

ASE-4046 Exercise 7 Solutions

Problem 1

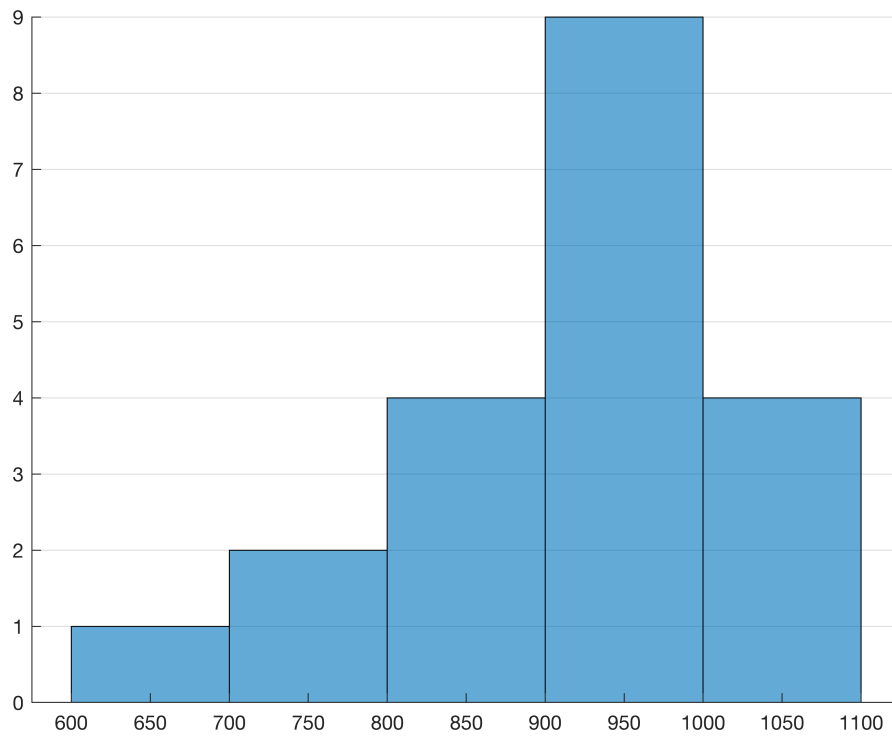
Part a

Frequency table made "by hand":

bin	#
[600,700)	1
[700,800)	2
[800,900)	4
[900,1000)	9
<u>[1000,1100)</u>	<u>4</u>
all	20

Check it with Matlab:

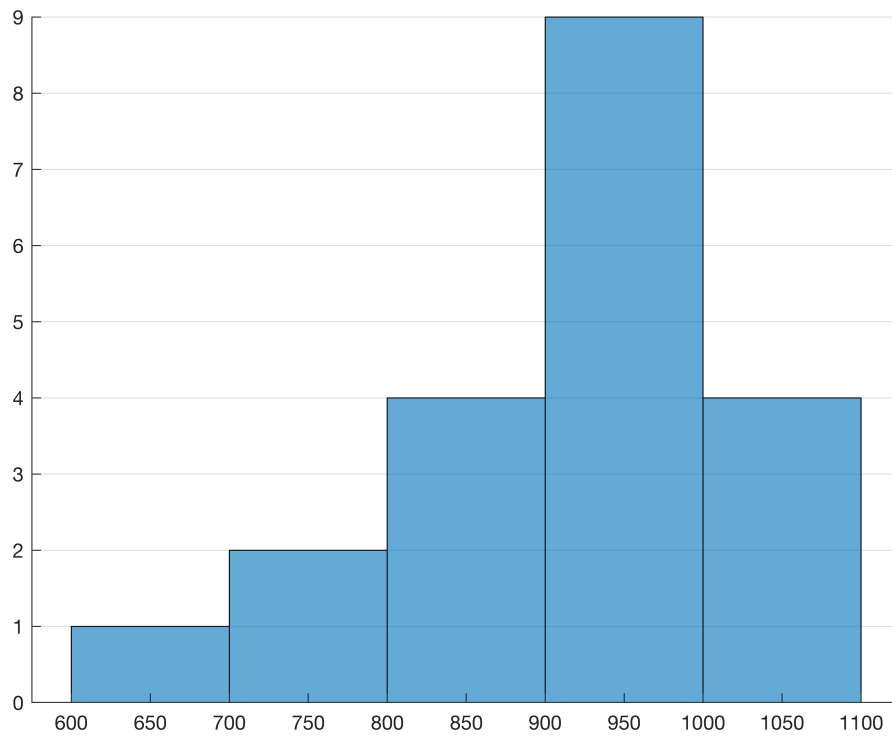
```
x1879=[850 900 930 950 980 1000 930 760 1000 960 ...  
       740 1070 850 980 880 980 650 810 1000 960];  
edges=600:100:1100;  
histogram(x1879,edges)  
set(gca,'box','off','ygrid','on')
```



