If you have only 40 metres of fencing available, determine the dimensions of the enclosure which will provide the hens with the maximum area.

Perimeter $= 40$

$2x + y + 10 = 40$

$2x + y = 30$

$y = 30 - 2x$

$= -2x + 30$

$A = \text{length} \times \text{width}$

$= x\,y$

$= x(-2x+30)$

$A = -2x^2 + 30x$

Maximize This

Find Vertex of $A = -2x^2 + 40x$

$f(x) = -2x^2 + 30x$

$= -2\left(x^2 - 15x + \frac{225}{4}\right) - (-2)\left(\frac{225}{4}\right)$

$\left(\frac{-15}{2}\right)^2 = \frac{225}{4}$

$= -2\left(x - \frac{15}{2}\right)^2 + \frac{225}{2}$

$\rightarrow$ Maximum when $x = \frac{15}{2}$

$y = -2x + 30$

$y = -2\left(\frac{15}{2}\right) + 30$

$y = -15 + 30$

$y = 15$

$\overline{AB} = 10 + \frac{15}{2}$

$= \frac{20}{2} + \frac{15}{2}$

$= 35/2$

$\boxed{\rightarrow \text{Dimensions are } \overline{AB} = \frac{35}{2},\ \overline{BC} = 15,\ \overline{CD} = \frac{15}{2}}$

The owner of an amusement park realizes that the number of people that show up increases by 20 for every decrease of $1 in the daily admission fee. For a daily admission fee of $60 there are an average of 1000 customers.

a) • Determine the maximum daily revenue for a daily admission fee which is discounted by $x. $60 500

b) • What admission price will allow the owner to make the maximum revenue? $55

c) • On average, how many customers will maximize the revenue? 1100 customers

Let x be the number of $1 rebates
Let y be the revenue

a) Price = 60 - 1x
Customers = 1000 + 20x

Revenue = Price × Customers

$$f(x) \text{ or } y = (60-x)(1000+20x)$$
$$= -(x-60)\cdot 20(x+50)$$
$$= -20(x-60)(x+50)$$

$$h = \frac{x_1+x_2}{2}$$
$$= \frac{-50+60}{2}$$
$$= \frac{10}{2}$$
$$h = 5$$ → Max revenue when x=5

$$f(5) = -20(5-60)(5+50)$$
$$= -20(-55)(55)$$
$$= -20(-3025)$$
$$= \$60500$$

$\boxed{\text{Max revenue} = \$60500}$

b) Price = 60 - 1(5)
$\boxed{= \$55}$

c) Customers = 1000 + 20x
= 1000 + 20(5)
= 1000 + 100
$\boxed{= 1100}$