MTH 225: Discrete Structures for Computer Science 1

Daily Preparation, Module 1B: Binary arithmetic

Due by: 11:59pm Eastern, Tuesday September 8

Estimated time requirement: About 45-60 minutes for the whole assignment. *If you have worked on this assignment for 30 minutes and you're not at least halfway done, DON'T work any further* — instead, *stop and ask for help* on the `#dailyprep` channel on CampusWire.

=======

Overview

In the first part of this module, we saw how to represent integers (whole numbers) in different ways that computers can understand: base 2 (binary), base 8 (octal), and base 16 (hexadecimal) and how to convert from one base to another. Computers don't just *store* numbers, though — they *compute* with them. So the next order of business is to learn how computers do basic arithmetic (addition, subtraction, multiplication, and division) in different bases. We'll focus just on binary (base 2) here, since that's the most basic* way commputers work with data. In this lesson you'll learn how to add, multiply, and divide in binary without switching to decimal first; you'll also learn how computers represent negative numbers using the **2's complement** format.

*See what I did there?

What you will learn

Learning Targets addressed in this module:

> A.2 **(Core)**: I can add, subtract, multiply, and divide two integers written in binary.

BEFORE your class meeting, use the Resources for Learning (below) to learn how to do the following:

- Add and multiply two integers represented in binary.
- Represent a negative integer in binary using 2's complement.

DURING AND AFTER your class meeting, you will learn how to do the following:

- Subtract two integers represented in binary.

- Divide two integers represented in binary to get a quotient and remainder (also in binary).

Resources for Learning

Video: Watch the following videos. The total running time is 34:45.

- How to add binary numbers – the Easy way! (10:43) https://www.youtube.com/watch?v=5F6orbqZigI
- Multiplying binary numbers (10:14) https://www.youtube.com/watch?v=Va_UvwJULcI
- Two's complement: Negative numbers in binary (13:48) https://www.youtube.com/watch?v=4qH4unVtJkE

Additionally, here are videos that cover what we will study in our meetings. You can view these beforehand or wait to use them as a review.

- How to subtract binary numbers (12:33) https://www.youtube.com/watch?v=ubCCemtuZH8
- Dividing binary numbers (11:13) https://www.youtube.com/watch?v=ubCCemtuZH8

Web resources:

- A free online binary calculator: https://www.calculator.net/binary-calculator.html
- Tutorial on binary arithmetic: https://www.tutorialspoint.com/computer_logical_organization/binary_arithmetic.htm

You are free to search for and use other resources in addition to, or instead of the above, as long as you can work the exercises below. If you find something good, share it on Campuswire and you might earn some engagement credits.

Exercises

The exercises for this assignment are on Classkick this time. Go to this link to find and work them out:

As with all Classkick activities, there's no "submit" button; the work saves automatically as you go. So just complete your work by the deadline; if you need help, use the "raise hand" feature.

Submission, grading, and getting help

Submitting your work:

How this is graded: Daily Prep assignments are graded on the basis of *completeness and effort*: If your submission has **all parts completed** (no blank entries, even if left blank accidentally) and **a good-faith effort to provide a correct solution or explanation is given** (no responses of "I don't know" or "I didn't understand") and **the work is submitted on time**, it gets a "check". Otherwise it gets an "x". If you are stuck

on an item, you're expected to ask questions and give your best effort.

Getting help on this assignment: *You may work with others on this assignment, but you may not copy each others' answers.* Evidence of copying will be treated as academic dishonesty. You may also ask questions on the #dailyprep channel on CampusWire, but you may not ask simply to be given the answers; giving and receiving answers on CampusWire will be treated as academic dishonesty.