Graunt's Life Table Extended

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Lifetable of J. Graunt

Data

Age	*Graunt*	*1993*
0	100	100
6	64	99
16	40	99
26	25	98
36	16	97
46	10	95
56	6	92
66	3	84
76	1	70

Data Input

```
graunt <- data.frame(x = c(0, 6, 16, 26, 36, 46, 56, 66, 76), lx.17th = c(100, 64, 40, 25, 16, 10, 6, 3, 1))
```

- 같은 연령대의 1993년 미국 생명표 입력

```
us.93 <- data.frame(x = graunt$x, lx.93 = c(100, 99, 99, 98, 97, 95, 92, 84, 70))
```

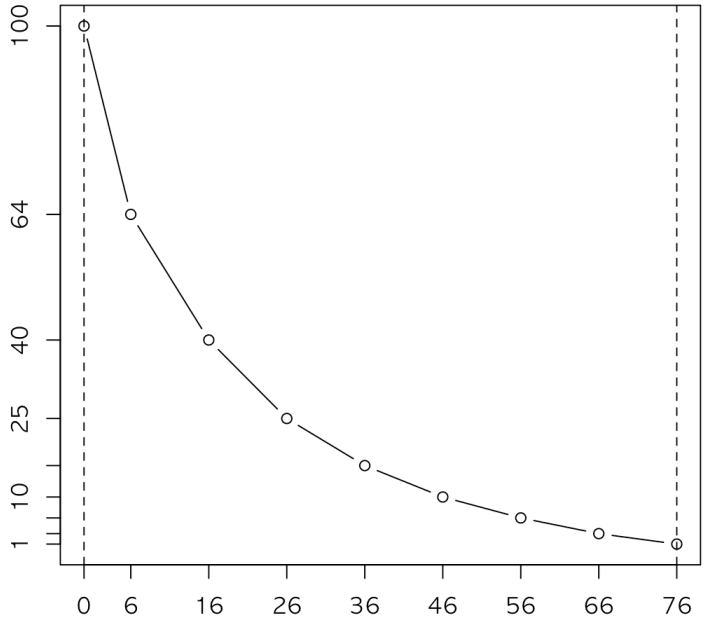
- 두 자료를 합쳐서 하나의 데이터프레임으로

```
graunt.us <- data.frame(graunt, lx.93 = us.93$lx)
graunt.us
```

```
##    x lx.17th lx.93
## 1  0     100   100
## 2  6      64    99
## 3 16      40    99
## 4 26      25    98
## 5 36      16    97
## 6 46      10    95
## 7 56       6    92
## 8 66       3    84
## 9 76       1    70
```

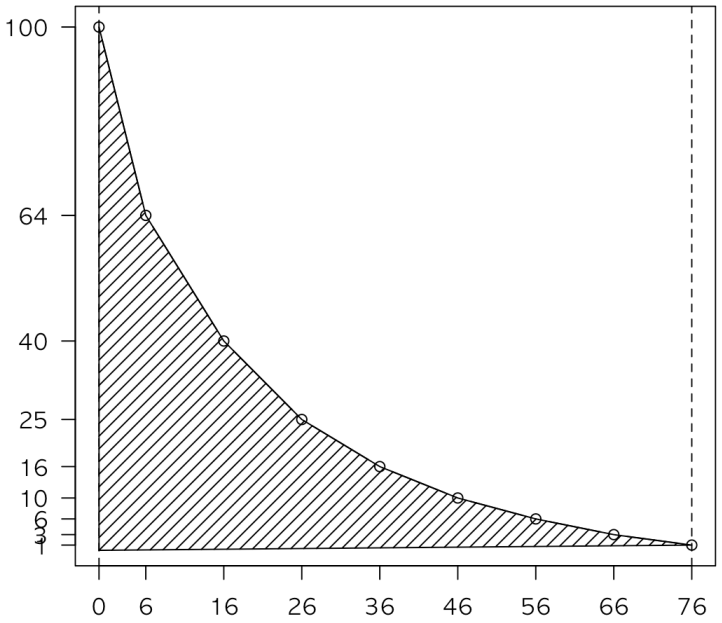
- Graunt 생명표로부터 개략의 생존함수 도시

```
plot(graunt$x, graunt$lx.17th, ann = F, xaxt = "n", yaxt = "n", type = "b")
axis(side = 1, at = graunt$x, labels = graunt$x)
axis(side = 2, at = graunt$lx.17th, labels = graunt$lx.17th)
abline(v = c(0, 76), lty = 2)
```



