

# Basic Statistics

## Representing Data - Graphing

Learning, Teaching  
and Student Engagement

# Representing Data

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## Learning Intentions

Today we will understand:

- ▶ Graphics don't just report data they show **trends and patterns**
- ▶ The graphic used is determined by the types of data collected
- ▶ Pie charts, bar graphs, histograms, scatterplots



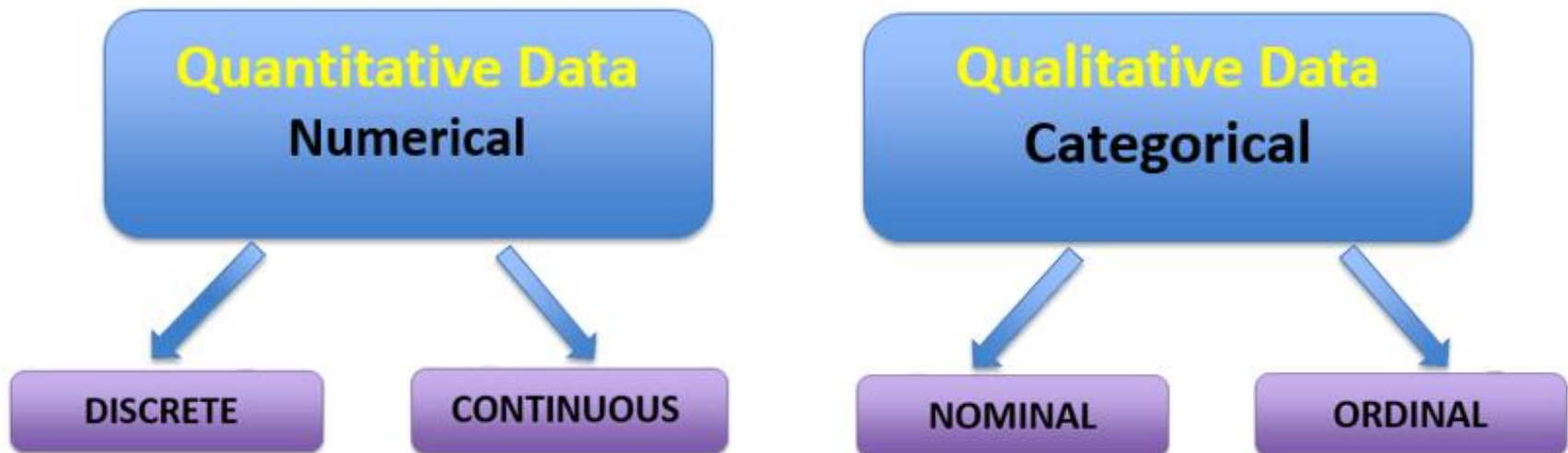
# Graphing

- ▶ Is an important way of **visually representing data**
- ▶ Provides a significant amount of information
- ▶ Moves from reporting data to showing **trends and patterns**
- ▶ Relationships are more easily identified in a graphic representation as compared to a table



# Graphing

- ▶ The graphic used is determined by the types of data collected
- ▶ Remember.....



# Graphing Categorical Variables

## Bar Graph

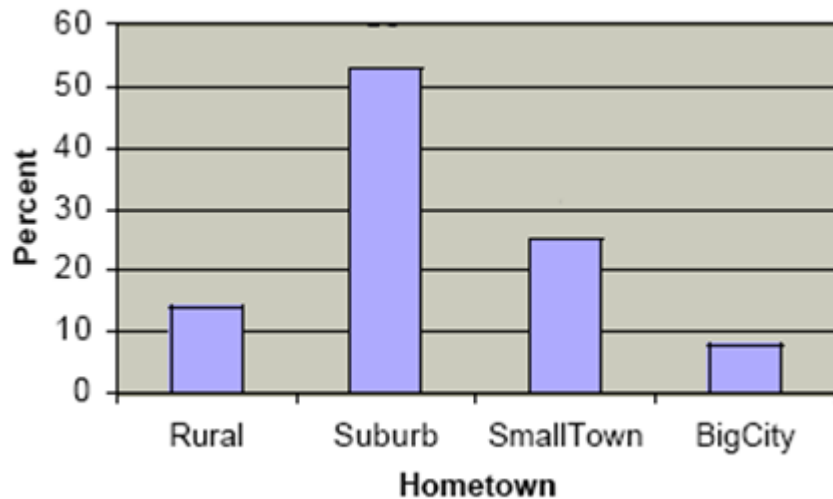


Figure 1. JCU student demographics

## Pie Chart

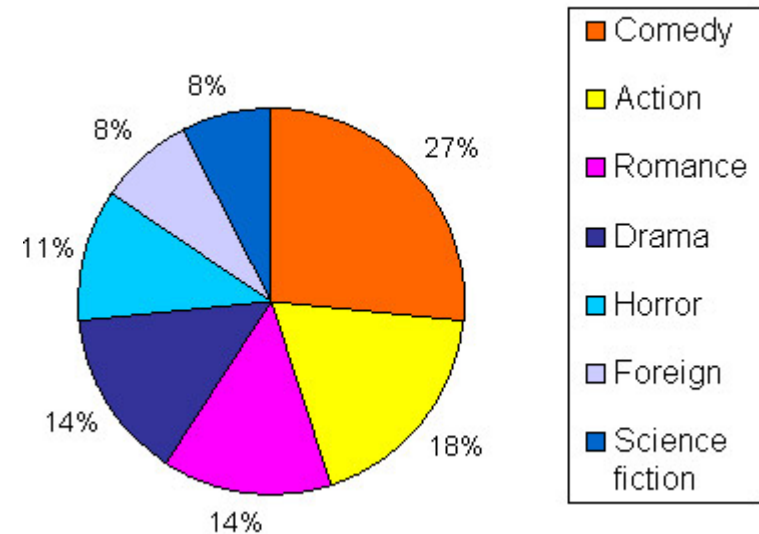
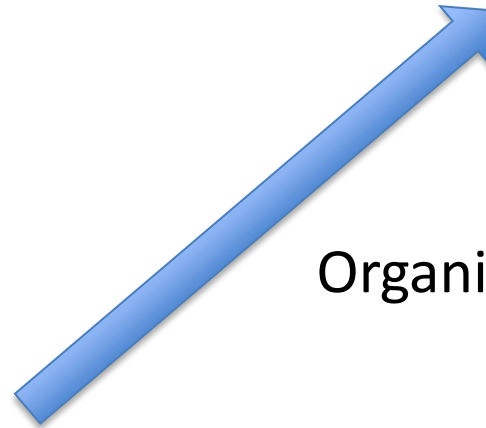


Figure 2. JCU students favourite movie genre

# Bar Graph

Date	Egg Colour
1 Oct	White
1 Oct	White
1 Oct	Dark Brown
1 Oct	White
1 Oct	Dark Brown
1 Oct	Blue
2 Oct	Dark Brown
2 Oct	Dark Brown
2 Oct	White
2 Oct	White
2 Oct	White
2 Oct	Light Brown

Egg Colour	Frequency
White	6
Dark brown	4
Blue	1
Light brown	1



Organise data

# Bar Graph

- ▶ Each category has its own bar with gaps between bars

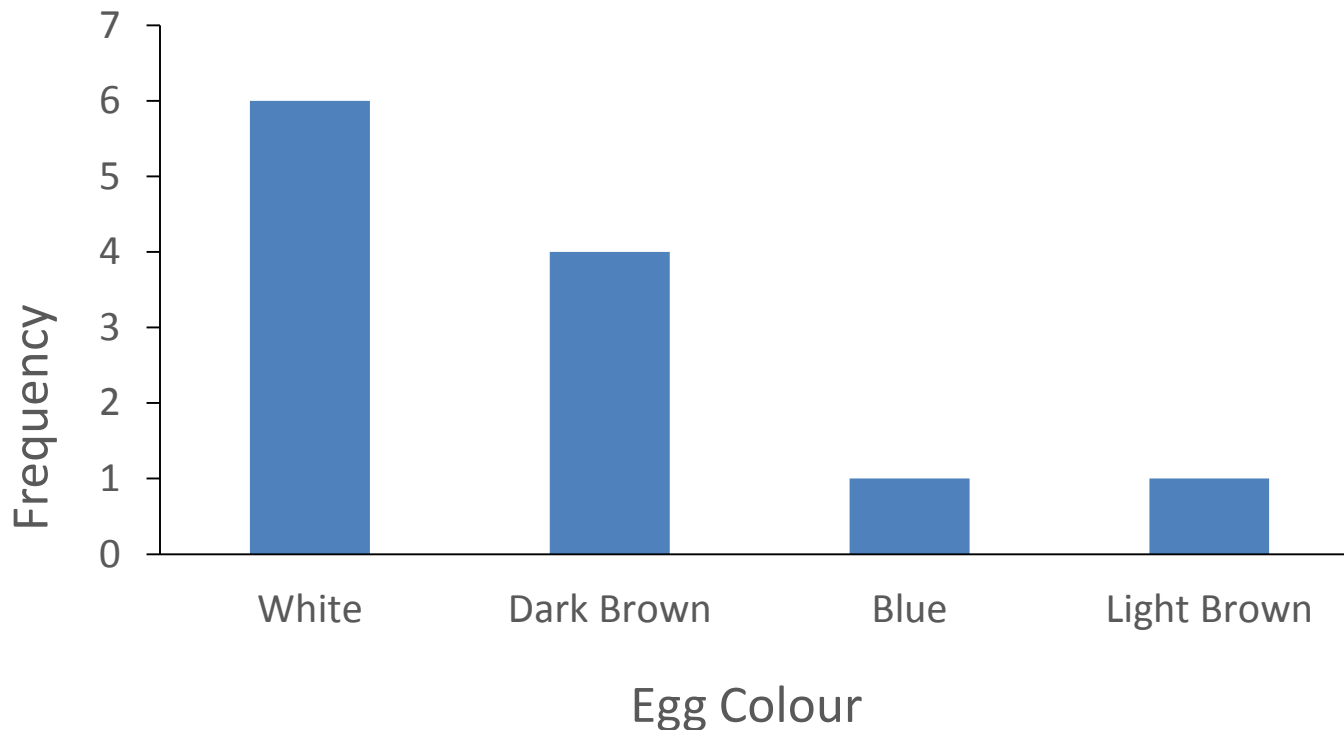


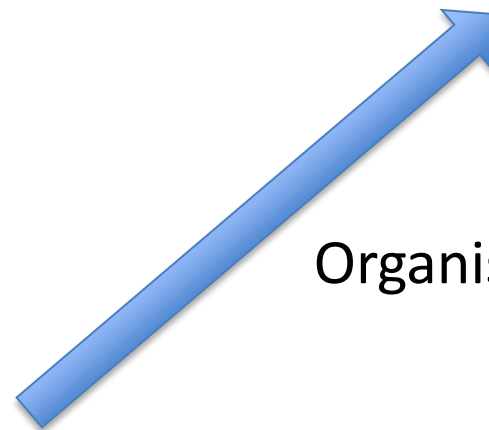
Figure 3. The colour of eggs laid during a two day period in October

# Bar Graph

- ▶ Column graphs can be combined to compare data

Date	Colour
1 March	Blue
1 March	Light Brown
1 March	Dark brown
1 March	Light Brown
1 March	Blue
1 March	Blue
2 March	Blue
2 March	Light Brown
2 March	White
2 March	Light Brown
2 March	Blue
2 March	Light brown

