

benefit to be derived by the mass of students from the present athletic system. The building of athletic stadia costing millions, while acute educational needs remain unsatisfied, is little less than a betrayal of the cause of education to commercialism. Neither scientific training nor scientific research can reach its highest development while our entire program for physical education concerns itself with an almost negligible minority of men and leaves the vast majority of students upon the bleachers.

### GRAPHICAL TRISECTION OF AN ANGLE.<sup>1</sup>

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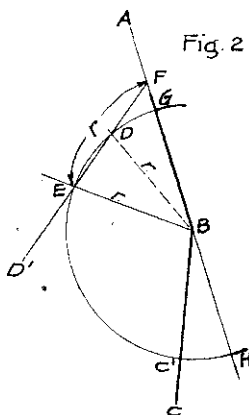
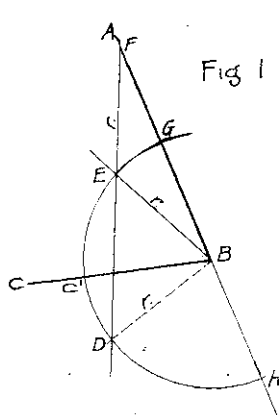
Given:  $\angle ABC$ .

Required: Trisect graphically.

CONSTRUCTION.

Produce one side as AB.

Describe an arc using any radius with B as center, cutting AB produced at G and H, and BC at C'.



Make  $DH = GC'$ . Draw DB.

Mark off on straight edge a distance equal to radius DB.

Maintaining straight edge on D move remote mark along GA

<sup>1</sup>Note by the Math. Ed.: A different method of trisecting an angle by means of a graduated ruler and compasses was published in this journal in 1913. Like the method given above it was, of course, not Euclidean. From the time of Hippias of Elio (about 420 B. C.), who invented the curve called the quadratrix by means of which an angle can be trisected, a solution of the trisection problem has been attempted by mathematicians and non-mathematicians alike. The first rigorous proof of the impossibility of the trisection of any given angle by means of an unmarked ruler and compasses is credited to Pierre Laurent Wantzel (1814-1848).

until other mark cuts arc. Designate these points, respectively, F and E, thus making  $EF = DB$ . Draw BE.

Then  $\angle EBF = \frac{1}{3}\angle ABC$ .

PROOF.

In Fig. 1:

$\angle EFB = \angle EBF = \frac{1}{2}\angle BED = \frac{1}{2}\angle BDE$ ,  
or  $\angle BDE = 2\angle EFB$ .

$\angle EFB + \angle BDE = \angle DBH$ .

Substituting  $2\angle EFB$  for  $\angle BDE$ ,

$\angle EFB + 2\angle EFB = 3\angle EFB = \angle DBH$ .

$\therefore \angle EFB = \frac{1}{3}\angle DBH$ .

But  $\angle DBH = \angle ABC$  by construction and  $\angle EFB = \angle EBF$ ,

$\therefore$  by substitution  $\angle EBF = \frac{1}{3}\angle ABC$ .

In Fig. 2:

When D lies between E and F substitute  $BED'$  for  $BED$  and  $BDF$  for  $BDE$  and proceed with  $\angle EFB = \angle EBF = \frac{1}{2}\angle BED' = \frac{1}{2}\angle BDF$  etc.

For angles greater than  $180^\circ$  bisect and proceed with either half, so that the remaining two thirds of the half angle is adjacent to the side of the angle.

## THE NEW ENTRANCE REQUIREMENT IN CHEMISTRY AT MASSACHUSETTS INSTITUTE OF TECHNOLOGY.<sup>1</sup>

BY ARTHUR A. BLANCHARD.

The purpose of the entrance requirement is not to make more advanced work in the college course possible; it is to establish a coordination of the high school and institute courses so that the latter may follow the former without discontinuity and without the sort of repetition that is demoralizing. It is of the spirit in which we hope that this coordination may be accomplished that I wish to speak.

Up to the present it has been an unsolvable problem at the institute how to give any adequate recognition to the excellent training some of our students have had at high school and still treat fairly those students who have had no previous chemistry. That the instruction in the high schools is good is evidenced by the one or two young men who almost every September take and pass with a very high rating our entrance examination for advanced standing in chemistry. Perhaps they have had more than one year of high school chemistry. These men are admitted at

<sup>1</sup>Read at meeting of New England Association of Chemistry Teachers, Boston, February 11, 1922.