

# CSC208 0427 Lab: Probability Practice

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## 1 Problem 1: Roleplaying

a.  $6/20 == 3/10 == 33.3$

b.  $3/10 * 3/10 == 0.09 = 9\%$

c.  $1 - (14/20)^2 == 0.51 == 51\%$

d.  $d20 + d > 8+s+i$

e. In the 7 hit points case, by calculating the probability of the 2d4 being less than 5 (since we have + 2 at the end), we can prove when the creature survives the magic missile.

We have cases of rolling (1,1), (1,2), (2,1), (1,3), (3,1), (2,2) so we can count 6 out of 4 \* 4 cases. Which is 6/16, making the probability of surviving 37.5%.

1.  $h \leq 4$ . Probability = 0, since the minimum damage that can be dealt is 4 and the victim won't be able to survive no matter what.

If  $h > 10$ , then  $P(\text{surviving}) = 1$ , since all outcomes lead to survival.

f. In the case of 46 hit points, the only probability we need to calculate is whether the victim resists the spell or not. Because the least amount of damage of the disintegrate spell is 50. The probability of the victim failing the resist procedure is the probability of  $d20+1$  being greater than or equal to 14, which is the probability of d20 being greater than or equal to 13.  $13/20 == 0.65$ . 65%.

In the case of 99 hit points, the spell needs to pass the resistance and deal at least 59 damage. To deal at least 59 damage, we need nine 6-rolled-dice and one 5-rolled-dice or all ten dice needs to roll a 10. This would be  $(1/6)^6 * (2/6) == 0.000007$ . Now we multiply this value to the probability of passing the resistance test, which is  $0.000007 * 0.65 == 0.0000046 == 0.00046\%$ .

## 2 Problem 2: Expectations

a.  $1 * \frac{42}{100} + 10 * 0.00144 + 100 * 0.0019 - 3 * 0.58 == 0.6244 - 1.74 == -1.1156$ . We expect to lose about 1.11 dollars per game.

b.  $2 * (\frac{9}{20} * \frac{1}{16}) + 3 * (\frac{9}{20} * \frac{2}{16}) + 4 * (\frac{9}{20} * \frac{3}{16}) + 5 * (\frac{9}{20} * \frac{4}{16}) + 6 * (\frac{9}{20} * \frac{5}{16}) + 7 * (\frac{9}{20} * \frac{6}{16}) + 8 * (\frac{9}{20} * \frac{7}{16}) == 0.056 + 0.168 + 0.34 + 0.56 + 0.50 + 0.39 + 0.225 == 2.239$ .

The expected amount of damage dealt to the monster by the player in a single attack would be 2.239 damage.