Chapter 14 / **Example 7**

Calculating with the binomial distribution

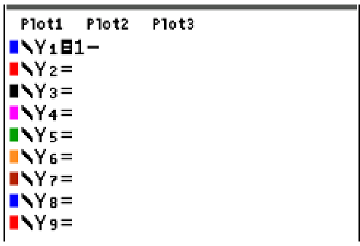
Use of a table or graph when the number of trials is unknown.

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 [f1] [y=] to display the equation entry screen.

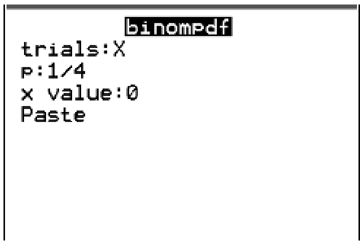
Type $1 -$ in the first equation as Y_1.



Press [2nd] [vars] ([distr])A:binompdf...

Enter X as the number of trials, $\frac{1}{4}$ as the probability of success (type 1 [÷] 4) and 0 as the X value.

Navigate down to Paste and press [enter].

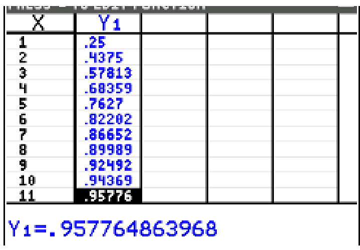


Press [2nd] [f5] ([table])

When $n = 10$, $P(X \geq 1) = 0.94368$

When $n = 11$, $P(X \geq 1) = 0.95776$

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.

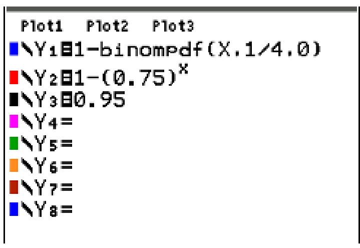


To solve the problem graphically, you need to solve the equation $1-(0.75)^n = 0.95$.

Press [f1] [y=] to display the equation entry screen.

Type $1-(0.75)^x$ in the second equation Y_2 and press [enter].

Type 0.95 in the third equation Y_3 and press [enter].



Chapter 14 / **Example 7**

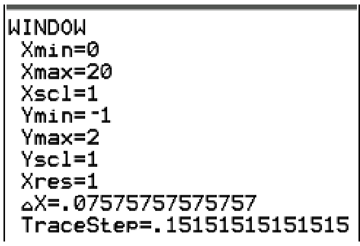
Calculating with the binomial distribution

Press [f2] [window]

Set the axes to show $0 \le x \le 20$ and $-1 \le y \le 2$

You can leave the last three items as they are.

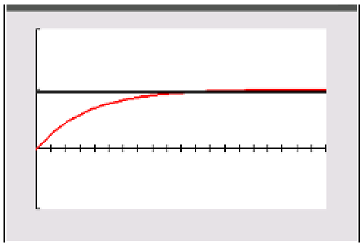
Press [f5] [graph] when you have finished.



The GDC now displays both straight-line graphs:

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

$f3(x) = 0.95$

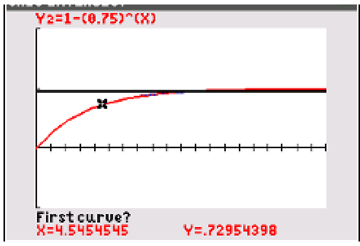


Press [2nd] [f4] [calc] 5:intersect

To find the intersection you need to choose the two lines that intersect.

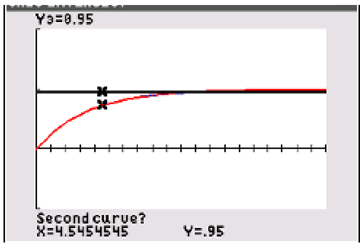
The GDC shows a cross on one of the lines and 'First curve?'.

Press [enter].



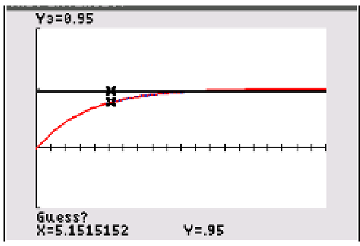
The GDC shows a cross on the other line and 'Second curve?'.

Press [enter].



The GDC requires an initial guess for the position of the intersection. Choose the default position.

Press [enter].



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.