

# Display Data in Box Plots

複習：教材 12 有提到如何求

1. 第 1 四分位數(Q1)

The **lower quartile** is the median of the lower half of the data set.

2. 第 3 四分位數(Q3)

The **upper quartile** is the median of the upper half of the data set.

**盒狀圖**是使用中位數、四分位數、最小值和最大值顯示數據分佈方式的圖形。

A **box plot** is a graph that shows how data are distributed by using the median, quartiles, the least value and the greatest value.

**盒狀圖**可以直觀地顯示數值數據和偏度的分佈。

A box plot visually shows the distribution of numerical data and skewness.

當數據為奇數個時：

利用教材 12 的例子來畫盒狀圖

Consider the prices for jackets: \$120, \$300, \$540, \$550, \$690, \$400, \$850.

Goal: Find the median, the lower quartile, and the upper quartile of the prices.

- A. Explain how to find the median, then find the median

Order the prices from least to greatest: \$120, \$300, \$400, \$540, \$550, \$690, \$850.

Identify the middle number or find the mean of the two middle numbers.

The median is \$540.

- B. The lower quartile is the median of the lower half of the data set or data to the left of the median. What is the lower half of the data? What is the lower quartile?

The lower half of the data is \$120, \$300, \$400.

The low quartile is \$300.

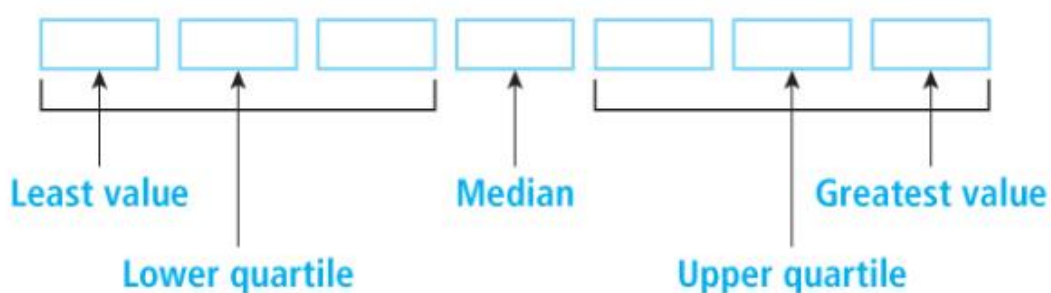
- C. The upper quartile is the median of the upper half of the data set or data to the right of the median. What is the upper half of the data? What is the upper quartile?

The upper half of the data is \$550, \$690, \$850.

The upper quartile is \$690.

- D. 在下列的格子中依序填寫價格。

You can do Parts A to C by using the following display. Fill in the boxes with the prices in order from least to greatest.

