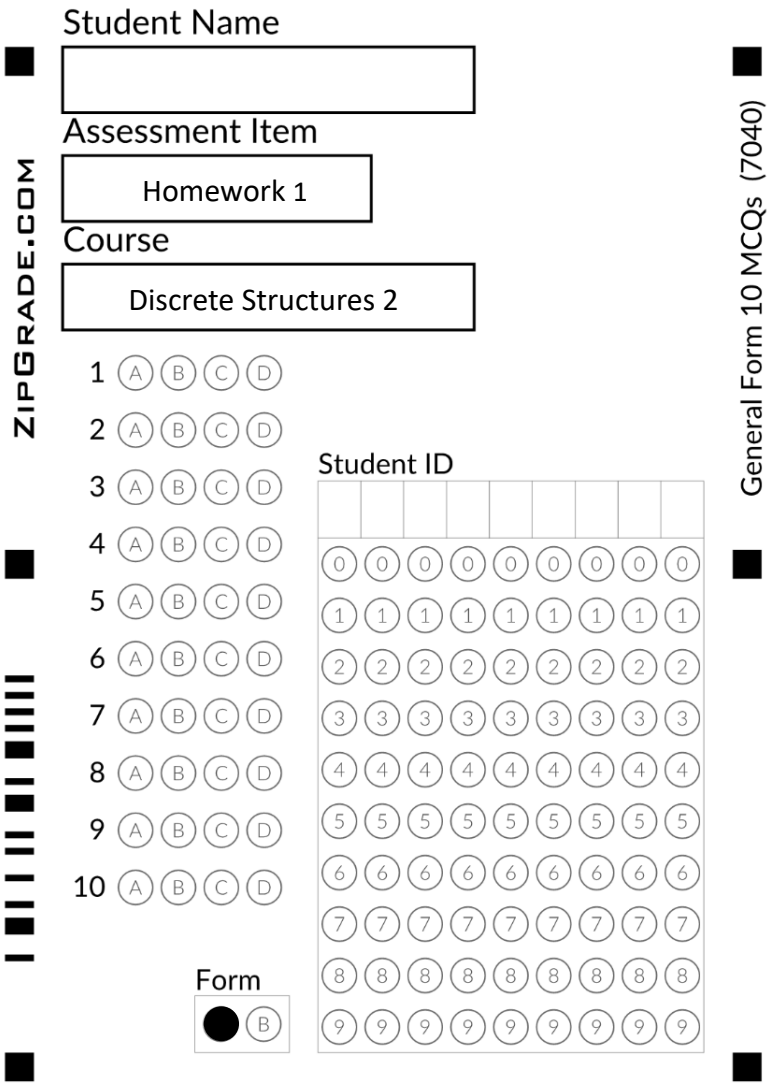

Student Name
Assessment Item
Homework 1
Course
Discrete Structures 2
1 A B C D
2 A B C D
3 A B C D
4 A B C D
5 A B C D
6 A B C D
7 A B C D
8 A B C D
9 A B C D
10 A B C D
Form
B
Student ID
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ASSIGNMENT 1: COUNTING THEORY

CS1303 Discrete Structures 2

Second Semester
1447 - 2026

MAY 3, 2026

Department of Computer Science and Artificial Intelligence
College of Computing
Umm Al-Qura University

Problem Set 1

(10 marks)

Based on your understanding of the topics discussed in Lectures 4 and 5, answer the following questions.

Q1) There are 4 available flights from Riyadh to Jeddah and 6 available flights from Jeddah to Dammam. In how many distinct ways can a person fly from Riyadh to Jeddah and then to Dammam?

A) 10 distinct ways.

B) 24 distinct ways.

C) 1,296 distinct ways.

D) 4,096 distinct ways.

Q1 Hand-Calculated Answer:

Q2) The Arabic alphabet consists of 28 letters. Consider the set of vowels to be { ي , و , آ , إ , أ } (5 letters). How many strings of length 10 can be formed using the Arabic alphabet if no letters can be repeated and the string must contain no vowels?

A) $P(28,10)$ strings.

B) $C(23,10)$ strings.

C) $P(23,10)$ strings.

D) 23^{10} strings.

Q2 Hand-Calculated Answer:

Q3) Using the same alphabet definitions as the previous question (28 total letters, 5 vowels), find the number of strings of length 8 formed with no repeated letters, provided the string begins with a vowel.

A) $5 \times P(27,7)$ strings.

B) 5×28^7 strings.

C) $P(28,8)$ strings.

D) $5 \times P(28,7)$ strings.

Q3 Hand-Calculated Answer:

Q4) A group of students is divided into four year-groups (1st, 2nd, 3rd, 4th). According to the Generalized Pigeonhole Principle, what is the smallest number of students you must select to guarantee that at least eight belong to the same year group?

A) 33 students.

B) 32 students.

C) 29 students.

D) 28 students.

Q4 Hand-Calculated Answer:

Q5) A teacher wants to take a photo of 4 students standing in a single row selected from a class of 30. How many different ordered arrangements are possible?

A) $C(30,4)$ distinct arrangements.

B) $P(30,4)$ distinct arrangements.

C) 30^4 distinct arrangements.

D) $4!$ distinct arrangements.

Q5 Hand-Calculated Answer:

Q6) A class contains 12 girls and 18 boys (30 students total). In how many ways can you arrange all the students in a single row?

A) 30 ways.

B) $12! + 18!$ ways.

C) $12! \times 18!$ ways.

D) $30!$ ways.

Q6Hand-Calculated Answer:

Q7) Using the same class of 12 girls and 18 boys, in how many ways can you arrange all students in a row if all the girls must stand on the left and all the boys on the right?

A) $30!$ ways.

B) $12! \times 18!$ ways.

C) $12! + 18!$ ways.

D) $(12 + 18)!$ ways.

Q7 Hand-Calculated Answer:

Q8) In a school club, there are 10 girls and 7 boys. We want to make a committee of 5 people. The committee must have exactly 3 girls and 2 boys. How many different committees like this can we choose from the club?

A) $P(10,3) \times P(7,2)$ committees.

B) $C(10,3) + C(7,2)$ committees.

C) $C(10,3) \times C(7,2)$ committees.

D) $C(17,5)$ committees.

Q8 Hand-Calculated Answer:

Q9) Which of the following represents the correct expansion of $(x + 3y)^3$?

A) $x^3 + 3x^2y + 3xy^2 + y^3$

B) $x^3 + 9x^2y + 27xy^2 + 27y^3$

C) $x^3 + 27y^3$

D) $x^3 + 9x^2y + 9xy^2 + 27y^3$

Q9 Hand-Calculated Answer:

Q10) Find the coefficient of $a^{17}b^{23}$ in the expansion of $(3a - 7b)^{40}$

A) $C(40,23) \cdot 3^{17} \cdot 7^{23}$

B) $C(40,17) \cdot 3^{40} \cdot (-7)^{40}$

C) $C(40,23) \cdot 3^{17} \cdot (-7)^{23}$

D) $3^{17} \cdot (-7)^{23}$

Q10 Hand-Calculated Answer: