

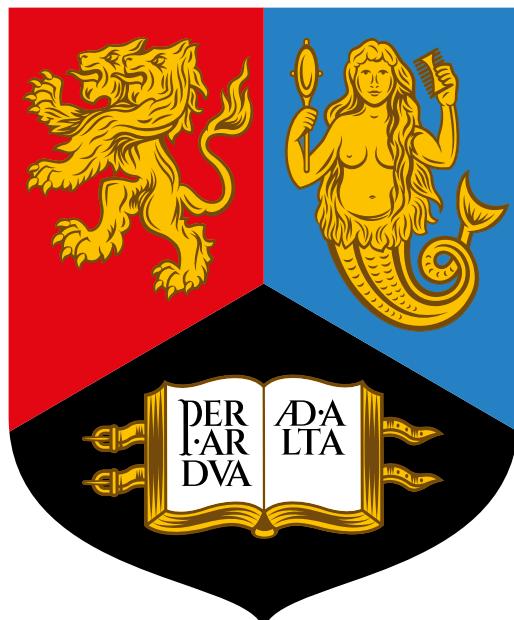
University of Birmingham

College of Engineering and Physical Sciences

School of Engineering

Birmingham Centre for Railway Research and Education

MSc in Railway Systems Engineering and Integration



Module Name: Module Name

Assignment Title: Assignment Title

Student ID Number: Student ID Number

Date Submitted: Date Submitted

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Executive summary

This is probably the most important part of an assignment as it is the first impression that you will make on the person that is reading or marking your work. The Executive Summary is a brief, comprehensive summary of the content of the assignment, and it needs to be dense with information. Suggested areas to be covered include:

- A very brief summary of the task or brief that has been set (a sentence or two only);
- A brief description of how you went about finding the answer;
- A summary of the work or analysis undertaken, and the outcome or results of this analysis;
- The main findings and recommendations.

This section is targeted at a busy senior manager, and it therefore needs to include the key information that would allow him or her to take meaningful decisions. It is also important that you clearly state your own views here if it is appropriate to do so, and that you make clear and helpful recommendations based on the work that you have done.

It is not normal to include references in an Executive Summary, and graphics or tables should be used sparingly. It should be between one to two pages in length.

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Table of Contents

1 How to get the most out of this template	
1.1 Setting up this template	
1.1.1 Template	
1.1.2 Metadata	
1.1.3 Style	
1.2 L ^A T _E Xresources	
1.3 Some interesting examples of things L ^A T _E Xcan do	
1.3.1 Referencing	
1.3.2 Numbers and units	
1.3.3 Figures	
1.3.4 Equations	
1.3.5 Tables	
2 Introduction	1
2.1 Scope	1
2.2 Methodology	1
2.3 Assignment structure	1
3 Background	3
4 Literature review	5
5 Case studies	7
6 Insert more of your own chapters here	9
7 Conclusions	11
7.1 Word count	11
A Appendix title	15

List of Figures

1.1 University of Birmingham Logo	
1.2 4 examples of Transport for London seat cover patterns or "Moquettes". Courtesy of Loughborough University, accessed 10 October, 2024, https://repository.lboro.ac.uk/projects/Transport_for_London_seat_cover_patterns/24400	

- 1.3 Fourier series approximation of a square wave with varying number of cosine terms.
Plotted with pgfplots from stored csv data
- 1.4 Fourier series approximation of a square wave with varying number of cosine terms.
Plotted with pgfplots from functions

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List of Tables

1	Glossary / List of Abbreviations
1.1	Example simple table
1.2	UK Passenger transport by mode, figures shown are a percentage of total passenger distance over the year (Department of Transport 2023)
1.3	Colour Reference for London Underground lines as listed in TfL colour standard (Transport for London 2022)

Glossary / list of abbreviations

The Glossary is essential to explain any specialist terminology or abbreviations you have used in your assignment. For specialist terminology, provide a brief one-sentence explanation of what the term means. For abbreviations (including acronyms), just provide the full version of what the abbreviation stands for. The list should be sorted alphabetically.

