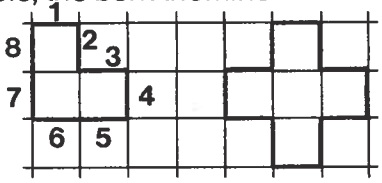
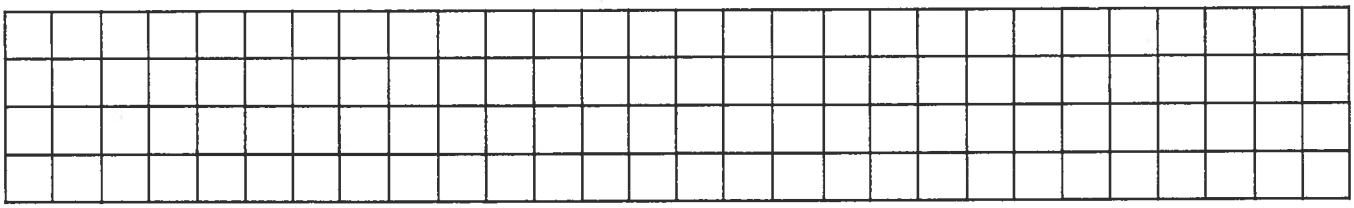
Perimeter 10

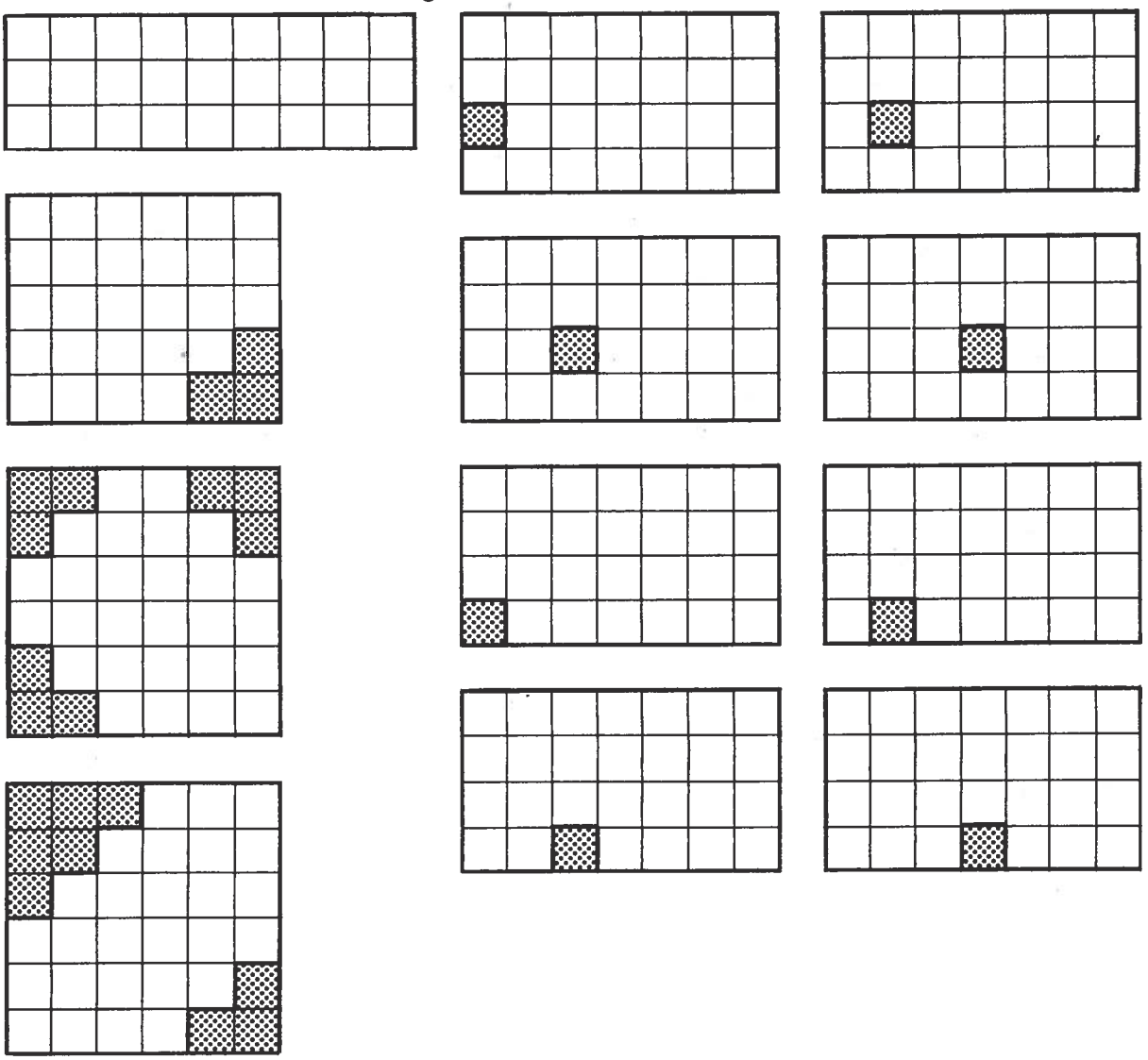
The perimeter of a polyomino is the distance around it. For example, the bent triomino has a perimeter of 8 and the X pentomino has a perimeter of 12.