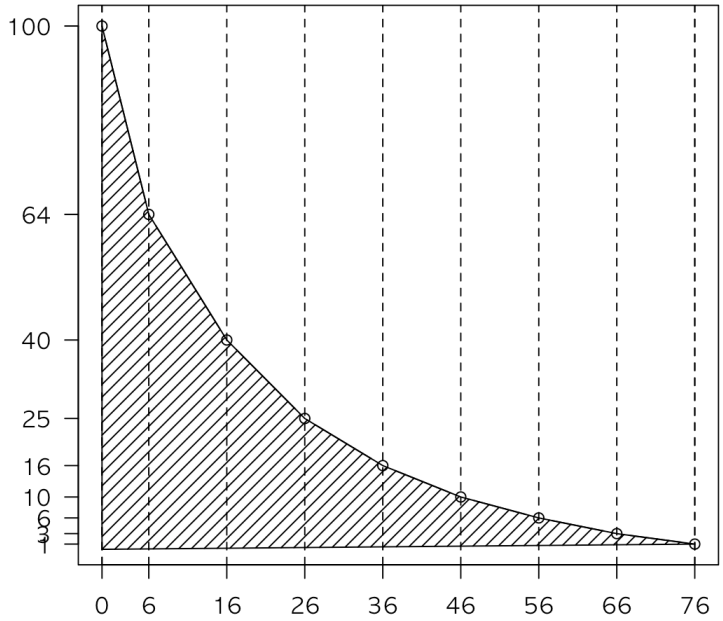
- 기대수명 파악이 용이하도록 빗금

```
plot(graunt$x, graunt$lx.17th, ann=F, xaxt="n", yaxt="n", type="b")
axis(side = 1, at = graunt$x, labels = graunt$x)
axis(side = 2, at = graunt$lx.17th, labels = graunt$lx.17th, las = 2)
abline(v = c(0, 76), lty = 2)
graunt.x <- c(graunt$x, 0)
graunt.y <- c(graunt$lx.17th, 0)
# graunt.x <- c(graunt$x, rev(graunt$x))
# graunt.y<-c(rep(0, length(graunt$x)), rev(graunt$lx.17th))
polygon(graunt.x, graunt.y, density = 15)
```