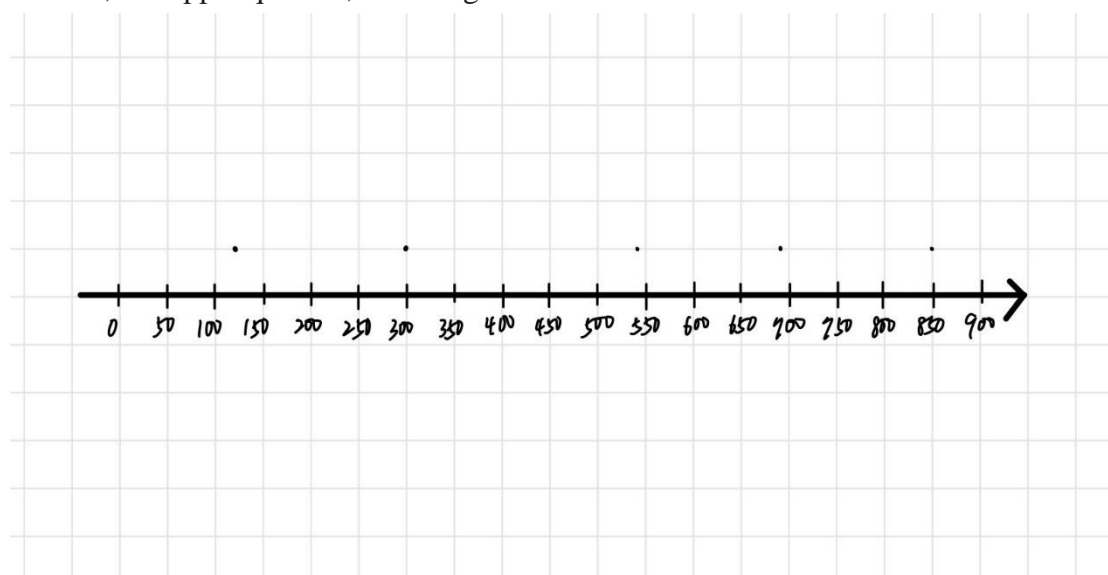


- E. 在數線上方繪製盒狀圖。

Draw the box plot above the number line.

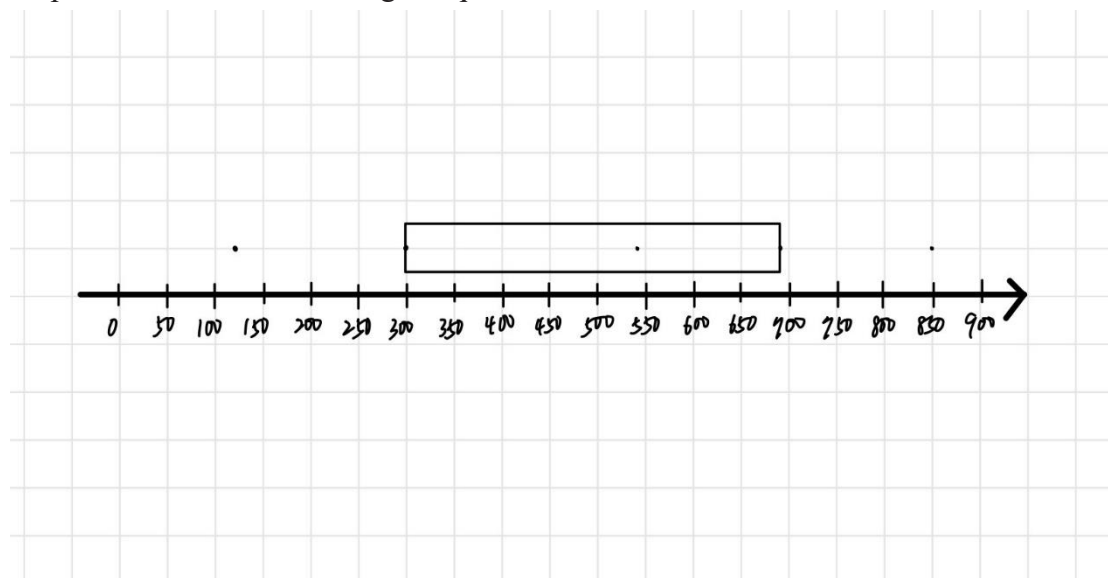
步驟 1. 首先在最小值、第 1 四分位數、中位數、第 3 四分位數和最大值的數字上方畫點。

Step 1. Start by putting dots above the least value, the lower quartile, the median, the upper quartile, and the greatest value.



