5. Prove the relations—

(*a.*) $\sin(A+B) \, . \, \sin(A-B) = \sin^2 A - \sin^2 B$;

(*b.*) $\dfrac{\sin A + \sin 3A}{\cos A + \cos 3A} = \tan 2A$;

(*c.*) $\dfrac{1-\tan^2(45^\circ - A)}{1+\tan^2(45^\circ - A)} = \sin 2A$.

6. Find an expression for $\sin(A+B+C)$ in terms of the ratios of A, B, and C.

If $A+B+C = 180^\circ$, show that—

$$\sin^2 A + \sin^2 B + \sin^2 C = 2(1 + \cos A \cos B \cos C).$$

7. If A be the angle of a triangle, find cos A and cos $\frac{1}{2}$ A in terms of the sides.

If the sides of a triangle are 12ft., 16ft., and 20ft., find the greatest angle and the area of the triangle.

8. Show how to solve a triangle when two sides and the contained angle are given, and give proofs of the formulæ employed.

Prove that in any triangle

$$a \cos A + b \cos B = c \cos(A-B).$$

9. Given log 2 = ·301, and log 3 = ·477, find the logarithms of 6, 15, ·18, and $\frac{1}{12}$.

Find also L sin 60°.

10. A steamer at sea sighted a lighthouse bearing due west, and after the steamer had proceeded on a west-north-west course for sixteen miles the bearing of the lighthouse was found to be south-west: find the distance of the steamer from the lighthouse at the time of each observation. [Given sin $22\frac{1}{2}^\circ$ = ·3827.]

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