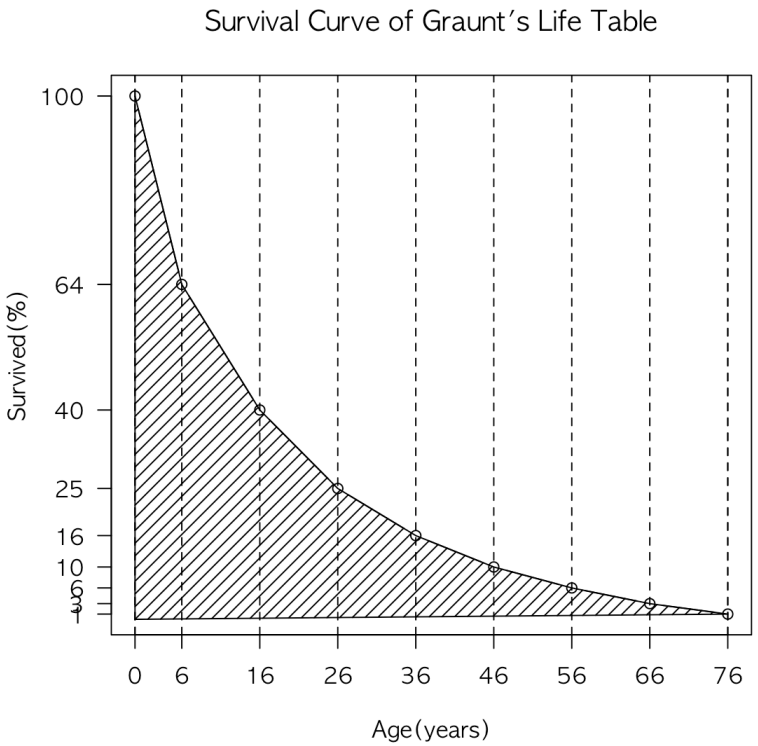
- 윤곽을 파악하기 쉽도록 격자 설정

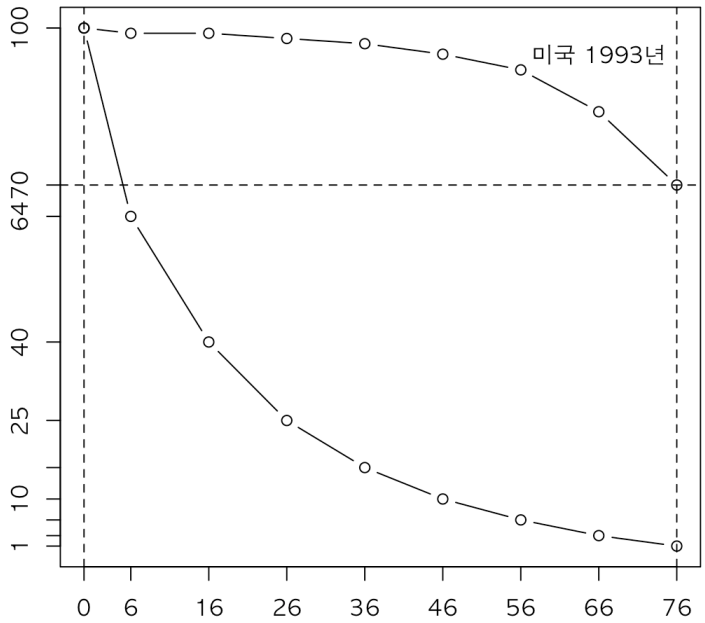
```
plot(graunt$x, graunt$lx.17th, ann = F, xaxt = "n", yaxt = "n", type = "b")
axis(side = 1, at = graunt$x, labels = graunt$x)
axis(side = 2, at = graunt$lx.17th, labels = graunt$lx.17th, las = 2)
abline(v = c(0, 76), lty = 2)
graunt.x <- c(graunt$x, 0)
graunt.y <- c(graunt$lx.17th, 0)
polygon(graunt.x, graunt.y, density = 15)
abline(v = graunt$x, lty = 2)
```



- 메인 타이틀과 x축, y축 라벨 설정.

```
# par(family = "Apple SD Gothic Neo")
plot(graunt$x, graunt$lx.17th, ann = F, xaxt = "n", yaxt = "n", type = "b")
axis(side = 1, at = graunt$x, labels = graunt$x)
axis(side = 2, at = graunt$lx.17th, labels = graunt$lx.17th, las = 2)
abline(v = c(0, 76), lty = 2)
graunt.x <- c(graunt$x, 0)
graunt.y <- c(graunt$lx.17th, 0)
polygon(graunt.x, graunt.y, density = 15)
abline(v = graunt$x, lty = 2)
# title(main = "John Graunt의 생존 곡선", xlab = "연령(세)", ylab = "생존률(%)")
title(main = "Survival Curve of Graunt's Life Table", xlab = "Age(years)", ylab
= "Survived(%)")
```





