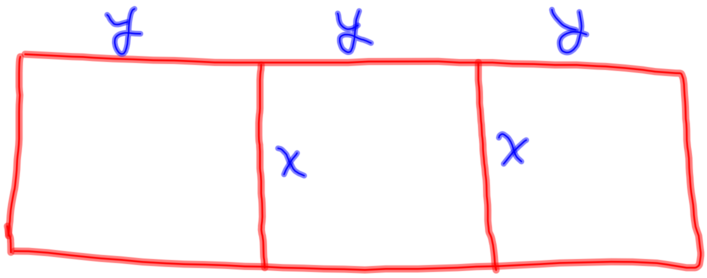
Pg. 33

#28 /



$$4x + 6y = 800$$

Maximize Area: (Whole Area)

$$x = \frac{800}{4} - \frac{6y}{4}$$

$$x = 200 - \frac{3}{2}y$$

$$A = x\,3y$$

$$A = 3xy$$

$$A = 3\left(200 - \frac{3}{2}y\right)y$$

$$A = -\frac{9}{2}y^2 + 600y$$

$$A = -\frac{9}{2}\left(y^2 - \frac{400}{3}y + \left(\frac{200}{3}\right)^2\right) + \frac{\cancel{9}^{3}}{2}\left(\frac{200}{\cancel{3}}\right)^2$$

$$A = -\frac{9}{2}\left(y - \frac{200}{3}\right)^2 + 60000$$

$$V\left(\frac{200}{3}, 60000\right)$$

$$(y, A)$$

$$x = 200 - \frac{\cancel{3}}{\cancel{2}}\left(\frac{\cancel{200}^{100}}{\cancel{3}}\right)$$

$$x = 100$$

$x = 100\text{m}$

$y = \frac{200}{3}\text{m}$

Warm Up

Determine two numbers whose difference is 25 and whose product is a minimum.

Let x Rep. 1st Number

Let $x+25$ Rep. 2nd number

$P = x(x+25)$ $\quad x^2+25x$

$P = x^2+25x$

$P = \left(x^2+25x+\frac{625}{4}\right)-\frac{625}{4}$

$P = \left(x+\frac{25}{2}\right)^2-\frac{625}{4}$

$V\left(-\frac{25}{2}, -\frac{625}{4}\right)$

Interpret $(x, P) \longrightarrow$ $\therefore$ other number is $-\frac{25}{2}+25$

$-\frac{25}{2}+\frac{50}{2}$

$=\frac{25}{2}$

2 #'s are $-\frac{25}{2}$ & $\frac{25}{2}$

MORE EXAMPLES...

A certain toll road averages 1000 cars per day when charging $1.00 per car. A survey concludes that for each one cent reduction in the toll charge there would be an increase of 20 cars using the road. Find the toll which should be charged to maximize revenue.

Revenue: Total money generated.
Profit: Revenue - Costs

"What will force revenue to change?"

Let x Rep. # of price drops

Revenue = (# of cars)(Toll charged)

$Rev = (1000 + 20x)(1 - 0.01x)$

$R = 1000 \overbrace{- 10x + 20x}^{10x} - 0.2x^2$

$R = -0.2(x^2 - 50x + 625) + 1000 + 125$

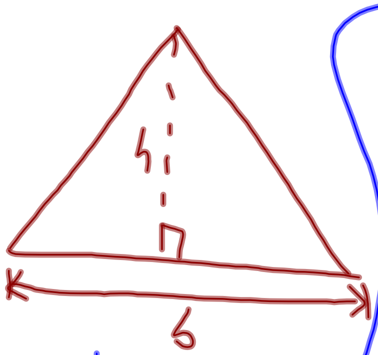
$R = -0.2(x - 25)^2 + 1125$

$V(25, 1125)$
(x, R)

Toll should be 75¢

MORE EXAMPLES...

Find the maximum area of a triangle for which the sum of the base and the height is 360 m.



$b+h=360$

$b=360-h$

$A=\frac{1}{2}bh$

$A=\frac{1}{2}(360-h)h$

$A=180h-\frac{1}{2}h^2$

$A=-\frac{1}{2}(h^2-360h+\underline{\underline{32400}})+16200$

$A=-\frac{1}{2}(h-180)^2+16200$

$V(180, 16200)$

$V(h, A)$

Max. Area $=16\,200\ m^2$

HOMEWORK...

pages 33 - 35:

# 19	# 28
# 22	# 29
# 26	# 30
# 27	# 31

Bonus:
Page 35
#34

SOLUTIONS...

#19. (a) No (b) just over 2 sec
#22. (a) 5 s (b) 12.5 m (c) 12 m (d) after 2 sec or 3 sec
#26. (a) 50 m underwater (b) about 11.18 min. (c) 62.5 m
#27. 12 km by 24 km to give a max area of 288 km^2
#28. x = 100 m; y = 66.67 m; max area = 20 000 m^2
#29. -6.5 & 6.5
#30. x = 7.5 cm and area is 112.5 cm^2
#31. (a) $2.85 (b) $3.25