Table 1: Glossary / List of Abbreviations

Term	Explanation / Meaning / Definition
GB	Great Britain (England, Scotland and Wales)
NR	Network Rail
TLA	Three Letter Acronym
UK	United Kingdom (Great Britain and Northern Ireland)

NOTE: At the first usages of an abbreviation in the document the full meaning should follow in brackets.

NOTE: There are L^AT_EX packages to manage this automatically (glossaries is an example) and online resources to help with table creation. This table was made using <https://www.tablesgenerator.com>

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1 How to get the most out of this template

This section is aimed to help you using this template. It does not aim to teach you how to use \LaTeX as there are plenty of resources that would do a far more effective job. Some places to start are included in section 1.2.

Instead the aim here is to help a relatively inexperienced \LaTeX user navigate the template, point them to places they can learn more, give some helpful hints and examples of cool stuff you can do.

1.1 Setting up this template

1.1.1 Template

You can use the code behind this project as your starting point, however, you will have to go through the process of removing all the guidance text. It may therefore be more advisable to use the blank template to start and then use this as your reference.

If you do choose to use this document as your starting point you can remove this chapter (no. 1) by taking out the input command in `main.tex` that refers to this file and the `guidance-example-section` folder.

1.1.2 Metadata

Your first steps upon starting working with this template should be to edit lines 6 to 11 in `main.tex`. They should currently read as:

```
% Document metadata
% fill these in to update header, footer and titlepage
\def\modulename{Module Name}
\def\assignmenttitle{Assignment Title}
\def\studentidnumber{Student ID Number}
\def\datesubmitted{Date Submitted}
```

Replace the text in black in the squigly brackets {} with your details and the details of your assignment and they will be updated on the title page, header and footer through the document.

1.1.3 Style

This template has been set up to best match the university style and uses appropriate fonts, logos, etc.

The University also has a published house style guide (University of Birmingham 2024) that may prove useful. For example the following guidance is given for headings:

Headings should always be in sentence case and without a full stop. This is an initial capital followed by all lower case (unless a proper noun appears in the heading). This

includes left-hand navigation bars on the web. Use sentence case for events. Do not use initial capitals for emphasis anywhere.

1.2 \LaTeX resources

You are obviously free to use any service or setup to edit and compile your \LaTeX documents but we would recommend Overleaf (as of Nov. 2024). It is web based so you don't need to install software and you should be able to access it from any computer. There is also a professional license for all students and staff in EPS (College of Engineering and Physical Sciences) accessed through UoB single sign-on.

Here are some handy starting points for getting started with \LaTeX for you to explore.

- Overleaf Documentation (Overleaf 2024)
 - As well as being a good option for managing your \LaTeX projects, the documentation and guidance provided by Overleaf is rather good.
 - A good starting point may be the learn \LaTeX in 30 minutes guide www.overleaf.com/learn/latex/Learn_LaTeX_in_30_minutes
- ShareLaTeX YouTube Guides (ShareLaTeX 2024)
 - A youtube channel recommended by the University library service that provides a number of guides.
 - <https://www.youtube.com/@ShareLaTeX/videos>
- University resources
 - There are often events through the year that are useful for getting started with LaTeX. There is a planned lecture as an introduction in the Engineering Department.
 - The University Computer Science Society (CSS) and Hacking Society (AFNOM) run a series of lunchtime lectures through the year called the missing semester (CSS and AFNOM 2024), this included a session on \LaTeX the notes for which can be found at: <https://missingsemester.afnom.net/2024/latex/>

1.3 Some interesting examples of things \LaTeX can do

1.3.1 Referencing

For documents produced for the MSc it is a requirement to use Harvard style referencing (Author-Date), luckily \LaTeX can handle remove most of the headache normally associated with managing references. This document template is setup to cite and produce a bibliography inline with these requirements.

It may be a good idea to manage your references with a reference manager, some examples of these are Zotero, EndNote or Mendeley. All will export your references in a `.bib` file which \LaTeX can read. If you are using Overleaf then at the time of writing there are integrations for both Zotero and Mendeley which enable library syncing which may be a nice feature for you.

Once you have a `bib` file it is very simple to create a citation, for Harvard style `\parencite` cites in brackets, `\textcite` is inline text, `\autocite` tries to make the choice based on context.

