

Chapter 14 / **Example 3****Test for the mean of a Poisson distribution**

The number of cars passing a school between 1 pm and 1.30 pm on a weekday can be modelled by a Poisson distribution with a mean of 32. A set of traffic lights is installed at one end of the road and it is hoped this will reduce the number of cars that use the road. A teacher records the number of cars (X) that pass between 1 pm and 1.30 pm on five days during a school week.

- Find the critical region for a test at the 5% level.
- If the total number of cars is 140, state if there is there evidence at the 5% level that the number of cars has been reduced.
- Find the p -value for a test statistic of 140 cars and use it to verify your conclusion in part **b**.

$$H_0: \mu = 160, H_1: \mu < 160$$

$$X \sim Po(160) \text{ Find } P(X \leq r) \leq 0.05$$

Press $[F1]$ $[Y=]$ to display the equation entry screen.

Press $[2nd]$ $[VAR]$ $([DISTR])$ D:poissoncdf(

Enter 160 as the value of λ and X as the x value.

Navigate down to Paste and press $[ENTER]$.

```
Poissoncdf
λ:160
x value:X
Paste
```

Press $[2nd]$ $[F5]$ $([TABLE])$

```
Plot1 Plot2 Plot3
Y1=poissoncdf(160,X)
Y2=
Y3=
Y4=
Y5=
Y6=
Y7=
Y8=
Y9=
```

A table of values is displayed. Scroll down the table using \uparrow .

From the table, $P(X \leq 138) > 0.0421$ and $P(X \leq 139) > 0.0501$.

The critical region is $X \leq 138$

140 is not in the critical region so we do not reject the null hypothesis.

X	Y1			
134	.01971			
135	.02406			
136	.02919			
137	.03518			
138	.04212			
139	.05011			
140	.05924			
141	.06961			
142	.08128			
143	.09435			
144	.10886			

X=138

$$P(X \leq 140) = 0.0592$$

$0.0592 > 0.05$, so not significant. Therefore, there is insufficient evidence at the 5% level to reject H_0 .

X	Y1			
134	.01971			
135	.02406			
136	.02919			
137	.03518			
138	.04212			
139	.05011			
140	.05924			
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142	.08128			
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Y1=.059242984273

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