

Homework 1

Due: 28 January 2025

The handin for this should be a \LaTeX file with answers to all three problems in it.

Problem 1.1 — theoretical

For each sub-part, give the transformed version of the statement (which may or may not be equivalent in truth value) in reasonably fluent English:

- a. Give the converse of: If it is Monday, then Walker's is closed.
- b. Give the converse of: Every square is a rectangle.
- c. Give the inverse of: If the battery is dead, the car won't start.
- d. Give the inverse of: All binary numbers can be rewritten in hexadecimal.
- e. Give the contrapositive of: If Ashok is home, his car is in the driveway.
- f. Give the contrapositive of: Linear algorithms take roughly twice as long to run when the input size doubles.
- g. Give the negation of: If the temperature is below 32° the road surface always freezes.
- h. Give the negation of: HTML files need a closing `</tag>` for every open `<tag>`.

For the negations, build them with real rephrasing, not just preceding them with "It is not the case that".

For the next two problems, give the proof both in a two-column form (one for the statements, one for the justifications) and in a prose form (i.e. written out in a paragraph).

For the two-column versions of each proof, the following bit of formatting makes nice tables:

```
\begin{tabular}{ll} % those are lowercase L, as in "left-justified"  
first part & second part \\  
another line, left side & right side \\  
\end{tabular}
```

Problem 1.2 — theoretical

Prove that if a divides b and b divides c , then a divides c .

Problem 1.3 — theoretical

Prove that a right triangle (with hypotenuse c and legs a and b) is isosceles if and only if its area is $\frac{1}{4}c^2$.

Hand in the \LaTeX source file using the handin script:

```
handin cmsc208 hwk1 myfile.tex
```

It's due at the start of class on the due date.

Collaboration policy: group work! If you work with other people on this homework, you can just hand in one copy and put all your names on top. There will be a revision cycle for this.

This document was written and prepared without the use of generative AI.