The strength of the cables made a company is tested in repeated experiments where a pipe is towed behind a truck through the cable. The experiments result in the following probabilities. The probability that the cable breaks before it starts to move is 0.6, and the probability that the cable breaks after it has started to move is 0.7. What is the probability that the cable will break? Resolve the problem if the two probabilities are 0.01 and 0.02.
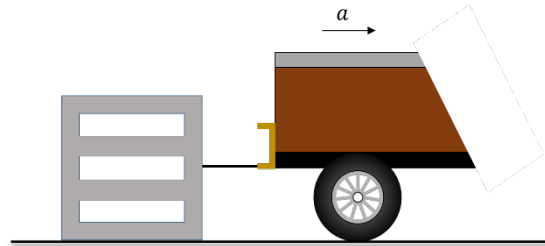
Solution

Define the events as follows.

A: Failure before moving
B: Failure after moving
C: Moving

$$P(A) = 0.6$$
$$P(B|C) = 0.7$$
$$P(C) = 1 - P(A) = 1 - 0.6 = 0.4$$
$$p_f = P(A \cup BC) = P(A) + P(BC) = P(A) + P(B|C)P(C) = 0.6 + 0.7(0.4) = 0.88$$

Note that A and BC are mutually exclusive.
For the new probabilities,

$$p_f = 0.01 + 0.02(1 - 0.01) = 0.0298$$