Egg Colour	Frequency
White	1
Dark brown	1
Blue	5
Light brown	5



Organise data



# Bar Graph

- ▶ Column graphs can be combined to compare data

Eggs Laid in October

Egg Colour	Frequency
White	6
Dark brown	4
Blue	1
Light brown	1

Eggs Laid in March

Egg Colour	Frequency
White	1
Dark brown	1
Blue	5
Light brown	5

# Bar Graph

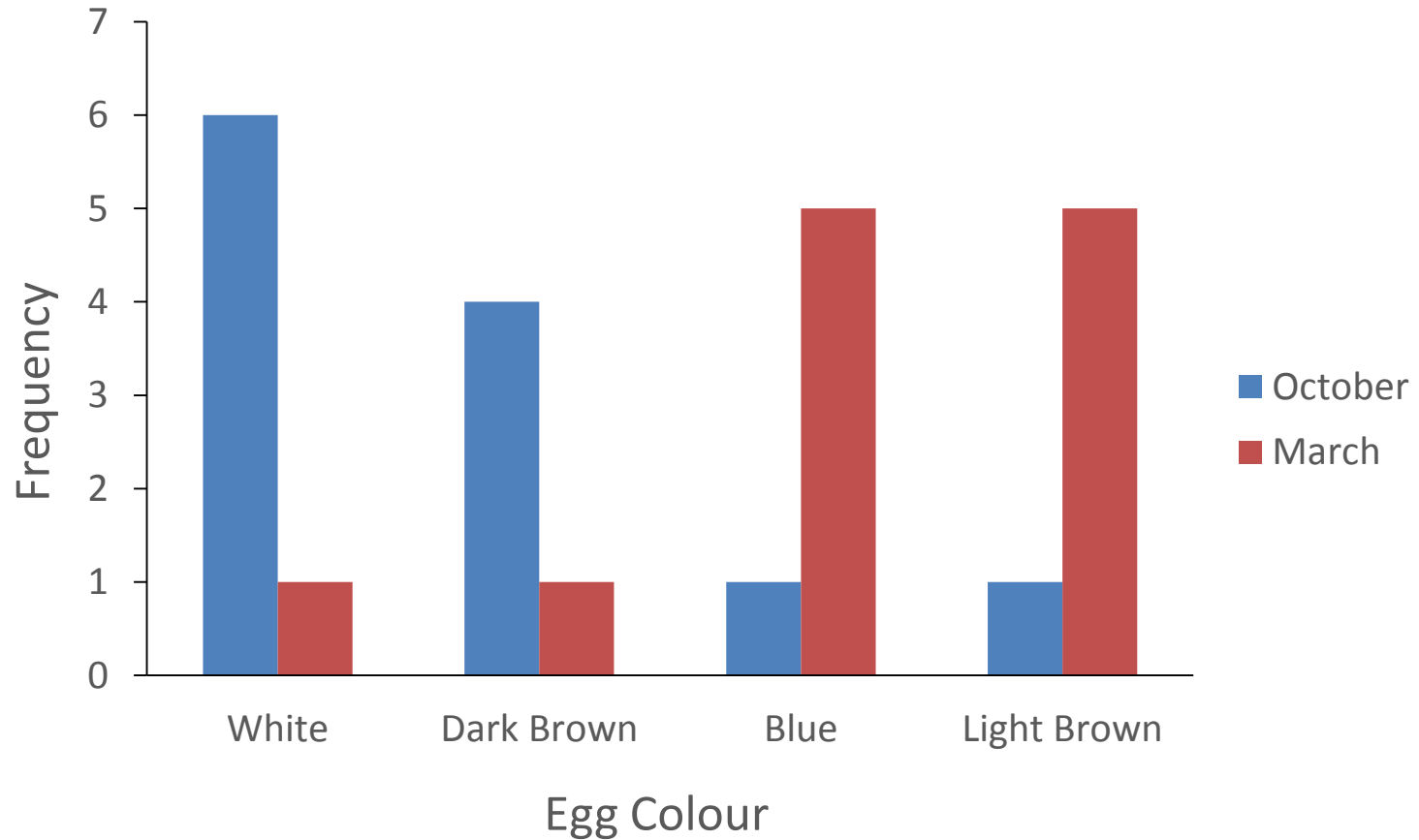


Figure 4. The colour of eggs laid during a two day period in October and March

# Pie Chart

- ▶ The area of the circle is proportional to the frequency

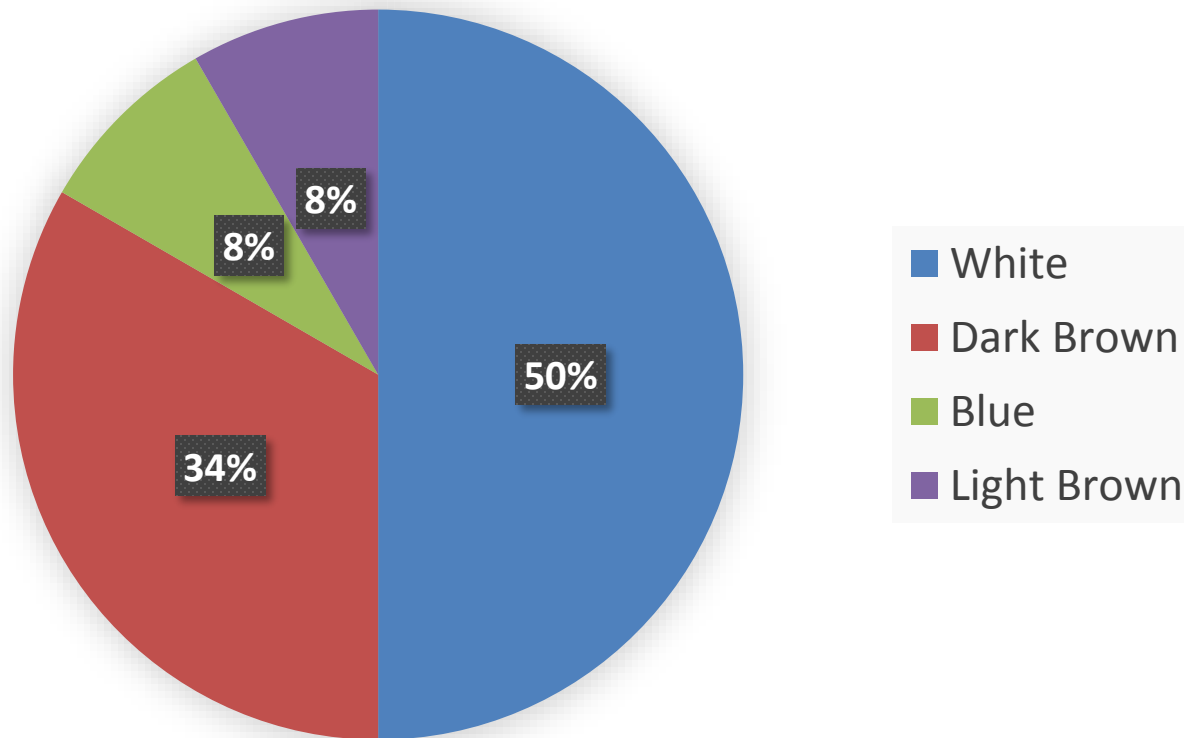


Figure 5. The colour of eggs laid during a two day period in October

# Pie Chart

- ▶ You cannot plot two variables on the same pie chart but you can compare two pie charts

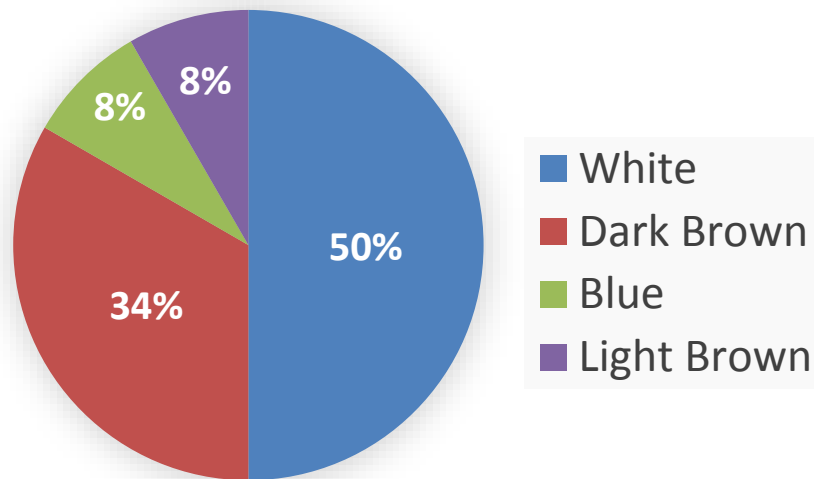


Figure 6. The colour of eggs laid during a two day period in October

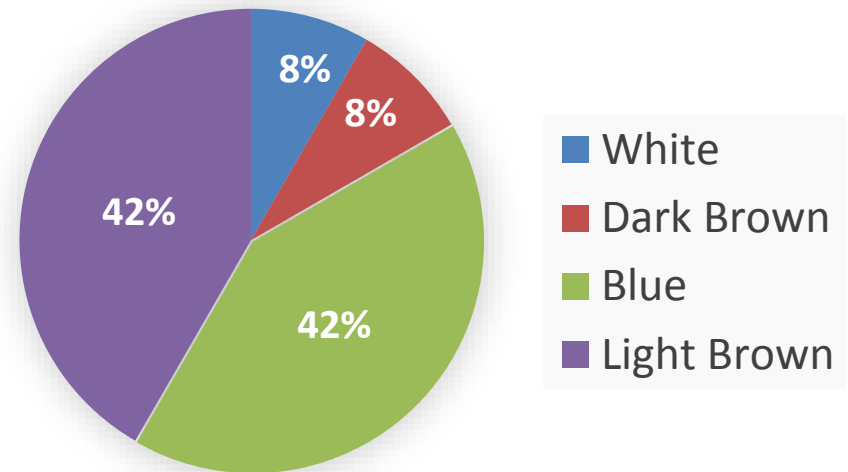
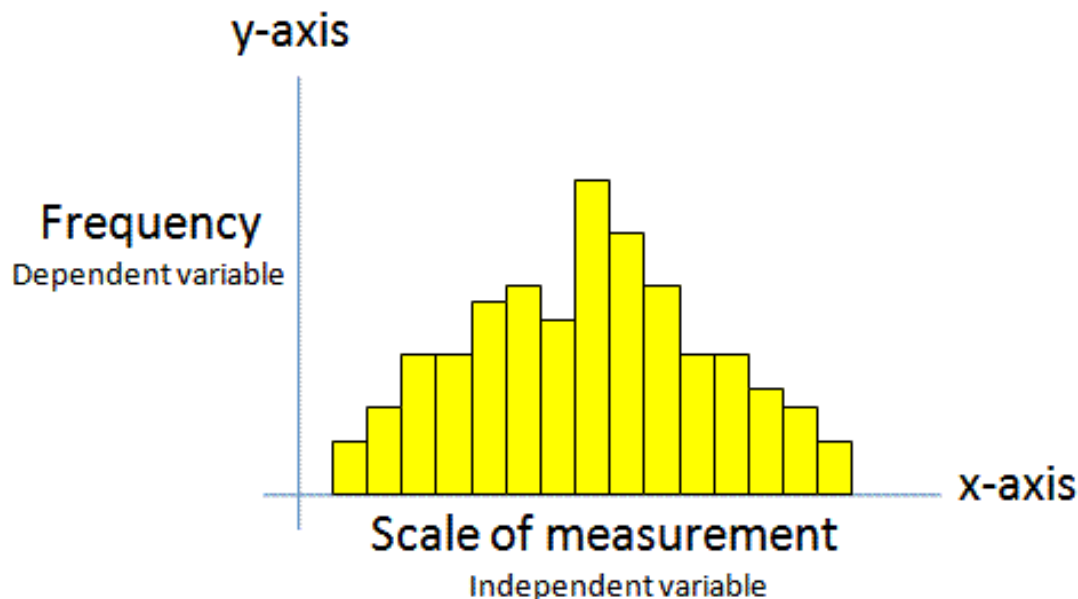


Figure 7. The colour of eggs laid during a two day period in March

# Histogram

- ▶ Visual display of frequencies
- ▶ **Quantitative** variable – **continuous** and/or **grouped**
- ▶ Shows distribution of all observations in dataset
- ▶ Describes shape, centre and spread of dataset



