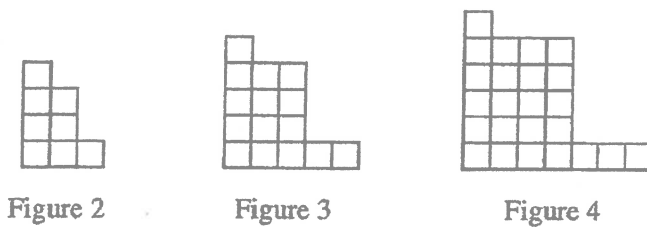
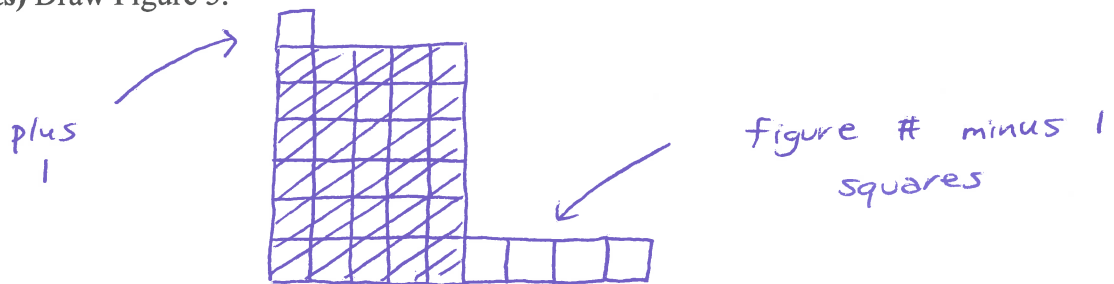


**Directions:** Read each question carefully and provide your answers in the space provided. Be sure to answer questions about your reasoning or thinking. You may use a calculator but correct answers without the supporting work will not receive full credit.

1. Examine the pattern below and note the figure number next to each.



(a) (3 points) Draw Figure 5.



(b) (3 points) Describe in words how the pattern is changing.

We see a rectangle that is "figure #" times "figure # + 1" (see shaded part) plus one square (top) and "figure # - 1" squares on the bottom.

(c) (4 points) Find a formula that gives the number of squares based on the figure number. Be sure to define your variables clearly.

let  $F = \text{figure \#}$ . From part (b), # of squares ( $S$ ) is  $(F)(F+1) + 1 + (F-1)$  or  $S = F^2 + 2F$

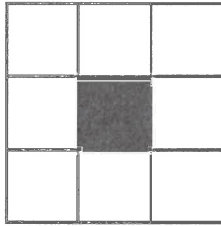
(d) (4 points) Based on part (c), how many squares would be in the 100<sup>th</sup> figure? How do you know?

let  $F = 100$

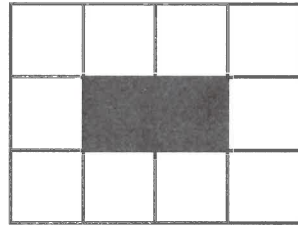
$$\begin{aligned}
 S &= 100^2 + 2(100) \\
 &= 10000 + 200 \\
 &= \boxed{10,200}
 \end{aligned}$$

Based on inferences from above

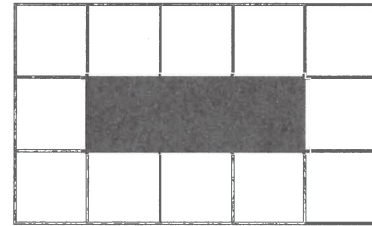
2. Alfredo Gomez is designing patios. Each patio has a rectangular garden area in the center. Alfredo uses black tiles to represent the soil of the garden. Around each garden, he designs a border of white tiles. The pictures shown below show the three smallest patios he can design with black tiles for the garden and white tiles for the border.



Patio 1

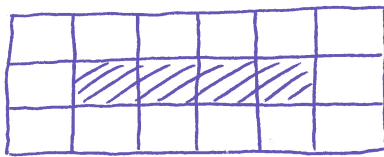


Patio 2



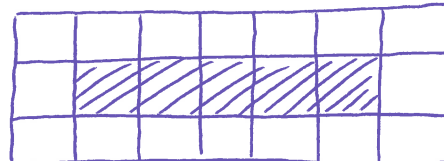
Patio 3

(a) (4 points) Draw patio 4 and patio 5. How many white tiles are in each?



Patio 4

14  
white  
tiles  
←



Patio 5

16  
white  
tiles  
←

(b) (4 points) Make some observations about the patios that could help you describe larger patios.

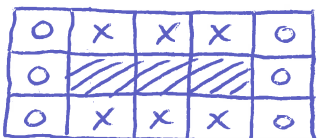
# of black tiles = Patio #  
Then surround this w/ white  
tiles around the perimeter.

(c) (4 points) Describe a method for finding the total number of white tiles needed for patio 50 (without constructing it).

You will need  $50 + 50 = 100$  white tiles  
(above + below the black tiles). You will also  
need  $3 + 3 = 6$  on the right + left.  
Thus,  $100 + 6 = 106$  white tiles.

(d) (5 points) Write a rule that could be used to determine the number of white tiles needed for any patio. Explain how your rule relates to the visual representation of the patio.

EX: PATIO 3



let  $b = \#$  of black tiles

You will need  $2b$  (see x's)

Also  $3 + 3$  (see o's). So if

$W = \#$  of white tiles, then

$$W = 2b + 6$$

3. (15 points) A campus bookstore received two shipments from Apple Computer over the last month. The first contained six iPods and eight MacBooks, and the cost to the bookstore was \$6,840. The second shipment was three iPods and five MacBooks, at a wholesale cost of \$4,170. The bookstore manager is unable to find the itemized invoice, and accounting needs to know how much each individual item costs. What were the individual costs?

$I$  = cost of an iPod  
 $M$  = cost of a MacBook

$$6I + 8M = 6840 \quad (\text{1st shipment})$$

$$3I + 5M = 4170 \quad (\text{2nd shipment})$$

times 2  $\Rightarrow 6I + 10M = 8340$

$$6I + 8M = 6840 \quad \sim \quad \times (-1)$$

$$6I + 10M = 8340$$

$$+ \quad -6I - 8M = -6840$$

$$+ \quad 6I + 10M = 8340$$

$$2M = 1500$$

$$\boxed{M = 750}$$

Now use this in any of the equations.

$$6I + 8(750) = 6840$$

$$6I + 6000 = 6840$$

$$6I = 840$$

$$\boxed{I = 140}$$

MacBook	\$ 750
iPod	\$ 140

