IT2025 ASSIGNMENT 01
(Due Date: October 3, 2025)

Instructions: Your answers can be in either Chinese or English. The following points should be noted.

- If you use a word processing software to edit your answer, please make sure that the file to be submitted is either in WORD or PDF format.
- You need to submit the answer file before the due date to the Gmail account `johnsum.nchu@gmail.com`.
- Email heading must be conformed to `IT2025_Assignment01_studentID`.
- File name must be conformed to `IT2025_Assignment01_studentID`.
- It is a bonus assignment. If you are too busy to complete the assignment, you can just skip it. There is no penalty.

The assessment of this course is solely depended on your work in the course project including your written report and your oral presentation. The scores obtained from the assignments are *bonus* marked up on your project score.

Question 1

(a) What is the value of $1 + 2 + 3 + \cdots + 100$? State your steps in detail and the equation you have applied.

(b) What is the value of $2 + 4 + \cdots + 200$? State your steps in detail and the equation you have applied.

(c) What is the value of $1 + 3 + \cdots + 199$? State your steps in detail and the equation you have applied.

(d) Comment if you need any intelligent technology (resp. AI tool) in your solutions for (a), (b) and (c).

Question 2

(a) You are given a set of 9 balls. All of them look the same and sensed the same. Eight of them weight 2000 grams and one of them weights 1999 grams. Pan balance is the only tool for use. Describe in detail, step by step, how do you use the pan balance to find the lighter ball.

(b) You are given a set of 9 balls. All of them look the same and sensed the same. Eight of them weight 2000 grams and one of them weights 2001 grams. Pan balance is the only tool for use. Describe in detail, step by step, how do you use the pan balance to find the heavier ball.

(c) Again, you are given a set of 9 balls which are looked and sensed the same. Eight of them are 2000 grams. However, we do not know if the abnormal ball is lighter or heavier. Describe in detail, step by step, how do you use the pan balance to find the abnormal ball.

(d) Now, the pan balance is not free for use. Each time you use the pan balance to weight the balls, you will need to pay NTD100. Calculate the costs for your solutions in (a), (b) and (c).

(e) Comment if you need any intelligent technology (resp. AI tool) in your solutions for (a), (b) and (c).

Question 3

Similar to Question 2, you are given a set of 9 balls which are looked and sensed the same. Now, there are *two abnormal balls* and their weights are unknown. Describe in detail, step by step, how do you use the pan balance to find the abnormal balls.

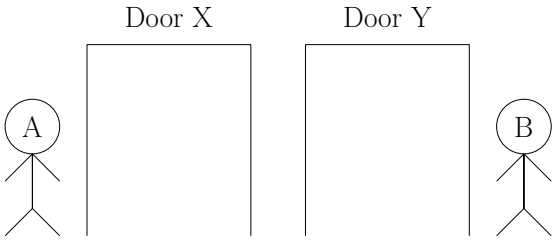

Figure 1: Two doors and two doormen.

Question 4

Imagine that you are now standing in front of two doors, say X and Y. One of them leads you to heaven and the other leads you to hell, see Figure 1. In each door, there is a doorman. Let the doorman standing in front of the door X is A and the doorman standing in front of the door Y is B. For the doormen, it is known that one of them always lies and the other always tells the truth. Besides, the doormen only answer 'Yes' or 'No' to you.

Now, you can ask two questions. Which of the following combinations of questions will help you make the right decision on the door to heaven?

(i) The first question is to ask Doorman A, '$1 + 1 = 2$'. The second question is to ask Doorman B, 'Door X is the door to heaven'.

(ii) The first question is to ask Doorman A, 'You are a liar'. The second question is to ask Doorman B, 'Door X is the door to heaven'.

(iii) The first question is to ask Doorman B, '$1 + 1 = 2$'. The second question is to ask Doorman A, 'Door Y is the door to heaven'.

Answer:

(a) (i) and (ii).

(b) (ii) and (iii).

(c) (i) and (iii).

(d) (i), (ii) and (iii).

(e) None of the above.

Question 5

Imagine that you are now standing in front of two doors, say X and Y. One of them leads you to heaven and the other leads you to hell, see Figure 1. In each door, there is a doorman. Let the doorman standing in front of the door X is A and the doorman standing in front of the door Y is B. For the doormen, it is known that one of them always lies and the other always tells the truth. Besides, the doormen only answer 'Yes' or 'No' to you.

Now, you can only ask one doorman one question. If you have asked the Doorman A the following question: *If I ask Doorman B, 'Door Y will lead me to heaven', Doorman B will say 'YES'.*. Which of the following decision(s) you should made so that you can walk to the door to heaven?

(i) If the Doorman A says 'YES', you walk to the Door X.

(ii) If the Doorman A says 'YES', you walk to the Door Y.

(iii) If the Doorman A says 'NO', you walk to the Door X.

(iv) If the Doorman A says 'NO', you walk to the Door Y.

Answer:

(a) (i) only.

(b) (ii) only.

(c) (iii) only.

(d) (iv) only.

(e) (i) or (iv) only.

(f) (ii) or (iii) only.