Exercise 9.5

(a) $20000a_{\overline{60:70}} = 20000\,(a_{60} + a_{70} - a_{60:70}) = 20000(13.90407+11.0083-10.22196) = 293,808.4$

```
A <- .00022
B <- 2.7*10^(-6)
c <- 1.124
muxt <- function(x,t){
A + B*c^(x+t)}
tpx <- function(x,t){
temp <- A*t + B*c^x*(c^t-1)/log(c)
exp(-temp)}
i <- 0.05
v <- 1/(1+i)
# limiting age
w <- 137
tt <- max(w-60,w-70)
t <- 1:tt
vt <- v^t
anni6070 <- sum(vt*tpx(60,t)*tpx(70,t))
anni60 <- sum(vt*tpx(60,t))
anni70 <- sum(vt*tpx(70,t))
anni6070B <- anni60 + anni70 - anni6070
```

```
> anni60
[1] 13.90407
> anni70
[1] 11.0083
> anni6070
[1] 10.22196
> anni6070B
[1] 14.69042
> 20000*anni6070B
[1] 293808.4
```

(b) $30000 \times \ddot{a}_{60:70:\overline{10|}} = 225,329.5$

```
t <- 0:9
vt <- v^t
ann6070t10 <- sum(vt*tpx(60,t)*tpx(70,t))
```

```
> 30000*ann6070t10
[1] 225329.5
```

(c) $25000 \times a_{70|60} = 25000 \times (a_{60} - a_{60:70}) = 25000 \times (13.90407 - 14.69042) = 92,052.87$

```
> revann7060 <- anni60 - anni6070
> 25000*revann7060
[1] 92052.87
```