

Chapter 14 / Example 7

Calculating with the binomial distribution

Use of a table or graph when the number of trials is unknown.

A box contains a large number of carnations, $\frac{1}{4}$ of which are red. The rest are white. Carnations are picked at random from the box. How many carnations must be picked so that the probability that there is at least one red carnation among them is greater than 0.95?

Press **MENU** 7 **TABLE**. Press **F5** SET and change the settings so that the table starts from 0 and ends at 20.

Press **EXIT**.

Table Setting

X

Start:1

End:20

Step:1

Type $1 - (0.75)^x$ and press **EXE** to enter the first equation as Y1.

Table Func :Y=

Y1:1-0.75^x [—]

Y2: [—]

Y3: [—]

Y4: [—]

Y5: [—]

Y6: [—]

[SELECT] [DELETE] [TYPE] [STYLE] [SET] [TABLE]

Press **F6** TABLE.

A table of values is displayed. Scroll down the table using **▼**.

When $n = 10$, $P(X \geq 1) = 0.9436$

When $n = 11$, $P(X \geq 1) = 0.9577$

Hence at least 11 carnations must be picked out of the box to ensure that the probability that there is at least one red carnation among them is greater than 0.95.

X	Y1
9	0.9249
10	0.9436
11	0.9577
12	0.9683

11

[FORMULA] [DELETE] [ROW] [EDIT] [GPH-CON] [GPH-PLT]

To solve the problem graphically, you need to solve the equation $1 - (0.75)^n = 0.95$.

Press **EXIT** to display the equation entry screen.

Type 0.95 in the second equation Y2 and press **EXE**.

Table Func :Y=

Y1:1-0.75^x [—]

Y2:0.95 [—]

Y3: [—]

Y4: [—]

Y5: [—]

Y6: [—]

[SELECT] [DELETE] [TYPE] [STYLE] [SET] [TABLE]

Press **MENU** 5 **GRAPH**

Press **SHIFT** **F3** V-WIN.

Set the axes to show $0 \leq x \leq 20$ and $0 \leq y \leq 1.2$

Press **EXIT** when you have finished.

View Window

Xmin:0

max:20

scale:1

dot:0.05291005

Ymin:0

max:1.2

[INITIAL] [TRIG] [STANDARD] [V-MEM] [SQUARE]

Chapter 14 / Example 7

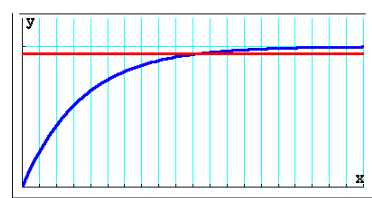
Calculating with the binomial distribution

Press **F6** DRAW to display the graph screen.

The GDC now displays both straight-line graphs:

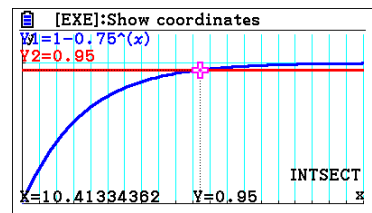
$$f2(x) = 1 - (0.75)^x$$

$$f3(x) = 0.95$$



To find the intersection press **F5** G-SOLV **F5** INTSECT.

Press **EXE** to display the coordinates.



Press **EXIT** to leave G-Solv mode and **F6** DRAW to display the graph screen again.

The GDC displays the intersection of the two straight lines at the point (10.4, 0.95)

So $1 - (0.75)^n > 0.95$ when $n > 10.4$

Hence at least 11 carnations must be picked out of the box to ensure that the probability that there is at least one red carnation among them is greater than 0.95.

