

GEOMETRY

A Guide For Teachers

Classroom activities in geometry form a major component of the seminars in our guide for teachers. These activities, worked on during the seminars, are meant for teachers to take into their classrooms. We have chosen three of the activities as examples of those found in our book.

Classroom Activity. You will find that the following fact is a very nice topic for classroom exploration:

Given any three points not on a line, there is a circle passing through them.

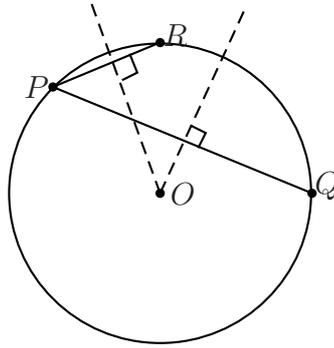
Part 1. Try to construct the circle from scratch.

Ask each of your students to take a piece of paper and mark three noncollinear points on it. Then ask them to *use a compass* to draw a circle passing through the points. (This is not easy to do.)

After about five minutes, do the following construction with your students. It shows them that they can construct the circle *effortlessly* using some interesting geometry.

Part 2. Construct a circle through three noncollinear points.

- (i) Mark three noncollinear points P , Q and R , and draw segments \overline{PQ} and \overline{PR} . (Have your students use the three points they marked in Step 1.)
- (ii) Use a compass and straightedge to construct the perpendicular bisectors of the line segments \overline{PQ} and \overline{PR} .
- (iii) Let O be the point of intersection of the perpendicular bisectors of \overline{PQ} and \overline{PR} .
- (iv) Draw the circle with center at O and radius $|OP|$.



The circle with center at O and radius $|OP|$ passes through P , Q and R .

(Note that construction with straightedge and compass of the perpendicular bisector of a line segment was discussed earlier in the seminar.)

The next classroom activity illustrates the process of triangulation of a polygon by means of diagonals. We use triangulation to compute the sum of the degrees in the interior angles of a 12-gon.

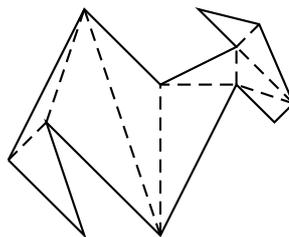
Classroom Activity.

This is a hands-on activity on triangulation. You will observe that it also tests students' understanding of the properties of polygons that we have discussed so far.

Directions for the students:

Draw a nonconvex 12-gon, triangulate it and compute the sum of the degrees in its interior angles.

Comments on the Classroom Activity. Here is an example of such a triangulated polygon.



The sum of the degrees in the interior angles of this 12-gon is the sum of the

degrees in the interior angles of the 10 triangles in its triangulation, namely $(10)180^\circ = 1800^\circ$.

The final example of the classroom activities in our book challenges students to cut a triangle into pieces which must then be rearranged to form a rectangle (with no gaps or overlaps). This process known as dissection.

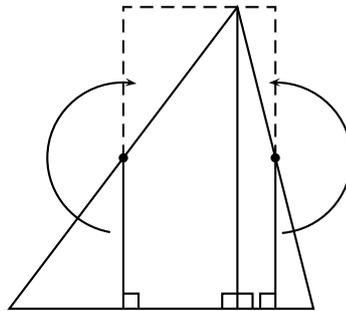
Classroom Activity.

The purpose of this activity is to show that it is possible to dissect a triangle into a rectangle of the same area.

Directions for the students:

- (i) Construct a triangle on paper and cut it out. (You may want more than one copy for experimental purposes.)
- (ii) Try to find a way to cut your triangle into polygonal pieces that can be rearranged to form a rectangle. Hint: It can be done by cutting off two smaller triangles from the given triangle.

Comments on the Classroom Activity. The dissection of a triangle into a rectangle is quite beautiful. As you will see, the midpoints of two sides of the triangle act like hinges which allow two small triangles to rotate upwards (or, which allow two other small triangles to rotate downwards) to form a rectangle. We let the pictures speak for themselves.



OR