The references section at the end of the document is created through the `\printbibliography` command at the end of the document and will include only the citations made in the document.

1.3.2 Numbers and units

`siunitx` is a package that allows for better number and unit typesetting. The full documentation gives an excellent guide (Wright 2024) but here are a few examples as a starting point.

Here are some examples of typesetting numbers:

- 125
- 12 345
- 1.2×10^{34}
- 1.2×10^{-3}
- 12.34°
- 1, 23 and 4567
- 90 to 125

Here are some examples of typesetting units, they can either be input in math style or interpreted:

- km/hr
- kg m/s²
- m/s
- m s⁻¹
- V² lm³ F⁻¹

Units and numbers can then be combined together in qty:

- Speed of light (c):
 - $299\,792\,458\,\text{m}\,\text{s}^{-1}$
 - $3.0 \times 10^8\,\text{m}\,\text{s}^{-1}$
- Planck constant (h):
 - $6.63 \times 10^{-34}\,\text{J}\,\text{Hz}^{-1}$
- Newtonian constant of gravitation (G):
 - $6.67 \times 10^{-11}\,\text{m}^3\,\text{kg}^{-1}\,\text{s}^{-2}$
- 90 mph to 125 mph
- $30\,\text{km}\,\text{h}^{-1}$, $45\,\text{km}\,\text{h}^{-1}$, $70\,\text{km}\,\text{h}^{-1}$, $90\,\text{km}\,\text{h}^{-1}$ and $150\,\text{km}\,\text{h}^{-1}$

1.3.3 Figures

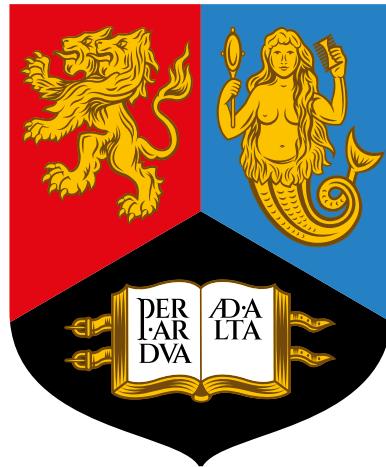


Figure 1.1: University of Birmingham Logo

This template uses the `graphicx` package for figures. Figure 1.1 is a example of a basic image as a figure.



(a) Circle line (Rathbone 2017a)



(b) DLR (Rathbone 2017b)



© Northern line (Rathbone 2017c)



(d) Piccadilly line (Rathbone 2017d)

Figure 1.2: 4 examples of Transport for London seat cover patterns or "Moquettes". Courtesy of Loughborough University, accessed 10 October, 2024, https://repository.lboro.ac.uk/projects/Transport_for_London_seat_cover_patterns/24400

Figure 1.2 is a slightly more complicated figure. It is a single figure that contains the sub figures 1.2a, 1.2b, 1.2c and 1.2d. For more complex sections of code for large figures like this is can be useful to store that section in a seperate .tex file as has been done here and in subsequent plots.

