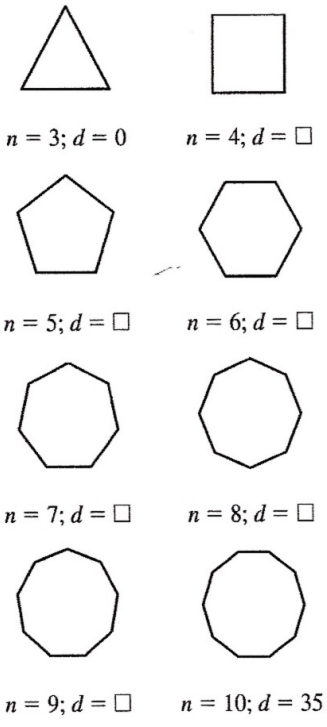

FIGURE 1.86 Some Polygons. (Exploration 1)

EXPLORATION 1 Diagonals of a Regular Polygon

How many diagonals does a regular polygon have? Can the number be expressed as a function of the number of sides? Try this Exploration.

1. Draw in all the diagonals (i.e., segments connecting nonadjacent points) in each of the regular polygons shown and fill in the number (d) of diagonals in the space below the figure. The values of d for the triangle ($n = 3$) and the decagon ($n = 10$) are filled in for you.
2. Put the values of n in list L1, *beginning with* $n = 4$. (We want to avoid that $y = 0$ value for some of our regressions later.) Put the corresponding values of d in list L2. Display a scatter plot of the ordered pairs.
3. The graph shows an increasing function with some curvature, but it is not clear which kind of growth would fit it best. Try these regressions (preferably in the given order) and record the value of r^2 or R^2 for each: linear, power, quadratic, cubic, quartic. (Note that the curvature is not right for logarithmic, logistic, or sinusoidal curve-fitting, so it is not worth it to try those.)
4. What kind of curve is the best fit? (It might appear at first that there is a tie, but look more closely at the functions you get.) How good *is* the fit?
5. Looking back, could you have predicted the results of the cubic and quartic regressions after seeing the result of the quadratic regression?
6. The "best-fit" curve gives the actual formula for d as a function of n. (In Chapter 9 you will learn how to derive this formula for yourself.) Use the formula to find the number of diagonals of a 128-gon.