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

Produce \( AC \) to \( D \) so that \( AD = AB. \) Join \( BD. \)

Then \( \hat{ABD} = \hat{ADB} = \frac{1}{2}(180° - \hat{A}) = 75°. \)
and \( \tan 15^\circ = \frac{CD}{BC} \).

Now let \( BC = 1 \).

Then \( AD = AB = 2 \),

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

\[ \therefore \tan 15^\circ = \frac{2 - \sqrt{3}}{1} = 2 - \sqrt{3} \]

II. Let \( ABC \) be a triangle in which \( \hat{A} = \hat{B} = 45^\circ, \hat{C} = 90^\circ \).

With the same construction as above, we have

\[ \hat{ABD} = \hat{ADB} = 67\frac{1}{2}^\circ \]

\[ \therefore \hat{CBD} = 22\frac{1}{2}^\circ \]

Taking again \( BC = 1 \), we find

\[ \tan 22\frac{1}{2}^\circ = \frac{\sqrt{2} - 1}{1} = \sqrt{2} - 1 \]

\textbf{Peter Ramsay}

\textbf{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 \( \frac{(n + 1)x}{x + 1} \), sometimes \( \frac{(n + 1)x}{x - 1} \); 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

\[ (74) \]