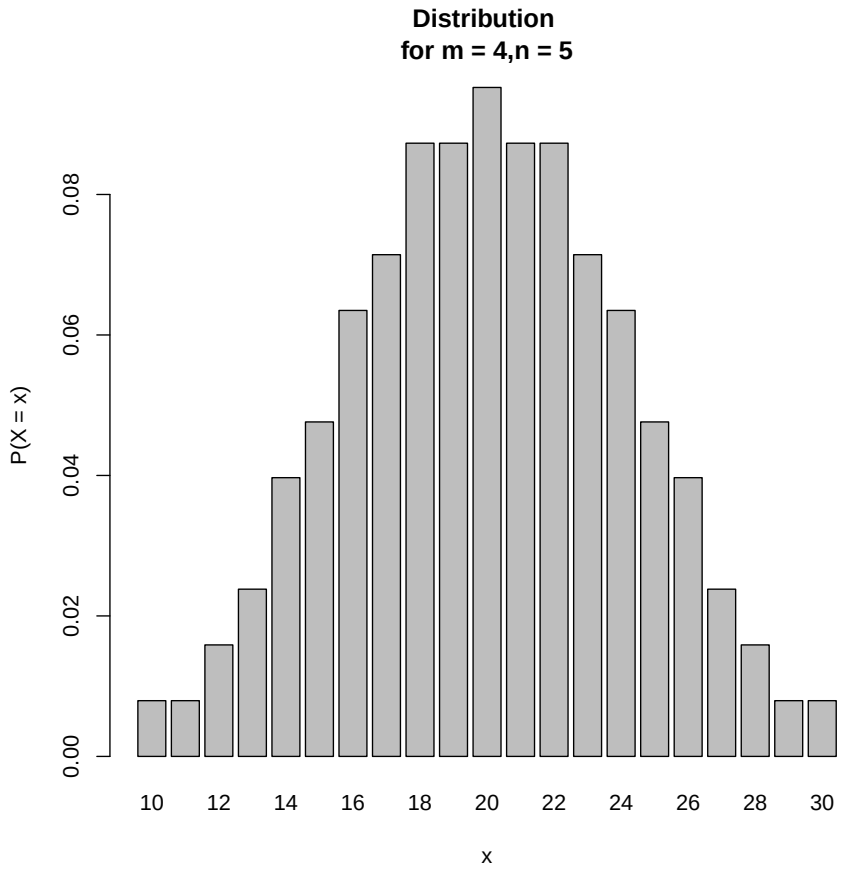
Probability Mass Function of W_N :-

The pmf of W_N for $m = 4, n = 5$ is :-

```
Attaching package:  'combinat'
The following object is masked from 'package:utils':
       combn
```



Clearly we can see that the distribution of W_N is symmetric about its mean $\frac{m(N+1)}{2} = 20$.

Probability Values :-

The probabilities for different mass points of W_N i.e $P\left(W_N = n\right), n = 10, 11, \ldots, 30$ are given below :-

n	$P(W_N = n)$	n	$P(W_N = n)$
10	0.007936508	21	0.087301587
11	0.007936508	22	0.087301587
12	0.015873016	23	0.071428571
13	0.023809524	24	0.063492063
14	0.039682540	25	0.047619048
15	0.047619048	26	0.039682540
16	0.063492063	27	0.023809524
17	0.071428571	28	0.015873016
18	0.087301587	29	0.007936508
19	0.087301587	30	0.007936508
20	0.095238095		

R Codes

The following plot is made using the code below :-

```
library(combinat)
m = 4;n = 5
z <- permn(c(rep(1,m),rep(0,n)))
z <- unique(z) ; t = NULL ; ind = 1:(m+n)
for(i in 1:length(z))
{
t[i] = sum(ind*z[[i]])
}
dis <- table(t)/length(z)
dist <- data.frame(dis)
colnames(dist) <- c("x","P(X = x)")
dist
barplot(dis,xlab = "x",ylab = "P(X = x)",main = "Distribution
for m = 4,n = 5")
```