5-20. A military commander wishes to destroy an enemy bridge. Each flight of planes he sends out has a probability of 0.8 of scoring a direct hit on the bridge. It takes four direct hits to completely destroy the bridge. If he can mount seven assaults before the bridge becomes tactically unimportant, what is the probability that the bridge will be destroyed?

We are looking for

P(A)

Where A is the event the bridge is destroyed

Since we are "waiting" for the 4th "successful" bombing run, we are dealing with a negative binomial RV with $p = 0.8$, $r = 4$ and event A corresponds to $4 \leq X \leq 7$, where X counts the number of bombing missions

$$P(A) = P\left(4 \leq X \leq 7\right) = \sum_{x=4}^{7} \binom{x-1}{3}(0.8)^4 (0.2)^{x-4}$$

$$\boxed{= 0.9667}$$