

# MTH102 Tutorial 03

## Conditional probability & independence

### Question 1

Two fair dice are rolled. What is the conditional probability that at least one lands on 6 given that the dice land on different numbers?

### Question 2

52 percent of the students at a certain college are females. 5 percent of the students in this college are majoring in computer science. 2 percent of the students are women majoring in computer science. If a student is selected at random, find the conditional probability that

- (a) the student is female given that the student is majoring in computer science;
- (b) this student is majoring in computer science given that the student is female.

### Question 3

Let  $A_1$  and  $A_2$  be the events that a person is left-eye dominant or right-eye dominant respectively. When a person folds his or her hands, let  $B_1$  and  $B_2$  be the events that the right thumb and the left thumb, respectively, are on top. A survey in one statistics class yielded the following table:

	$B_1$	$B_2$	Total
$A_1$	10	15	25
$A_2$	25	10	35
Total	35	25	60

If a student is selected randomly, find the following probabilities:

- (a)  $P(A_2|B_1)$  and  $P(B_2|A_1)$ .
- (b) If the students had their hands folded and you hoped to select a left-eye dominant student, would you select a "right thumb on top" or a "left thumb on top" student? Why?

#### Question 4

In each game, the player Wu Lei scores a goal with probability 0.4 if he receives an assist, with probability 0.1 if he takes a free kick and with probability 0.9 if he takes a penalty kick. Suppose that he receives an assist with probability 0.6, he is awarded a free kick with probability 0.3 and a penalty kick with probability 0.1.

- (a) What is the probability that Lei scores a goal in one shooting?
- (b) If Lei has scored a goal in one shooting, what is the conditional probability that it is from a free kick?

#### Question 5

A boy has five blue and four white marbles in his left pocket and four blue and five white marbles in his right pocket. He transfers one marble at random from his left to his right pocket, and then draw one marble from his right pocket.

- (a) What is the probability that it is a blue marble?
- (b) If it is a blue marble, what is the conditional probability that he has transferred one blue marble from his left to his right pocket?

#### Question 6

On rainy days, Joe is late to work with probability 0.3; on nonrainy days, he is late with probability 0.1. With probability 0.7, it will rain tomorrow.

- (a) Find the probability that Joe is early tomorrow.
- (b) Given that Joe was early, what is the conditional probability that it rained?

#### Question 7

Three independent reviewers are reviewing a book. Let  $A_i$  denote the event that a favorable review is submitted by reviewer  $i$ ,  $i = 1, 2, 3$ . Assume that  $A_1, A_2, A_3$  are mutually independent and that  $P(A_1) = 0.6$ ,  $P(A_2) = 0.57$  and  $P(A_3) = 0.4$ .

- (a) Compute the probability that at least one of the reviewers submits a favorable review.
- (b) Compute the probability that exactly two reviewers submit favorable reviews.

### Question 8

Two hunters shoot at a target with probabilities of  $p_1$  and  $p_2$ , respectively. Assuming independence, can  $p_1$  and  $p_2$  be selected so that  $P(\text{zero hits})=P(\text{one hit})=P(\text{two hits})$ ?