

# CSCA67H3 - Discrete Mathematics

## Week 1 Tutorial Questions

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# Solutions

## 0.1 Exercises 1

*Either both Ralph and Ed are tall, or both of them are handsome.*

**Solution:**

$$(R_t \wedge E_t) \vee (R_h \wedge E_h).$$

*Both Ralph and Ed are either tall or handsome.*

**Solution:**

$$(R_t \vee R_h) \wedge (E_t \vee E_h).$$

*Both Ralph and Ed are neither tall nor handsome.*

**Solution:**

$$(\neg R_t \wedge \neg R_h) \wedge (\neg E_t \wedge \neg E_h).$$

*Neither Ralph nor Ed is both tall and handsome.*

**Solution:** This one was a bit tricky. The natural reading is that no one has both properties:

$$\neg(R_t \wedge R_h) \wedge \neg(E_t \wedge E_h).$$

*Alternative reading:* It could also be interpreted as "it's false that both of them simultaneously have both properties." Basically, not all of the following conditions can be true at the same time:

$$\neg(R_t \wedge R_h \wedge E_t \wedge E_h).$$

*Either both Ralph and Ed are tall, or neither of them are.*

**Solution:**

$$(R_t \wedge E_t) \vee (\neg R_t \wedge \neg E_t).$$

*Either Ralph is tall and Ed is handsome, or vice versa.*

**Solution:**

$$(R_t \wedge E_h) \vee (E_t \wedge R_h)$$

## 0.2 Exercises 2

Let  $T$  denote “taxes will go up” and  $D$  denote “the deficit will go up.”

$$T \vee D.$$

*Taxes will go up or the deficit will go up.*

$$(T \vee D) \wedge \neg(T \wedge D).$$

*Either taxes will go up or the deficit will, but not both.*

$$(T \wedge \neg D) \vee (D \wedge \neg T).$$

*Either taxes will go up but not the deficit, or the deficit will go up but not taxes.*