

ARTS DEPARTMENT.

ARCHIBALD MACMURCHY, M.A., MATHEMATICAL EDITOR, C. E. M.

Our correspondents will please bear in mind, that the arranging of the matter for the printer is greatly facilitated when they kindly write out their contributions, intended for insertion, on one side of the paper ONLY, or so that each distinct answer or subject may admit of an easy separation from other matter without the necessity of having it re-written.

We have received solutions to a number of the questions proposed in our last issue, but our space will admit of giving only two of them; these are by the proposer, Prof. Edgar Frisby, M.A., Naval Observatory, Washington. Solutions were also sent in to the same problems by Messrs. Barton and MacMurchy, University College, Toronto.

It is with special pleasure that we direct the attention of our readers to the article on recent changes made in the rules for conducting the examinations for *honours* at the University of Cambridge, which appears in this number, from the pen of the eminent and well-known Cambridge Mathematician, Isaac Todhunter, M.A., F.R.S., widely known in this country through his many and valuable works on Mathematics. The writer of the article is also the author of the volume "The Conflict of Studies, and other Essays connected with Education," published in 1873, a book which every educator should have and carefully read.

SOLUTIONS.

A solution for the following has been asked for:

Let ABC be an isosceles triangle; BA , BC equal sides; produce BC ; draw ED cutting AC in D so that $ED=DF$, E point in side AB and F in side BC produced; prove $EB+BF=AB+BC$.

—Let ABC be an isosceles $\triangle$ having the $\angle BAC = \angle BCA$. Produce BC , and draw EDF so that $ED=DF$; then $EB+BF=AB+BC$. Join EC and AF , and draw $EG+FH \perp$ to AC . Then since $ED=DF$, $\triangle EDC = \triangle CDF$, and $\triangle EAD = \triangle DAF$,

$\therefore$ whole $\triangle AEC =$ whole $\triangle CAF$,

$\therefore \perp EG = \perp FH$,

and $\angle EGA = \text{rt. } \angle = \angle CHF$,

and $\angle HCF = \angle BCA = \angle BAC$.

$\therefore EA=FC$ (26.1),

to each add EB and BC ,

$\therefore EB+BF=AB+BC$.

F. BOULTBEE, Univ. Coll.

40. Sum to n terms and to infinity.

$$\frac{7}{3 \cdot 4 \cdot 5 \cdot 6} + \frac{11}{4 \cdot 5 \cdot 6 \cdot 7} + \frac{17}{5 \cdot 6 \cdot 7 \cdot 8} + \dots$$

The second differences in the numerator are constant, and therefore it can be assumed to be of the form $(an^2 + bn + c)$, making $n=1, 2$ and 3 respectively, we have the three equations

$$a + b + c = 7$$

$$4a + 2b + c = 11$$

$$9a + 3b + c = 17$$

whence $a=1, b=1, c=5$,

and the n^{th} term is

$$\frac{n^2 + n + 5}{(n+2)(n+3)(n+4)(n+5)}$$

This can be resolved into partial fractions of the form

$$\frac{A}{n+2} + \frac{B}{n+3} + \frac{C}{n+4} + \frac{D}{n+5} \\ = \frac{n^2 + n + 5}{(n+2)(n+3)(n+4)(n+5)}$$

whence $A = \frac{7}{6}, B = -\frac{11}{2}, C = \frac{17}{2}, D = -\frac{25}{6}$.

If we had reduced the left-hand member to a common denominator and equated numerators, the coefficient of n^3 would have been $A+B+C+D$; and as there is no n^3 on the right-hand side, we have plainly $A+B+C+D=0$, and this will always happen when the general term has its denominator at least two dimensions greater than its numerator.