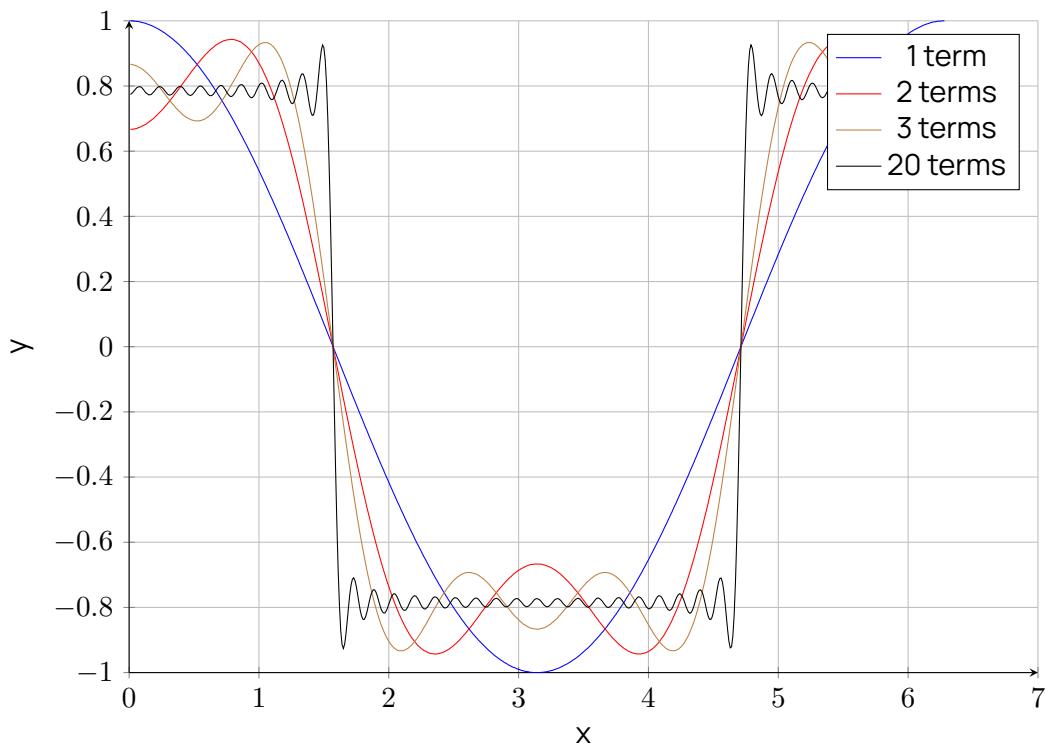


Figure 1.3: Fourier series approximation of a square wave with varying number of cosine terms.
Plotted with pgfplots from stored csv data

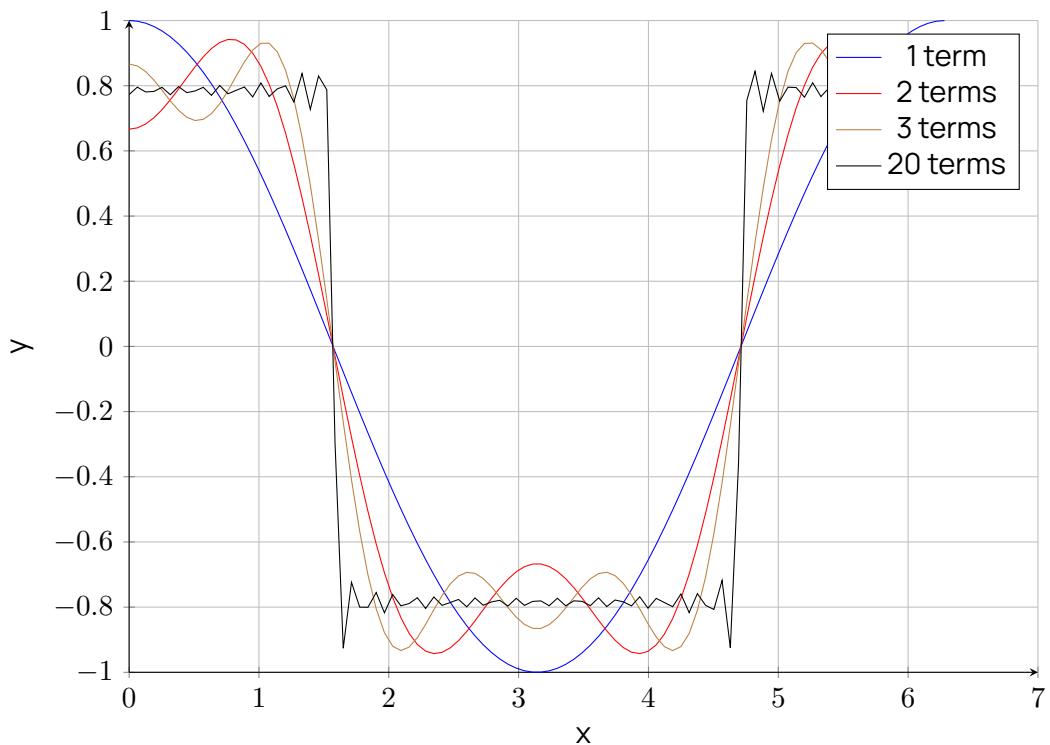


Figure 1.4: Fourier series approximation of a square wave with varying number of cosine terms.
Plotted with pgfplots from functions

Figures 1.3 and 1.3 both show figures plotted with the pgfplots package. Figure 1.3 is plotted from data stored in a csv file, while Figure 1.4 is plotted directly from a set of functions.

