

# Air passengers 1949-1960

**22 marks**

## Airline passengers.

Here we will examine the monthly total of the number of air passengers in the US from 1949 to 1960.

The data are available as the data set `AirPassengers` from the `datasets` package in the standard R distribution.

`AirPassengers`

```
##      Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
## 1949 112 118 132 129 121 135 148 148 136 119 104 118
## 1950 115 126 141 135 125 149 170 170 158 133 114 140
## 1951 145 150 178 163 172 178 199 199 184 162 146 166
## 1952 171 180 193 181 183 218 230 242 209 191 172 194
## 1953 196 196 236 235 229 243 264 272 237 211 180 201
## 1954 204 188 235 227 234 264 302 293 259 229 203 229
## 1955 242 233 267 269 270 315 364 347 312 274 237 278
## 1956 284 277 317 313 318 374 413 405 355 306 271 306
## 1957 315 301 356 348 355 422 465 467 404 347 305 336
## 1958 340 318 362 348 363 435 491 505 404 359 310 337
## 1959 360 342 406 396 420 472 548 559 463 407 362 405
## 1960 417 391 419 461 472 535 622 606 508 461 390 432
```

- a. **(7 marks)** Use the function `decompose()` on this data and plot the results.
  - i. *(2 marks)* Show your plot.
  - ii. *(1 mark)* Describe the trend.
  - iii. *(2 marks)* Describe the seasonal pattern.
  - iv. *(2 marks)* What do you conclude from the residuals?
- b. **(9 marks)** Use the function `stl()` on this data with seasonality loess span `s.window = 7` and the local polynomial for the seasonal loess being a line.
  - i. *(2 marks)* Show your plot.
  - ii. *(2 marks)* Describe the trend. Is it significant? Why or why not?
  - iii. *(3 marks)* Describe the seasonal pattern. Is it significant? Why or why not?
  - iv. *(2 marks)* What do you conclude from the residuals?
- c. **(6 marks)** Compare the plots from parts (a) and (b).
  - i. *(2 marks)* What are the major differences in the plots?
  - ii. *(2 marks)* What characteristics of the two methods caused these differences?
  - iii. *(2 marks)* Which fitted model do you prefer and **why**?