Part b

Make the histogram with default bin edges:

```
histogram(x1879)  
set(gca, 'box', 'off', 'ygrid', 'on')
```

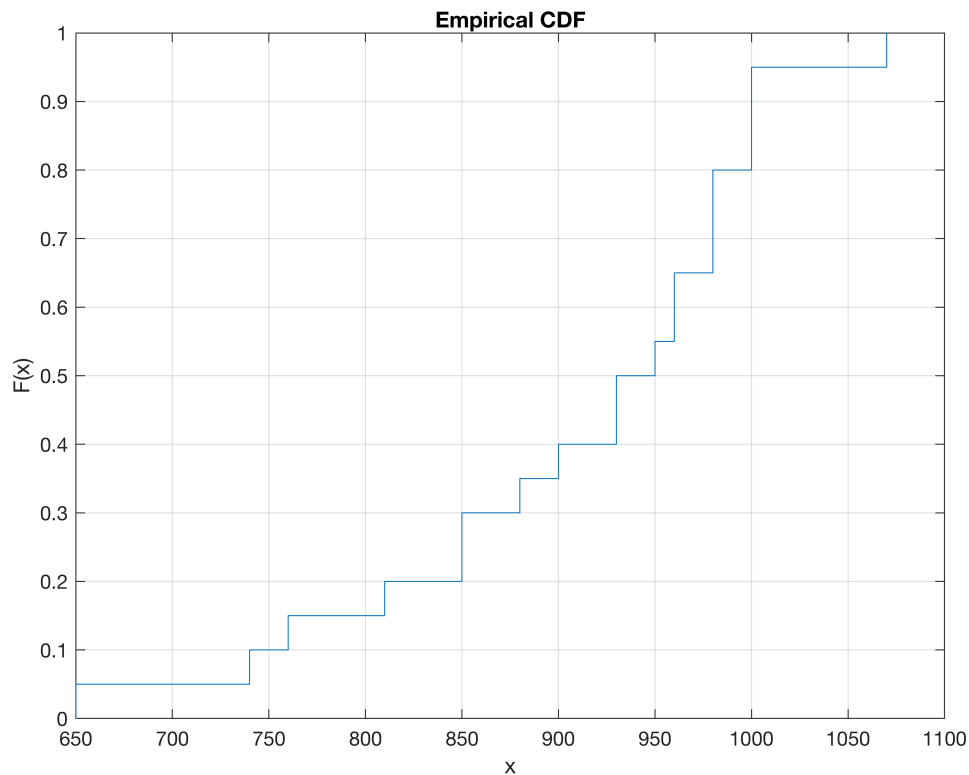


The bin edges are the same as in the part 1. The histogram shows that the distribution is unimodal and slightly skewed left (i.e. the left tail is longer).

Part c

Empirical cumulative distribution function

```
cdfplot(x1879)
```



The ECDF is equal to 0.5 on the interval [930,950). This is the "mathematical" median, i.e. the 0.5 quartile. The ECDF crosses 0.25 at 850 and 0.75 at 980; these are the first and third quartiles.

Part d

The quartiles as computed by Matlab are

```
q=quantile(x1879,[0.25 0.5 0.75])
```

```
q = 1×3
    850    940    980
```

The inlier range is

```
[q(1) q(3)]+[-1.5,1.5]*iqr(x1879)
```

```
ans = 1×2
    655    1175
```

There is one outlier, the point 650.

