

1. You are playing “Who wants to be a millionaire”. You have \$ 64,000. If you answer the next question correctly, your total winnings will be \$125,000. If you answer it incorrectly, then you will end up with only \$32,000. The question is multiple choice with four choices. Using expected values, determine what you should do if the following holds:
 - (a) you have no lifelines left and you are just guessing.
 - (b) you have the 50-50 lifeline left, so you are able to eliminate two of the incorrect choices and then guess from among the remaining two choices.
2. Let X be the set of positive divisors of 24. Consider the partial ordering on X given by “evenly divides”. Find a Hasse diagram for the relation.
3. Let $X = \{p, w, f, d\}$. Suppose R is a partial order of X with dRf , dRw , dRp , fRp and wRp . Find two different topological sortings of X
4. Draw the graph for the relation that describes the *Rock-Scissors-Paper* game. Then do the same for the improved game *Rock-Scissors-Paper-Lizard-Spock*.
5. Let $<$ and $>$ be the standard relations on the integers. Describe $<<$ and $<>$ and $><$, where AB means do A first, then do B (which is the opposite of the way the book does it).
6. In the game 267Dice, a coin is flipped three times. If three heads result then the player receives five dollars. If (exactly) two heads results then the player receives three dollars. For any other result there is no payout. What is the expected payout for the game ?
7. Draw the Hasse diagram for the partial order on the power set of $\{0, 1, 2\}$ given by \subset (i.e., “is a subset of”).
8. A Donut shop sells 5 varieties of donuts. How many different orders of a ten donuts are possible ?
9. Find the coefficient of the term x^5y^8 that you obtain by expanding $(x + y)^{13}$.
10. A pair of fair dice, one red and one yellow, is rolled. Find the following. Show the sample space that you use:
 - (a) the probability that the sum is ≤ 4
 - (b) the probability that the sum is ≤ 4 given that the red die is ≤ 2
 - (c) Are the events “the sum is ≤ 4 ” and “the red die is ≤ 2 ” independent or dependent ?

11. A math club has 34 members.
 - (a) in how many ways can the three officers “the president, vice-president and treasurer”, be chosen ?
 - (b) in how many ways can a five person committee be chosen from the non-officers ?
12. in how many ways can the letters in the string DDDDDOGGYYY be arranged ?
13. Five cards are dealt from a shuffled deck
 - (a) how many hands are four-of-a-kind's?
 - (b) how many hands are flushes (including straight flushes) ?
14. Define each of terms as they would refer to a binary relation R on a set X : *reflexive*, *symmetric*, *transitive*, *irreflexive*, *antisymmetric*.
15. A binary string of length 6 is randomly chosen. Find the probability that it has the same number of ones as zeroes.
16. Draw Pascal's triangle with row 0 through row 9. Circle $C(8, 5)$.
17. Taking the state of Alabama as the sample space, let A be the event “being a smoker” and let B be the event “having respiratory problems”. Which is likely to be larger, $P(B)$ or $P(B|A)$?
18. Being divisible by 5 is an equivalence relation on the set of integers. Describe the corresponding partition.
19. A coin is flipped three times. Consider the events “the second flip is heads” and “you get at least two heads”. Determine whether these events are independent or dependent.
20. Suppose for the events A and B you have $P(A) = .3$ and $P(B) = .3$ and $P(A|B) = .4$. Are A and B independent or dependent or is it not possible to decide from the given information ?
21. Suppose $R = \{(a, 3), (b, 2), (b, 1), (c, 3)\}$ and $S = \{(1, x), (2, y), (3, z)\}$. Find RS (where R is first and S is second (as in class and not our text).
22. Define partial order. Define equivalence relation. Be sure define all the math terms you use.
23. Review all the homework, old quizzes, the handouts and everything else.