1. Find all the polyominoes that have a perimeter of 10. List them here. ★



2. Use the above polyominoes to cover these shapes. Do not use any polyomino more than once in each figure.



Perimeter and Area Table

The area of a polyomino is the number of square units it contains. For example, pentominoes have an area of 5.

1. Can you draw a polyomino with a perimeter that is an odd number?_____
2. Experiment on grid paper. Fill out as much of this table as you can. It has been started for you. Look for patterns.

	PERIMETER	
AREA	*Shortest*	*Longest*
1	4	4
2	____	____
3	____	____
4	8	10
5	____	____
6	____	____
7	____	____
8	____	____
9	____	____
10	____	____
11	____	____
12	____	____
13	____	____
14	____	____
15	____	____
16	____	____
17	____	____
18	____	____
19	____	____
20	____	____
21	____	____
22	____	____
23	____	____
24	____	____

Perimeter-Area Predictions

1. Draw polyominoes each having an area of 10 that have all the possible perimeters you can find. Use the grid below and more grid paper if you need it. ★
2. Draw polyominoes each having an area of 16 with all possible perimeters. ★
3. Predict the longest possible perimeters for shapes with these areas. Experiment on grid paper to test your predictions.

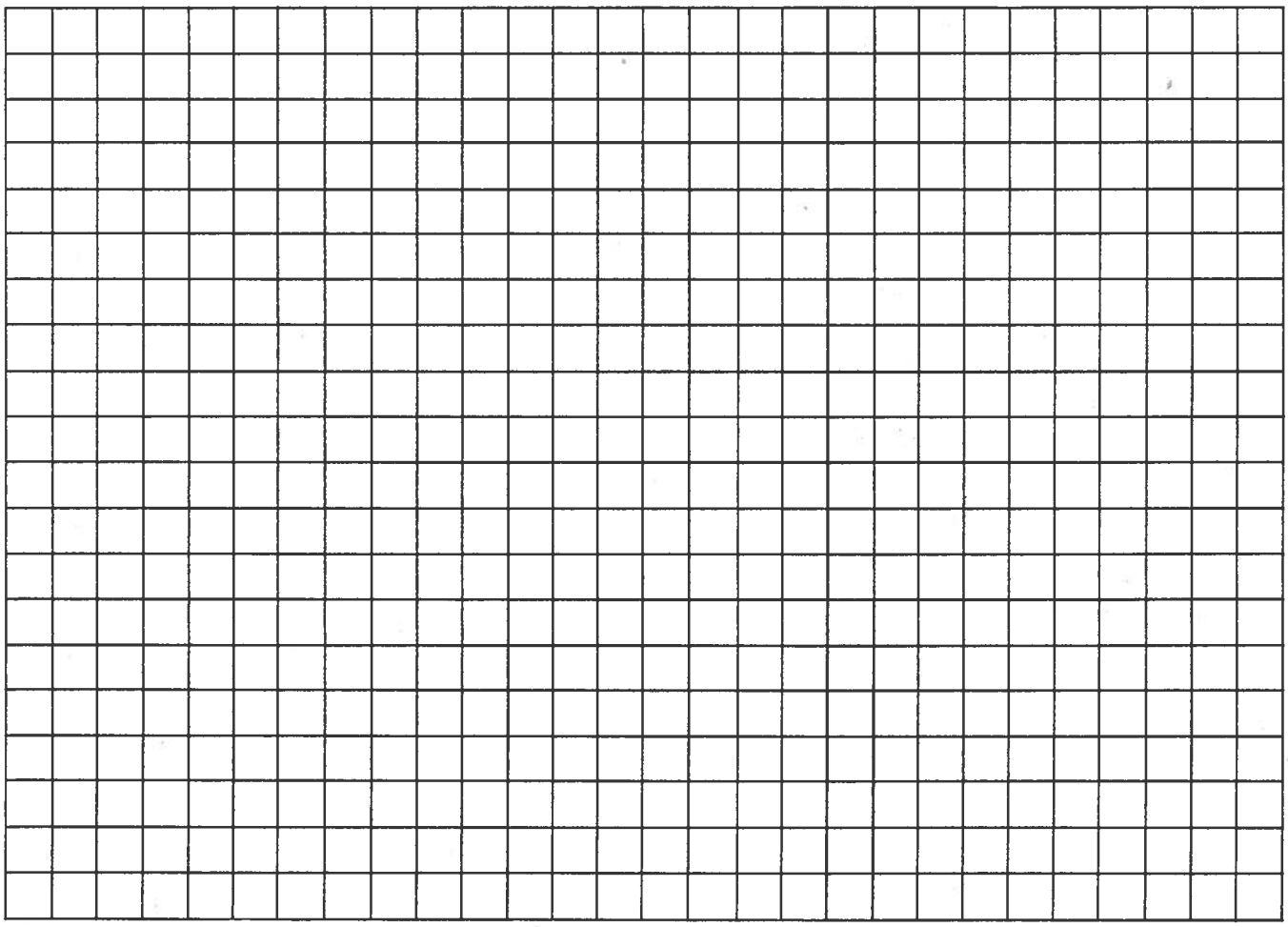
   36 _____ 40 _____ 100 _____ 99 _____ 101 _____

