

Name: ANSWER KEY

Score: \_\_\_\_\_

A company sells running shoes to dealers at a rate of \$40 per pair if fewer than 50 pairs are ordered. If a dealer orders 50 or more pairs (up to 600), the price per pair is reduced at a rate of 4 cents times the number ordered. What size order will produce the maximum amount of money for the company?

Quantities: basic cost of shoe (\$40)  
 number of shoes sold (?)  
 decrement in price (\$0.04)  
 number of decrements (?)  
 revenue (?)

Analysis: Revenue = unit cost  $\times$  number sold  
 Unit cost = basic cost - (decrement)(no. of decrements)  
 No. of decrements = no. sold

Equation: Let  $n$  = number sold ( $50 \leq n < 600$ )  
 Then  $40 - .04n$  = unit cost

$$R = (40 - .04n)n$$

$$= -.04n^2 + 40n$$

Solution:  $R$  is a quadratic function of  $n$ , whose graph opens down.  
 $\therefore R$  attains a maximum at its vertex.

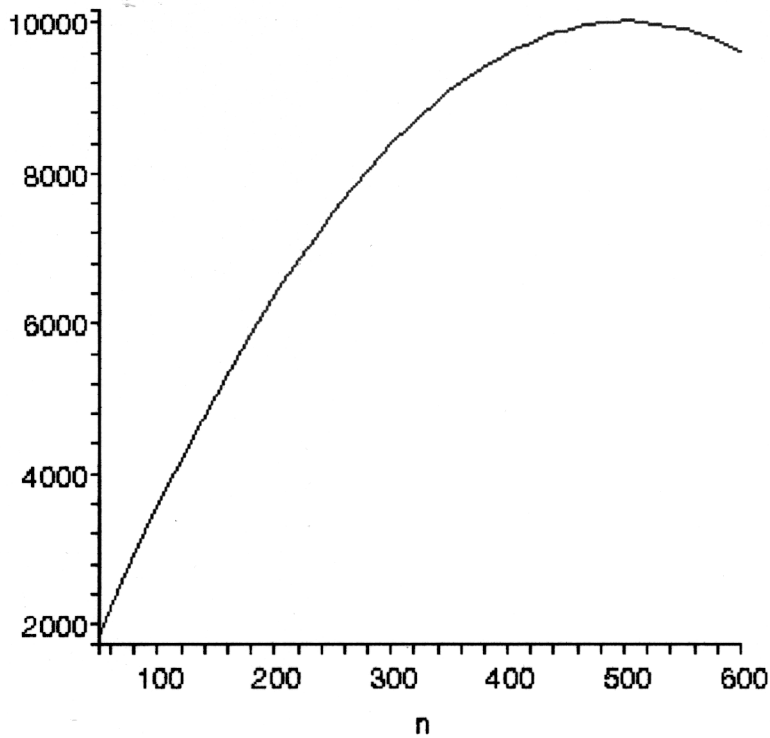
$$n = -\frac{b}{2a} = -\frac{40}{2(-.04)} = \boxed{500}$$

Check: In an optimization problem like this there is no simple check (such as substitution to check an eqn.) The only check is to plot a graph of  $R$ . See reverse.

```
> R:=(40-0.04*n)*n;
```

$$R := (40 - 0.04 n) n$$

```
> plot(R,n=50..600);
```



Revenue

```
> maximize(R,n=50..600,location);
```

```
10000.00, [{n=500.}, 10000.00]
```

```
>
```