

National College of Ireland
School of Computing
First Year Entrance Sample Assessment

Mathematics Sample Assessment
For Different Sections

19th, 20th and 21th August 2019

DAY 1, DAY 2 and DAY 3

All questions carry equal marks

DAY 1 (9:00 am to 5:00 pm)

Section: Probability and Statistics

Question 1:

(a) Two cards are drawn from a deck of 52 cards in such a way that the card is replaced after the first draw. Find the probabilities in the following cases:

- (i). First card is King and the second is Queen
- (ii). Both cards are faced cards, i.e., King, Queen and Jack.

(15 marks)

(b) Three coins are tossed, each toss resulting in a head (H) or a tail (T). Make out a sample space for the possible results and write down the probability that the coins show

- (i). HHH
- (ii). HTH in that order
- (iii). 2 heads and 1 tail in any order

(10 marks)

Question 2:

Over the course of a rugby competition, a record is kept of the number of penalties conceded per game. The results are presented in the following frequency distribution:

Number of Penalties Conceded	Number of Games
0	0
1	3
2	5
3	8
4	2
5	2

Calculate the **standard deviation** of the distribution.

(25 marks)

Calculator can be used for the calculation.

DAY 2 (9:00 am to 5:00 pm)

Section 2: Geometry and Trigonometry

Question 3:

(a) Find two values of $\tan(x)$ for which $\cos(x) = \frac{1}{\sqrt{2}}$, where $0^\circ < x \leq 360^\circ$.
(10 marks)

(b) The length of the perpendicular to a line from the origin is 5 units. The line passes through the point (3, 5). Find the equations of two such lines.
(15 marks)

Section 4: Number Systems

Question 4:

(a) Show that $(-2 + 2i)$ is a root of the equation $z^3 + 3z^2 + 4z - 8 = 0$. Write the other roots.
(15 marks)

(b) Solve the equation $z^2 - 2z + 2 = 0$ and express your answer in form $r(\cos\theta + i \sin\theta)$.
(10 marks)

DAY 3 (9:00 am to 5:00 pm)

Section 5: Algebra

Question 5:

(a) Find the point of intersection of each of the following sets of planes.

$$2a + b + c = 8$$

$$5a - 3b + 2c = -3$$

$$7a - 3b + 3c = 1$$

(15 marks)

(b) Find the values of k if the equation $k^2x^2 + 2(k + 1)x + 4 = 0$.
(10 marks)

Section 6: Functions

Question 6:

(a) Let $f: N \rightarrow N$ with $x \mapsto 2x$ define a function.

- (i). What is the domain of f ?
- (ii). What is the range of f ?
- (iii). Using the codomain and range, explain why f is not a surjective function.

(iv). Is f a one-to-one function?

(v). Suggest a restriction on the codomain to make f a surjective function.

(15 marks)

(b) Find the equation of the tangent to the curve $y = \ln x + x - 2$ at the point where $x = 1$.

(10 marks)