Sr

   I was very glad to hear of your good health by Mr Smith & to have any opportunity given me of shewing how ready I should be to serve you or your friends upon any occasion & wish that something of greater moment would give me a new opportunity of doing it so as to become more useful to you than in solving only a mathematical question. In reading ye Question it seemed to me at first to be ill stated & in examining Mr Smith about the meaning of some phrases in it he put the case of ye Questions ye same as if A plaid with six dyes till he threw a six & then B threw as often wth 12 & C with 18 the one for twice as many the other for thrice as many sixes. To examin who had ye advantage I tooke the case of A throwing wth one Dye & B wth two, the former till he threw a six, the latter as often for two sixes, & found that A had ye advantage. But whether A will have ye advantage when he throws wth 6 & B with 12 dyes I cannot tell. for the number of dyes may alter the proportion of ye chances considerably & I did not compute it in this case, the Problem being a very hard one. And indeed upon reading the Question anew I found that these cases do not come within the Question. For here an advantage is given to A by his throwing first till he throw a six: whereas the Question requires that they throw upon equal luck & by consequence that no advantage be given to any one by throwing First. The Question is this

   A has 6 dyes in a box wth wch he is to fling a six.

   B has in another box 12 dyes wth wch he is to fling two sixes.

   C has in another box 18 dyes wth wch he is to fling 3 sixes.

   Q. Whether B & C have not as easy a task as A at eaven luck.

If this Question must be understood according to the plainest sense of ye words, I think that sense must be this.

   1. Because A, B, & C are to throw upon equal luck, there must be no advantage of luck given to any of them by throwing first or last or by making any thing depend upon the throw of any one wch does not equally depend on the throws of the other two. And therefore to barr all inequality of luck on these accounts, I would understand ye Question as if A, B & C were to throw all at the same time.

   2. I take the most proper & obvious meaning of the words of ye question to be that when A flings more sixes then one he flings a six as well as when he flings but a single six & so gains his expectation, & so when B flings more sixes then two & C more then three they gain their expectations. But if B throw under two sixes & C under three they miss their expectations because in the Question tis exprest that B is to throw 2 & C three sixes.

   3. Because each man has his dyes in a box ready to throw & ye question is put upon ye chances of that throw wthout naming any more throws then that: I take the Question to be the same as if it had been put thus upon single throws.

   What is ye expectation or hope of A to throw every time one six at least wth six dyes?

   What is ye expectation or hope of B to throw every time two sixes at least wth 12 dyes?

What is ye expectation or hope of C to throw every time three sixes at least wth 18 dyes?

And whether has not B & C as great an expectation or hope to hit every time what they throw for as A hath to hit his what he throws for?

If the Question be thus stated, it appears by an easy computation that the expectation of A is greater then that of B or C, that is, the task of A is the easiest. And the reason is because A has all the chances of sixes on his dyes for his expectation but B & C have not all the chances on theirs. For when B throws a single six or C but one or two sixes they miss of their expectations. This Mr Smith understands & therefore allows that if the question be understood as I have stated it, then B & C have not so easy a task as A: but he seems of opinion yt the question should be so stated that B & C as well as A may have all ye chances of sixes on their dyes within their expectations. I do not see that ye words of the Quesiton as tis set down in your letter will admit it, but this being no mathematical Question but a Question, what is the true Mathematical question, it belongs not to be to determin it. I have contented my self therefore to set down how in my opininon the Question according to ye most obvious & proper meaning of the words is to be understood & yt if this be the true state of the Question then B & C have not so easy a task as A. But whether I have hit the true meaning of the Question I must submit to ye better judgments of yourself & others. If you desire ye computation I will send it you. I am Sr

<div align="center">
Your most humble & most
obedient Servant
Is. NEWTON
</div>

Cambridge, Novemb. 26.
     1693.

<div align="center">
from H. W. Turnbull, *ed*., **The Correspondence of Isaac Newton**,
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