EVENT: Start with the initial **thm** theory.

DEFINITION:
merge $(l,\ m)$
$=$ **if** $l \simeq$ **nil** **then** m
elseif $m \simeq$ **nil** **then** l
elseif car $(l) <$ car (m) **then** cons (car (l), merge (cdr (l), m))
else cons (car (m), merge $(l$, cdr $(m)))$ **endif**

DEFINITION:
evens (l)
$=$ **if** $l \simeq$ **nil** **then nil**
elseif cdr $(l) \simeq$ **nil** **then nil**
else cons (cadr (l), evens (cddr $(l)))$ **endif**

DEFINITION:
odds (l)
$=$ **if** $l \simeq$ **nil** **then nil**
else cons (car (l), odds (cddr $(l)))$ **endif**

THEOREM: evens-length
$((l \not\simeq$ **nil**$) \wedge$ (cdr $(l) \not\simeq$ **nil**$)) \rightarrow$ (length (evens $(l)) <$ length $(l))$

DEFINITION:
mergesort (l)
$=$ **if** $l \simeq$ **nil** **then nil**
elseif cdr $(l) \simeq$ **nil** **then** l
else merge (mergesort (evens (l)), mergesort (odds $(l)))$ **endif**

```
; Interestingly, the prover can now prove (SORTEDP (MERGESORT L)) automatically,
; but we won't bother with that here.
```

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