This can be a very useful as if you want to change the way your data is plotted (or the data that is plotted), you can change it directly in Latex without having to re-export from your tool every time.

Image Formats

As a rule of thumb vector images are preferable over rasterized images. \LaTeX 's preferred format for vector images is .pdf files. There are other vector formats including .svg and .eps which you can convert between with a bit of google assistance.

For raster images (.png, .jpg, etc.) the usual guidance applies, try where possible to use high quality images, especially high resolution. It is worth noting that allows the use of the scale command when specifying an image size which would allow the natural size or integer scaling of the natural size to maximise image quality.

If you want to learn more about image types then Adobe have produced an article that covers the difference between raster and vector images [Adobe 2024](#).

1.3.4 Equations

\LaTeX allows you to do inline equations, i.e. $y = mx + c$, or set on their own line, such as equations 1.1, 1.2 and 1.3.

$$f(x) = 2[H\frac{x}{L} - H(\frac{x}{L} - 1)] - 1 \quad (1.1)$$

$$\begin{aligned} b_n &= \frac{1}{L} \int_0^{2L} f(x) \sin\left(\frac{n\pi x}{L}\right) dx \\ &= \frac{4}{n\pi} \begin{cases} 0 & n \text{ even} \\ 1 & n \text{ odd} \end{cases} \end{aligned} \quad (1.2)$$

$$f(x) = \frac{4}{\pi} \sum_{n=1,3,5,\dots}^{\infty} \frac{1}{n} \sin\left(\frac{n\pi x}{L}\right) \quad (1.3)$$

1.3.5 Tables

Table 1.1: Example simple table

Name	Age
Adam	30
Eve	30

Table 1.1 is an example of a very simple table, but there is the possibility of making them more complex, table 1.3 has a little more data, includes some cell shading and has been placed on its own separate page, printed in landscape.

It is also possible to load data in directly from a .csv file and then display in a table. This has been done for table 1.2

Table 1.2: UK Passenger transport by mode, figures shown are a percentage of total passenger distance over the year (Department of Transport 2023)

Year	Road	Rail	Air
1977	92	7	0
1978	92	7	1
1979	92	7	1
1980	92	7	1
1981	93	7	1
1982	93	6	1
1983	93	7	1
1984	93	7	1
1985	93	7	1
1986	93	7	1
1987	93	6	1
1988	93	6	1
1989	93	6	1
1990	93	6	1
1991	94	6	1
1992	94	6	1
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2003	93	6	1
2004	92	6	1
2005	92	7	1
2006	92	7	1
2007	91	7	1
2008	91	8	1
2009	91	8	1
2010	91	8	1
2011	90	9	1
2012	90	9	1
2013	90	9	1
2014	89	10	1
2015	89	10	1
2016	89	10	1
2017	89	10	1
2018	89	10	1
2019	89	10	1
2020	97	3	0
2021	92	7	1
2022	91	9	1

Table 1.3: Colour Reference for London Underground lines as listed in TfL colour standard (Transport for London 2022)

London Underground line	PMS	CMYK	RGB	Colour Sample
Bakerloo line	470	C026 M070 Y097 K016	R166 G090 B042	
Hammersmith & City line	197	C003 M048 Y015 K000	R236 G155 B173	
Piccadilly line	072	C100 M097 Y003 K003	R000 G015 B159	
Central line	485	C006 M098 Y100 K001	R225 G037 B027	
Jubilee line	430	C055 M041 Y038 K005	R123 G134 B140	
Victoria line	299	C081 M018 Y000 K000	R000 G160 B223	
Circle line	116	C000 M018 Y100 K000	R255 G205 B000	
Metropolitan line	235	C041 M100 T041 K021	R135 G015 B084	
Waterloo & City line	338	C055 M000 Y039 K000	R107 G205 B178	
District line	356	C096 M027 Y100 K015	R000 G121 B052	
Northern line	Black	C000 M000 Y000 K100	R000 G000 B000	

2 Introduction

This will become Chapter 1 when you have deleted the instructions above. While it is usual to start a fresh chapter in a dissertation on a new page, this is not usually necessary for assignments. To change this behaviour have a look at the `titlesec` commands in the template file (`bcrre_assignment.cls`).

