the tangent, and the secant; and explain the origin of the names.

Prove that the sine of a given angle can have only one value. Is the converse true?

Write down the value of cos 0°, sin 45°, tan 30°.

5. Having given L cos $37^\circ 14' = 9.9010102$, and difference for $1' = 960$, find L cos $37^\circ 14' 16''$, and L cosec $52^\circ 45' 54''$.

6. Prove the formulæ

(1) $\sin(A-B) = \sin A \cos B - \cos A \sin B$.

(2) $\cos 2A = 1 - 2\sin^2 A$.

(3) $\dfrac{\sin A + \sin B}{\sin A - \sin B} = \dfrac{\tan \frac{1}{2}(A+B)}{\tan \frac{1}{2}(A-B)}$.

(4) $\dfrac{\sin A + \sin 2A}{1 + \cos A + \cos 2A} = \tan A$.

7. How many parts of a triangle must be given to effect its solution?

In a certain triangle ABC it is known that $\sin^2 A = \sin^2 B + \sin^2 C$. Shew that one of the angles may be found, and find it.

8. In any triangle prove that

(1) $\dfrac{\sin A}{a} = \dfrac{\sin B}{b} = \dfrac{\sin C}{c}$.

(2) $\tan \dfrac{A-B}{2} = \dfrac{a-b}{a+b} \cot \dfrac{C}{2}$.

(3) $\sin B \operatorname{cosec} A = \dfrac{\cot \frac{A}{2} + \cot \frac{C}{2}}{\cot \frac{B}{2} + \cot \frac{C}{2}}$.

9. Solve the triangles

(1) $A = 143^\circ 23'$, $a = 60$ ft., $b = 54$ ft.

(2) $A = 64^\circ 56'$, $b = 311.5$ ft., $c = 111.5$ ft.

10. Having given the three sides of a triangle, find the radii of the inscribed and circumscribed circles.

Number.	Log.	Angle.	Log.
11150	.04727	$4^\circ\ 9'$	L sin 8.85955
20000	.30103	$20^\circ\ 55'$	L sin 9.55268
28290	.45163	$32^\circ\ 28'$	L sin 9.72982
30000	.47712	" "	L tan 9.80363
42300	.62634	$36^\circ\ 37'$	L sin 9.77558
70000	.84510	" "	L tan 9.87106
72798	.86212	$64^\circ\ 56'$	L sin 9.95704

EUCLID.—HONORS.

1. If a point be taken within a circle, from which there fall more than two equal lines to the circumference, that point is the centre of the circle.

2. If a straight line touch a circle, the straight line drawn from the centre to the point of contact shall be perpendicular to the line touching the circle.

3. About a given circle describe a triangle equiangular to a given triangle.

4. Inscribe an equilateral and equiangular hexagon in a given circle.

5. Define ratio, compound ratio, and proportion. How is the equality of two ratios ascertained?

6. If the segments of the base of a triangle have the same ratio which the other sides have, the straight line drawn from the vertex to the point of section divides the vertical angle into two equal angles.

7. Find a fourth proportional to three given straight lines.

8. Rectilineal figures which are similar to the same rectilineal figure are also similar to one another.

9. From a vessel two known points are seen under a given angle; the vessel sails a given distance in a given direction, and the same two points are seen under another given angle. Find the position of the vessel.

10. About a given circle describe a triangle, the angular points of which lie on three given straight lines drawn from the centre of the circle.

11. The locus of the vertices of triangles on a given base, having their sides in a given ratio, is a circle.

ALGEBRA.—HONORS.

1. Find the relation among the co-efficients of $ax^2 + 2hxy + by^2 + 2gx + 2fy + c$ in order that it may break up into two linear factors with real co-efficients.

2. Solve

(1) $54x^3 + 27y^3 = 8216$

$x + y = 10$.