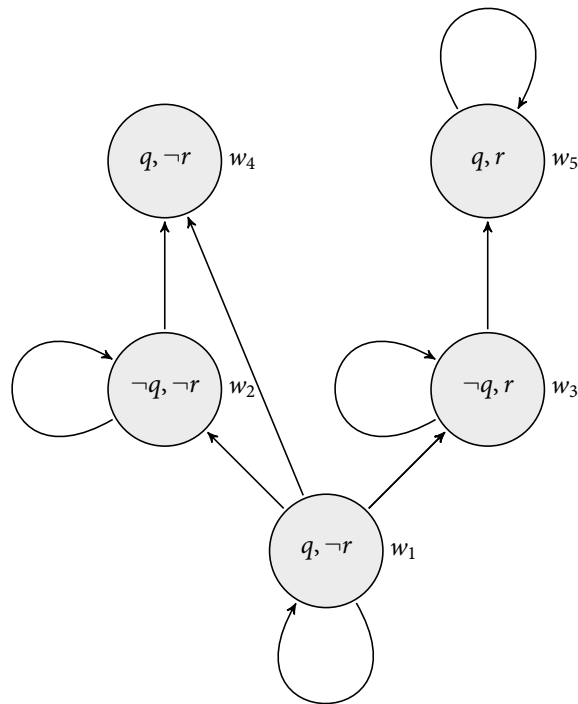


# Assignment Eight

## Modal Models

Due November 15, 5pm



All questions concern the model above. It has five worlds, with accessibility relations show. The truth values for  $q$  and  $r$  at each world are shown within the worlds. (So at  $w_1$ , for example,  $q$  is true and  $r$  false.) Your task is to say which worlds  $p$  must be true in order for some things to apply. You should make  $p$  true at as few worlds as possible. If the question said “Make  $q \rightarrow p$  true everywhere in the model, the answer would be  $w_1, w_4$  and  $w_5$ . You’ll be marked incorrect if you also make  $p$  true at  $w_2$ , even though that would indeed make  $q \rightarrow p$  true.

1. Make  $\Box p$  true at  $w_1$
2. Make  $\Box\Box p$  true at  $w_1$
3. Make  $\Diamond q \rightarrow p$  true everywhere in the model.
4. Make  $\Box p \rightarrow p$  true everywhere in the model.
5. Make  $\Diamond r \rightarrow p$  true everywhere in the model.
6. Make  $\Box r \rightarrow p$  true everywhere in the model.
7. Make  $\Diamond\Box r \rightarrow p$  true everywhere in the model.
8. Make  $\Box(q \vee p)$  true everywhere in the model.
9. Make  $\Box(q \rightarrow p)$  true everywhere in the model.
10. Make  $\Box(r \vee p)$  true everywhere in the model.

## The Logic K

Which of these are theorems of K?

- 11.  $(\Box A \vee \Box B) \rightarrow \Box(A \vee B)$
- 12.  $(\Box A \wedge \Diamond B) \rightarrow \Diamond(A \wedge B)$
- 13.  $\Box(A \wedge \Diamond B) \rightarrow \Diamond(A \wedge B)$
- 14.  $(\Box A \rightarrow \Box B) \rightarrow (\Diamond A \rightarrow \Diamond B)$
- 15.  $\Box(A \rightarrow B) \rightarrow (\Diamond A \rightarrow \Diamond B)$