

This is Assignment 1 for MATH1005 students in a Friday workshop. It is due at 6 pm on the Thursday after Workshop 1 (6 days after it was released).

There are four problems. The numbering of the problems is strange because the numbering is taken from a much larger document that has many problems from which I can select. As long as you can see four different problems, then you have the complete assignment.

You should write your best solutions to the problems here, and then upload your solutions before the due time. Here are three ways you may complete the assignment:

1. Print the assignment sheet. Write your solutions in pen or pencil on the print out. Scan your completed assignment, turn the file into a single .pdf file, then upload your solution file to Wattle.
2. Write your solutions in pen or pencil on blank paper. You should clearly label your solutions and you should write them in the order in which the problems appear in your assignment. Scan your completed assignment, turn the file into a single .pdf file, then upload your solution file to Wattle.
3. Download the assignment sheet to a tablet. Annotate the file using your favourite annotation software. **Flatten the file**—this makes your annotations a permanent part of the file, and if you do not do this then we see only a blank assignment in our grading software. Upload your flattened solution file to Wattle.

**In all cases, the file you upload must be a .pdf file.**

Please remember to plan your time carefully so you are not trying to submit your assignment at the last minute. No late work is accepted.

Please enjoy,

AP

**Question 1\*** Define the logical variables  $C$ ,  $E$  and  $r$  as follows:

$C$  = “Cathy will win”

$E$  = “Ewen wil win”

$r$  = “The result will be challenged”

Express each of the following in symbols, **as succinctly as you can.**

- (a) There can be only one winner, and it will be either Cathy or Ewen.
- (b) Whoever wins, the result will be challenged.
- (c) If Cathy wins, the result won't be challenged, but if not, it will.

**Question 2<sup>+</sup>** Negate each of the statements below.

Use as natural sounding English as you can manage, and try to avoid using the word ‘not’. Do not use symbols in your answer, but they may help you to reach your answer.

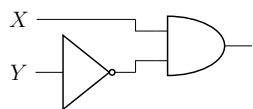
- (a) He'll play soccer or tennis
- (b) If he plays tennis, he'll give up soccer.
- (c) He'll play just one sport from soccer and tennis.

**Question 4** Let  $p$  : “If the new drug succeeds, diabetes rates will fall”.

- (a) Write out the converse of  $p$ . Is this equivalent to  $p$ ?
- (b) Write out the contrapositive of  $p$ . Is this equivalent to  $p$ ?
- (c) Express  $p$  using the phrase “necessary condition”.

**Question 6<sup>†</sup>** Write the correct letters in the boxes.

For this question, working is not required and will not be marked.



The circuit at left implements the logical expression  $X \wedge \neg Y$  and so has the input-output table at right.

inputs		output
X	Y	
1	1	0
1	0	1
0	1	0
0	0	0

We could express this fact by saying that the circuit's output is give by column *E* in the table below, which lists all 16 possible output columns for a 2-input logic circuit.

inputs		possible outputs															
X	Y	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R
1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
1	0	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1
0	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
0	0	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1

Similarly, find the output columns for each of the circuits below.

• Circuit has output given by column

• Circuit has output given by column

• Circuit has output given by column

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• Circuit has output given by column