

PLANE GEOMETRY

Thursday, January 24, 1918—1.15 to 4.15 p. m., only

Write at top of first page of answer paper (a) name of school where you have studied, (b) number of weeks and recitations a week in plane geometry. The minimum time requirement is five recitations a week for a school year.

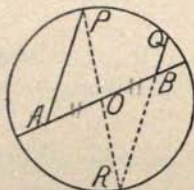
Name the author of the textbook you have used in plane geometry.

Answer eight questions, including question 1.

Assign 16 credits to the first question and 12 credits to each of the others.

1 O is the center of the circle and AOB is a straight line on which A and B are points equidistant from O . AP and BQ are any two parallel lines through A and B .

Produce PO to meet the circle at R and draw RB .



Assign a reason for each step in the following proof:

- 1 $PO=OR$
 $AO=OB$
- 2 $\angle AOP=\angle ROB$
- 3 $\triangle AOP=\triangle ROB$
- 4 $\angle APO=\angle ORB$
- 5 $AP\parallel RB$
- 6 RQ is a straight line
- 7 $PQ\perp BQ$
- 8 $PQ\perp AP$

2 Prove that if two right triangles have the hypotenuse and a side of one respectively equal to the hypotenuse and a side of the other, the triangles are congruent.

3 Prove that the sum of the angles of any triangle is equal to two right angles.

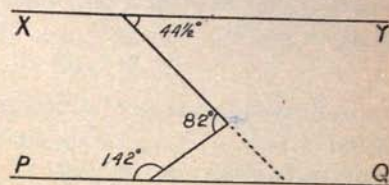
4 Prove that a perpendicular to a tangent at the point of contact passes through the center of the circle.

5 Prove that if two triangles have an angle of one equal to an angle of the other and the sides including these angles proportional, the triangles are similar.

PLANE GEOMETRY—concluded

- 6 a What is the angle between the hands of a clock at 12 minutes past 11?
- b The vertex angle of an isosceles triangle is $18^\circ 44'$; how many degrees are there in each base angle?
- c The smaller arc intercepted by two secants which meet at an angle of 38° is 65° ; how many degrees are there in the greater intercepted arc?

7 In the accompanying figure the value of each of three angles is indicated; XY and PQ are straight lines which are nearly but not quite parallel. Determine in which direction the lines must be produced in order to meet.

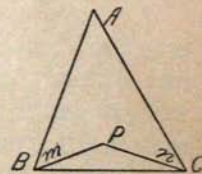


8 In the accompanying figure $\angle A=50^\circ$, $\angle ABC=70^\circ$, $\angle ABP=m$ and $\angle ACP=n$

a Find all the angles of the triangle BPC in terms of m and n .

b If the angle BPC is a right angle, find the relation between m and n .

c If BP and CP produced were perpendicular to AC and AB respectively, what values would m and n then have?



9 If z is the hypotenuse of a right triangle and x and y are the sides, prove that the perpendicular drawn from the right angle to the hypotenuse equals $\frac{xy}{z}$.

10 AOD is the diameter of a circle whose center is O . B is any point on the circle. At B a tangent is drawn and OP is drawn through the center parallel to AB to meet the tangent at P . Prove that PD is a tangent to the circle.

11 The sides of a triangle are 7, 11 and 14. Find the radius of the circle whose area is equal to the area of the triangle.

12 Draw a circle and by construction draw two parallel chords which are equal. At the extremity of one of these chords construct a tangent to the circle. [To receive credit construction lines must be shown.]