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

\[
28 \times 2 + 18 \times 2 = 92
\]
non-corner edge pieces.

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

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