# Histogram

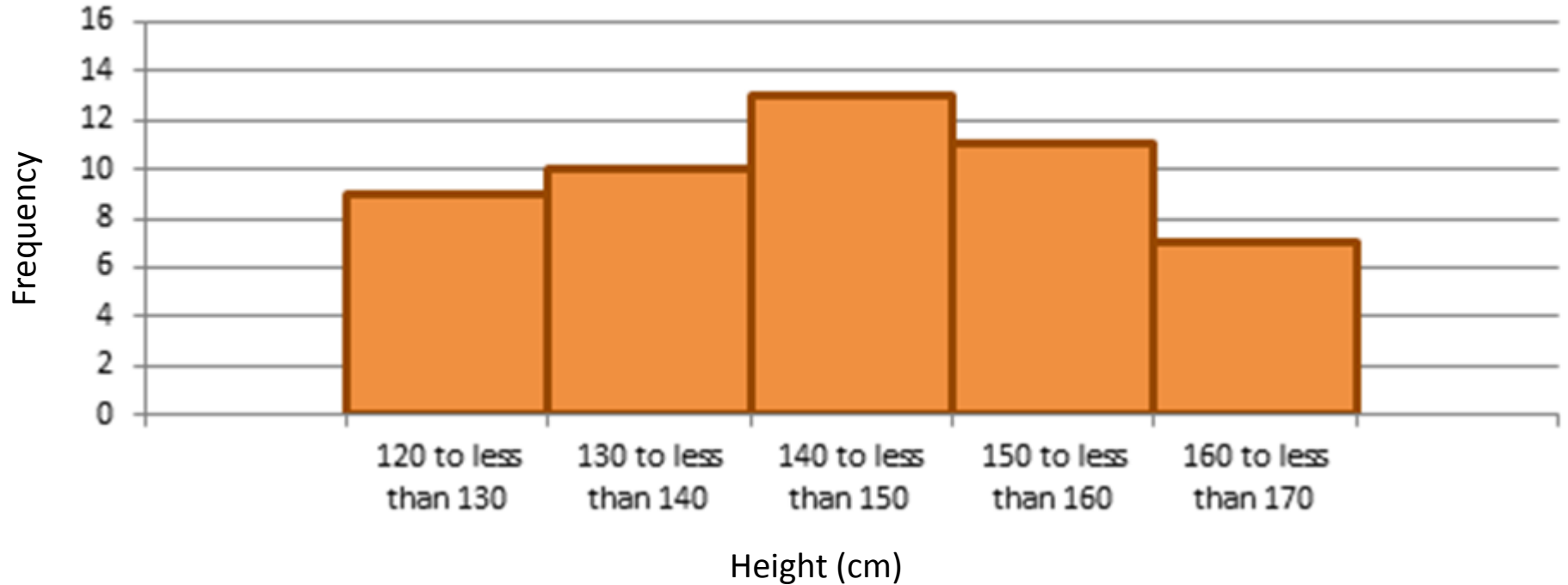


Figure 8. Distribution of children's height

# Histogram

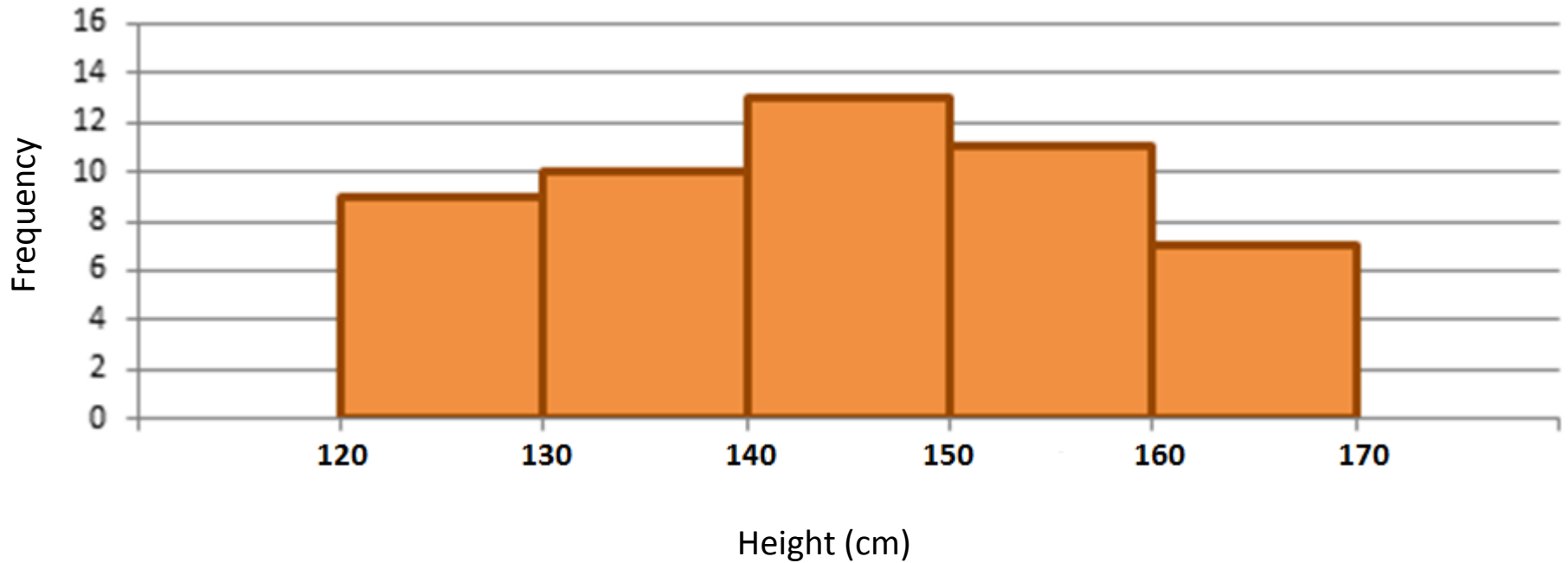


Figure 8. Distribution of children's height

# Histogram

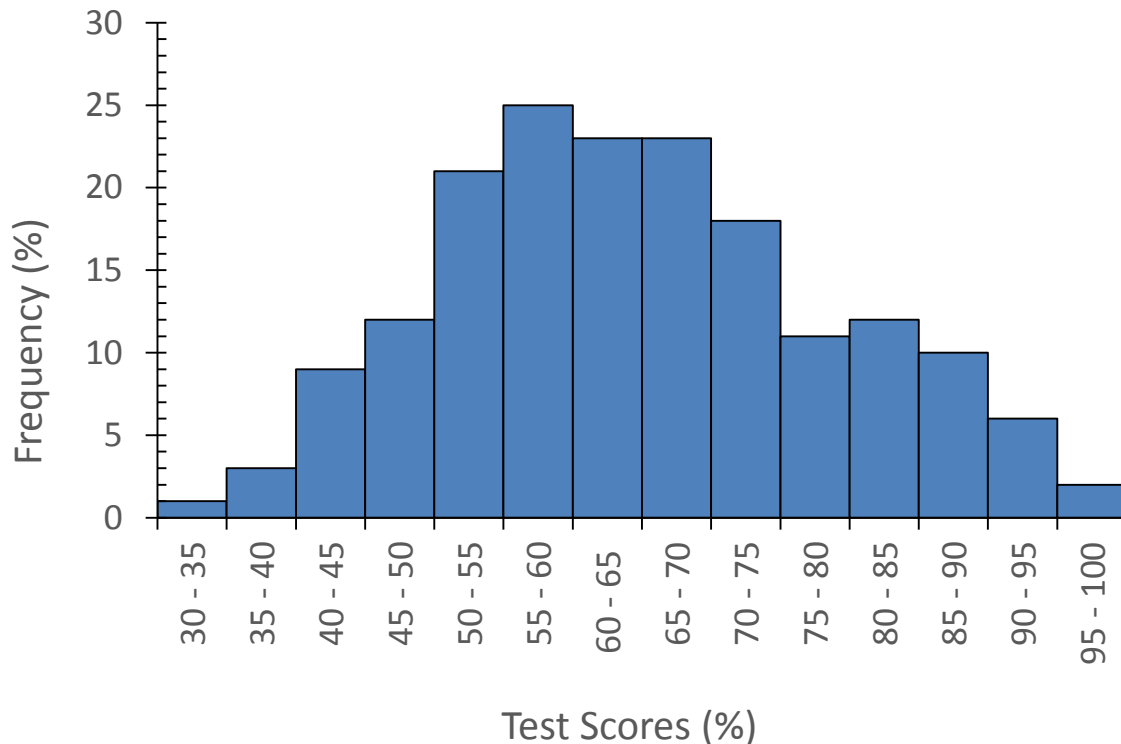


Figure 9. JCU students test scores

Frequency can also be expressed as a percentage of total observations.

Why is this not a good example of a histogram?

Which column would 50 go in?  
65? 60? 70?



# Scatterplot

- ▶ Show association between **two numerical** variables
- ▶ Data plotted as Cartesian (X,Y) coordinates
- ▶ Suggests relationships between variables

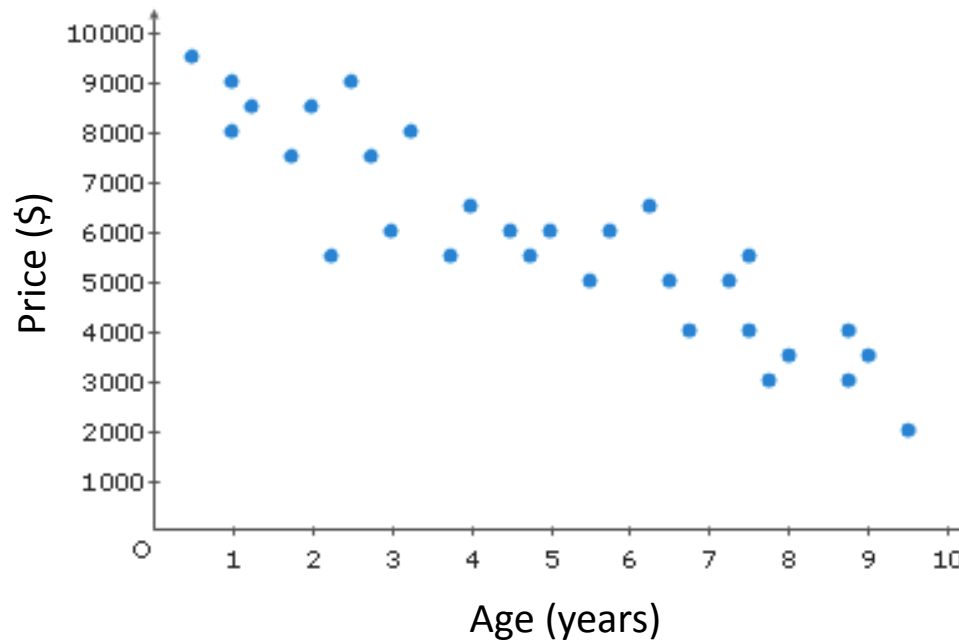


Figure 10. Car price according to age of the car

# Scatterplot

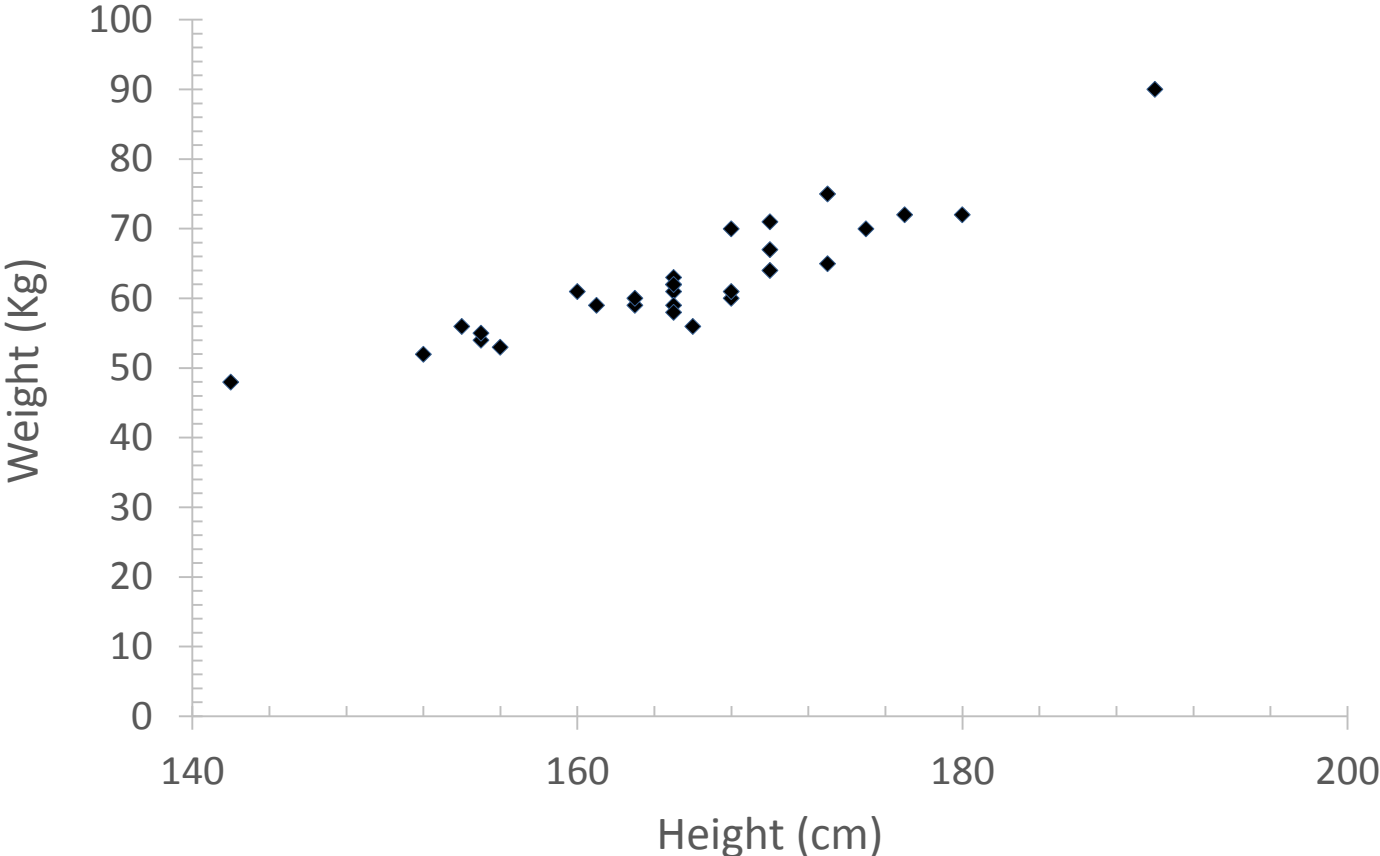


Figure 10. Height (cm) and weight (Kg) of JCU students

# Scatterplot

- ▶ Can show a “Trend Line” or “Line of Best Fit” on a scatterplot
- ▶ Quantifies the correlation

