# MAT 230 Module Two Homework

**General:**

* Before beginning this homework, be sure to read the textbook sections and the material in Module Two.
* Type your solutions into this document and be sure to show all steps for arriving at your solution. Just giving a final number may not receive full credit.
* You may copy and paste mathematical symbols from the statements of the questions into your solution. This document was created using the Arial Unicode font.
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1. State whether each of the following is a statement or is not a statement and explain why. If it is a statement, give its truth value.
2. Drink more water.
3. Paris is the capital city of the United States of America.
4. Is it going to rain tomorrow?

This problem is similar to Example 1 and to Exercise 1 in Section 2.1 of your SNHU MAT230 textbook.

1. Not a statement; it is a command.
2. Is a statement but isn’t true because Paris is not the capital city of the US. Washington, D.C. is.
3. Not a statement; it is a question. A statement would be: “It is going to rain tomorrow”
4. Consider the two propositions.

p: We can buy a book.

q: We can go to a restaurant.

Write each of the following statements in symbolic notation and as English sentences.

1. The conjunction (∧) of p and q.
2. The disjunction (∨) of p and q.
3. The negation (~) of the conjunction (∧) of p and q.
4. The negation (~) of the disjunction (∨) of p and q.

This problem is similar to Examples 2–4 and to Exercises 5 and 10 in Section 2.1 of your SNHU MAT230 textbook.

1. : We can buy a book and We can go to a restaurant
2. : We can buy a book or we can go to a restaurant
3. : We cannot buy a book and we cannot go to a restaurant
4. ): We cannot buy a book or we cannot go to a restaurant
5. Write the statement “Every number is more than its reciprocal” symbolically by first defining a predicate and then using a quantifier.

This problem is similar to Example 8 and to Exercise 18 in Section 2.1 of your SNHU MAT230 textbook.

Let :

1. Let P(n): n2 = n + 6.
2. What is P(2) as a statement?
3. What is P(3) as a statement?
4. What is the truth value of ∀n P(n)?
5. What is the truth value of ∃n P(n)?

This problem is similar to Examples 8 and 9 and to Exercises 19, 20, and 21 in Section 2.1 of your SNHU MAT230 textbook.

* 1. False, because as we see in part a, every value does not work.
  2. True, because as we see in part b, there is at least one value that does work.

1. Complete a truth table for (p ∧ ~q) ∨ (~p ∧ q). There are multiple ways to set up the columns of a truth table, so you may need fewer or more columns than shown.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| p | q | (p ∧ ~q) | ∨ | (~p ∧ q) |
| T | T | F | F | F |
| T | F | T | T | F |
| F | T | F | T | T |
| F | F | F | F | F |
|  |  |  |  |  |  |  |

This problem is similar to Example 5 and to Exercises 27–30 in Section 2.1 of your SNHU MAT230 textbook.

1. Use the following:

p: I will watch TV.

q: I have finished my homework.

Write each of the following statements in terms of p, q, and logical connectives.

1. I will watch TV if I have finished my homework.
2. I will watch TV only if I have not finished my homework.
3. I will watch TV is a necessary condition for I have finished my homework.
4. I will not watch TV is a sufficient condition for I have finished my homework.
5. I will watch TV if and only if I have finished my homework.

This problem is similar to Example 1 and to Exercises 1 and 2 in Section 2.2 of your SNHU MAT230 textbook. You may want to use the symbols ⇒, ⇐, or ⇔.



1. Consider the following statement: If it is Friday, then Emily will go to the museum.
2. Write the contrapositive of that statement.
3. Write the converse of that statement.

This problem is similar to Example 2 and to Exercises 3 and 4 in Section 2.2 of your SNHU MAT230 textbook.

* 1. If it is not Friday, then Emily will not go to the museum.
  2. If Emily will go to the museum, then it is Friday.

1. Construct a truth table for (p ∧ q) ⇒ (p ∨ q). Explain how this truth table shows whether this statement is a tautology, a contradiction (absurdity), or a contingency.

This problem is similar to Example 5 and to Exercises 10–12 in Section 2.2 of your SNHU MAT230 textbook.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| p | q | p ∧ q | p ∨ q | (p ∧ q) ⇒ (p ∨ q) |
| T | T | T | T | T |
| T | F | F | T | F |
| F | T | F | T | F |
| F | F | F | F | F |

This truth table shows a contingency, because this statement can be either true or false depending on the values of p and q.

1. Write each of the arguments below symbolically and then explain whether it is valid or not.
2. If it is hot outside, then I will go swimming.  
   I will not go swimming.  
   ∴ It is not hot outside.
3. If it is not hot outside or if it is raining, then I will not go swimming.  
   It is not raining.  
   ∴ I will not go swimming.
4. I will go swimming if and only if it is hot outside.  
   I will not go swimming.  
   ∴ It is not hot outside.

This problem is similar to Examples 2–5 and to Exercises 1–9 in Section 2.3 of your SNHU MAT230 textbook.

* 1. , , , this argument is valid based on proof by contradiction
  2. , , , this argument is invalid because we do not know what p is.
  3. , , , this argument is valid because swimming was an explicit condition as to whether it was hot outside or not.

1. Prove or disprove that if the product of two numbers (in ℕ) is even, then at least one of them must be even.

This problem is similar to Examples 8 and 9 and to Exercises 13–18 in Section 2.3 of your SNHU MAT230 textbook.

1. Prove or disprove that if the sum of two numbers (in ℕ) is even, then at least one of them must be even.

This problem is similar to Examples 8 and 9 and to Exercises 23–26 in Section 2.3 of your SNHU MAT230 textbook.