QUEEN MARY, UNIVERSITY OF LONDON

MTH 4106 Introduction to Statistics

Practical 6 14 February 2012

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1 (Plotting a probability mass function as a histogram) In Practical 4 we plotted the probability mass function of several discrete random variables. Sometimes a histogram gives a better visual impression. We can get this from Minitab by using

`Graph` → `Probability Distribution Plot...`

Choose the `View Single` option. Then choose the `Binomial` distribution and fill in the parameters `9` and `0.5`. Clicking on `OK` should give you a histogram of the probability mass function of the distribution $\text{Bin}(9, 0.5)$.

Append this graph to a **Report Pad** and then close the graph.

2 (Other discrete distributions) Use the same method to draw histograms for the other standard discrete distributions that we did in Practical 4:

- $\text{Geom}(0.1)$
- $\text{Hg}(9, 20, 40)$
- $\text{Poisson}(6)$
- $\text{Bin}(10, 0.6)$
- $\text{Bin}(20, 0.3)$
- $\text{Bin}(30, 0.2)$.

Close each one after copying it to your **Report Pad**. Remember to save your **Report Pad** frequently.

Which form of plot do you find clearer, the ones that you did in Practical 4 or these histograms?

3 (Several histograms on one graph) In Practical 4, we plotted the probability mass functions of the last three Binomial distributions on a single graph. Let's try to do the same thing for the histograms. Choose the option `Vary Parameters` and select `Binomial`. Fill in `Number of Trials:` as `10 20 30` with no punctuation between the numbers. Similarly, fill in `Event Probability:` as `0.6 0.3 0.2`

Click on `Multiple Graphs...` and choose to overlay the histograms all on one graph.

What does Minitab do? How many histograms has it made? How clearly can you see them?

Try this again, choosing to view them in separate panels of the same graph. Is this really what we want?

4 (Plotting a probability density function) Now we turn our attention to some continuous random variables. Suppose that X is a uniform random variable with support $[2, 10]$. Sketch the probability density function of X below. Remember to give the scale on both axes.

Now get Minitab to plot this by using

`Graph` → `Probability Distribution Plot...`

and choosing the appropriate options. Does the result look like your sketch? Did you get the scales right? Do you think that Minitab is drawing this correctly?

Copy this into your **Report Pad**.

5 (Exponential distributions) The other standard continuous distribution that we have met is the exponential one. Suppose that $X \sim \text{Exp}(\lambda)$. What is $\mathbb{E}(X)$?

Let f be the probability density function of X. Then $f(0)$ is not defined. Write down the formula for $f(x)$ when x is positive. What is the value of $f(x)$ when x is just slightly above 0?

When you use Minitab to plot the probability density function of an exponential random variable, it asks you for two parameters, the `Scale` and the `Threshold`. Put in a value of your choice for `Scale`, leave the `Threshold` as `0.0` and let Minitab draw the graph. How is the `Scale` related to the parameter λ?

6 (Several probability density functions on one graph) Now choose to vary the parameters, and plot several probability density functions of exponential random variables on a single graph. Give `Scale` the values `1.0` and `2.0`, and give `Threshold` the values `0` and `5`.

Look at the graph. Is it useful? Work out what the parameter `Threshold` does.

7 (Finishing the report) Copy the exponential graphs to your report, and edit it to explain what the `Scale` and `Threshold` parameters are. You may find it helpful to print the report and insert it in your lecture notes at an appropriate point.