

Writing Mathematics Reports

This handout provides guidelines for writing and structuring a mathematics report. The suggestions provided here apply specifically to writing initial reports during Year 1.

A mathematics report presents a mathematics problem, which may often arise from modelling a real life application. Some mathematics problems may also come from a specific topic within mathematics, which is not necessarily related to a real life problem in a direct way. The report should explain the solution of the problem within a certain structure, or format.



What is in the report and how should the report be set out?

In general mathematics reports consist of the following numbered sections:

Sections	Focus of each section
1 Introduction	the purpose, the motivation, an outline of the report
2 Statement of the problem	what problem is to be investigated, preliminaries
3 Solution of the problem	methods used, calculations and what you found out
4 Discussion & Conclusion	what the results mean and how they relate to the theory, summary of findings related to the purpose
References	a list of books, software, Internet sites, etc., utilised
Appendices	detailed data and long calculations, if necessary

Note that the numbered sections are referred to as Section 1, Section 2, and so on, when cited anywhere in the report text. The References and Appendices are not numbered.

The above structure is explained in more detail along with examples from a sample report in the following:

1 Introduction

This section of the report presents the

- *aim and significance* of the problem,
- an *outline* (or *plan*) of the report.

First the *aim*, or *purpose*, of investigating the problem is stated. Often this is accompanied by necessary *background* information, such as: identifying the mathematical approaches or tools which could be applied to the problem; or, specific applications of the problem and its *history*. Use *present passive tense*.

aim	The aim is to analyse the behaviour of a work piece dragged by some vehicle on a factory floor.
background	While the vehicle travels along a straight line, the work piece follows a path called the tractrix .
history	The tractrix is sometimes called a <i>tractory</i> or <i>equitangential curve</i> . It was first studied by Huygens in 1692 who gave it its name. Later Leibniz, Johann Bernoulli, and others studied the curve.
outline	First the slope of the tractrix is found. Then this slope is used in an integral, and the equation of the tractrix is obtained. The distances travelled by the workpiece along the tractrix and by the vehicle at any time are calculated. Furthermore, Finally, as time approaches to infinity, the difference between the travelled distances is shown to be

2 Statement of the Problem and Preliminaries

The problem is presented in detail together with identification of assumptions. Some relevant equations and facts can also be given here. Every symbol or variable used should be explained. Use *present passive tense*.

stating in detail	In the xy-plane the work piece is initially located at point (L,0), L some positive number, and tightly connected to the vehicle at point (0,0), the origin. The vehicle then moves gently at a constant speed V along the y-axis in the positive direction, thereby dragging the work piece across the floor.
use of figures	This is illustrated in the sketch given in Figure 1.
assumptions	It is assumed that the connecting rope between the work piece and vehicle remains tight; in other words, the distance between the work piece and vehicle is constant.

3 Solution of the Problem

The solution outlines the methods used along with relevant equations and facts, and briefly presents results obtained from calculations and graphs. If the calculations and graphs are extensive ('long and tedious'), place these in Appendices. Every symbol or variable used should be explained. Sometimes using subsections such as 3.1, 3.2, etc. with appropriate titles can be useful especially when this section is rather long. Use *present passive tense*.

method	The velocity of an object is found by differentiating its position function with respect to time. So the velocity v of the work piece along the tractrix is given by
equation (with a reference to the equation: (1))	$v = ds/dt$ (1)
definition of symbols	where s is the distance travelled by the work piece along the tractrix, and t is time. The acceleration a of the work piece is calculated similarly as
another equation	$a = dv/dt$ (2)
referring to the equations	Equations (1) and (2) will be the basis of an analysis to be given below. ...
referring to Appendices	Further details of the derivation of v as a function of the x -coordinate can be found in Appendix B. ... Graphs depicting different cases are given in Appendix B.
use of and referencing to graphs; citing references	A graph of the velocity v of the work piece, as generated by MATLAB, is given in Figure 2. As seen from the graph, v is a decreasing function of time. ... Note that the x - and y -coordinates of the work piece are given in terms of the hyperbolic trigonometric functions, which are defined by the following expressions (Grossman 1992). ...

4 Discussion and Conclusion

This section presents a summary of findings related to the aim and interprets the results by exploring what the results mean and how they relate to the theory. Use *past passive* or *past-perfect passive tense*.

summary	The behaviour of a work piece dragged by some vehicle on a factory floor has been analysed. It has been observed that ... It was seen that ...
interpretation	The fact that as time approaches infinity x approaches zero is what one would expect intuitively. However, it is interesting to note that the difference between the distances travelled by the vehicle and by the work piece is ...

References

The References section contains a list of resources such as books, software, internet sites, etc. that have been utilised in the work. Any resource in the list must be referred to somewhere in the report.

Appendices

The Appendices present details of long calculations, raw data and graphs, or theorems. If using an Appendix one should always refer to it in the previous sections. The Appendix is not numbered. If there are more than one appendix then they are labelled as Appendix A, Appendix B, etc, and referred to similarly. (See the example of usage in above.)