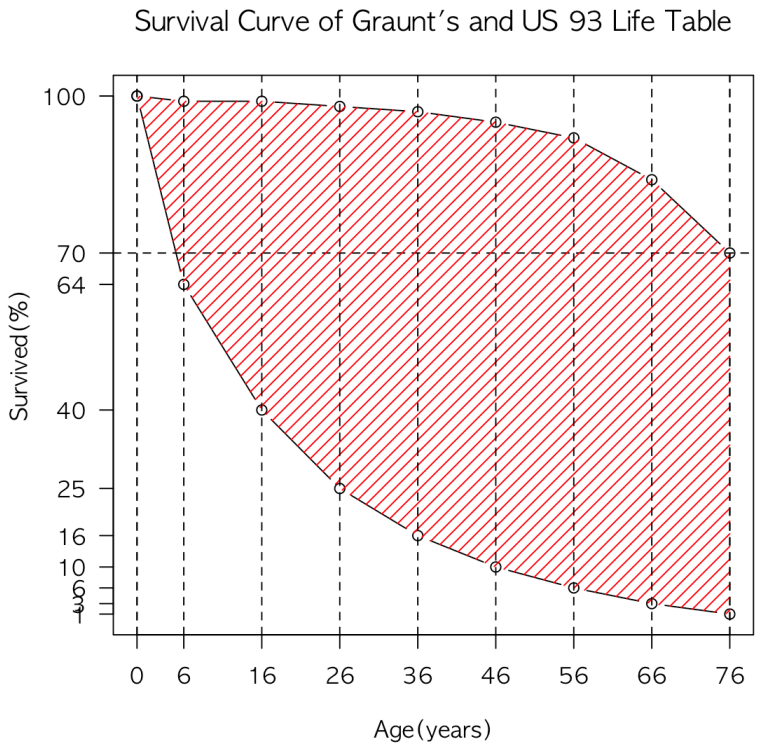
1993년 미국의 생명표와 비교

- 1993년 미국의 생존함수와 비교하기 위하여 `lines()` 에 `type = "b"` 로 설정. y 축의 70% 가 어떤 의미인지 음미할 것.

```
plot(graunt$x, graunt$lx.17th, ann=F, xaxt="n", yaxt="n", type="b")
axis(side=1, at=graunt$x, labels=graunt$x)
axis(side=2, at=graunt$lx.17th, labels=graunt$lx.17th)
abline(v=c(0, 76), lty=2)
lines(us.93$x, us.93$lx.93, type="b")
axis(side=2, at=70, labels=70)
abline(h=70, lty=2)
text(x=66, y=95, labels="미국 1993년")
```

- Graunt의 생존곡선과 1993년 미국 생존곡선 사이의 빗금친 부분은 무엇을 상징하는가?

```
plot(graunt$x, graunt$lx.17th, ann = F, xaxt = "n", yaxt = "n", type = "b")
axis(side = 1, at = graunt$x, labels = graunt$x)
axis(side = 2, at = graunt$lx, labels = graunt$lx.17th, las = 2)
abline(v = c(0, 76), lty = 2)
# lines(us.93$x, us.93$lx.93, type = "b")
lines(graunt$x, us.93$lx.93, type = "b")
axis(side = 2, at = 70, labels = 70, las = 1)
abline(h = 70, lty = 2)
us.graunt.x <- c(graunt$x, rev(graunt$x))
us.graunt.y <- c(us.93$lx.93, rev(graunt$lx))
polygon(us.graunt.x, us.graunt.y, density = 15, col = "red", border = NA)
abline(v = graunt$x, lty = 2)
# title(main = "Graunt와 1993년 미국의 생존 곡선", xlab = "연령(세)", ylab = "생존률
(%)")
title(main = "Survival Curve of Graunt's and US 93 Life Table", xlab = "Age(yea
rs)", ylab = "Survived(%)")
```



ggplot

- Work with `graunt.us`

```
str(graunt.us)
```

```
## 'data.frame':    9 obs. of  3 variables:
##  $ x      : num  0 6 16 26 36 46 56 66 76
##  $ lx.17th: num  100 64 40 25 16 10 6 3 1
##  $ lx.93  : num  100 99 99 98 97 95 92 84 70
```

- wide format을 long format으로 바꾸기 위해서 'reshape2' 패키지 등록

```
library(reshape2)
```

- `melt()` 함수의 사용법에 대하여 도움말 요청

```
?melt
```

- 다음 구조를 명확히 이해.

```
graunt.melt <- melt(graunt.us, id.vars = "x", measure.vars = c("lx.17th", "lx.93"), value.name = "lx", variable.name = "times")
graunt.melt
```

```
##     x   times  lx
## 1   0 lx.17th 100
## 2   6 lx.17th  64
## 3  16 lx.17th  40
## 4  26 lx.17th  25
## 5  36 lx.17th  16
## 6  46 lx.17th  10
## 7  56 lx.17th   6
## 8  66 lx.17th   3
## 9  76 lx.17th   1
## 10  0   lx.93 100
## 11  6   lx.93  99
## 12 16   lx.93  99
## 13 26   lx.93  98
## 14 36   lx.93  97
## 15 46   lx.93  95
## 16 56   lx.93  92
## 17 66   lx.93  84
## 18 76   lx.93  70
```

```
str(graunt.melt)
```

```
## 'data.frame':    18 obs. of  3 variables:
##  $ x    : num  0 6 16 26 36 46 56 66 76 0 ...
##  $ times: Factor w/ 2 levels "lx.17th","lx.93": 1 1 1 1 1 1 1 1 1 2 ...
##  $ lx   : num  100 64 40 25 16 10 6 3 1 100 ...
```

- 17세기 생명표와 1993년 생명표를 `times` factor로 구분

```
levels(graunt.melt$times) <- c("17th", "1993")
str(graunt.melt)
```