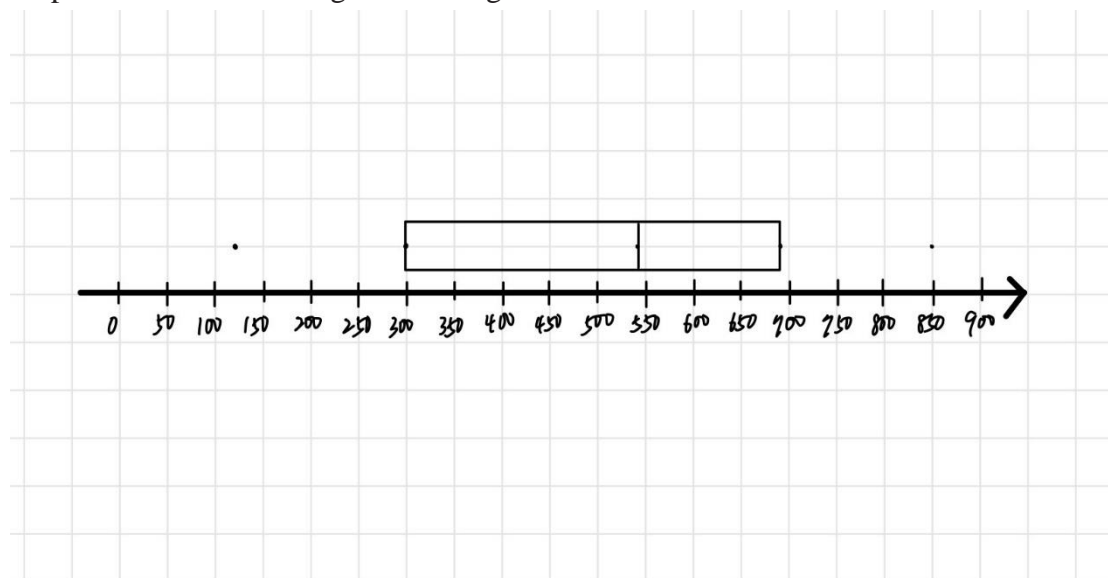
步驟 2. 繪製盒子以連接第 1 四分位數和第 3 四分位數。

Step2. Draw a box connecting the quartiles.



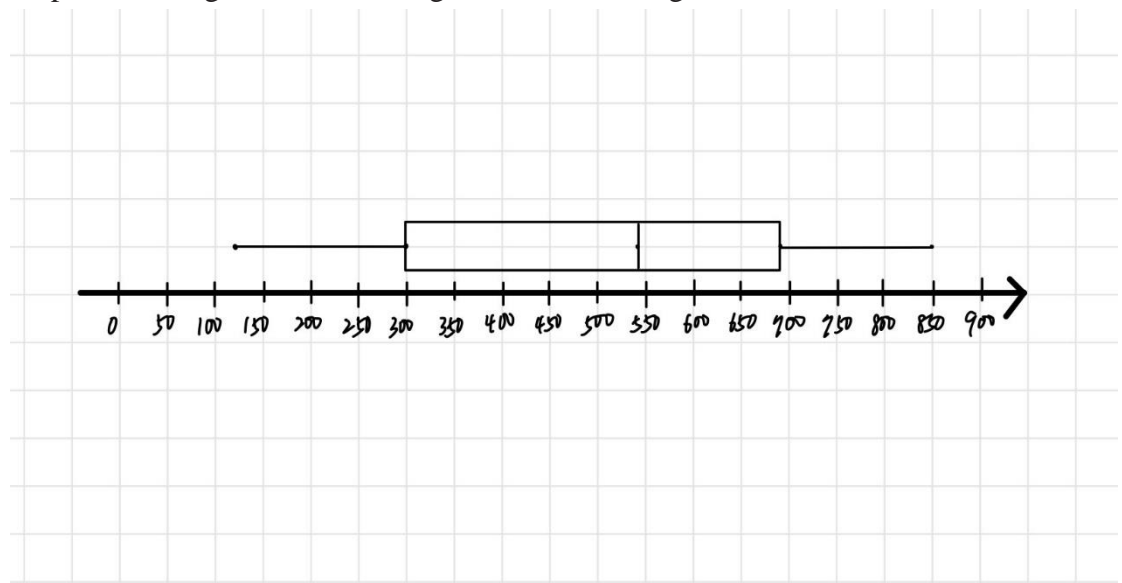
步驟 3. 在中位數畫一條垂直線。

Step3. Draw a vertical segment through the median.



步驟 4. 繪製將最小值和最大值連接到四分位數的線段。

Step4. Draw segments connecting the least and the greatest values to the box.



