Using R Commander to find binomial probabilities:

1. To find values for the **pdf, i.e. $P(X = k)$** for various values of k:
Distributions →Discrete distributions → Binomial distribution → Binomial probabilities
(then fill in n and p in the popup box)
This command results in a table with possible values from 0 to n listed, then the probability for each value listed next to them.
EXAMPLE: Find the probability of 2 successes when $n = 4$ and $p = 0.2$:
Distributions →Discrete distributions → Binomial distribution → Binomial probabilities
Fill into the popup box:
Binomial trials 4
Probability of success .2

Results, with the one we were looking for in bold:
```
      Pr
0 0.4096
1 0.4096
2 0.1536
3 0.0256
4 0.0016
```

2. To find **cumulative (tail) probabilities**, either $P(X \le k)$ or $P(X \ge k)$
Distributions →Discrete distributions → Binomial distribution → Binomial tail probabilities
Then fill in the values of k, n and p in the popup box, and which "tail" you want.
If you check "lower tail" the result will be $P(X \le k)$
However, if you check "upper tail" the results will be $P(X > k)$, not $P(X \ge k)$.
EXAMPLE: For $n = 4$ and $p = 0.2$, find the $P(X \le 1)$:
Distributions →Discrete distributions → Binomial distribution → Binomial tail probabilities
Fill in the popup box:
Variable value(s) = 1
Binomial trials = n = 4
Probability of success = p = 0.2
Lower tail
Result is:
```
[1] 0.8192
```
Notice that this is the sum from the table above of $P(X = 0) + P(X = 1) = .4096 + .4096 = .8192$.

EXAMPLE: For $n = 4$ and $p = 0.2$, find the $P(X \ge 2)$:
You have 2 choices:
Method 1: Use $1 - P(X \le 1)$, which we found in the previous example.
You will need to subtract the results from 1, since you have just found $P(X \le 1)$
So $P(X \ge 2) = 1 - P(X \le 1) = 1 - .8192 = .1808$.

Method 2: Note that $P(X \ge 2) = P(X > 1)$, so follow instructions for Method 1, but use "upper tail". This will give you the answer directly – no need to subtract from 1. Here is the result:
```
[1] 0.1808
```

In general, note that $P(X \ge k) = 1 - P(X \le k - 1) = P(X > k - 1)$.