4. Can you state a method or formula to get the longest perimeter when you know the area? ★ _____

   _____

5. Predict the shortest possible perimeters for shapes with these areas. Experiment on grid paper.

   36 _____ 40 _____ 100 _____ 99 _____ 101 _____



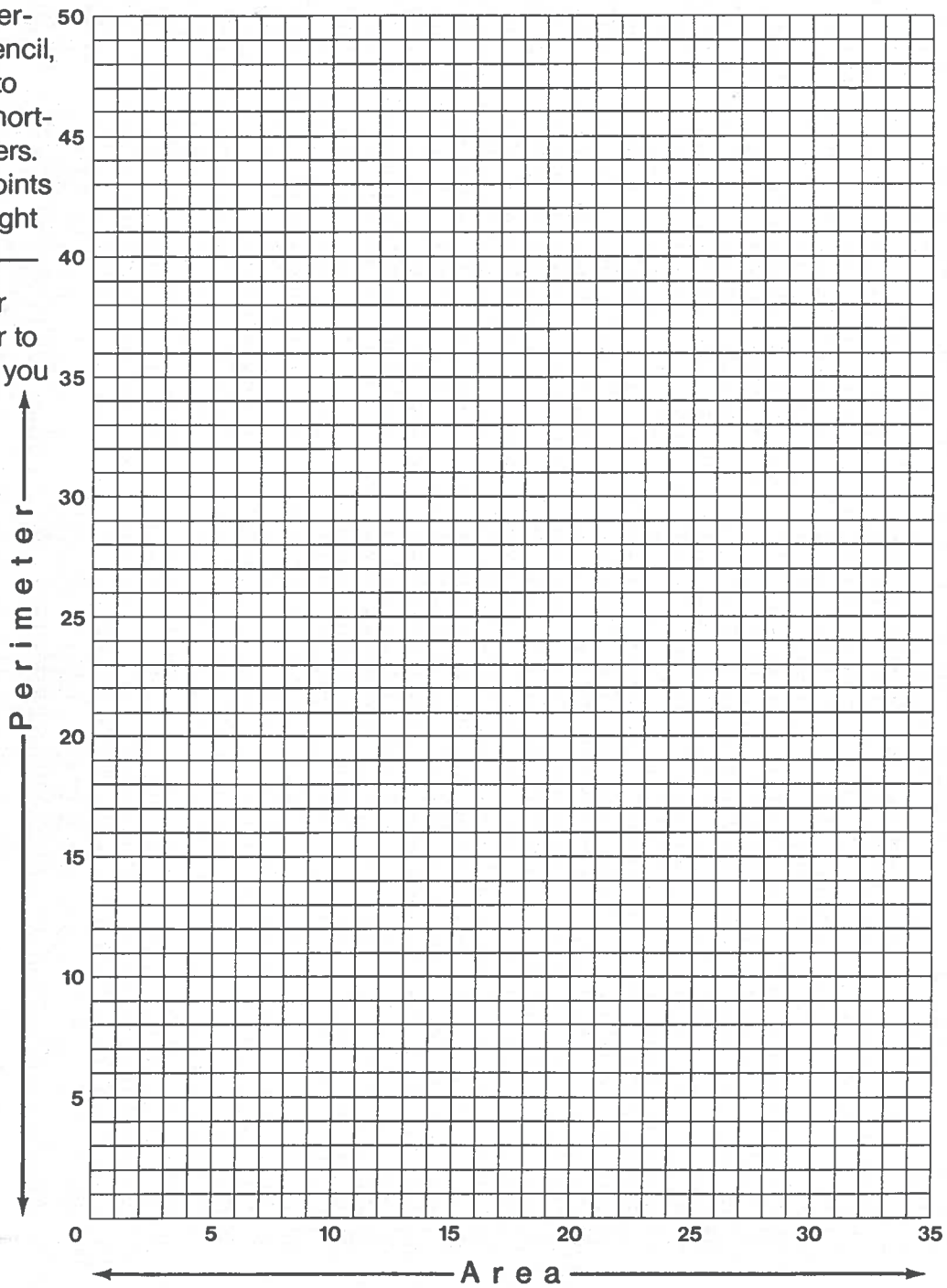
Perimeter-Area Graphing

1. Look at your table showing perimeter and area (page 35). Put the information about the longest perimeters on this graph. Since the longest perimeter for an area of 4 is 10, put a dot at point (4,10) on the graph. (Start at 0, go 4 spaces over to the right and 10 spaces up.) What do you notice about all these points?

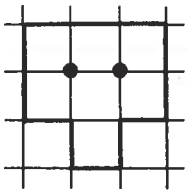
_____

2. Using a different color pencil, make dots to show the shortest perimeters. Do these points lie in a straight line? _____

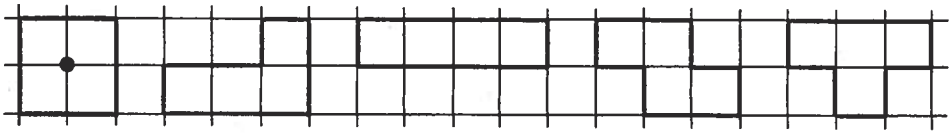
3. Extend your graph as far to the right as you can.