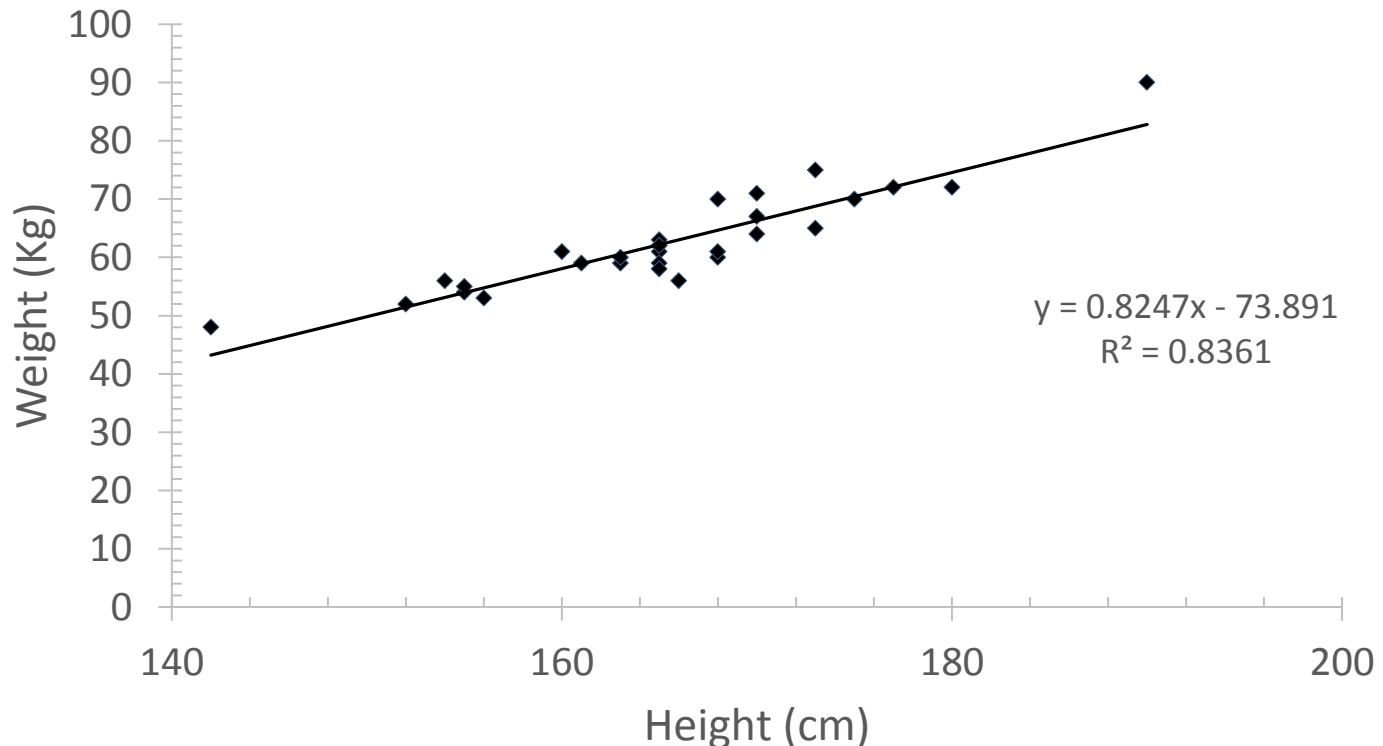
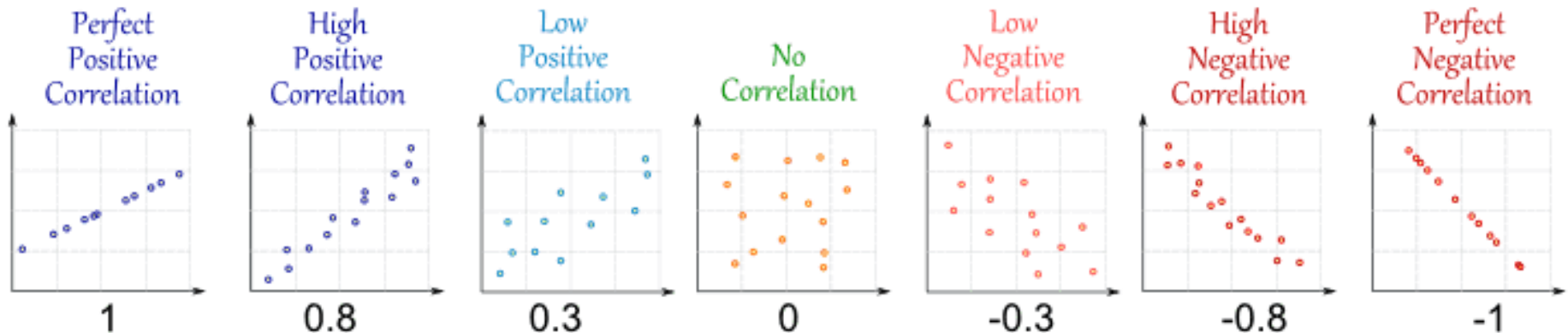


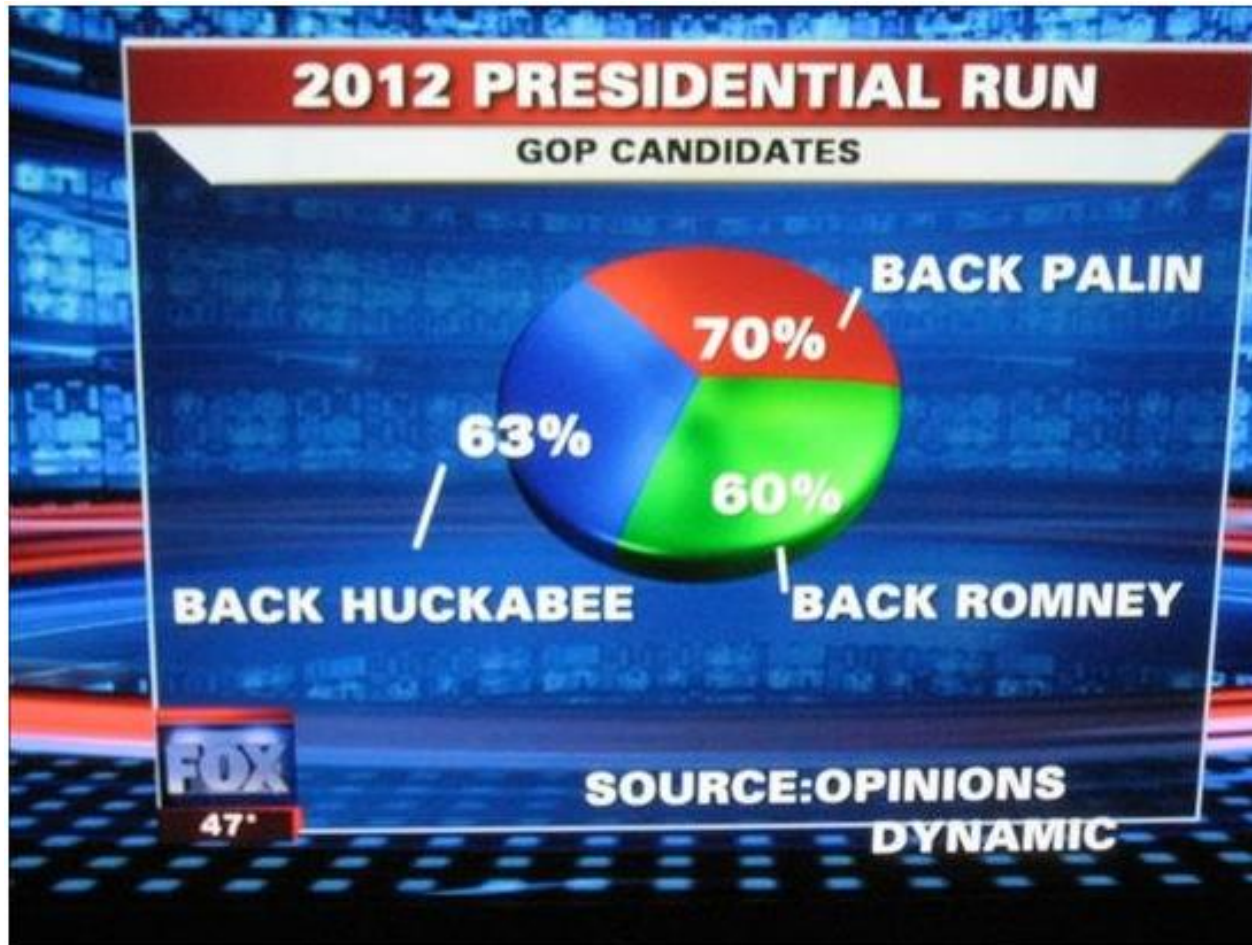
Figure 11. Height (cm) and weight (Kg) of JCU students

# Correlation Between Variables

- ▶ Correlation is the relationship between two variables
- ▶ Correlation is **positive** when the **values increase together**
- ▶ Correlation is **negative** when **one value decreases as the other increases**



# Graphs Can Be Misleading



# Graphs Can Be Misleading.....

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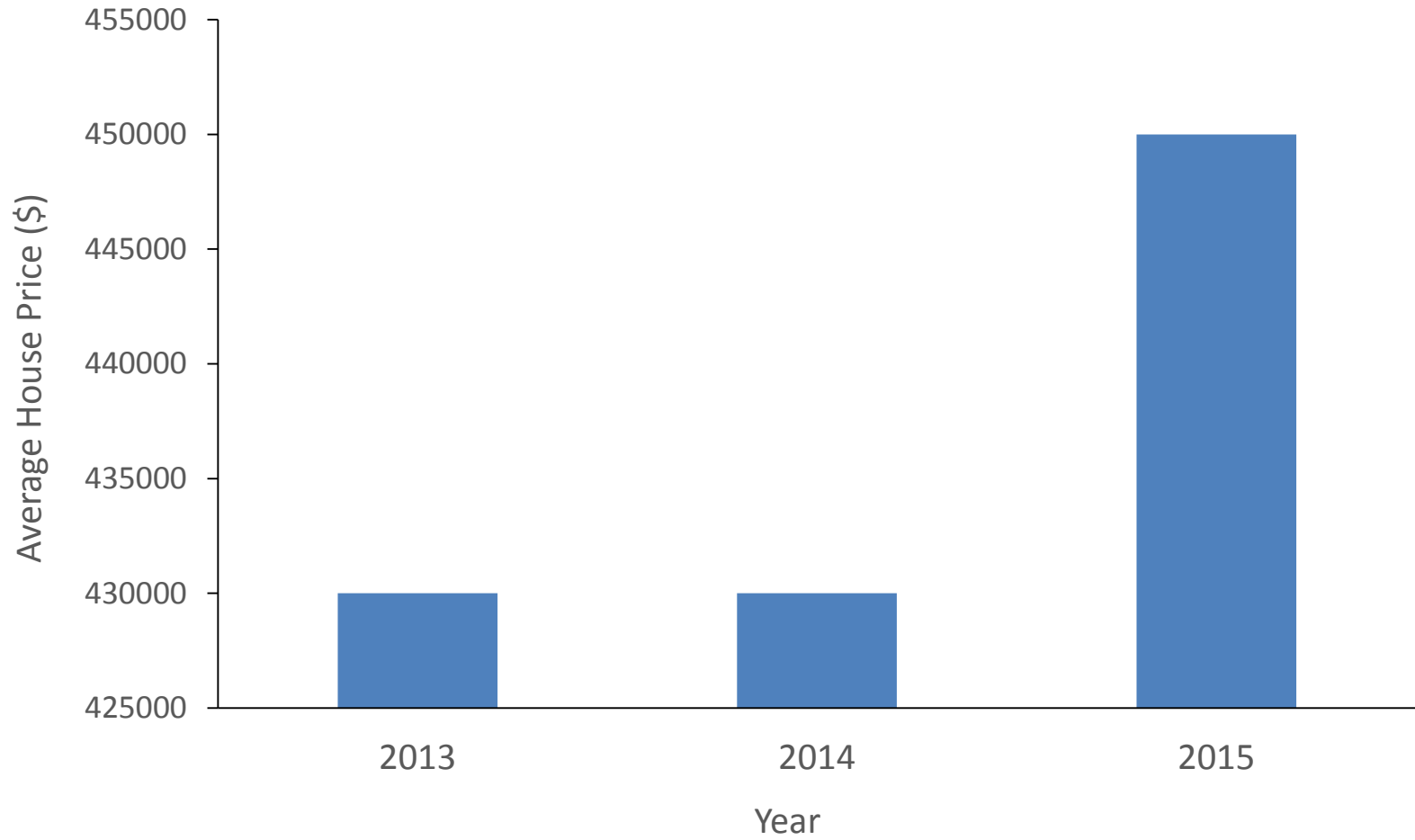