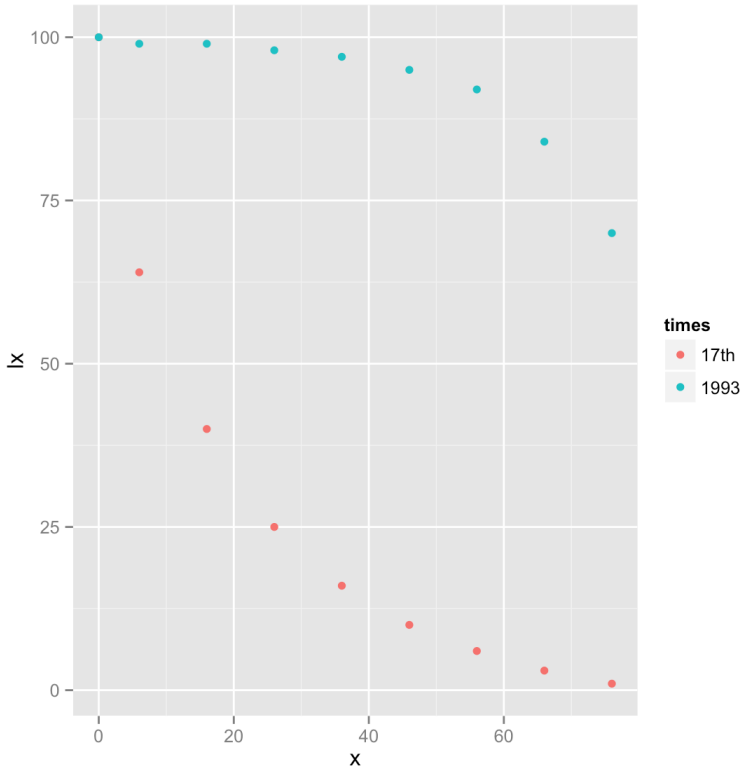
```
## 'data.frame':    18 obs. of  3 variables:
##  $ x    : num  0 6 16 26 36 46 56 66 76 0 ...
##  $ times: Factor w/ 2 levels "17th","1993": 1 1 1 1 1 1 1 1 1 2 ...
##  $ lx   : num  100 64 40 25 16 10 6 3 1 100 ...
```

- `ggplot2` 패키지 등록

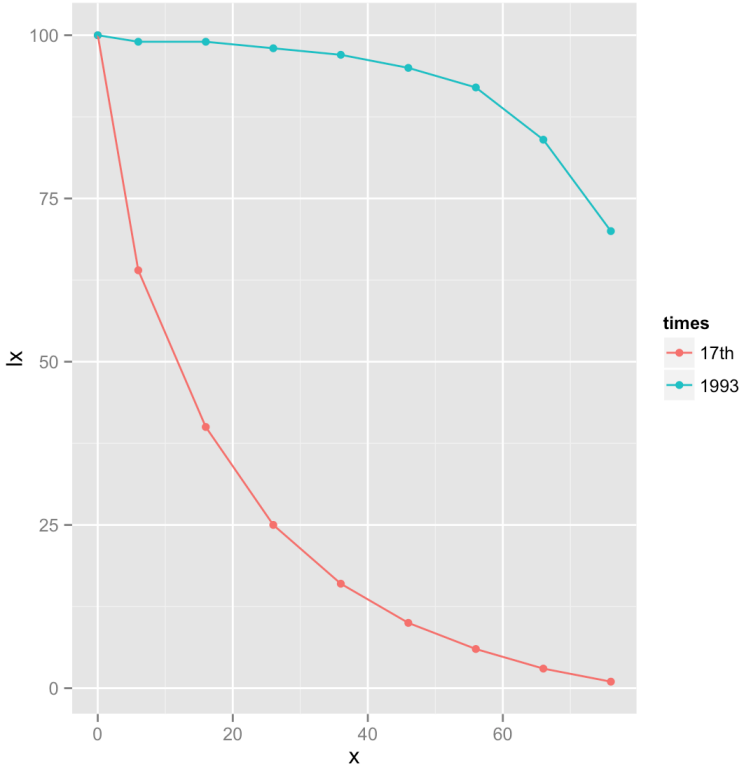
```
library(ggplot2)
```

- ggplot의 구조를 이해하기 쉽도록 가능한 단계별로 작업하고 저장. `geom_polygon` 작업에서 `data.frame` 과 `aes` 가 바뀌므로 `ggplot()` 을 비워놓은 점에 유의.