(步驟 5. 台灣課本有些還會在最大值以及最小值各畫一條直線

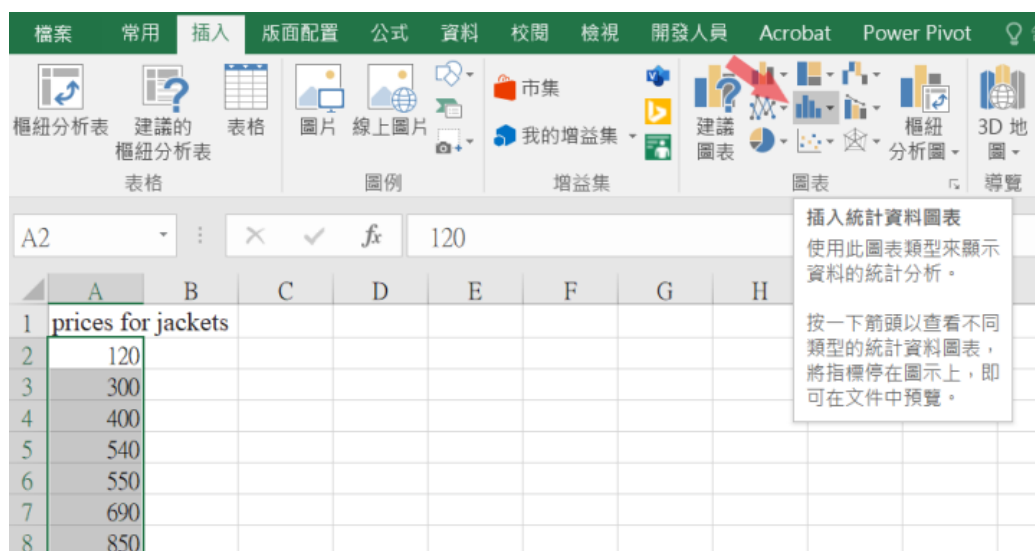
Step5. draw two vertical segments through the greatest value and the least value.)

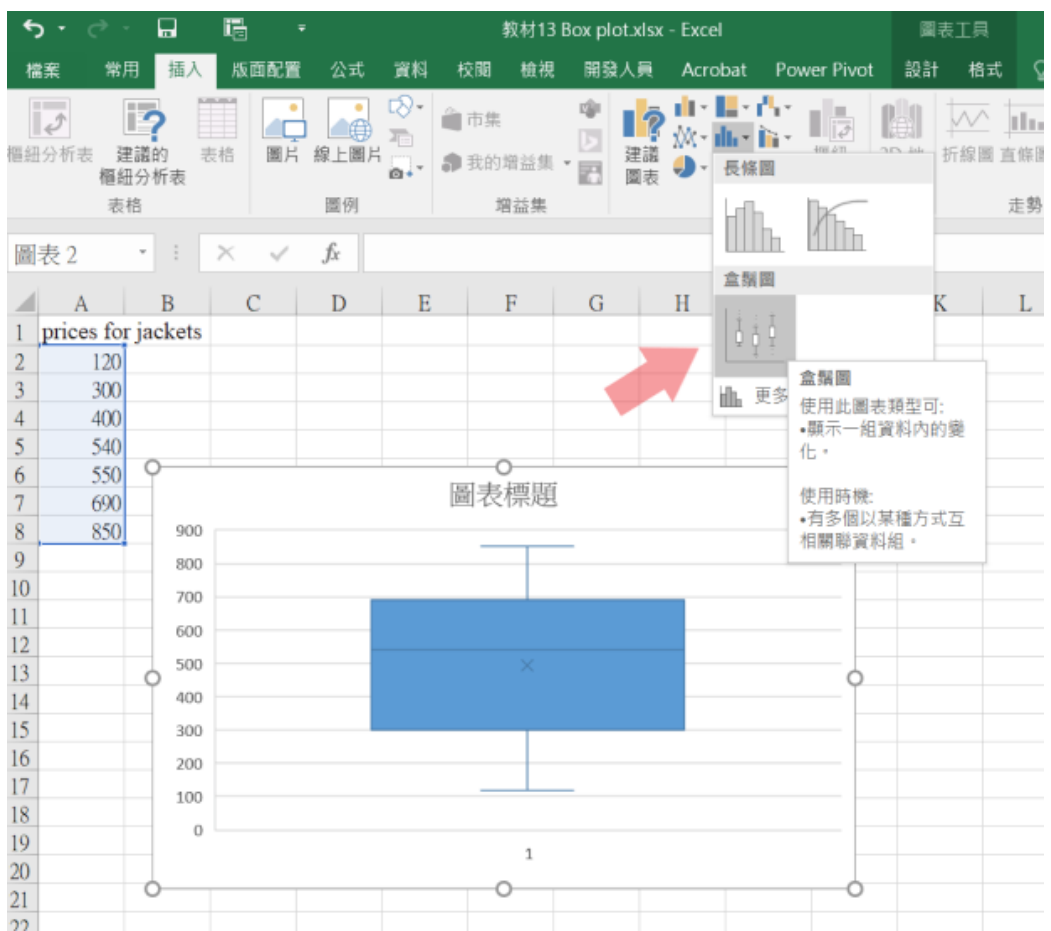
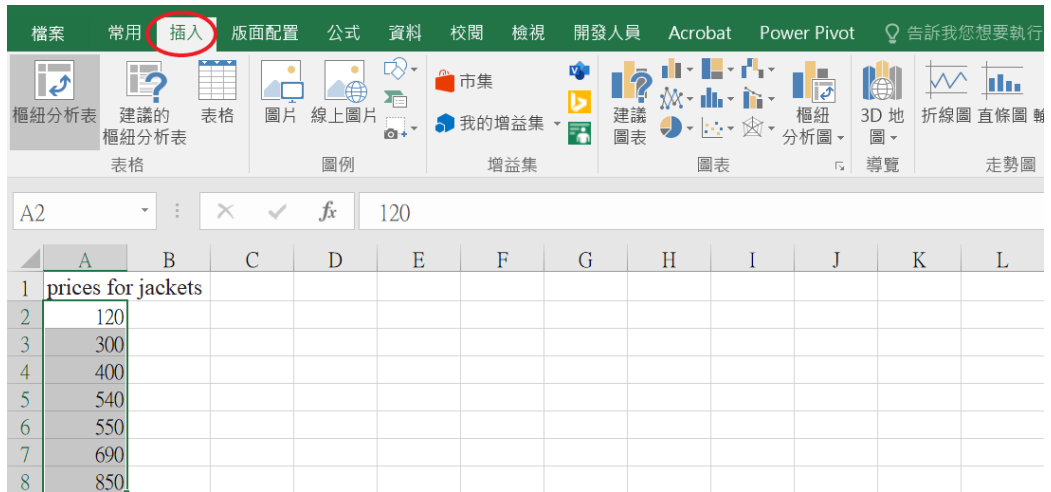
如何在 Excel 中創建盒狀圖(盒鬚圖)：