Figure 12. Average house price in Cairns

# A Better Representation.....

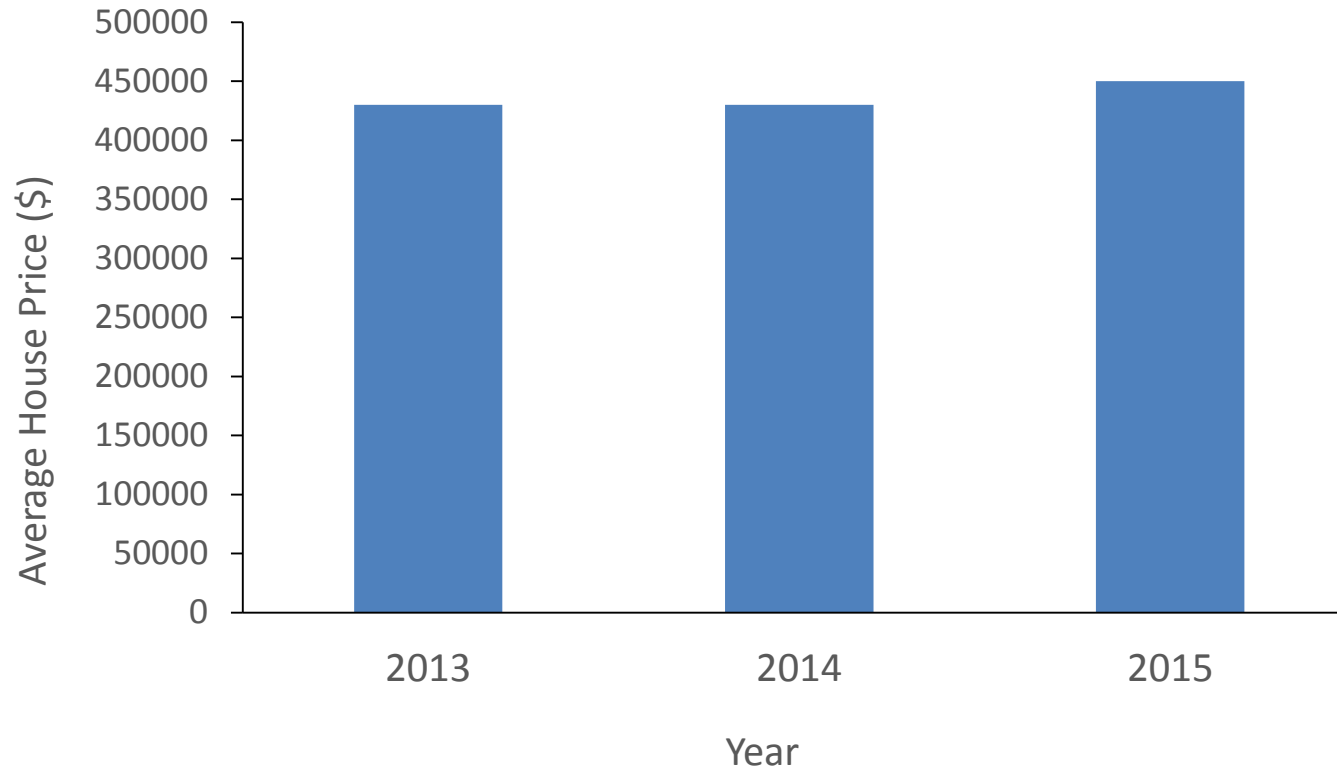


Figure 13. Average house price in Cairns

# Keep It Simple

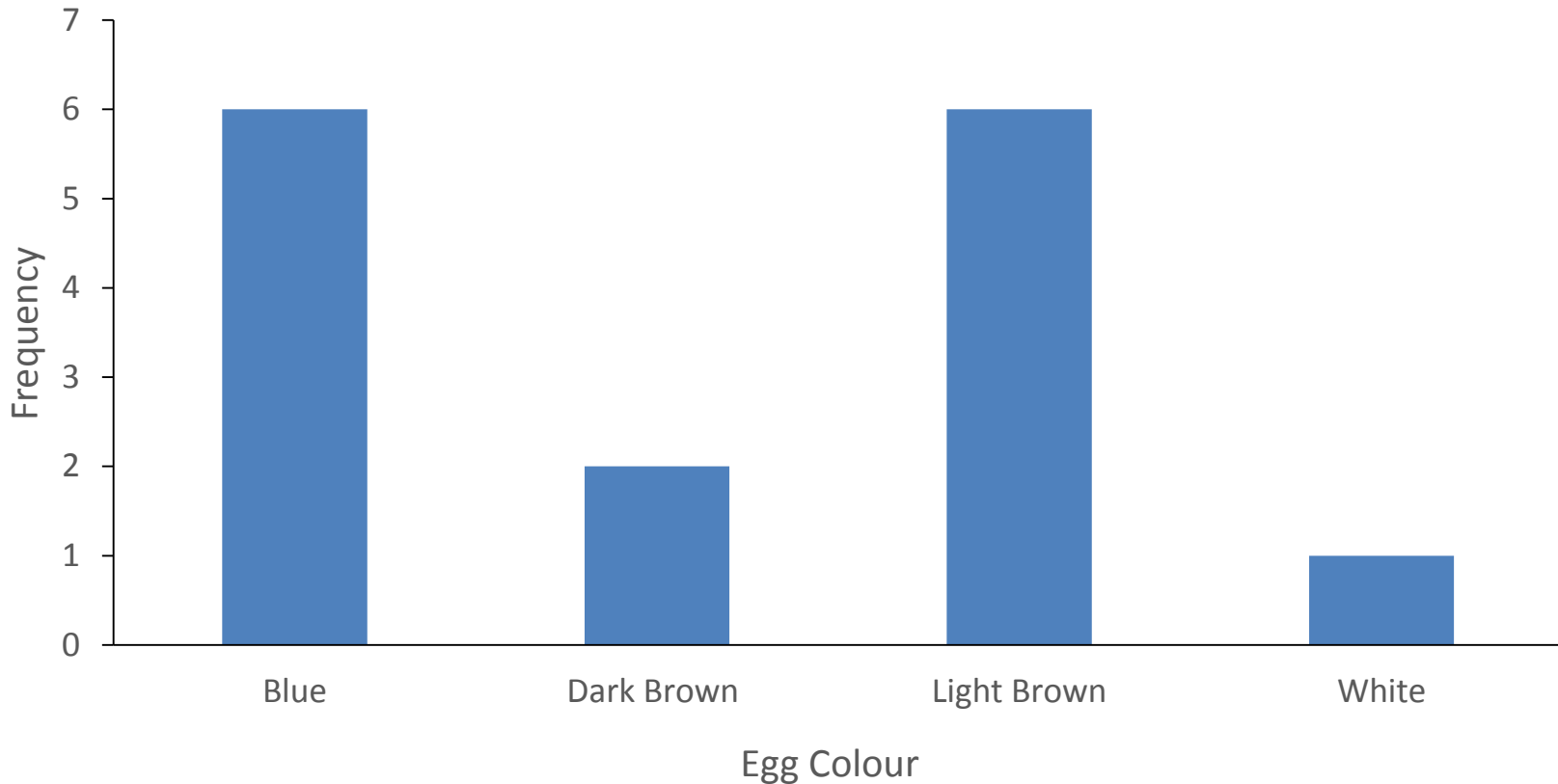


Figure 15. The colour of eggs laid during a two day period in October

**Is better than.....**



# Keep It Simple

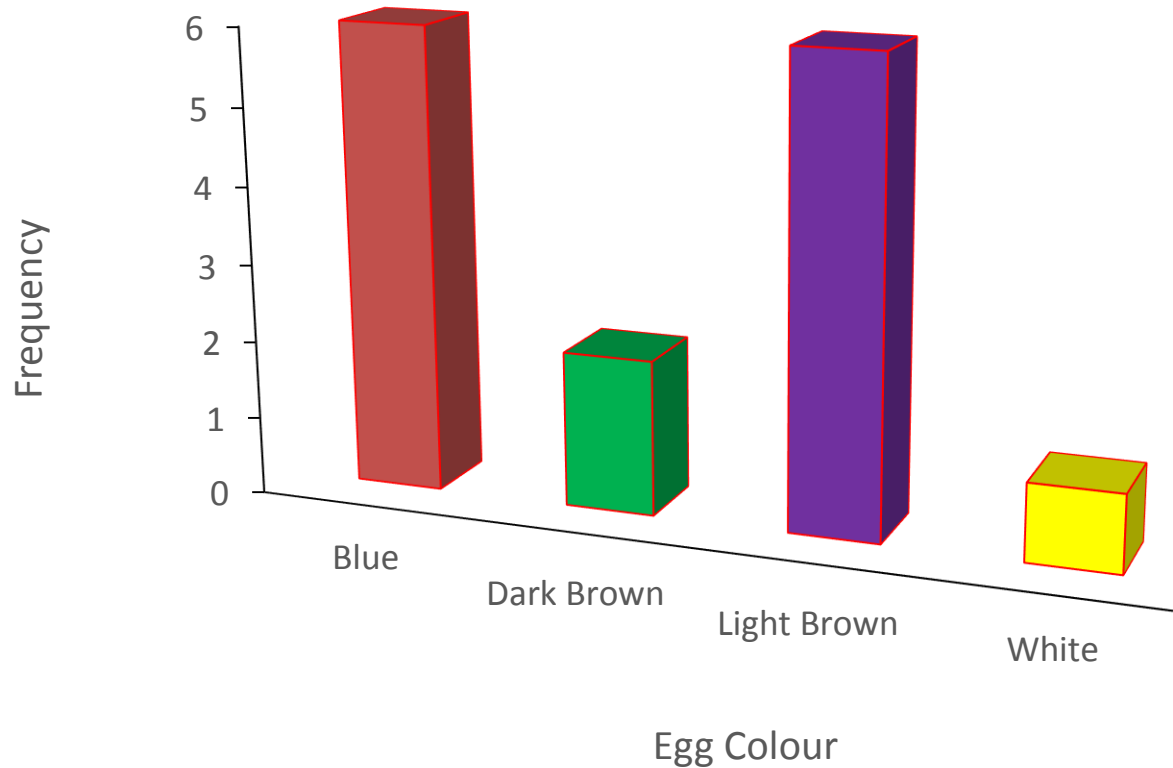
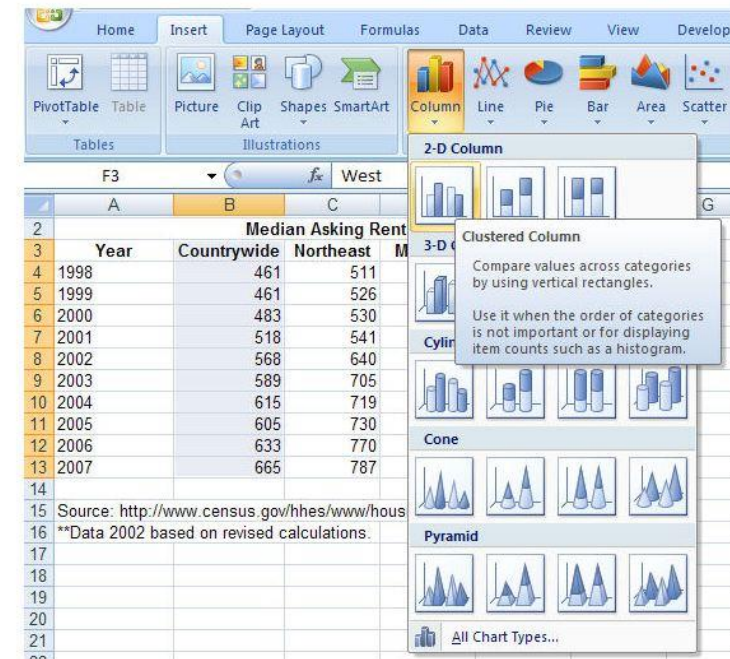