It is usual to give a brief introduction to the subject area (just a few sentences) and a brief summary of what you have been asked to do (again just a few sentences).

2.1 Scope

Describe what is and more importantly what **is not** included (i.e. the limitations or boundaries of the work you have done). While this section is not absolutely necessary for assignments, it is a good idea to practice this as you will definitely need to include such a section for your dissertation.

2.2 Methodology

This section details how you tackled the assignment and the associated research. For example, how did you gather the data required, what analysis or simulation tools did you use?

This section is not strictly necessary for assignments, but again it can be a good idea to practice including this section as you will definitely need it for your dissertation.

2.3 Assignment structure

While not strictly necessary for assignments, it can be helpful to include a brief description of how the document is structured, perhaps giving a sentence or two about each chapter of your work. Phrase it in terms of the author / writer doing things, e.g. 'In Chapter 4, the author describes ...'. This is not needed for minor assignments.

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3 Background

You can assume that the reader is aware of general railway concepts, but you cannot assume for example, that the reader is familiar with a specific technology or the geography of a particular country (with the exception of the UK). So this is where you describe the general knowledge that you have on the subject that the reader might not know.

For example, this chapter could be used to introduce the history of a particular railway construction project, or perhaps to describe the current situation in the UK or elsewhere. It can be particularly helpful to include maps if you are going to discuss foreign railways later on in the assignment.

While it is normal to include a background chapter in dissertations, it may or may not be necessary for an assignment, depending on the subject matter. It is also quite common (and perfectly acceptable) to include a degree of background information as part of your introduction, particularly for shorter assignments.

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4 Literature review

While it is normal to include a formal literature review for dissertations, this is usually not necessary for assignments unless the brief explicitly asks for one. Indeed, for most assignments, it is acceptable to weave your research / reading into the main body of the document with appropriate citations and quotations. But if you do decide to include a formal literature review, it needs to include the following elements:

- What have people said about this topic?
- Where do they agree?
- Where do they differ?
- Who is right in the view of the author of the assignment?
- What lessons are appropriate for this assignment?

But regardless of the approach you take, **you must use the author-date (i.e. Harvard) method of referencing.**

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5 Case studies

Some assignments can benefit from case studies where you want to give detailed examples of good or bad practice. Case studies normally include the following elements:

- Why is it relevant?
- What happened in this case study?
- What lessons are appropriate for this assignment?

However, there is no absolute requirement to have case studies in your assignment.

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6 Insert more of your own chapters here

Overall, an assignment should contain a limited number of chapters (somewhere between 5 and 9). But make sure that the title you use for each chapter gives the reader a good idea of what it contains.

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7 Conclusions

Like the Executive Summary, the Conclusions section is another important part of any assignment, and you need to make sure it is to a high standard. Here, you need to provide a brief summary of your work and link it to the problem under investigation, then examine, interpret, and qualify the results / findings and emphasize any theoretical or practical consequences of the results. It is recommended that you divide your conclusions into two sections:

- The first section titled “Findings” should be used to provide a factual summary of what you have found during your research;
- The second section titled “Recommendations” should be more subjective and personal since you will be suggesting a way forward.

It is sometimes helpful to also include a review of the approach you have taken to the assignment to provide a critique of what you have done. It can also be appropriate to discuss what areas or further work or research might be useful, or how the work / research you have done could be developed further. Bear in mind that the Conclusions section needs to be a strong section as it will be the final impression that you leave the reader with.

7.1 Word count

If you are using Overleaf then in the top left menu there is a tool to show your current wordcount.

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A Appendix title

Appendices are optional, and are typically used to include detailed data used in the main body of the report. Always include a sentence or two to introduce the table or other information that you are presenting in each and every appendix.