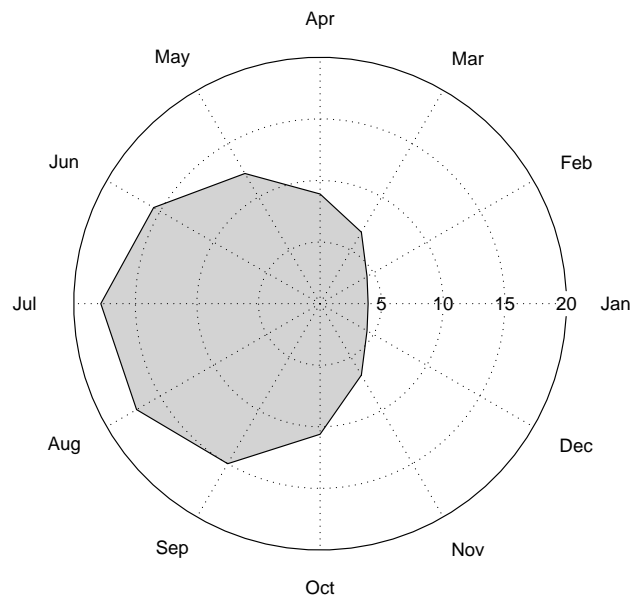


Answer all three questions. All are worth equal marks.

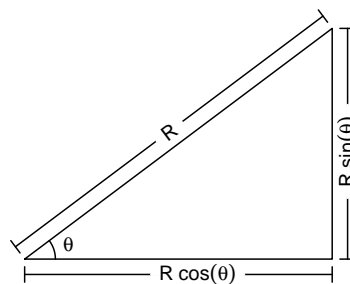
- Describe how to draw the following plot using R. Your description can either consist of some R code, or a *precise* description which could be translated *directly* into R code. (You should be aiming for about 20 lines of code.)



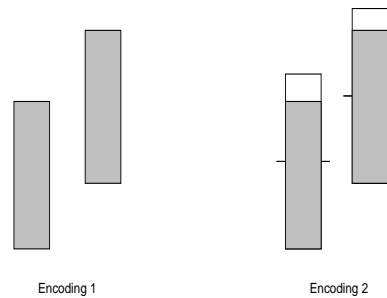
You can assume that the January through December data values and the month abbreviations have been stored using the following assignments.

```
temp = c( 3.9,  4.4,  6.7,  8.9, 12.2, 15.6,
          17.8, 17.2, 15.0, 10.6,  6.7,  4.4)
month = c("Jan", "Feb", "Mar", "Apr",
          "May", "Jun", "Jul", "Aug",
          "Sep", "Oct", "Nov", "Dec")
```

You may also find the following diagram helpful.



2. (a) Describe *three* visual illusions which could have an influence on graphical presentations. Describe what the influence would be.
- (b) The following graphs show a pair of numerical values encoded in two different ways. Use Weber's law to explain why the second of these encodings is more successful.



- (c) The Cleveland-McGill scale ranks a number of methods of encoding numerical values graphically. Write down the ranking.
 - (d) Give one example of an encoding method *not* included in the Cleveland-McGill ordering. Explain (in detail) where you think this new attribute might fall within the Cleveland-McGill ranking.
3. (a) The representation of colour is different at different stages of the visual pathway (from the eye to the visual cortex). Explain the representations used at *three* different stages of the visual pathway.
 - (b) Give *two* reasons why luminance (i.e. brightness) needs to be considered when designing graphical displays. Give details.
 - (c) Explain why it might be important to use the CIELUV colour space rather than CIEXYZ, HSV or RGB spaces when making colour choices for graphical displays.
 - (d) Give *two* examples of ways in which colour could be used *badly* in a graphical display. Explain why the use would be bad.