109. *Proposed by J. O. Mahoney, Dallas, Texas.*

How many angles are formed by lines connecting n points in a plane?
How many diagonals may be drawn in an ordinary figure of n sides?

Geometry.

110. *Proposed by W. L. Malone, Fern Hill, Wash.*

Through two given points draw a circle tangent to a given circle.

111. *Proposed by R. C. Shellenbarger, Yankton, So. Dak.*

Find the radius of a circle having given the length and height of an arc in linear units.

107. *Proposed by Walter L. Brown.*

Find the fallacy in the following argument: "All triangles are isosceles."

Proof: Bisect the vertical angle A by the line AO, and let this

line meet the perpendicular bisector of BC in O. Draw OS perpendicular to AC and OR perpendicular to AB. Connect OB, OC. Then $RO = OS$, $OB = OC$, angle $BRO =$ angle CSO being right angles, and therefore $RB = SC$. Likewise $AR = AS$. By addition it now follows that $AB = AC$.

Applied Mathematics.

112. *Proposed by G. B. M. Zerr, Ph.D., Philadelphia, Pa.*

The specific gravity of copper is 8.8, of aluminum 2.5. The price of copper is 16 cents per pound, of aluminum 35 cents per pound. The conductivity of copper to aluminum = 100 : 65. Which is the cheaper for electrical conductors?

THE TEACHING OF GEOMETRY. A WAY OUT.

BY MARGARET A. GAFFNEY,

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For several years I have been a more or less astonished reader of the discussion of the material and methods of high school geometry. At last I am driven to cry out with the satirist:

*"Semper ego auditor tantum? Nunquamne reponam
Vexatus toties rauci Theseide Codri?"*

The opposing partisans of the non-rigorous and the rational contend for different ways of presenting what they seem to regard as one subject. Whereas the truth appears to be that what passes under the name of geometry is a combination of two distinct subjects, namely, experimental or intuitional geometry and rational geometry, differing in material, development, and application. Both are too valuable for either to be allowed to oust the other.

The proposed way out of the conflict is just this. Admit that there has been a disadvantageous confusion of two distinct things, separate

them, giving to rational geometry preferably a new name; then deal with each according to its nature and use. Thus, in the allotted time, let experimental or intuitional geometry be taught in the way that will soonest and easiest put its students in possession of the largest body possible of the mathematical truths which have application in physical science and mechanics. Let its students be taught truly, so far as they go, measurement and the use of instruments of measurement. Let it be a discipline toward delicacy and sureness of eye and hand. Let the end sought be practical, accurate results, not logical impeccability; a good and worthy end it is, too.

But this admission should not give offense to rational geometry, nor detract in the slightest from its claim to a place, say, in the last year of the high school course. Indeed, it may well be asserted that rational geometry is even more important than the experimental, since there is no condition of life where its teachings are not in place. But to profit most largely, its students should be left in no doubt as to what they are about. They are no longer engaged chiefly in the acquirement of mathematical facts. Material precision is no longer of consequence. On the contrary, they are being introduced to a study of the working of their own minds, through which they may come to get some skill in analyzing the origin of their own mental content, distinguishing between what comes to them through intuition, perception, authority, and deduction; some notion of the place of hypothesis in science; and, greatest of all, the habit of dealing with the problems of every-day life with some approach to the methods of rational beings.

If geometry could be thus separated and organized, the student of experimental geometry need not, for instance, prove that all right angles are equal; and the student of rational geometry would never think of exclaiming, when occupied with that same theorem, "Why, any fool knows that!"

Now, if our mathematical masters would set themselves to differentiate and illuminate for us the nature, aims, and values of these two distinct subjects, or, at least, these two very different phases of the same subject, instead of contending for this or that method of presenting both as one, many teachers, themselves without authority or right of initiative, would be helped and would be thankful, while now they are too often like "the hungry sheep," who "look up and are not fed."

NOTICE.

Will any one who has extra copies of the report of the Committee on Geometry which was read at the St. Louis meeting, kindly send them to Miss Mabel Sykes, South Chicago High School, Chicago, Ill.?