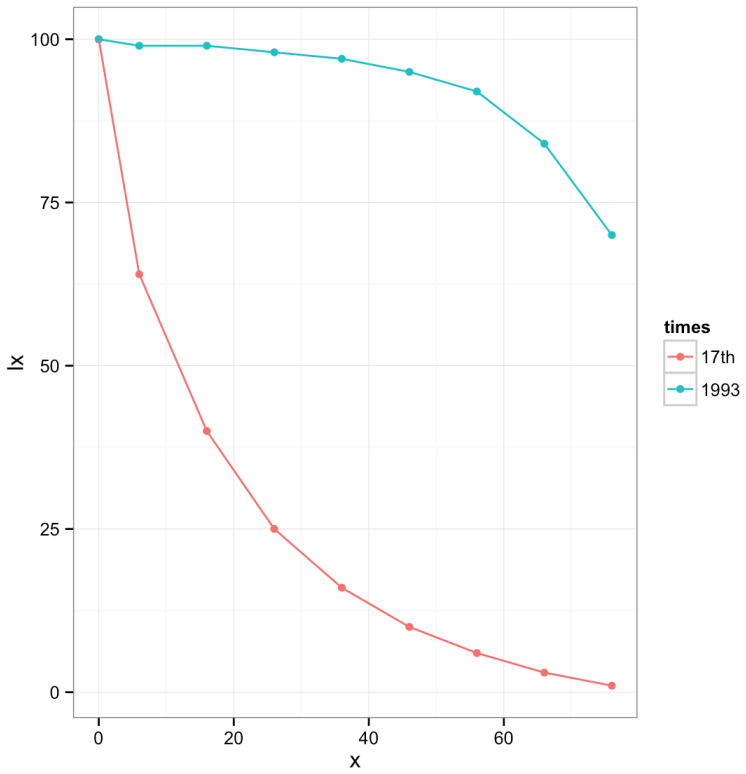
```
g1 <- ggplot() + geom_point(data = graunt.melt, aes(x = x, y = lx, colour = tim
es))
g1
```




```
g2 <- g1 + geom_line(data = graunt.melt, aes(x = x, y = lx, colour = times))
g2
```




```
g3 <- g2 + theme_bw()
g3
```

