

## 1 Warm-up exercise

Give the logical form of the following sentences by using  $\forall$  and/or  $\exists$ . Try not looking at your notes from last time!

- Using  $\forall$  and  $\exists$  where appropriate, write logical forms for the sentences below.

- Every possum was brown

$$\forall x[\text{POSSUM}(x) \rightarrow \text{BROWN}(x)]$$

- Mounissa ate a sandwich

$$\exists x[\text{SANDWICH}(x) \ \& \ \text{EAT}(m, x)]$$

- A young woman was speaking

$$\exists x[\text{WOMAN}(x) \ \& \ [\text{YOUNG}(x) \ \& \ \text{SPEAK}(x)]]$$

Note: It doesn't matter what order the conjuncts are in!  
 $p \ \& \ q$  is logically the same thing as  $q \ \& \ p$ .

- Shana filled all the gaps

$$\forall x[\text{GAP}(x) \rightarrow \text{FILL}(s, x)]$$

- Every guest thanked Jones

$$\forall x[\text{GUEST}(x) \rightarrow \text{THANK}(x, j)]$$

- Using  $\forall$  and  $\exists$  where appropriate, write logical forms for the sentences below.

- There was a black hat on the bed

$$\exists x[\text{HAT}(x) \ \& \ [\text{BLACK}(x) \ \& \ [\text{ON}(x, b)]]]$$

- All roads lead to Rome

$$\forall x[\text{ROAD}(x) \rightarrow \text{LEAD}(x, \text{to r})]$$

- Utopia welcomes all Spanish travellers

$$\forall x[[\text{TRAVELLER}(x) \ \& \ \text{SPANISH}(x)] \rightarrow \text{WELCOME}(u, x)]$$

- Clive got murdered

$$\exists x[\text{PERSON}(x) \ \& \ \text{KILL}(x, c)]$$

- Jones read every book in the library

$$\forall x[[\text{BOOK}(x) \ \& \ \text{IN}(x, l)] \rightarrow \text{READ}(j, x)]$$

- Ada saw something nasty in the woodshed

$$\exists x[\text{NASTY}(x) \ \& \ [\text{IN}(x, w) \ \& \ [\text{SEE}(a, x)]]]$$