PLANE TRIGONOMETRY

Thursday, September 9, 1920—9.15 a.m. to 12.15 p.m., only

Answer six questions. Papers entitled to less than 75 credits will not be accepted.

1. If $n$ represents one side of a regular pentagon, show that the area is $\frac{1}{2} n^2 \tan 54^\circ$.

2. If $A = 18^\circ$, then $\sin 3A = \sin (90 - 2A) = \cos 2A$. Expanding both sides of this equation and solving for $\sin A$, find, without using the tables, the value of $\sin 18^\circ$ expressed as a decimal.

3. Find by the use of logarithms the value of
$$\sqrt[3]{\frac{(-0.00326)^2 \times 321.38}{2.3017}}$$

4. Without the use of tables, find all possible values of $A$ between $0^\circ$ and $360^\circ$ that satisfy the equation
$$2\sqrt{3} \cos^2 \theta = \sin \theta$$

5. If $\tan 2x = \frac{3}{4}$, find $\tan x$ and $\sin x$ when it is known that $x$ is an angle in the third quadrant.

6. An observer standing on the bank of a river notes that the angle subtended by a flagpole on the opposite bank is $33^\circ 10'$; when he retires 120 feet from the bank he finds the angle to be $18^\circ 16'$. Find the width of the river.

7. Solve the triangle $ABC$ when $C = 104^\circ 13' 48''$, $b = 115.72$, $c = 165.28$.

8. A man in a railway car going 45 miles an hour observes the rain drops falling at an angle of $10^\circ$ with the horizontal; assuming that the rain drops are actually falling vertically, find their speed.