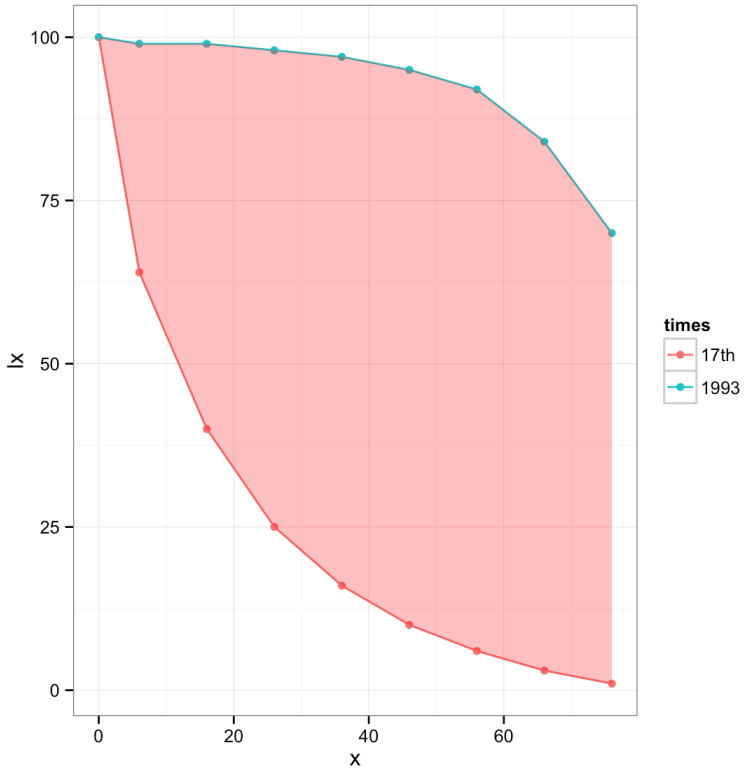


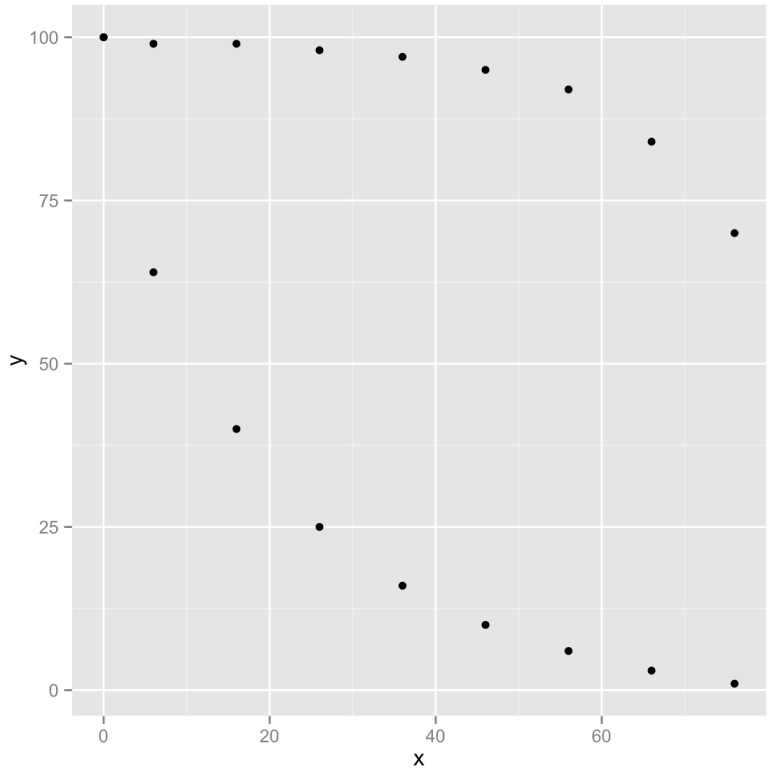
- polygon 으로 두 생명곡선의 차이를 드러내기 위해서는 polygon의 좌표를 나타내는 별도의 데이터 프레임이 필요함.

```
graunt.poly <- data.frame(x = graunt.melt[c(1:9, 18:10), 1], y = graunt.melt[c
(1:9, 18:10), 3])
graunt.poly
```

```
##      x   y
## 1    0 100
## 2    6  64
## 3   16  40
## 4   26  25
## 5   36  16
## 6   46  10
## 7   56   6
## 8   66   3
## 9   76   1
## 10 76  70
## 11 66  84
## 12 56  92
## 13 46  95
## 14 36  97
## 15 26  98
## 16 16  99
## 17  6  99
## 18  0 100
```

```
g4 <- g3 + geom_polygon(data = graunt.poly, aes(x = x, y = y), alpha = 0.3, fil
l = "red")
g4
```



