

IE 202 – Introduction to Probability

Quiz 1

Problem 1 (30 percent):

The elite units of the Israeli army select 90% of their recruits based on rigorous emotional, physical and psychological testing; the other 10% are selected at random from those who would normally be rejected. The theory behind this is, apparently, that all the extensive testing is not foolproof and that this method gives the army a chance at some potentially good recruits that they might otherwise reject.

Suppose that 40% of those selected through the testing method make it through the training (i.e., do not drop out) and are in such a unit 1 year later. Also suppose that 15% of those selected at random make it through the training and are in an elite unit a year later.

You might find the following table useful in answering the rest of this question:

Make it through training	Selection Method	
	Testing	Random
Yes		
No		

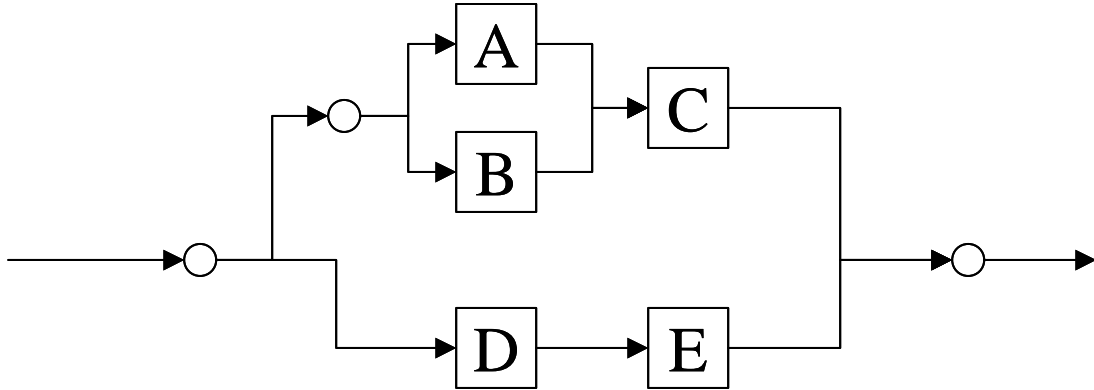
- a) What is the probability that a soldier was selected based on the testing and that he or she survives a year?
- b) What is the probability that a soldier was selected at random and that he or she survives a year?

- c) What is the probability that a soldier makes it through the training and is in the unit a year later?
- d) Given that a soldier has made it through the training and is in the unit a year later, what is the probability that he or she was originally selected based on the testing?
- e) Given that a soldier did **not** make it through the training, what is the probability that he or she was selected based on the testing?
- f) Is the survival probability independent of the selection method? Briefly justify your answer.

- d) Four of the 13 faculty members above are from the Production and Logistics group (Daskin, Hopp, Iravani, and Smilowitz). Assuming there are 8 faculty members going to lunch, what is the probability that there will be no faculty from the Production and Logistics group?
- e) Again, assuming that 8 faculty go to lunch, what is the probability of having exactly 2 faculty members from the esteemed Production and Logistics group, the “coolest” of the Cool Guys?

Problem 3 (35 percent):

Consider the following electrical system:



The system will work if either the top path through components A, B and C works or if the bottom path through components D and E works. The top path will work if (1) either component A or B works or both and (2) component C works. The bottom path will work if both components D and E work.

The component reliabilities are shown in the table below.

- a) What is the probability that the subsystem composed of components A and B will work?

Component	Reliability
A	0.7
B	0.7
C	0.85
D	0.95
E	0.9

- b) What is the probability that the top path will work?

- c) What is the probability that the bottom path will work?
- d) What is the probability that the system will work?
- e) What is the probability that the bottom path will fail?
- f) *HINT: For the next 4 parts of the problem, you may want to draw a Venn diagram showing components D and E failing. Given that the bottom path has failed, what is the probability that component D has failed? Notice that the probability that the bottom path fails AND component D fails is simply the probability that component D fails.*

- g) Given that the bottom path has failed, what is the probability that component E has failed?
- h) Given that the bottom path has failed, what is the probability that **both** component D and component E have failed?
- i) Given that the bottom path has failed, what is the probability that **ONLY** component D has failed?

Please place your name on all pages NOW

Work Sheet