27 minutes after B. They all arrived at Q at the same time. Find the distance from P to Q. *Ans.* 21 miles. [25.]

10. (*a*) A triangle, altitude 60 feet, is bisected by a line drawn parallel to the base. Find the perpendicular distance between the base and the dividing line. [15.]

(*b*) The areas of the several faces of a rectangular solid are 57, 27 and 19 square feet. Find its dimensions. *Ans.* $6\frac{1}{3}$ ft., 9 ft., 3 ft. [15.]

EUCLID.

Examiner—J. Dearness.

NOTE.—Symbols, except of operation, may be employed. Use capital letters with the diagrams. It is recommended that each step in the demonstration begin on a new line.

1. When is one proposition said to be the converse of another? [3.]

State the converse proposition of I. 41. If a parallelogram and a triangle be upon the same base, etc.). [3.]

Show by an example that the converse of a true proposition is not necessarily true. [3.]

2. If one side of a triangle be produced the exterior angle is greater than either of the interior opposite angles. (I. 16.) [10.]

3. In the figure of the preceding, let *AC* be the side bisected in *E*, and produce *BE* to *F*; similarly bisect *BC* in *H*, join *AH* and produce it to *L*; join *LB* and *FA* and produce them to meet in *M*. Show that the triangle *FML* is quadruple of the triangle *ABC*. [10.]

4. Show whether the angles of a triangle can be changed without changing (shortening or lengthening) the sides. [8.]

Also whether the angles of a quadrilateral (as of a rhombus) can be changed without changing the length of the sides. [8.]

5. If the vertical angle of an isosceles triangle is two-thirds of two right angles the square on the base is equal to three times the square on one of the equal sides. [10.]

6. If a straight line be divided into any two parts the square on the whole line is equal to the squares on the two parts together with twice the rectangle contained by the parts. (II. 4.) [10.]

Enunciate the geometrical proposition expressed by the equation $(a+b+c)^2$
$$=a^2+b^2+c^2+2ab+2bc+2ca. \quad [4.]$$
Construct it geometrically. [4.]

7. If a straight line be divided into any two parts, the squares on the whole line and on one of the parts are equal to twice the rectangle contained by the whole and that part together with the square on the other part. (II. 7.) [10.]

Show from the demonstrations of II. 4, and II. 7, that the square on the sum of two lines is as much greater than the sum of their squares as the latter is greater than the square of the difference. [4.]

Illustrate the same truth algebraically. [3.]

8. Divide a given straight line into two parts so that the rectangle contained by the whole and one of the parts shall be equal to the square on the other part. (II. 11.) [10.]

Show algebraically that the square on the sum of the whole line and the lesser segment is equal to five times the square on the greater segment. [4.]

9. *In every triangle the square on the side* subtending any of the acute angles is less than the squares on the sides containing that angle by twice the rectangle contained by either of these sides and *the straight line* intercepted between the perpendicular let fall upon it from the opposite angle, and the acute angle. (II. 13). Deal only with the case of the obtuse-angled triangle. [10.]

(Total 114. Count 100 marks a full paper.)

CLASSICS.

G. H. ROBINSON, M.A., TORONTO, EDITOR.

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Examiner—J. E. Hodgson, M.A.

Candidates for III. take A and B. Candidates for II. take B and C.

A.

Translate:

Jucundum potius, quam odiosum! . . . sed in literis certe elaboravi.—C. M. [15.]