Chapter 13 / **Example 7**

Calculating probabilities

Trains at a busy railway station are occasionally cancelled due to staff shortages, breakdowns, a lack of available trains and many other causes. Assume that there are on average 2.31 cancelled trains per day and that the number of cancelled trains C can be modelled by $C \sim \text{Po}(2.31)$.

a Find the probability that there will be 4 or more cancellations on a given day.

b Find the probability that there will be at least 81 cancellations in the month of March.

c Find, in two different ways, the probability that there are no cancellations in a working week of five days.

d In a working week of five days, find the probability that there will be 4 or more cancellations on exactly 3 of these days.

$C \sim Po(2.31)$. Find $\text{P}(C \geq 4)$.

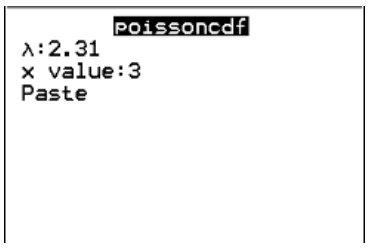
The Poisson CDF function on the TI-84 Plus C finds the probability that G is less or equal to the given value.

To find $\text{P}(C \geq 4)$ calculate $1 - \text{P}(C \leq 3)$.

Type 1 – and press 2nd vars ([distr]) D:poissoncdf(.

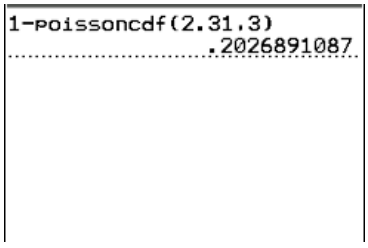
Enter 2.31 as λ and 3 as the x value.

Navigate down to Paste and press enter.



Press enter.

The GDC displays the solution $\text{P}(C \geq 4) = 0.203$.



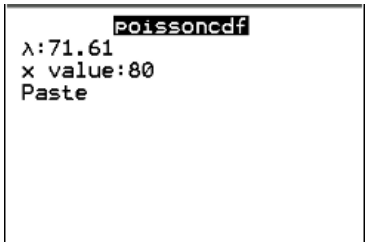
$M \sim Po(71.61)$. Find $\text{P}(M \geq 81)$.

To find $\text{P}(M \geq 81)$ calculate $1 - \text{P}(M \leq 80)$.

Type 1 – and press 2nd vars ([distr]) D:poissoncdf(.

Enter 71.61 as λ and 80 as the x value.

Navigate down to Paste and press enter.



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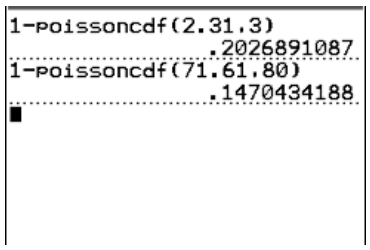
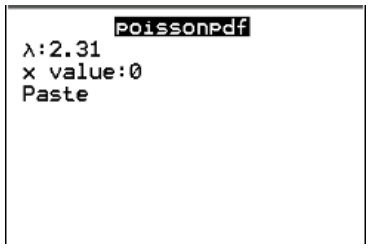
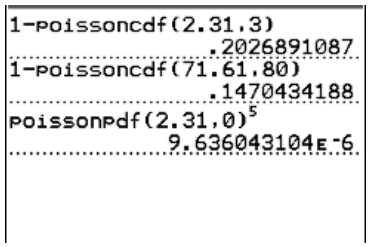
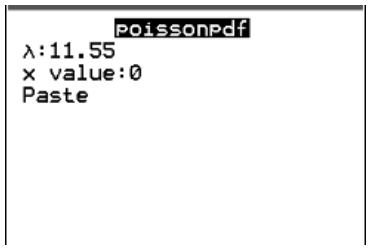
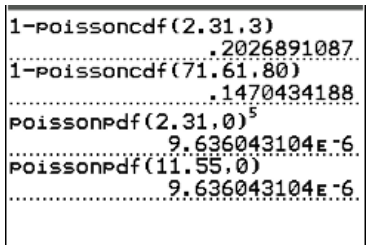
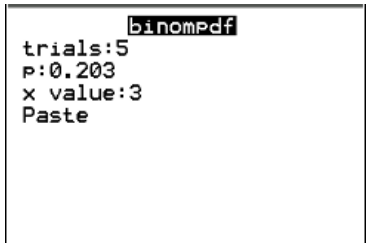
Press enter. The GDC displays the solution $\mathrm{P}(M \geq 81) = 0.147$.	
$C \sim Po(2.31)$. Find $(\mathrm{P}(C = 0))^5$. Press 2nd vars ([distr]) C:poissonpdf(. Enter 2.31 as λ and 0 as the x value. Navigate down to Paste and press enter.	
Type ^5 and press enter. The GDC displays the solution $(\mathrm{P}(C = 0))^5 = 0.00000964$.	
$W \sim Po(11.55)$. Find $\mathrm{P}(W = 0)$. Press 2nd vars ([distr]) C:poissonpdf(. Enter 11.55 as λ and 0 as the x value. Navigate down to Paste and press enter.	
Press enter. The GDC displays the solution $\mathrm{P}(W = 0) = 0.00000964$.	
$D \sim \mathrm{B}(5,\ 0.203)$. Find $\mathrm{P}(D = 3)$. Press 2nd vars ([distr]) A:binompdf(. Enter 5 as the number of trials, 0.203 as the probability of success and 3 as the x value. Navigate down to Paste and press enter.	

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Press enter. The GDC displays the solution $P(D = 3) = 0.0531$.