

University of Bahrain
College of Science
Department of Mathematics
First Semester 2010-2011
Math 352
Test 1
Tuesday, October 26 2010
09:00 - 10:00

Name	_____
ID#	_____

Instructions

1. Please write your name and your university identity number in the spaces provided above.
2. Make sure that your copy of this test consists of 6 pages and 5 different questions.
3. In Question 1, you mark your answer by writing **T (True)** if the statement is true and **F(False)** if the statement is false. In Questions 4 – 5, you must provide the details of your solutions to the problems.

	Maximum Points Possible	You Scored
Question 1	5	
Question 2	5	
Question 3	5	
Question 4	5	
Question 5	5	
Total	25	

Question 1 [05 points]

In the following, if the statement is true, briefly explain why. If false, give a counter example.

(a) if x, y and z are integers such that $x \mid z$ and $y \mid z$, then

$$xy \mid z. \quad [\text{-----}].$$

(b) Any subset of non-negative integers has a least element. $[\text{-----}]$.

(c) 1 can be written as a linear combination of 77 and 78. $[\text{-----}]$.

(d) If p is a prime and a_1, a_2, \dots, a_n are integers such that $p \mid a_1 a_2 \dots a_n$, then $p = a_k$ for some $k, 1 \leq k \leq n$.

[- - - -].

(e) $lcm[36, 90, 72] = 3240 \cdot [- - - -]$.

Question 2 [05 points]

(a) State the Division Algorithm.

(b) Show that the square of any integer is of the form $3m$ or $3m + 1$.

(c) Show that for any integer n , $3n^2 - 1$ cannot be a perfect square.

Question 3 [05 points]

Show that for any integer n , $8n + 3$ and $5n + 2$ are relatively prime.

Question 4 [05 points]

Use Mathematical Induction to prove that

$$\sum_{k=1}^n (-1)^{k-1} k^2 = (-1)^{n-1} \frac{n(n+1)}{2}.$$

Question 5 [05 points]

Mohsin Air offers three types of tickets on their Bahrain-Doha- Istanbul flights. First-class tickets are BD140, Second-class tickets are BD110 and standby tickets are BD78. If 69 passengers pay a total of BD6548 for a particular flight, how many of each type were sold?