1. 在 Excel 中選擇你的數據——單個或多個數據。
2. 在功能區欄上，選擇**插入**。
3. 選擇**插入統計圖表**
4. 選擇**盒鬚圖**。

To create a box plot in Excel:

1. Select your data in your Excel workbook—either a single or multiple data series.
2. On the ribbon bar, click the Insert tab.
3. Click Insert Statistical Chart
4. Click Box and Whisker.





備註：x 為平均數

當數據為偶數個時：

The salaries of Sam's classmates are: \$27500, \$27500, \$28000, \$34000, \$28000, \$25000, \$29000, \$60000, \$32000, and \$110000

A. Explain how to find the median, then find the median

Order the prices from least to greatest: \$25000, \$27500, \$27500, \$28000, \$28000, \$29000, \$32000, \$34000, \$60000, and \$110000.

Identify the middle number or find the mean of the two middle numbers.

The median is \$28500.  $\left(\frac{28000+29000}{2}\right)$

B. The lower quartile is the median of the lower half of the data set or data to the left of the median. What is the lower half of the data? What is the lower quartile?

The lower half of the data is \$25000, \$27500, \$27500, \$28000, \$28000.

The low quartile is \$27500.

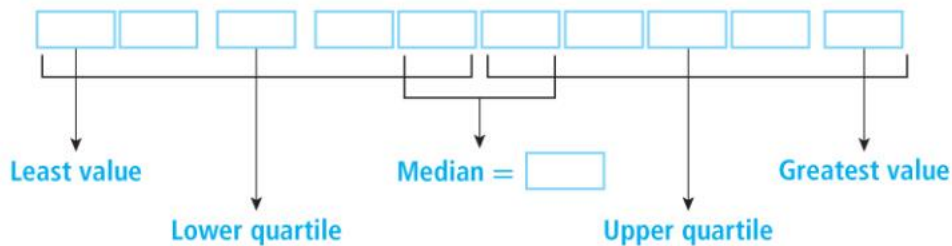
C. The upper quartile is the median of the upper half of the data set or data to the right of the median. What is the upper half of the data? What is the upper quartile?

The upper half of the data is \$29000, \$32000, \$34000, \$60000, \$110000.