Figure 16. The colour of eggs laid during a two day period in October

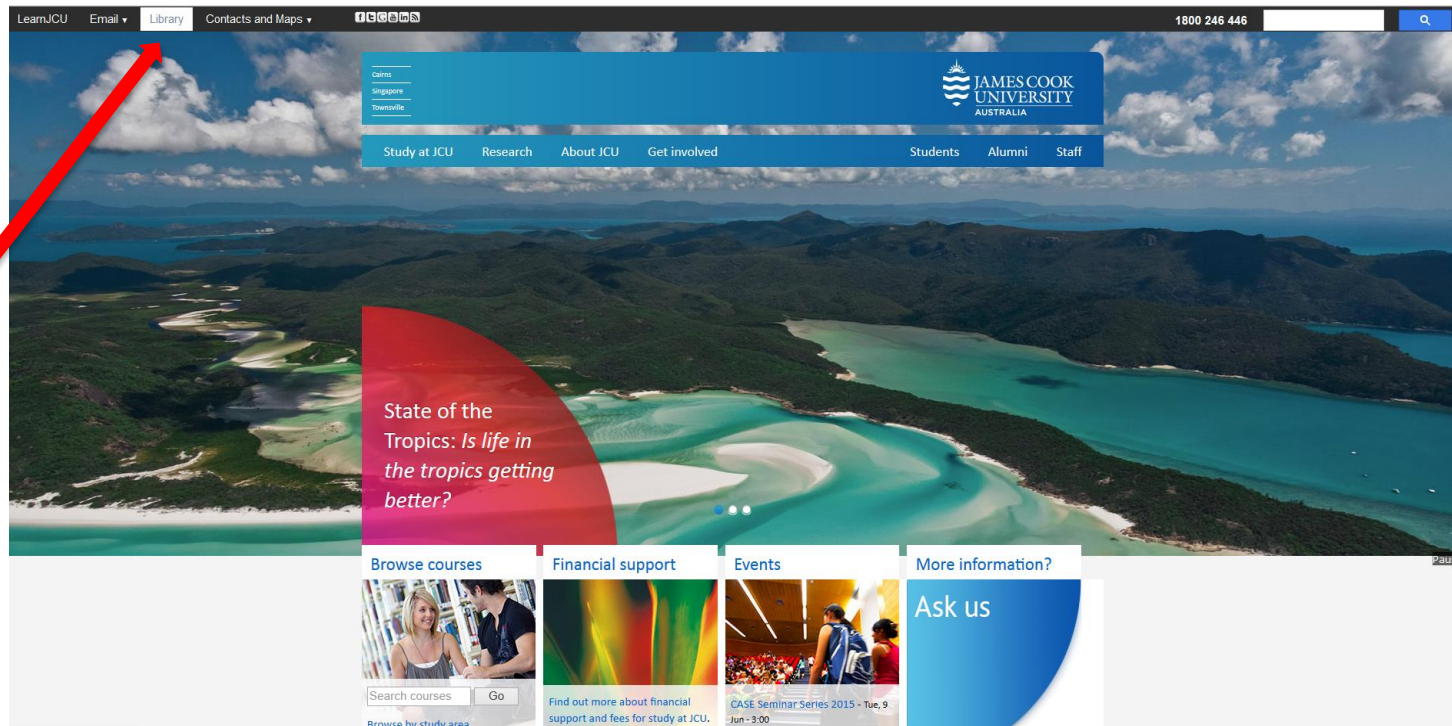
**The simplest representation is best**

# Graphing Using Excel

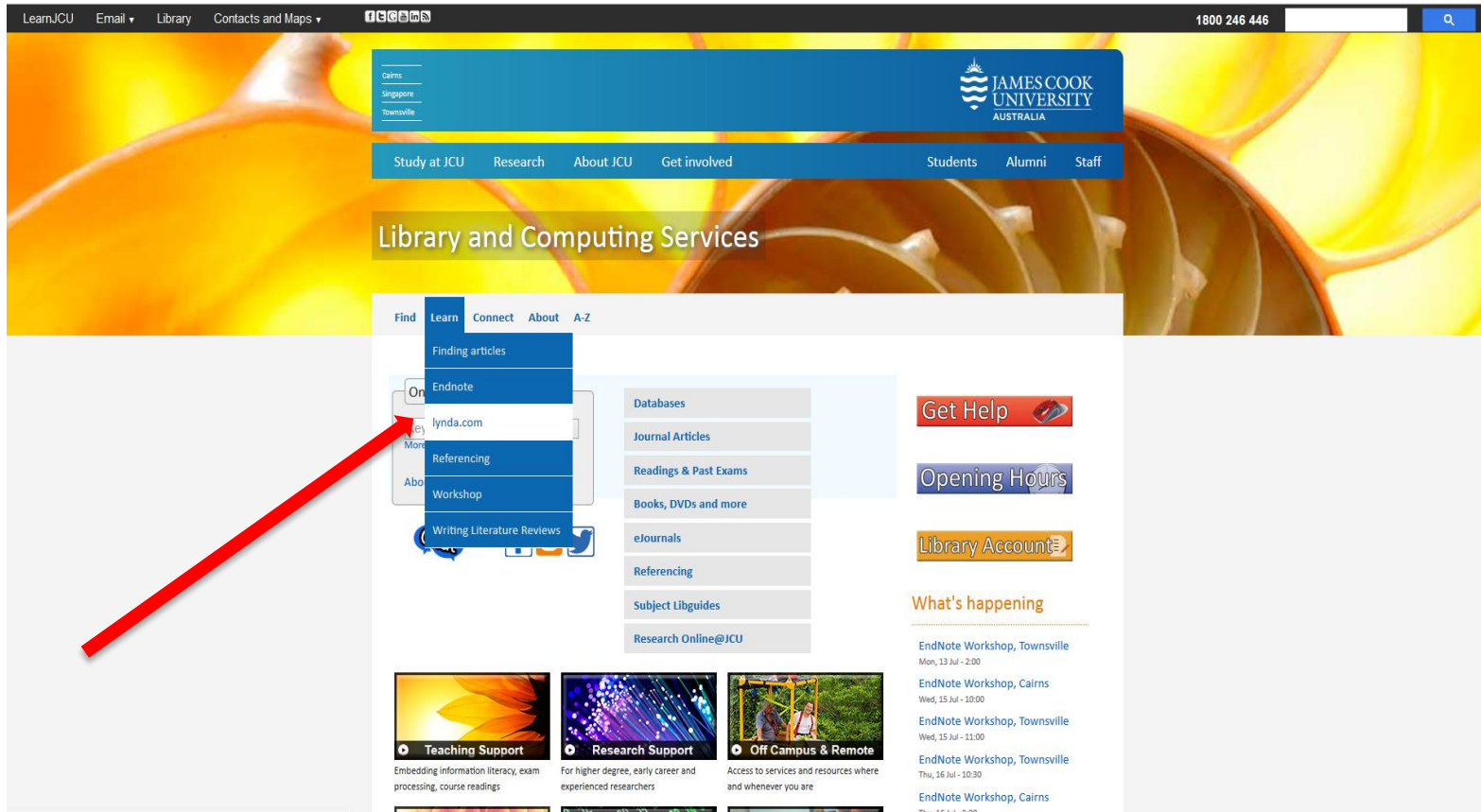
- ▶ Excel is a good data management tool
- ▶ With some practise, you can produce and edit graphs quickly in Excel
- ▶ Search the internet and YouTube for videos and tutorials about creating graphs in Excel
- ▶ Specialised statistical software such as S-Plus will enable you to produce graphs that represent your data with more precision



- ▶ You can find and access courses to help with your study through **Lynda.com**
- 1) Go to website [www.jcu.edu.au](http://www.jcu.edu.au)
  - 2) Click on “Library”

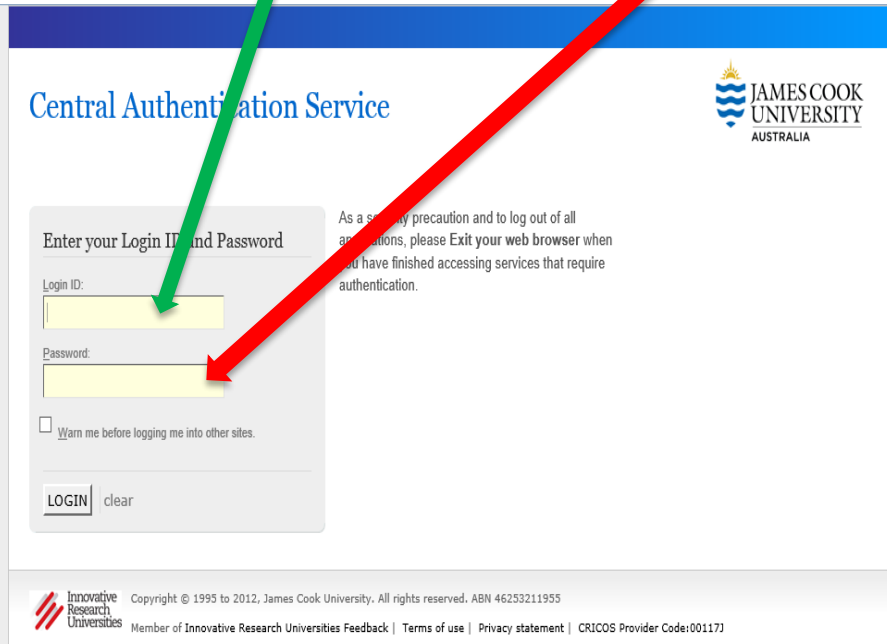


- 3) Go to “Learn”
- 4) Click on “Lynda.com”




The screenshot shows the James Cook University Library and Computing Services website. The top navigation bar includes links for "Learn", "Connect", "About", and "A-Z". A dropdown menu is open under "Learn", showing options like "Finding articles", "Endnote", "lynda.com", "Referencing", "Workshop", and "Writing Literature Reviews". A red arrow points to the "lynda.com" link. The page also features a search bar, a "Get Help" button, "Opening Hours", "Library Account", and a "What's happening" section with event listings for EndNote Workshops in Townsville and Cairns.

## 5) Log in using your **jc number** and **password**



Central Authentication Service



As a security precaution and to log out of all applications, please Exit your web browser when you have finished accessing services that require authentication.


Enter your Login ID and Password

Login ID:

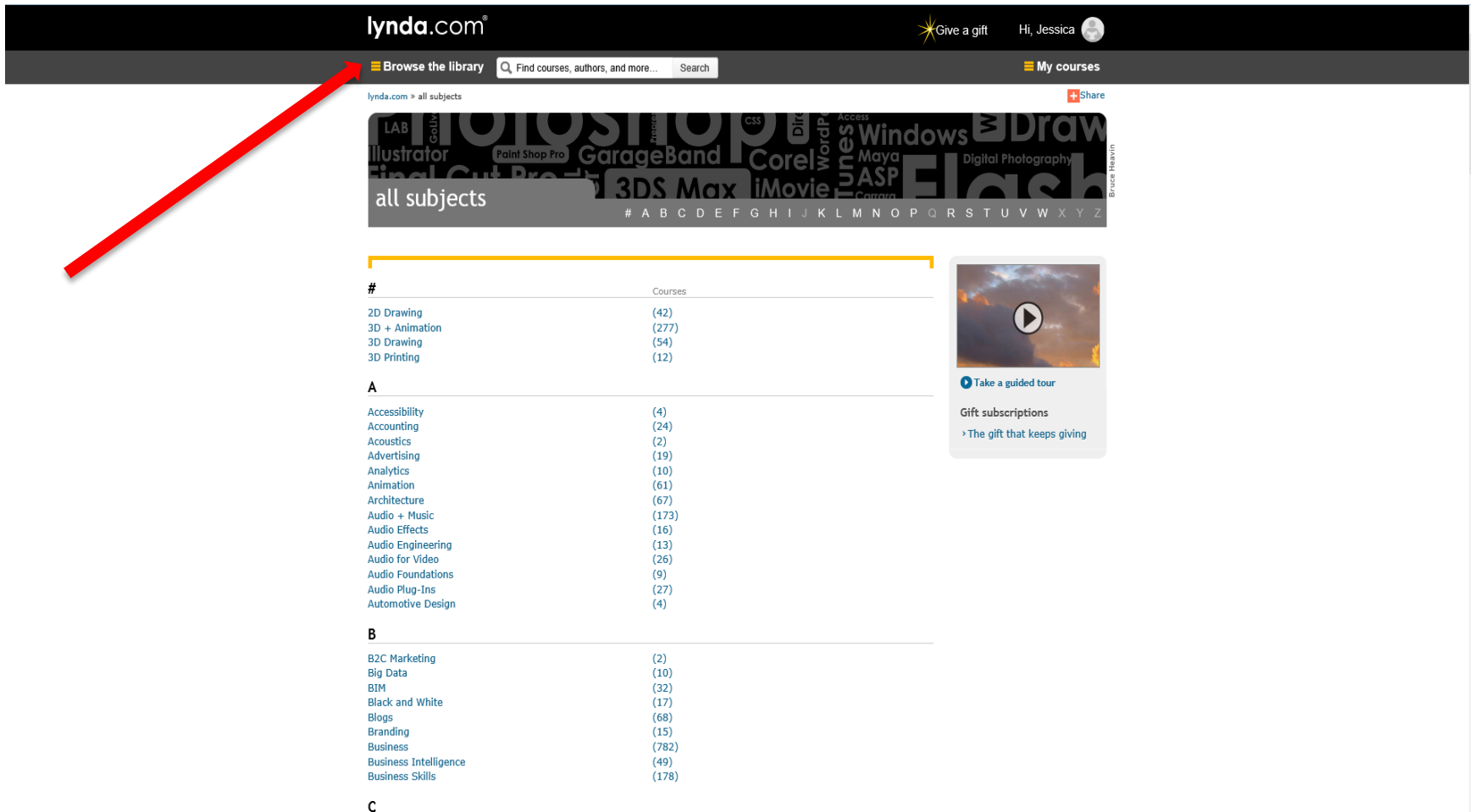
Password:

Warn me before logging me into other sites.

