



## 13. TECHNOLOGY CORNER

# BINOMIAL PROBABILITY ON THE CALCULATOR

TI-Nspire instructions in Appendix B; HP Prime instructions on the book's Web site.

There are two handy commands on the TI-89 for finding binomial probabilities: `binompdf` and `binomcdf`. The inputs for both commands are the number of trials  $n$ , the success probability  $p$ , and the values of interest for the binomial random variable  $X$ .

`binompdf(n, p, k)` computes  $P(X = k)$

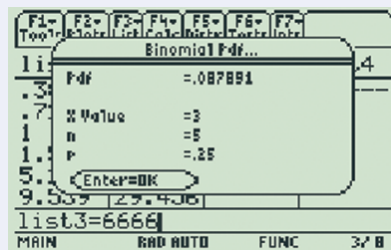
`binomcdf(n, p, k)` computes  $P(X \leq k)$

Let's use these commands to confirm our answers in the previous example.

- (a) Find the probability that exactly 3 of the children have type O blood.

### TI-89

- In the Stats/List Editor, Press **[F5]** (Distr) and choose Binomial Pdf.
- In the dialog box, enter these values: Num Trials,  $n:5$ , Prob Success,  $p:0.25$ , X value:3, and then choose **[ENTER]**.



These results agree with our previous answer using the binomial probability formula: 0.08789.

- (b) Should the parents be surprised if more than 3 of their children have type O blood?

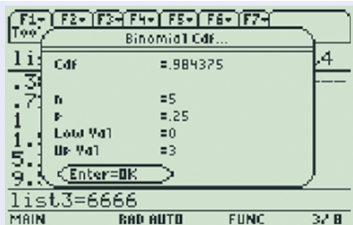
To find  $P(X > 3)$ , use the complement rule:

$$P(X > 3) = 1 - P(X \leq 3) = 1 - \text{binomcdf}(5, 0.25, 3)$$

- In the Stats/List Editor, Press **[F5]** (Distr) and choose Binomial Cdf....
- In the dialog box, enter these values: Num Trials,  $n:5$ , Prob Success,  $p:0.25$ , lower value:0, upper value:3 and then choose **[ENTER]**. Subtract this result from 1 to get the answer.

We could also have done the calculation for part (b) as

$$\begin{aligned}P(X > 3) &= P(X = 4) + P(X = 5) \\&= \text{binompdf}(5, 0.25, 4) + \\&\quad \text{binompdf}(5, 0.25, 5) \\&= 0.01465 + 0.00098 = 0.01563.\end{aligned}$$



Now we subtract from 1 to get the desired answer:  $1 - 0.984375 = 0.015625$ . This result agrees with our previous answer using the binomial probability formula: 0.01563.

**AP<sup>®</sup> EXAM TIP** Don't rely on "calculator speak" when showing your work on free-response questions. Writing  $\text{binompdf}(5, 0.25, 3) = 0.08789$  will *not* earn you full credit for a binomial probability calculation. At the very least, you must indicate what each of those calculator inputs represents. For example, "I used  $\text{binompdf}(\text{trials}:5, \text{p}:0.25, \text{x value}:3)$ ."