Eyes



Let's call the points of intersection of the grid lines inside a polyomino *eyes*. The square tetromino has 1 eye. No other tetrominoes have any eyes.



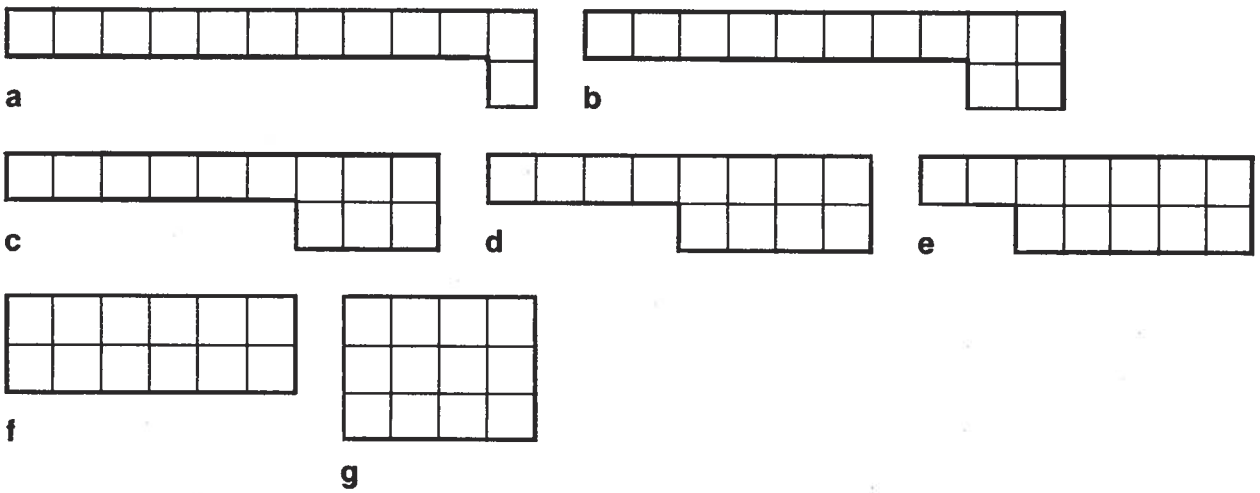
1. Look at the tetrominoes and fill out this table. It has been started for you.

Tetromino:	square	l	i	n	t
Eyes:	1	0	0	0	0
Perimeter:	___	___	___	___	___

2. Now fill out this table about pentominoes. You may need to use grid paper and draw the pentominoes. ★

Pentomino:	F	L	I	P	N	T	U	V	W	X	Y	Z
Eyes:	___	___	___	___	___	___	___	___	___	___	___	___
Perimeter:	___	___	___	___	___	___	___	___	___	___	___	___

3. Draw in all the eyes in the 7 figures below.



4. Then fill out this table about those figures.

Figure:	a	b	c	d	e	f	g
Area:	___	___	___	___	___	___	___
Eyes:	___	___	___	___	___	___	___
Perimeter:	___	___	___	___	___	___	___

5. Think of figures that have the same area. As the number of eyes increases, does the perimeter get longer or shorter? _____

Perimeter-Area Formulas

Here is how to find the longest perimeter for a given area. Call p the perimeter and a the area.

$$p = (2 \times a) + 2$$

or

$$p = (a + 1) \times 2$$

In other words, you double the area, then add 2, or add 1 to the area, then double it.

1. Check to see that this works for polyominoes that have an area of 5 or less. Check it for areas of 10, 12, and 16.

2. If you keep the area the same, but increase the number of eyes by 1, what happens to the perimeter?_____

Here is how to find the perimeter of a polyomino. Call a the area and e the number of eyes.

$$p = (2 \times a) + 2 - (2 - e)$$

or

$$p = (a + 1 - e) \times 2$$

3. Check to see that this works for tetrominoes, pentominoes, and the 12-ominoes shown on page 38. Use the space below for your figuring.