[clear](#)

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## 6) Browse the Lynda Library for courses of interest



lynda.com® Give a gift Hi, Jessica

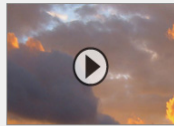
[Browse the library](#)   [My courses](#)

lynda.com > all subjects [Share](#)

LAB Golly Photoshop CSS Dribbble Access Windows Draw  
Illustrator Paint Shop Pro GarageBand Corel wordP Maya Digital Photography  
Final Cut Pro 3DS Max iMovie iTunes ASP Elash  
Bruce Heavin

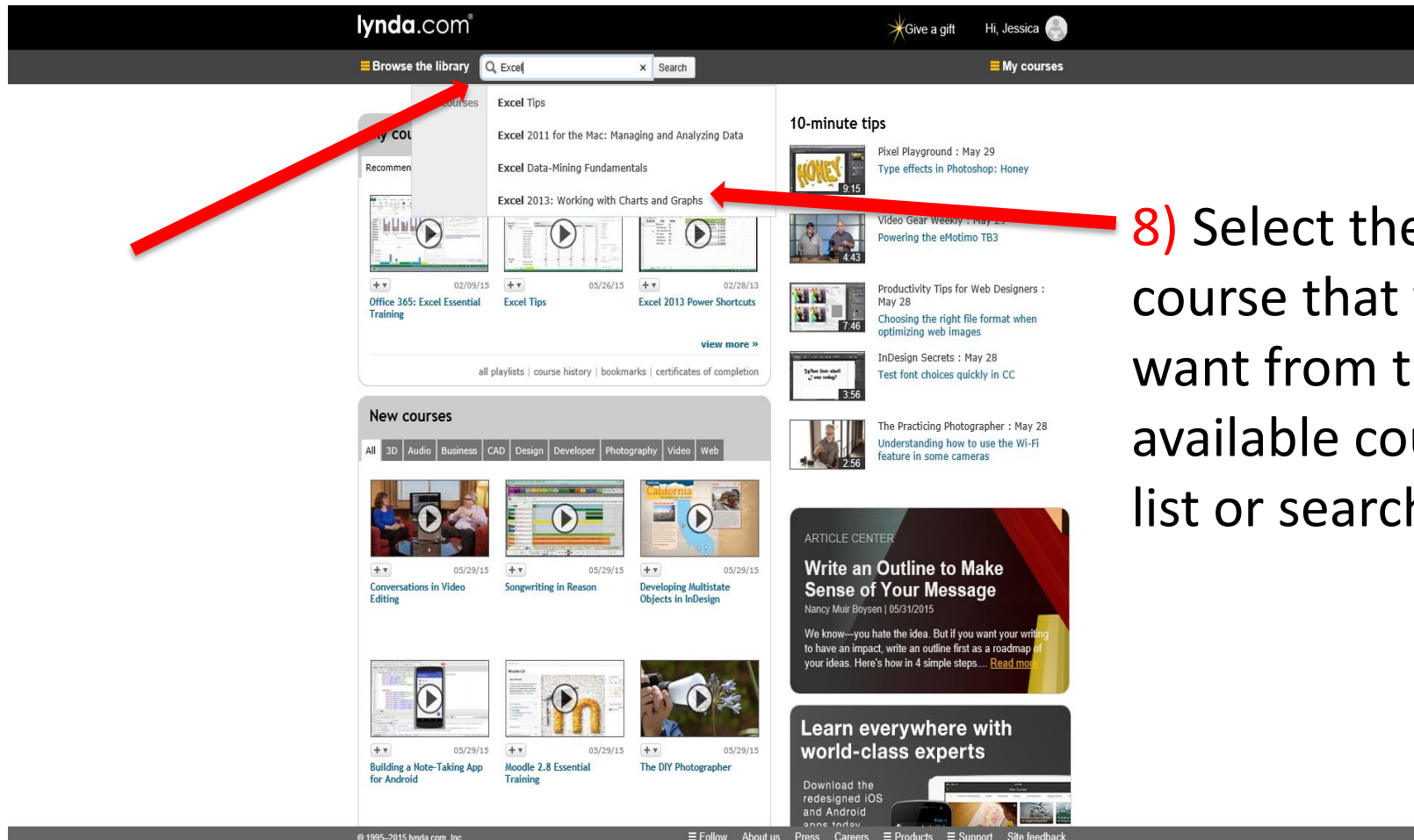
all subjects # A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

#	Courses
2D Drawing	(42)
3D + Animation	(277)
3D Drawing	(54)
3D Printing	(12)
<b>A</b>	
Accessibility	(4)
Accounting	(24)
Acoustics	(2)
Advertising	(19)
Analytics	(10)
Animation	(61)
Architecture	(67)
Audio + Music	(173)
Audio Effects	(16)
Audio Engineering	(13)
Audio for Video	(26)
Audio Foundations	(9)
Audio Plug-Ins	(27)
Automotive Design	(4)
<b>B</b>	
B2C Marketing	(2)
Big Data	(10)
BIM	(32)
Black and White	(17)
Blogs	(68)
Branding	(15)
Business	(782)
Business Intelligence	(49)
Business Skills	(178)
<b>C</b>	

  
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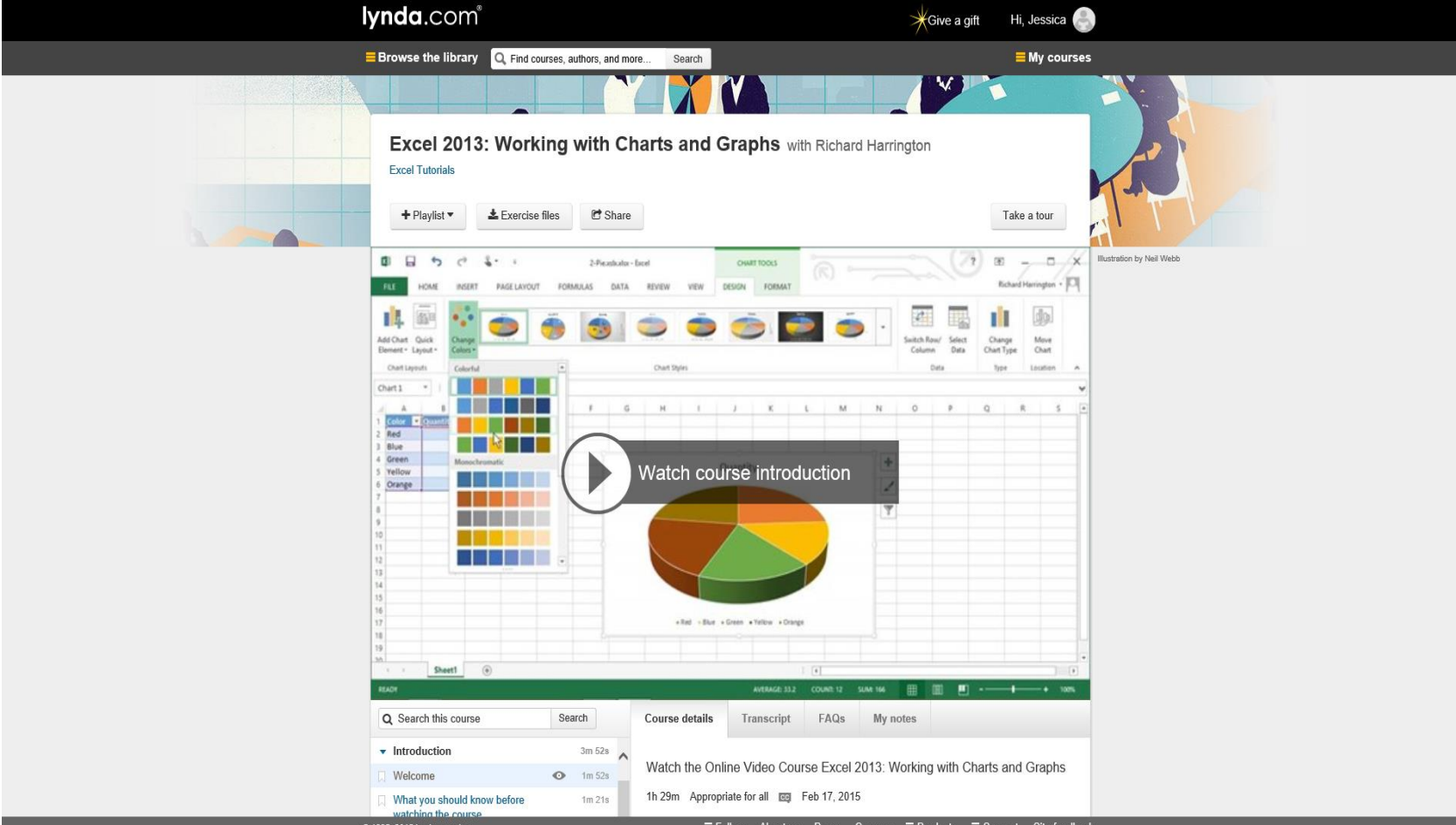
## 7) Search the Lynda Library for courses of interest



The screenshot shows the Lynda.com website interface. At the top, there is a search bar with the text 'Excel' entered. Below the search bar, a dropdown menu displays search results for 'Excel', including 'Excel Tips', 'Excel 2011 for the Mac: Managing and Analyzing Data', 'Excel Data-Mining Fundamentals', and 'Excel 2013: Working with Charts and Graphs'. A red arrow points from the search bar to the dropdown menu. Another red arrow points from the dropdown menu to the 'Excel 2013: Working with Charts and Graphs' course. Below the search results, there is a section for 'New courses' with various course thumbnails. On the right side of the page, there is a section for '10-minute tips' with several video thumbnails. A red arrow points from the '10-minute tips' section to the 'Excel 2013: Working with Charts and Graphs' course. At the bottom of the page, there is a footer with copyright information and navigation links.

8) Select the course that you want from the available course list or search again

## 9) When you select a course it opens up like this



The screenshot shows the Lynda.com interface for the course "Excel 2013: Working with Charts and Graphs" by Richard Harrington. The course is categorized under "Excel Tutorials". The main content area displays a preview of the course material, which is a screenshot of the Microsoft Excel 2013 ribbon, specifically the "CHART TOOLS" tab. The ribbon includes sections for "Chart Layouts" (with "Colorful" and "Colorful 2" options) and "Chart Styles". A 3D pie chart is visible on the spreadsheet, with a legend below it showing segments for Red, Blue, Green, Yellow, and Orange. A play button icon is overlaid on the chart with the text "Watch course introduction".

At the top of the page, the Lynda.com logo is on the left, and navigation links for "Browse the library", "Find courses, authors, and more...", and "My courses" are in the center. The user's name "Hi, Jessica" and a "Give a gift" link are on the right. Below the course title, there are buttons for "Playlist", "Exercise files", "Share", and "Take a tour".

