Mathematical Notes.

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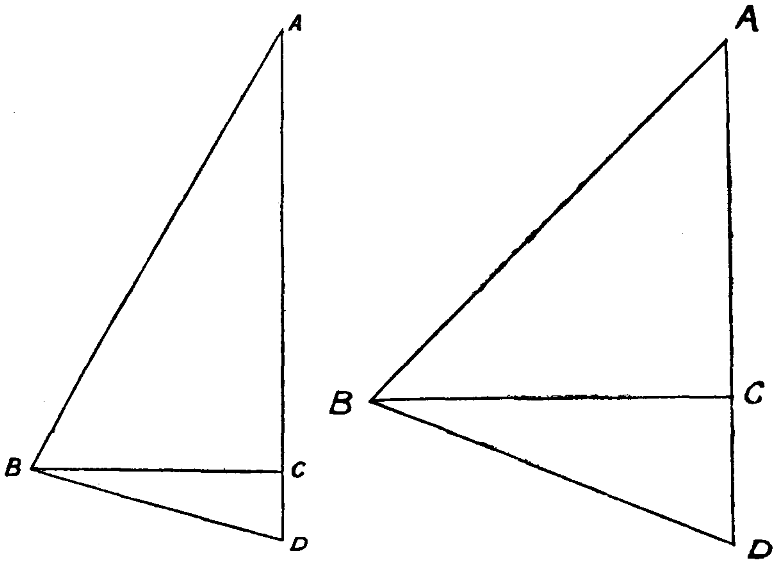
The Tangents of 15° and of 22½°.—I. Let ABC be a triangle in which $\hat{A} = 30°$, $B = 60°$, $C = 90°$.



Produce AC to D so that $AD = AB$. Join BD.

Then $A\hat{B}D = A\hat{D}B = \frac{1}{2}(180° - A) = 75°$.

$$\therefore \quad C\widehat{B}D = 15°,$$

and $$\tan 15° = \frac{CD}{BC}.$$

Now let $BC = 1$.

Then $AD = AB = 2$,

and $CD = AD - AC = 2 - \sqrt{3}$.

$$\therefore \quad \tan 15° = \frac{2 - \sqrt{3}}{1}$$
$$= 2 - \sqrt{3}.$$

II. Let ABC be a triangle in which $\widehat{A} = \widehat{B} = 45°$, $\widehat{C} = 90°$.

With the same construction as above, we have

$$A\widehat{B}D = A\widehat{D}B = 67\tfrac{1}{2}°.$$

$$\therefore \quad C\widehat{B}D = 22\tfrac{1}{2}°.$$

Taking again $BC = 1$, we find

$$\tan 22\tfrac{1}{2}° = \frac{\sqrt{2} - 1}{1} = \sqrt{2} - 1.$$

PETER RAMSAY

The Numerically Greatest Term of a Binomial Expansion.—The problem of the greatest term of a binomial expansion is a favourite one in elementary text-books, and its solution is often difficult to a beginner. The difficulty, at least in the case where the index is negative or fractional, seems to be caused by the fact that a "formula" is provided which gives a value for r, such that the $(r+1)$th term is the greatest. Moreover, this formula is not always the same. Sometimes it is $\dfrac{(n+1)x}{x+1}$, sometimes $\dfrac{(n+1)x}{x-1}$; and unless the student has a very good memory he is sure sometimes to make mistakes. Elementary mathematics ought not to be a memory exercise. It is a platitude to say that the educational value of the teaching of mathematics lies in its training of the powers of reasoning. This element is

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