Maximum/Minimum Problems

Maximum/minimum problems involve finding the vertex of a quadratic

Read the question carefully to see if it is the *x* value or the *y* value you are required to find.

e.g. (*i*) Find the maximum value of $y = -3x^2 + x - 5$

(Need to find the y value of the vertex)

$$y = -3x^2 + x - 5$$

$$= -3\left(x^2 - \frac{1}{3}x\right) - 5$$

$$= -3\left(x - \frac{1}{6}\right)^2 + \frac{1}{12} - 5$$

$$= -3\left(x - \frac{1}{6}\right)^2 - 4\frac{11}{12}$$

$\therefore$ maximum value is $-4\frac{11}{12}$

OR

$$\Delta = 1^2 - 4(-3)(-5)$$

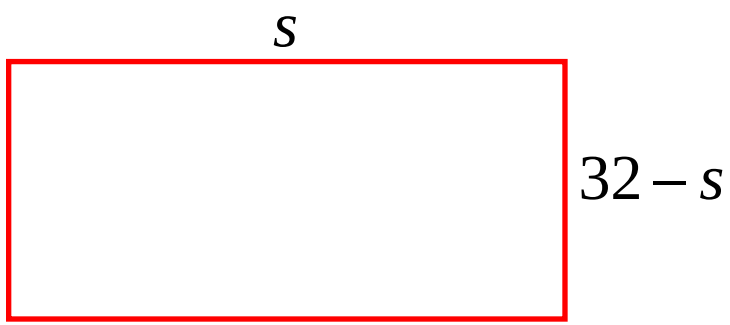
$$= -59$$

$$\text{maximum value} = \frac{-\Delta}{4a}$$

$$= \frac{-59}{12}$$

$$= -4\frac{11}{12}$$

(*ii*) A rectangle has perimeter of 64 cm.
What dimensions would the rectangle have for maximum area?



$$A = s(32 - s)$$

We want the dimensions, so it is the x value of the vertex we need to find.

$$A = 32s - s^2$$
$$= -(s^2 - 32s)$$
$$= -(s - 16)^2 + 256$$

$\therefore$ dimensions for a maximum area are 16cm $\times$ 16cm

Exercise 8E; 1a *iv*, 2a *iii*, then multiples of 3