At the bottom of the page, there is a search bar for the course, a "Search" button, and a "Course details" section with tabs for "Transcript", "FAQs", and "My notes". The transcript shows the following items:

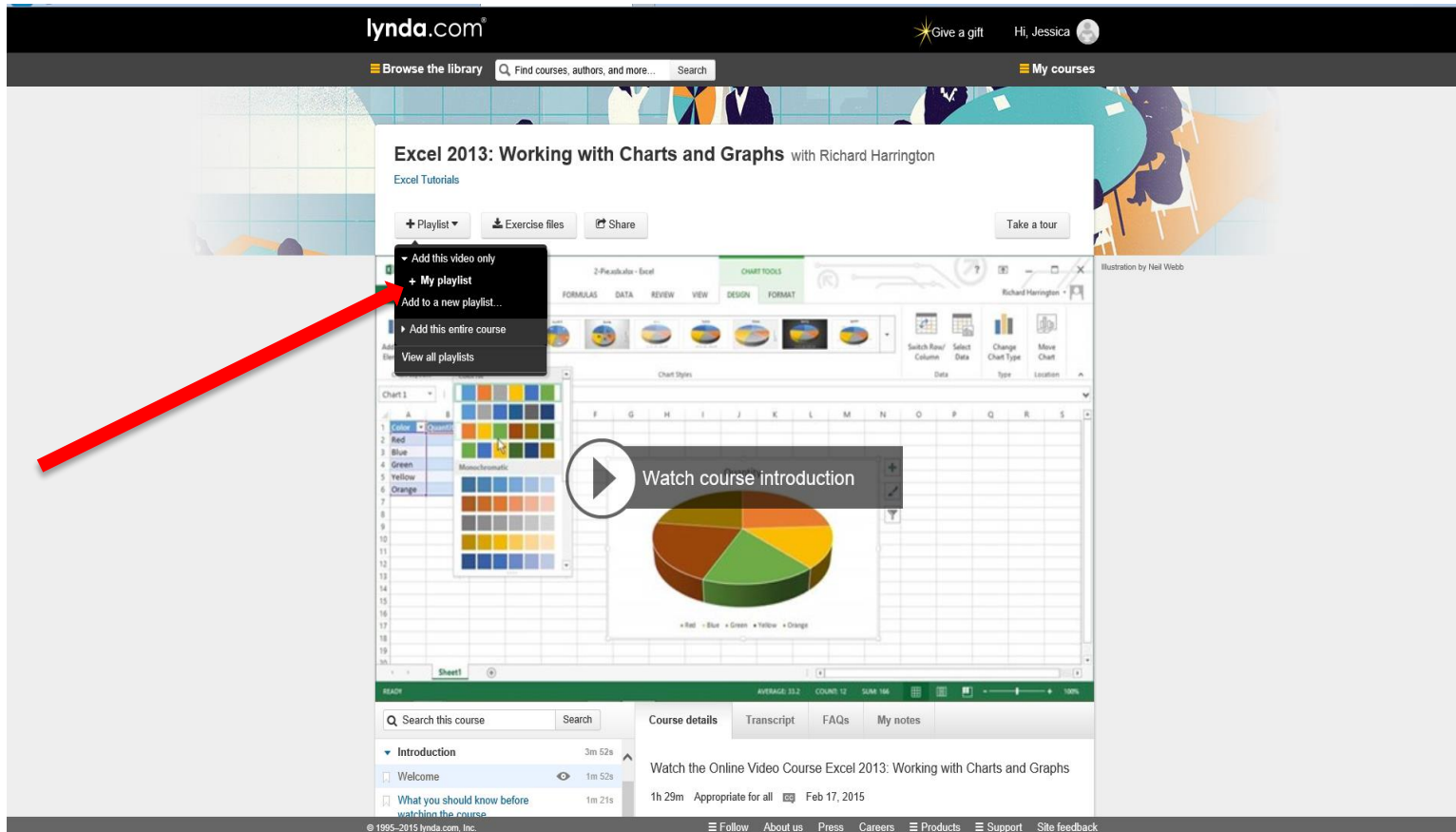
- Introduction (3m 52s)
- Welcome (1m 52s)
- What you should know before watching the course (1m 21s)

The course details section includes the text: "Watch the Online Video Course Excel 2013: Working with Charts and Graphs", "1h 29m", "Appropriate for all", and "Feb 17, 2015".

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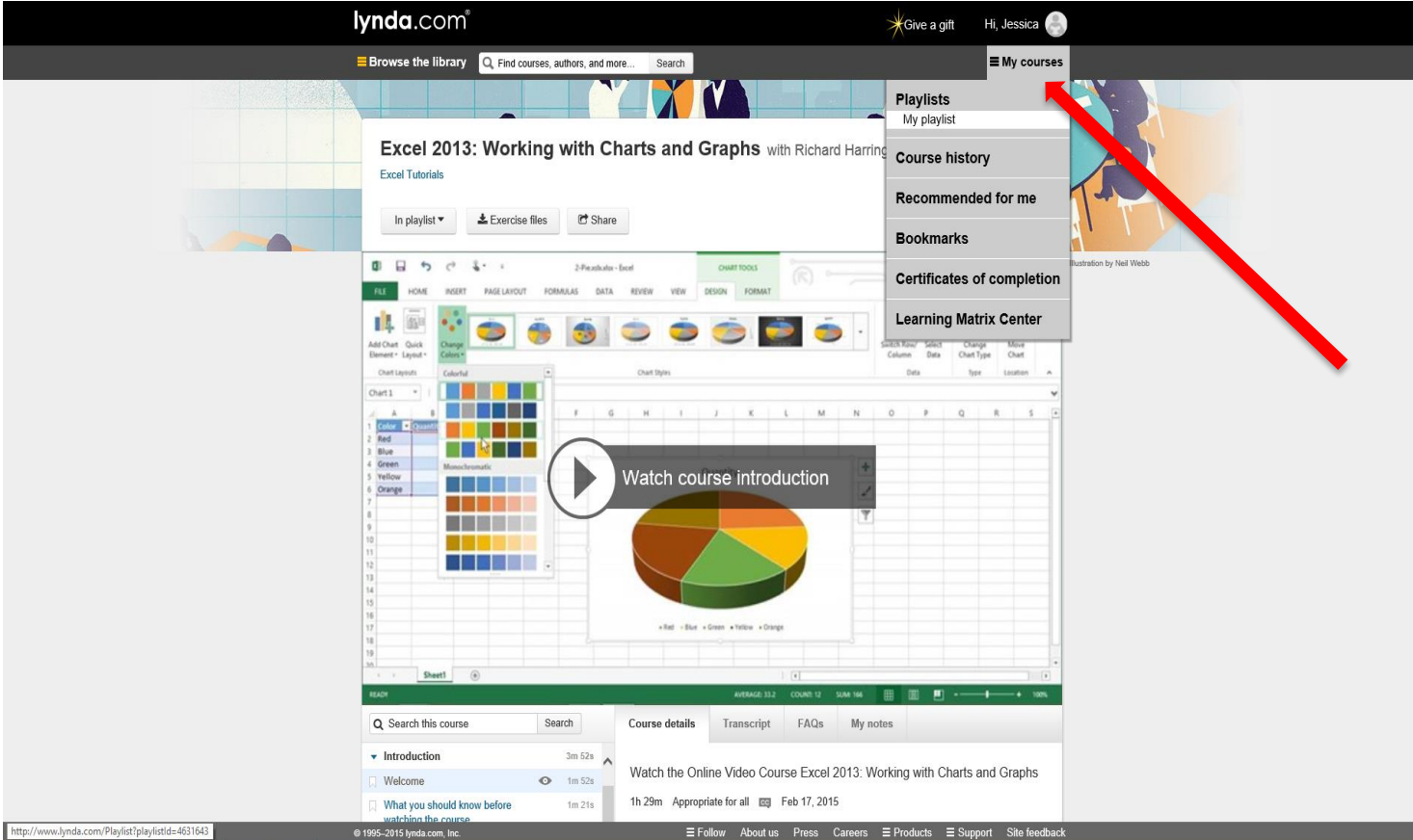


10) It is suggested that you save it to your playlist so that it is easy to find again



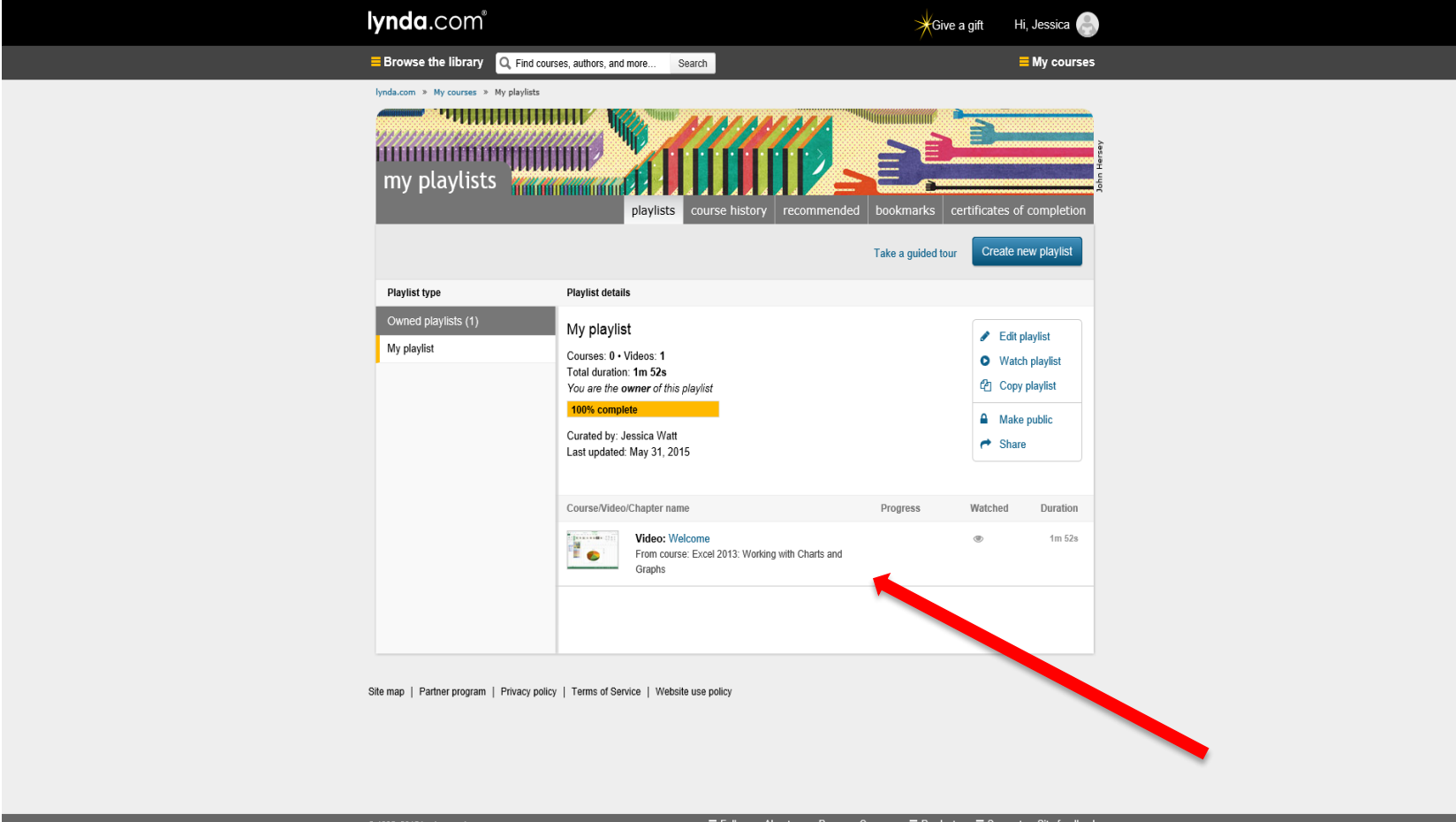
The screenshot displays the Lynda.com interface for the course "Excel 2013: Working with Charts and Graphs" by Richard Harrington. The course is categorized under "Excel Tutorials". A dropdown menu is open, showing options: "Add this video only", "+ My playlist" (highlighted by a red arrow), "Add to a new playlist...", "Add this entire course", and "View all playlists". The background shows a preview of the course content, including an Excel spreadsheet with a 3D pie chart and a "Watch course introduction" button. The bottom of the page features a search bar, course details, and a list of video lessons: "Introduction" (3m 52s), "Welcome" (1m 52s), and "What you should know before watching this course" (1m 21s).

11) To find the course again click on **My Courses** located on the left side of the screen



The screenshot displays the Lynda.com interface. At the top, the user is logged in as 'Hi, Jessica'. A search bar is visible with the text 'Browse the library' and 'Find courses, authors, and more...'. The main content area shows a course titled 'Excel 2013: Working with Charts and Graphs with Richard Harrington'. A red arrow points to the 'My courses' dropdown menu, which is open and lists several options: 'Playlists', 'My playlist', 'Course history', 'Recommended for me', 'Bookmarks', 'Certificates of completion', and 'Learning Matrix Center'. The background shows a preview of an Excel spreadsheet with a pie chart and a 'Watch course introduction' button.

## 12) When you select My Playlist your saved course(s) appear



lynda.com® Give a gift Hi, Jessica

Browse the library Find courses, authors, and more... Search My courses

lynda.com > My courses > My playlists

### my playlists

playlists course history recommended bookmarks certificates of completion

Take a guided tour Create new playlist

**Playlist type**

- Owned playlists (1)
- My playlist**



**Playlist details**

**My playlist**

Courses: 0 • Videos: 1  
Total duration: 1m 52s  
You are the **owner** of this playlist  
**100% complete**

Curated by: Jessica Watt  
Last updated: May 31, 2015

- Edit playlist
- Watch playlist
- Copy playlist
- Make public
- Share

Course/Video/Chapter name	Progress	Watched	Duration
 <b>Video: Welcome</b> From course: Excel 2013: Working with Charts and Graphs			1m 52s

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# References

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<http://www.abs.gov.au/websitedbs/a3121120.nsf/home/statistical+language>