Part e

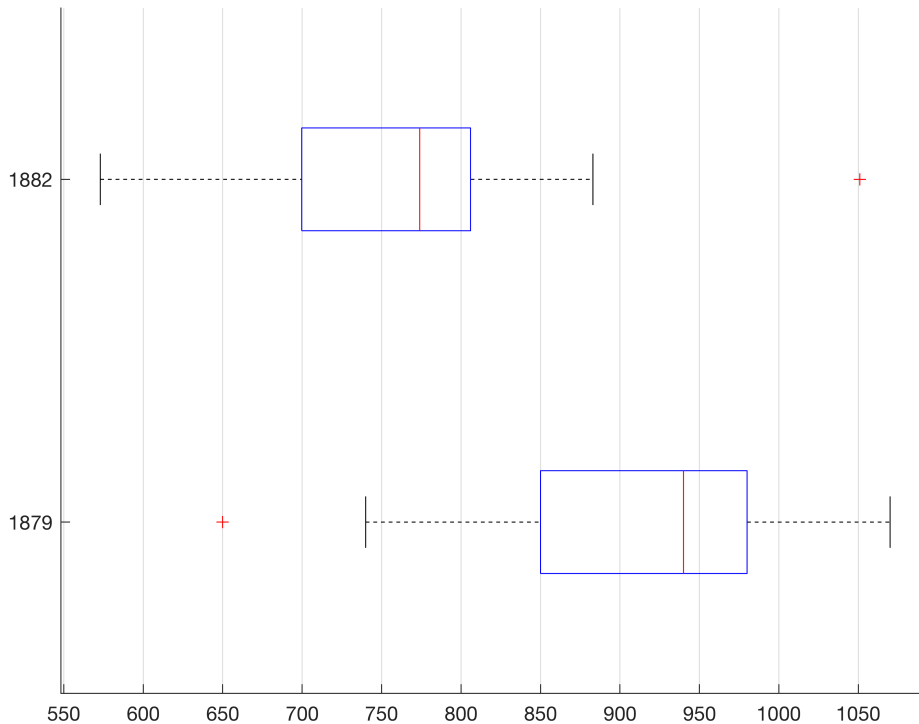
Box plots:

```
x1882=[883 778 682 611 1051 578 774 772 573 748 851 723 ...
```

```

816 796 711 599 781 796 820 696 748 797 809];
x=[x1879 x1882]; % concatenate data into a single vector
Batch=[1879*ones(size(x1879)) 1882*ones(size(x1882)) ]; % batch labels
boxplot(x,Batch,'orientation','horizontal')
set(gca,'box','off','xgrid','on')

```



The box plots indicate that both data sets are slightly left-skewed (the medians are off-centre in the IQR region).

The 1882 data values are smaller: the values differ so much that the IQR regions are clearly separated.

The 1882 data has a bit less spread:

```
iqr(x1879), iqr(x1882)
```

```

ans = 130
ans = 106.2500

```

Problem 2

First, produce the plot using default parameters.

```

a=[4 4 4 4]; b=[2 4 8 16];
x=0:.01:1;
clear p
for k=1:length(a)
    p(k,:)=betapdf(x,a(k),b(k));

```

```
end
h=plot(x,p); % save the figure handle
```

Adjust parameters using commands. Editing can also be done with the interactive Matlab figure editor, but a script is easier to modify and reuse.

```
set(gca, 'box', 'off', ... % remove the box (unnecessary ink)
'fontsize', 16, ... % increase font size for readability
'tickdir', 'out', ... % axis tick marks shouldn't collide with data
'xtick', 0:.1:1, ... % a denser tick spacing improves lookup possibility
'xticklabel', {'0', '', '', '', '', '', '', '', '', '1'}, ... % remove unnecessary tick labels
'ytick', 0:5, 'yticklabel', {'0', '', '', '', '5'}) % ditto for y ticks and their labels
set(h, 'linewidth', 3) % thicker curves
xlabel('\it x', 'fontsize', 20) % label the x-axis (italic)
ylabel(' {\it p}({\it x})', 'fontsize', 20, ... % label the y-axis
'rot', 0, 'horizontalAlignment', 'right') % rotate it to read left-to-right
legend('betapdf(x,4,2)', ... % legend labels the curves
' (x,4,4)', ... % avoid unnecessary repetition
' (x,4,8)', ...
' (x,4,16)', ...
'box', 'off') % remove the box (unnecessary ink)
```

