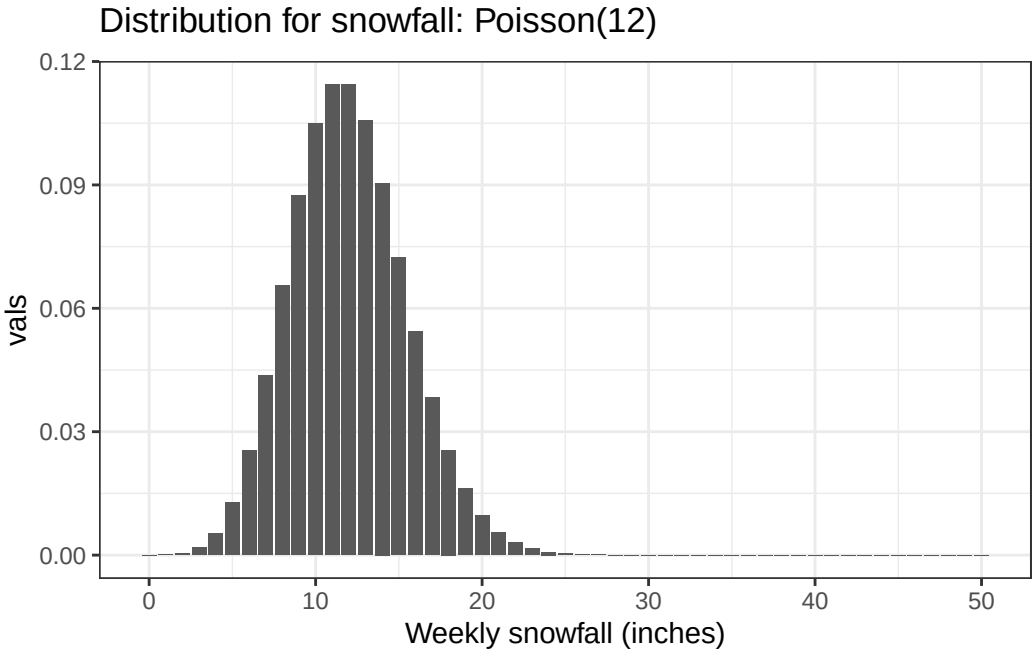
Lab 2

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?

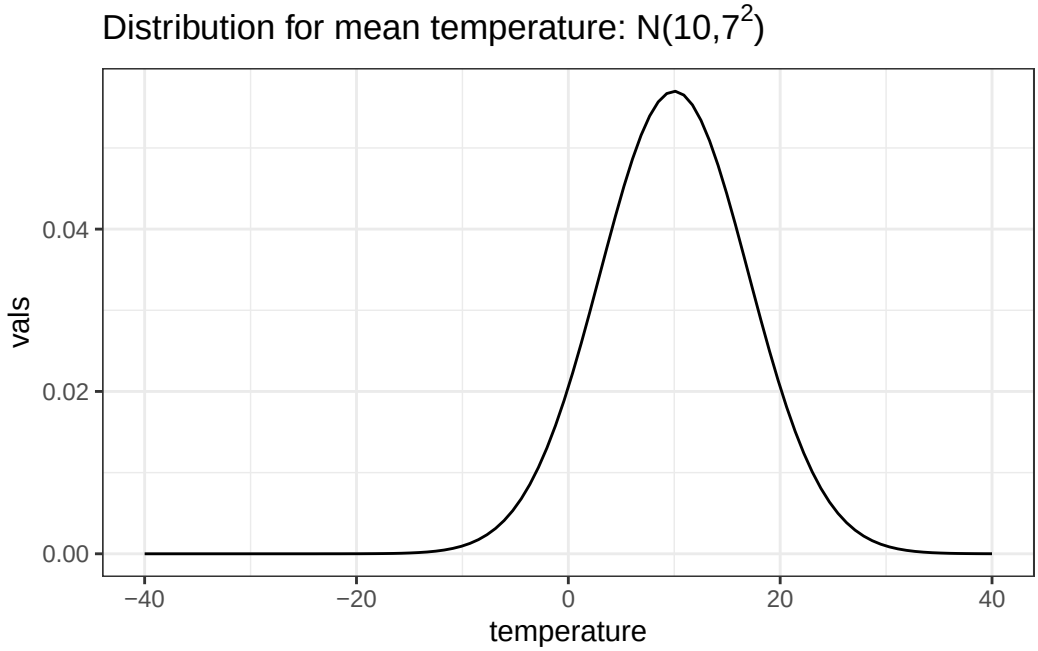
d. (2 points)

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.

```
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? (Starting at 0)

b. (2 points)

What would be the upper 95% interval? (Ending at ∞)

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 your best guess for shortest 95 percent interval. An approximate interval is okay here.

a. (2 points)

Beta(1,10)

b. (2 points)

Beta(1,100)

c. (2 points)

Beta(1, 1)

Q4. (10 points)

Our goal is to calculate the probability that dealer "busts" in black jack.

Here we will explore a simplified the calculation (albeit not being entirely correct), you can treat all Aces as being worth 11 points and assume that the dealer will take one additional card. Furthermore to simplify the problem, we will assume that the dealer has a 6 of hearts showing. So this problem will amount to simulating the dealer receiving two additional cards and adding the total of those cards (where face cards are worth 10) to determine if that total is greater than 21.