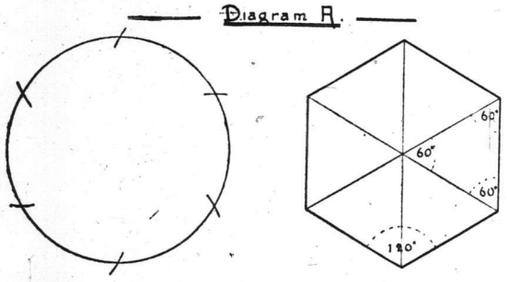
Cardboard Work — No. 5.

By T. B. Kidner.

Exercise 19.—A hexagonal table mat. This exercise will introduce the drawing of the hexagon, a more difficult plane figure than any of the preceding ones. There are several methods which may be used for the construction of the figure, the simplest, perhaps, being that of the circumscribing circle. Compasses are an advantage in this, but, as in the case of the circle and exercises based upon it, the slip of card (Ex. 14) will serve the purpose.

Commence, then, by reviewing the lesson on the circle and then point out that the radius will step round the circle exactly six times. After drawing the circle, place the pin in the circumference and with the pencil in the same hole used to draw the circle, mark off a small arc cutting the circumference. Transfer the pin to this new point and repeat the operation and so on round the circle. By joining the points thus obtained, the hexagon is constructed. The number of degrees in the angle of a hexagon can next be discovered by drawing the three diagonals. This will cut up the figure into six equilateral triangles, and by reviewing the early lessons, the angles of these are shown to be sixty degrees. As two of these are contained in the angle of

Diagram A.



the hexagon, the children will readily see that it will be 120°. The diagram A will make this clear.

A purely mechanical method is to use the 60° set square, and to this there is no objection, provided that the children understand why the hexagon can be obtained by its aid. In either case the diagram suggested for the circle method should be drawn by the teacher on the blackboard, and the properties of the hexagon worked out. The method in this case depends on the size of the exterior angle of the hexagon. By producing one side of the figure, a little judicious questioning and demonstrating will enable the children to calculate the number of degrees in the exterior angle. For instance, by drawing a straight line and a perpendicular to it, two right angles, or $90° + 90°$ are obtained. If the line be not perpendicular, the sum of the angles is still 180°. The interior angle of the hexagon being 120°, the exterior must be the supplement = 60°. (Of course, such terms as complement and supplement should not be used with children at this stage). A few illus-

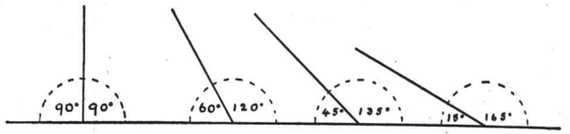
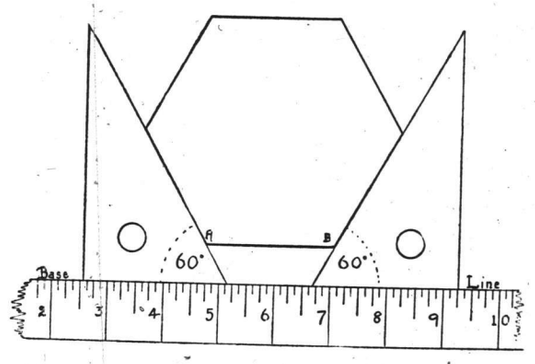


Diagram B

trations, such as are shown in the diagram B, will make this clear, and afford another opportunity for some mental arithmetic.

To construct the figure with the set square, commence by drawing a base line across the paper. Then, parallel to that, draw one side of the hexagon (AB in the diagram C). Further explanation than that afforded by

Diagram C



the diagram is scarcely necessary; the second and third sides are drawn by the aid of the set square as shown, and made equal in length to the first. By sliding the square along, the fourth and fifth sides can be drawn, and the sixth, parallel to AB, will complete the figure.

Either of the foregoing methods will suffice, but a variant of the first is to give one side of the hexagon and construct on it an equilateral triangle. The apex of this gives the centre of the circumscribing circle and the other points are obtained as before.

The cutting out is simple, but a bright color is advisable for this exercise, as it can be used for a vase stand against a dark cloth or table.

Exercise 20.—A silk winder. This is based on the hexagon, the six pointed star being obtained by joining alternate points round the circumscribing circle. The children should note that by joining the inner angles a small hexagon is obtained. The cutting requires care,