The upper quartile is \$34000.

D. 在下列的格子中依序填寫薪水。

You can do Parts A to C by using the following display. Fill in the boxes with the prices in order from least to greatest.



E. 在數線上方繪製盒狀圖。

Draw the box plot above the number line.

步驟 1. 首先在最小值、第 1 四分位數、中位數、第 3 四分位數和最大值的數字上方畫點。

Step1. Start by putting dots above the least value, the lower quartile, the median, the upper quartile, and the greatest value.

步驟 2. 繪製盒子以連接第 1 四分位數和第 3 四分位數。

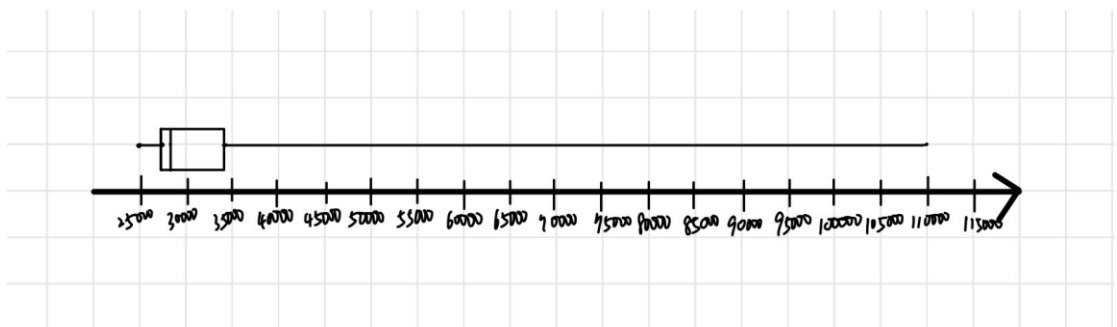
Step2. Draw a box connecting the quartiles.

步驟 3. 在中位數畫一條垂直線。

Step3. Draw a vertical segment through the median.

步驟 4. 繪製將最小值和最大值連接到四分位數的線段。

Step4. Draw segments connecting the least and the greatest values to the box.



(步驟 5. 台灣課本有些還會在最大值以及最小值各畫一條直線








Step5. draw two vertical segments through the greatest value and the least value.)

透過這個盒狀圖除了可以看到最小值、最大值、第一四分位數、中位數及第三四分位數，還能看到中間 50% 的數據皆位於 27,500 到 34,000 之間，甚至可以明顯看出至少有 75% 的數據皆集中在 35,000 以下。對於非常大量的數據，**盒狀圖**可以直觀地顯示數值數據分散情況和偏度的分佈。

Through this box plot, you can not only see the least value, the greatest value, lower quartile, median, and upper quartile, but also observe that the middle 50% of the data is between 27,500 and 34,000. It is even apparent that at least 75% of the data is concentrated below 35,000. For a large amount of data, box plots visually show the distribution of numerical data and skewness.



## Example

Day	Conditions	
	Temperature	Weather
Tue 7 Mar	 26 / 13 °C	Sunny.
Wed 8 Mar	 27 / 13 °C	Sunny.
Thu 9 Mar	 26 / 14 °C	Sunny.
Fri 10 Mar	 28 / 17 °C	Sunny.
Sat 11 Mar	 28 / 19 °C	Afternoon clouds.
Sun 12 Mar	 29 / 17 °C	Cloudy.
Mon 13 Mar	 16 / 13 °C	Sprinkles early. Overcast.

The daily high temperatures for Taiwan, Taipei in March are 26, 27, 26, 28, 28, 29, and 16 degrees.

Make a box plot to display the data.

- Find the median, the lower and upper quartiles, the least value, and the greatest value. Start by ordering the data.
- On the number line, draw dots above the least value, the lower quartile, the median, the upper quartile, and the greatest value. Then draw a box and lines to complete the box plot.

## 參考資料來源

1. 111 國中數學翰林版課本
2. Into Math Advanced1
3. [How to Create and Interpret Box Plots in Excel - Statology](#)
4. [Taipei Extended Forecast with high and low temperatures](#)

☆老師們可以自己從中選擇以做出適合自己學生程度的學習單或是在課堂中適時補充這些英文。

製作者：康橋國際學校 陳怡伶