



Problem of the Week

Problem B

A Probability Puzzle

Problem

Jacob has the 600 pieces of a rectangular puzzle in a box. He knows that

- the finished puzzle will have a perimeter of 200 cm, with the width being $\frac{2}{3}$ of the length, and
 - the straight edge on each edge piece is 2 cm long, including the two edges of each corner piece.
- a) If Jacob puts his hand in the puzzle box without looking, and pulls out one piece, what is the probability that it will be a corner piece?
- b) What is the probability that it will be an edge piece, but not a corner piece?

Solution

- a) Since only 4 of the 600 puzzle pieces are corner pieces, the theoretical probability that Jacob will pull out a corner piece is

$$\frac{\text{Number of desired outcomes}}{\text{Total number of possible outcomes}} = \frac{4}{600} = \frac{1}{150}.$$

- b) Since the perimeter of the puzzle is 200 cm, the length + width = 100 cm. Thus the width must be 40 cm and the length must be 60 cm, in order that the width be $\frac{2}{3}$ of the length.

On each 60 cm length, there will be thirty 2 cm edges, while on each 40 cm width, there will be twenty 2 cm edges. But the corner pieces each have two such edges. Thus there are 28 non-corner edge pieces on each 60 cm length, and 18 non-corner pieces on each 20 cm width, giving a total of

$$28 \times 2 + 18 \times 2 = 92 \text{ non-corner edge pieces.}$$

So the probability that Jacob will draw a non-corner edge piece is

$$\frac{92}{600} = \frac{46}{300} = \frac{23}{150}.$$

