

CSc 245 Discrete Structures - Summer 2020

Homework #1

Due: June 12th, 2020 by 5 p.m.

Instructions:

1. Homework assignments are to be completed individually, **not** in groups.
2. If you need help, take advantage of Piazza and office hours.
3. Assignments are to be submitted in PDF form. They may be typed (which is preferable and strongly recommended) or handwritten with each page scanned or photographed and compiled into a single PDF.
4. If you choose to handwritten your assignments, please write neatly. Illegible assignments may not be graded.
5. Extra credit will be given for typed homework. To make this easier, a **Latex** template will be provided for each assignment.
6. Show your work (when appropriate) for partial credit!

Questions

1. Send me an email at rjfaust+sum20csc245@email.arizona.edu with the subject line “[Last Name] - Hw1 Q1” and the following in the body:
 - (a) Your preferred name
 - (b) What year you are in
 - (c) Your math background
 - (d) Your CS background
 - (e) What time zone you will be in for the course
2. Fractions: Simplify the following fractions
 - (a) $\frac{-(\frac{x}{5}+2)}{4} * \frac{x}{8}$
 - (b) $\frac{2x}{5} - \frac{(x+9)}{7}$
3. Rational Numbers: Determine if the following are rational numbers. If so, state the number as a ratio of two integers. If not, briefly explain why. (For guidance, refer to Section A.2, specifically Example 199, in the math review excerpt from Dr. McCann’s book).
 - (a) 9.72727272727...
 - (b) 1.57079632679...
4. Sets (pt 1) Write the resulting sets:
 - (a) $\mathbb{Z}^+ \cup \mathbb{Z}^*$

(b) $\mathbb{Z}^{odd} \cup \mathbb{Z}^{even}$

(c) $\mathbb{Z}^{odd} \cap \mathbb{Z}^{even}$

(d) $\mathbb{Z}^* - \mathbb{Z}^+$

5. Sets (pt 2) Write true or false for each of the following:

(a) If $k \in \mathbb{Z}$, then $2k \in \mathbb{Z}^{even}$

(b) If $2k \in \mathbb{Z}$, then $k \in \mathbb{Z}^{even}$

6. Sets (pt 3) Let $A = \{\alpha\}$ and $B = \{\beta, \gamma\}$ be sets from the universe $\mathcal{U} = \{\alpha, \beta, \gamma, \delta\}$. Write the following sets:

(a) $A - B$

(b) $\mathcal{U} - A$

(c) $(A \cup B)$

(d) \overline{A}

7. Associative, Commutative, and Distributive Properties.

(a) Expand $(z - y + 4)x$

(b) Simplify $5(3x - 4) + 7(2y - x + 2)$

8. Properties of Inequalities (part 1): Determine if each inequality is True or False

(a) $-4 < -5$

(b) $34 \geq 34$

(c) $16 < 16$

9. Properties of Inequalities (part 2): Solve the following equations for x

(a) $x + 4 < 6x$

(b) $6 - 3x \geq 12$

10. Summation and Product Notations: Evaluate the following expressions.

(a) $\sum_{i=0}^5 (i^2 + 2)$

(b) $\prod_{i=2}^4 i + 1$

11. Integer Division (pt 1): Evaluate the following, giving a non-negative answer

(a) Evaluate $17 \% 7$.

(b) Evaluate $-12 \% 13$.

(c) Evaluate $4 \% 17$.

12. Integer Division (pt 2): Specify if the following statements are true or false.

(a) $2 \equiv 18 \pmod{4}$

(b) $-3 \equiv 3 \pmod{5}$

(c) $-3 \equiv 3 \pmod{6}$

(d) $m + 1 \equiv m - 1 \pmod{2}$ where $m \in \mathbb{Z}$

13. Integer Division (pt 3):
- (a) Evaluate $3|39$.
 - (b) Give 3 integers that are congruent to 23, modulo 5.
14. Exponents and Logarithms (pt 1): Evaluate the following expressions, show your work.
- (a) $\log_2 32$
 - (b) $\log_6 216 - \log_6 36$
 - (c) $\log_{11}(\frac{1}{11})$
 - (d) $\frac{\log_6 9}{\log_6 3}$
15. Exponents and Logarithms (pt 2): Simplify the expressions to use exactly one exponent.
- (a) $6^3 7^3$
 - (b) $3^6 3^7$
16. Exponents and Logarithms (pt 3): Solve.
- (a) $\log_3 9^x = 5$
 - (b) $5^{\log_x 5} = 25$
17. Factoring Quadratics: Find the roots of the following equations by factoring
- (a) $6x^2 + 13x + 6 = 0$
 - (b) $2x^2 - 3x - 2 = 0$
 - (c) $x^2 - x = 0$
18. Number systems: Each value below is in either Binary, Octal, Decimal, or Hexadecimal. Convert each value to the 3 forms it is not given in.
- (a) 123_{10}
 - (b) 10010101011_2
 - (c) 6723_8
 - (d) $A83C_{16}$