Formalize each of the following statements as a binary expression.

(a) Everybody loves somebody sometime.
\[ \forall p: \text{people} \cdot \exists q: \text{people} \cdot \exists t: \text{time} \cdot (p \text{ loves } q \text{ at time } t) \]

(b) Every 10 minutes someone in New York City gets mugged.
\[ \forall t: (10 \text{ minute intervals}) \cdot \exists p: (\text{people of New York City}) \cdot (p \text{ gets mugged at time } t) \]
More likely the speaker is saying

(a long time in minutes)

/ (the number of people in New York City who get mugged during that time)

= 10 approximately

(c) Every 10 minutes someone keeps trying to reach you.
\[ \exists p: \text{people} \cdot \forall t: (10 \text{ minute intervals}) \cdot (p \text{ tries to reach you at time } t) \]

(d) Whenever the altitude is below 1000 feet, the landing gear must be down.
\[ \forall a: \text{real} \cdot a < 1000 \Rightarrow (\text{gear down}) \]

(e) I'll see you on Tuesday, if not before.
\[ \text{Let } s \text{ be a predicate of time, so that } s(t) \text{ means I'll see you at time } t. \text{ If the given statement means I'll see you on Tuesday regardless of whether I see you before, then } \]

\[ \exists t \cdot \text{now} < t \leq \text{Tuesday} \land s(t) \]

But if it means I'll see you sometime between now and then,

\[ \exists t \cdot \text{now} < t \leq \text{Tuesday} \land s \]

(f) No news is good news.
\[ \text{Maybe this means the same as "There's no such thing as good news.". If so, we might formalize it as} \]

\[ \neg \exists n: \text{news} \cdot \text{good } n \]
where news is all the news and good is a predicate over news. But I think it was intended to mean the same as “The fact that there isn't any news is a piece of good news.”. I'll let news: *char be a bunch of texts. Then we might formalize it as

“news=null” \land good “news=null”

Or it might mean “If there isn't any news then that will be a piece of good news.”.

news=null \Rightarrow “news=null” \land good “news=null”

If “news=null” then news=null is false, so “news=null” is false news, but there's no logical inconsistency.

(g) “I don't agree with anything you say.”
\[ \text{Introduce prefix operators Iagreewith and Yousay.} \]

\[ \forall x: \neg(Iagreewith x) \Leftarrow (Yousay x) \]

(h) “I don't agree with everything you say.”
\[ \text{Introduce prefix operators Iagreewith and Yousay. It seems to me there are two possible interpretations for the sentence. One is the same as part (a).} \]

\[ \forall x: \neg(Iagreewith x) \Leftarrow (Yousay x) \]

The other is

\[ \neg \forall x: (Iagreewith x) \Leftarrow (Yousay x) \]

They are not equivalent. To decide between them requires more context.