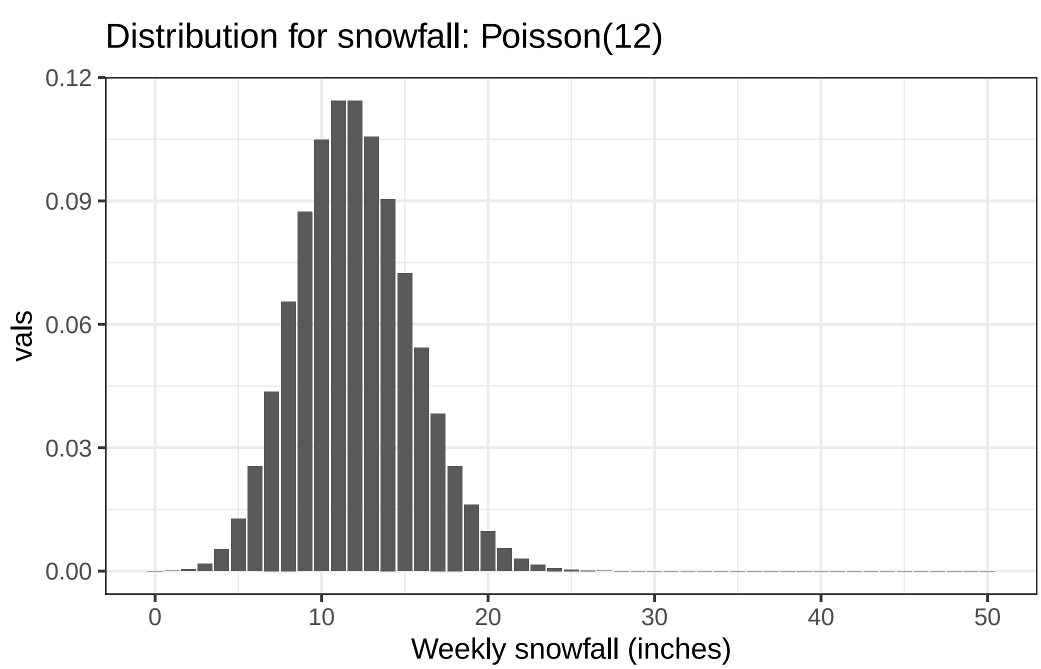
Lab 2

Q1.

Recall the probability mass function for weekly winter snowfall at Bridger Bowl that we saw on Tuesday.

```
library(tidyverse)
snow_seq <- 0:50
tibble(vals = c(dpois(snow_seq, 12)),
       `Weekly snowfall (inches)` = snow_seq) %>%
  ggplot(aes(x = `Weekly snowfall (inches)`, y = vals)) +
  geom_col() + theme_bw() +
  ggtitle(expression(paste('Distribution for snowfall: Poisson(12)')))
```



We decided this distribution did a poor job handling larger snowfall events and events near zero.

a. (4 points)

Now use a negative binomial distribution (`dnbinom()`) to create a better model for weekly snowfall. (Hint: using the parameterization of `dnbinom()` with `mu` and `size` might be more intuitive than default values.) Create a figure to show this distribution.

b. (4 points)

Describe the parameters in the negative binomial model and defend the choices you made for those parameters.

c. (2 points)

According to this distribution, what is the probability of a week having 23 inches of snow?

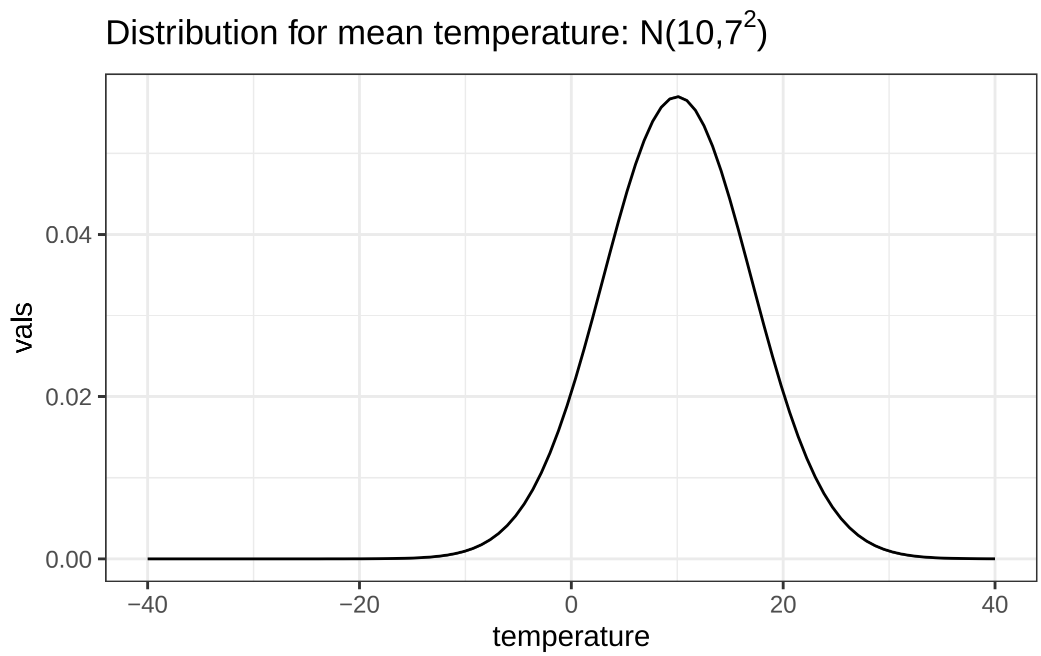
d. (2 points)

According to this distribution, what is the probability of a week having 0 inches of snow

Q2.

Recall, the probability distribution for average temperature in Hyalite that is Normal with mean = 10 and standard deviation = 7.

```r
temp_seq <- seq(-40,40, length.out = 100)
tibble(vals = c(dnorm(temp_seq, 10, 7)),
       temperature = temp_seq) %>%
  ggplot(aes(x = temperature, y = vals)) +
  geom_line() + theme_bw() +
  ggtitle(expression(paste('Distribution for mean temperature: N(10,',7^2,')')))
```



Answer the following questions with an numeric answer and a description of why that answer is true.

a. (2 points)

What would be the lower 95% interval?

b. (2 points)

What would be the upper 95% interval?

c. (4 points)

What is the shortest 95% interval, why?

d. (2 points)

Recreate the plot from above and denote these three intervals on the figure.

Q3.

For the following Beta distributions find the mean of the distribution and the shortest 95 percent interval.

a. (2 points)

Beta(1,10)

b. (2 points)

Beta(1,100)

c. (2 points)

Beta(1, 1)

Q4. (10 points)

What is the probability that dealer "busts" in black jack. To simplify the calculation (albeit not being entirely correct), you can treat all Aces as being worth 11 points.

Note that the dealer must continue to take cards until the total is 17 or more, at which point the dealer must stand.