

Instructions: Headings indicate skill being tested, where applicable. Show work, explain answers, reveal assumptions if relevant to your answer.

DT1. Skill: Apply basic concepts of probability (events and outcomes, and, or, conditional)

1. Forecast says it may snow or may rain or sky might just be cloudy or it might be sunny (4 mutually exclusive possibilities). There's a 10% chance of snow (we'd write $P(\text{snow}) = 0.1$), 30% chance of rain, 40% chance of cloudy skies, and 20% chance of sunny skies.

What is the probability of no precipitation (i.e., $P(\text{neither snow nor rain})$)? Show the logic/math of your answer.

2. Forecast says 60% chance of nice weather tomorrow. Experience says 30% chance your partner can get the day off at short notice. ***What is the probability you can spend a day with your partner out in nice weather tomorrow? Show the logic/math of your answer.***

DT2. Calculate expected monetary value (EMV)

3. Suppose an extra 6 hours studying for an exam *could* raise your grade by a whole letter grade.

But it turns out to not be a sure thing. Research has shown that the extra studying has a 60% chance of increasing your grade by one letter grade, a 25% chance of having no effect, and a 15% chance of actually lowering it by one letter grade (increased anxiety and not enough sleep).

Calculate the expected value of the investment of 6 hours of study time in terms of "letter grades per hour."

FC6. Use flowchart to demonstrate stepwise refinement and blackboxing

4. Consider the following scene. *Sketch a series of three flow charts in which you employ "black boxes" and stepwise refinement* to represent the process Elmer is describing in a manner that will not confuse poor Josée.

Josée: How do we do this?

Elmer: First we *A* and then we *B*. After that we *C*.

Josée: OK, but how do you *A*?

Elmer: *A*? That's easy: to *A* is first to *D* and then *E*.

Josée: And *B*? Is that, at least, straightforward?

Elmer: Well, sorta. It means P, Q, and then R until S.

Josée: Ah, I should have known. I'm embarrassed, but I have to ask you how one *Cs*?

Elmer: Seriously? And you are in grad school? *C* has three steps: L, M, N. And that's it.

Josée: And *D*? What is that?

Elmer: Again, easy: you *F* and then you *G*.

Josée: And I guess *E* is also obvious?

Elmer: Indeed: to *E* is to *H* and then *I* if *J* or *K* if not.

Josée: OK, then, I think I can do this.

Or, if you find words easier than letters, here is same problem with nonsense words

Josée: What should we do?

Elmer: First we *waffle* and then we *side-step*. After that we *build a gaboodle*.

Josée: OK, but what is *waffle*?

Elmer: *Waffle*? That's easy: to *waffle* is first to *zango* and then *bloohob*.

Josée: And *side-step*? Is that, at least, straightforward?

Elmer: Well, sorta. It means check Facebook, chug a Redbull, and then eat chocolate until you are bored.

Josée: Ah, I should have known. I'm embarrassed, but I have to ask you how one builds a *gaboodle*?

Elmer: Seriously? And you are in grad school? *Gaboodling* has three steps: buy some oversized boots, buy some ping pong balls, fill the right boot with ping pong balls. And that's it.

Josée: And *zango*? What is that?

Elmer: Again, easy: you draw a circle and then you buy some perfume.

Josée: And I guess *bloohobbing* is also obvious?

Elmer: Indeed: to *bloohob* is to buy a rabbit and dowse it with perfume if it is a boy or with pesto if it is a girl.

Josée: OK, then, I think I can do this.

