

## MATH 5010 – Quiz

Name:

**3.90** Suppose that  $n$  independent trials, each of which results in either 0, 1, or 2, with respective probabilities  $p_0$ ,  $p_1$ , and  $p_2$ , are performed. Find the probability that outcomes 1 and 2 both occur at least once.

Let  $A = \{1 \text{ occurs at least once}\}$ ,  
 $B = \{2 \text{ occurs at least once}\}$ ,

$$\begin{aligned} P(A \cap B) &= 1 - P(A^c \cup B^c) \\ &= 1 - [P(A^c) + P(B^c) - P(A^c \cap B^c)] \\ &= 1 - [(1-p_1)^n + (1-p_2)^n - p_0^n] \\ &= 1 - (1-p_1)^n - (1-p_2)^n + p_0^n \end{aligned}$$