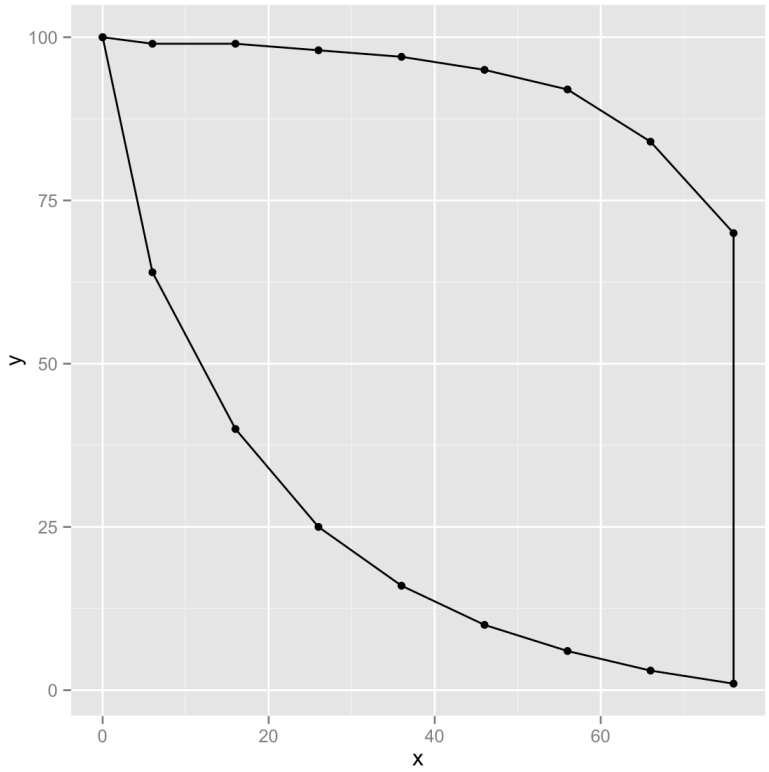


Starting with a different plot

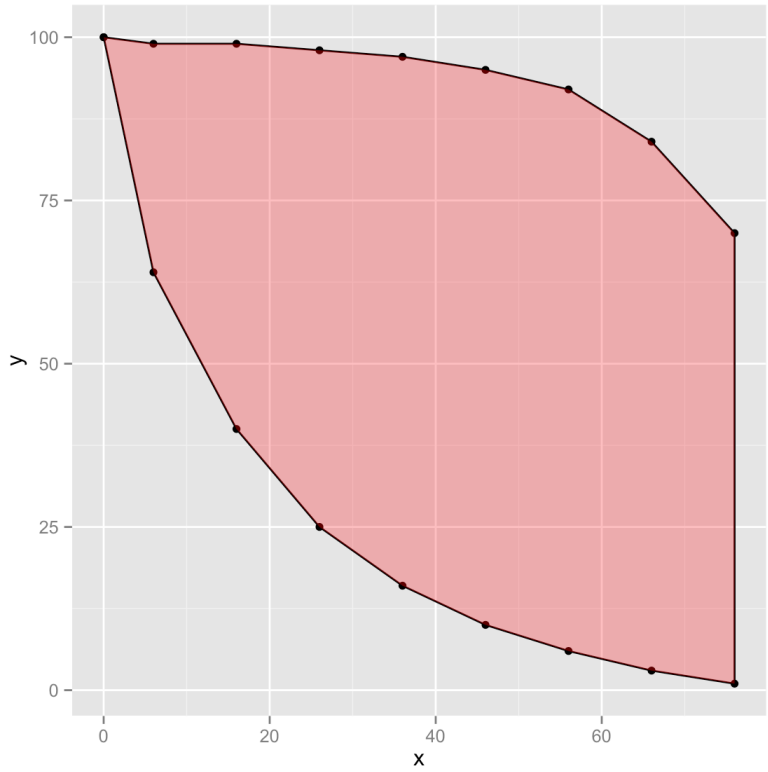
- 점들을 선으로 이어주기 위하여 `geom_line()` 를 사용하면 원하지 않는 결과를 얻게 됨. `geom_path()` 를 사용하여야 함.

```
p1 <- ggplot(graunt.poly, aes(x = x, y = y)) + geom_point()
p1
```

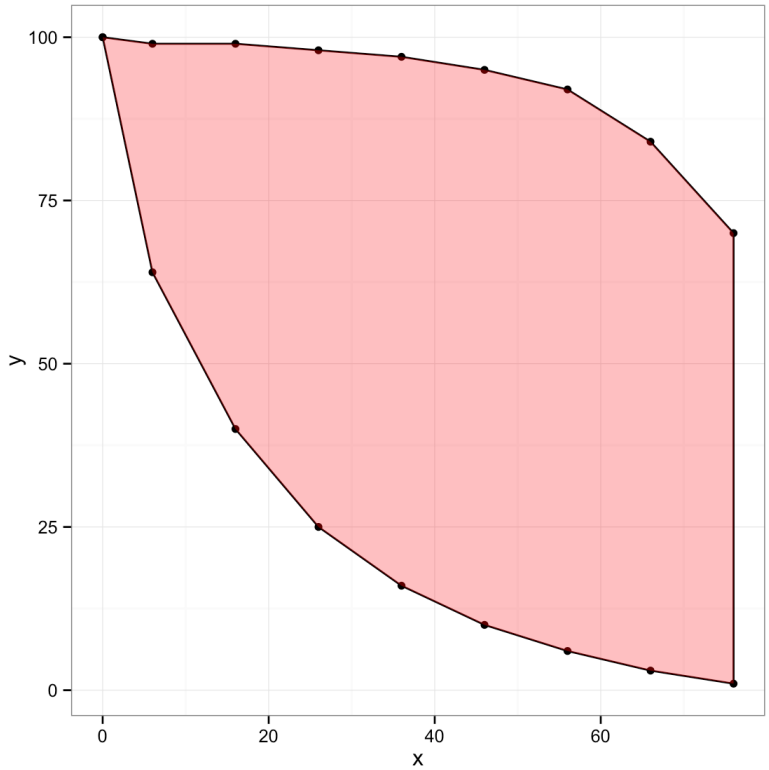
```
p2 <- p1 + geom_path()
p2
```




```
p3 <- p2 + geom_polygon(alpha = 0.3, fill = "red")
p3
```




```
p4 <- p3 + theme_bw()
p4
```



- 타이틀과 자막에 한글을 넣는 방법은 다음 시간에^^