

1. (20 pts) Suppose a bowl has four chips: two of the chips are black, and two of the chips are red. One of the black chips has the number 1 written on it, while the other black chip has the number 2 written on it. One of the red chips has the number 2 written on it, while the other red chip has the number 3 written on it. In other words, the chips in the bowl were: B1, B2, R2, and R3. Suppose one chip was randomly chosen from the bowl. Consider the following events:

- A = a red chip was chosen
- B = the number on the chip was an odd number

(a) (4 pts) Determine the probability that the chosen chip was red (i.e. find $P(A)$).

$$P(A) = \frac{2}{4} = \frac{1}{2} \quad \rightarrow \text{out of 4 chips, 2 are red.}$$

(b) (4 pts) Determine the probability that the chosen chip was red and was inscribed with an odd number (i.e. find $P(A \text{ and } B)$). Hint: just think about this one; there is no need to use the general product rule.

$$P(A \text{ and } B) = \frac{1}{4} \quad \rightarrow \text{out of 4 chips, only one is red and odd (i.e. R3).}$$

(c) (4 pts) Determine the probability that the chosen chip was red or was inscribed with an odd number (i.e. find $P(A \text{ or } B)$). Show all of your work using proper mathematical notation.

$$P(A \text{ or } B) = \overset{\text{not m.c.}}{P(A) + P(B) - P(A \text{ and } B)}$$

$$= \frac{2}{4} + \frac{2}{4} - \frac{1}{4} = \frac{3}{4}$$

(d) (4 pts) Determine the probability that a red chip was chosen, given that the number on the chip was an odd number (i.e. find $P(A|B)$). Show all of your work using proper mathematical notation.

$$P(A|B) = \frac{P(A \text{ and } B)}{P(B)} = \frac{1/4}{2/4} = \frac{1}{2}$$

(e) (4 pts) Are A and B independent? Why? Show all of your work using proper mathematical notation.

Indep, since $P(A|B) = P(A)$. (could also show that $P(B|A) = P(B)$ or $P(A \text{ and } B) = P(A)P(B)$)