



Problem of the Week Problem B and Solution Sanjiv's Blocks

Problem

Priya's little brother Sanjiv loves to build towers with his coloured blocks.

- (a) Sanjiv builds a tower with three blocks: two identical red blocks and one green block. If each colour combination is equally likely, what is the theoretical probability that Sanjiv's tower will have the two red blocks next to each other?
- (b) Sanjiv also builds towers with four blocks: two identical red blocks, one green block, and one blue block. If each colour combination is equally likely, what is the theoretical probability that such a tower will have the two red blocks next to each other?
- (c) Priya notices that of the last six four-block towers Sanjiv built, four had the two red blocks next to each other. What is the experimental probability that one of Sanjiv's four-block towers has two red blocks next to each other? Does this observation confirm that Sanjiv does like to have the red blocks together?

Solution

- (a) Let R represent a red block and G represent a green block. There are three possible configurations of the blocks. Listing the blocks from top to bottom, the configurations are RRG, RGR, and GRR. Of these, two have the red blocks next to each other. Thus, the theoretical probability that Sanjiv's tower has two red blocks together is $\frac{2}{3}$.
- (b) Let R represent a red block, G represent a green block, and B represent a blue block. There are twelve possible configurations of the blocks. Listing the blocks from top to bottom, the configurations are RRGB, RRBG, RGRB, RBRG, RGBR, RBGR, GRRB, BRRG, GRBR, BRGR, GBRR, BGRR. Of these, six have the red blocks next to each other. Thus, the theoretical probability that Sanjiv's tower has two red blocks together is $\frac{6}{12} = \frac{1}{2}$.
- (c) Priya observes four of the six towers have the red blocks next to each other. Thus, the experimental probability that the two red blocks are next to each other is $\frac{4}{6} = \frac{2}{3}$. Since this is greater than the theoretical probability $\frac{1}{2}$, it is more likely to be Sanjiv's choice to have the red blocks next to each other. However, the sample size is quite small, and experimental and theoretical probabilities often differ, especially for small sample sizes.