A guidance document for tutors of Open University modules in the Department of Mathematics and Statistics.¹

**Important notes**
Students on most mathematics and statistics modules at the Open University have the choice to submit their work electronically or on paper; the examples in the current document aim to show a variety from each choice of format. In any case, the principles of effective tuition in mathematics and statistics assignments are the same whichever medium is used.

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1 Introduction

As an Associate Lecturer (AL) at the Open University, you have access to general resources to support your work on the Tutoring [7], Supporting Students [5] and general Correspondence Tuition [3] websites; each of these websites can be found from your TutorHome page [6]. These sites provide a good reference guide to general aspects of effective tuition, resources to aid ALs in supporting their students, and also the administrative information you need to deal with Tutor-Marked Assignments (TMAs) and electronic Tutor-Marked Assignments (eTMAs). We suggest that you take a look at these websites before you continue with this document.

It takes time to assimilate the more general resources listed above, and to relate information to the task in hand – particularly if you’re new to the University. Effective tuition in mathematics and statistics is, in some ways, rather different from assignment-based tuition in subjects that involve students primarily in essay writing.

We therefore think it’s helpful to provide you with a subject-specific document: you may appreciate the chance to see illustrations of general principles at work in mathematics and statistics, through examples of students’ scripts and the comments that tutors have made on them. New modules and changing methods of delivery, especially electronic marking, give opportunities for a different process for providing effective tuition compared to paper marking. Nevertheless, the common core of good practice remains the same whatever the medium – so the ideas illustrated here remain relevant. Furthermore, it is important that tutors mark with a degree of consistency so that students receive a similar experience in feedback, support, guidance and advice.

Tutors naturally have individual styles of commenting, and what sounds right when written by one can sound artificial from another. This makes it tricky to lay down a set of hard-and-fast rules for effective tuition, but there are guidelines to follow. These are set out in detail in Sections 3 to 12, where we also provide coverage of some frequently encountered situations, along with examples of a variety of tutors’ ways of dealing with them.

The points we make are illustrated by instances of what we consider both good and not-so-good tutoring practice; for simplicity, most of the examples are taken from first and second level modules. Although there may not be any from the module which you’re teaching, we hope that many of the examples will be relevant to your work. We believe they cover most of the different types of situation that are likely to arise in mathematics and statistics modules.

We begin the document with some thoughts upon starting to mark a batch of scripts for modules which we tutor ourselves. This is followed by the main sections, including a range of examples; then we look at the monitoring process and how it will affect you. In Section 14 we provide an at-a-glance summary sheet of good practice points that can be used alongside the Tutor Notes for your module.

We hope that this document will help you to:

• establish processes to manage your marking of TMAs;
• grade student work in accordance with the guidelines for your module;
• encourage student progress and learning through appropriate feedback;
• appreciate monitoring as a quality assurance mechanism and as part of staff development; and
• know how to obtain further help if needed.

This document was originally written in 1999, with an updated version in 2008. Since then, a number of new modules have been produced, and an increasing emphasis has been put upon electronic marking. In the current version, we have aimed to include examples from the new
modules and we have tried to weave Good Mathematical Communication (GMC) throughout these examples.

We have mainly used the acronym ‘TMA’ in this document, but assume that each assignment could have been submitted electronically as an eTMA. Students may typeset their work, or write it by hand; most mathematics and statistics modules allow the students to submit their work electronically or on paper regardless of how it was prepared. Furthermore, tutors that mark electronically do so in a variety of different ways: some use a stylus to handwrite annotations, some use software to typeset annotations. Regardless of the methods involved, the principles of effective tuition remain the same.

We, the authors, would like to thank those who wrote the original versions of this document upon which the current version is based, and the many others who have helped in the revision; academic, secretarial, full-time and part-time staff, including Associate Lecturers who have, knowingly or unknowingly, provided examples for our use.

Gloria Baldi, Felicity Bryers, Chris Hughes, Joe Kyle, Andy Stittle, Frances Williams

2 Tutors at work

Felicity General approach

It’s a week after the cut-off date for TMA02 on MST124 Essential mathematics 1. I have marked one script which was submitted early but then exam work for another module intervened so I’m later starting the main batch of marking this time. I start by marking the TMAs sent in on paper because I find it easier to get to grips with the mark scheme this way. Sometimes I mark question by question until I’m familiar with the mark scheme, but generally I prefer to mark script by script so that I can build up a picture of each student’s work, particularly recurrent mistakes.

This TMA is not too difficult to mark. The most time-consuming question to mark is about vectors. Students often misinterpret the question and use the wrong angles. I must follow through the initial error and this involves doing all the arithmetic again. I make a note of the answers in case other students have made the same mistake!

There are marks awarded for Good Mathematical Communication (GMC). I usually use a different colour to comment on GMC; this allows me to see easily where the student’s communication has not been up to standard for the summary at the end of the TMA.

Most students have done well on the assignment. I think that it is very important to praise high quality work, particularly when the mathematics is beautifully presented. If you tell students when their work is good, then this may encourage them to produce more of this standard of work in the future – at least I like to think so!

A few students have found the work difficult and there are gaps in their TMAs or attempts at solutions that are full of mistakes. It can be difficult to know how to respond. I could work through a poor answer correcting every error but this might leave the student feeling overwhelmed, so I try to pick a couple of important errors and comment on these. I may refer the student to a similar example in the teaching materials. I may start the solution for a student and then invite them to continue, contacting me if they need more help. Occasionally I cut and paste a solution from the specimen solutions provided by the Module Team but usually only to help a student who could answer the question but who had difficulty with presentation. I don’t think it’s useful generally to give students too many complete solutions.

I find it difficult keeping track of marks for eTMAs so I create a table on paper and record the marks as I go along. I also build up a bank of comments in a separate electronic document
so that I can copy and paste comments for common mistakes, tweaking a little to suit each student’s needs.

Before I complete the PT3 form (in which overall feedback to the student is summarised), I look back to see what I said last time. This allows me to congratulate a student whose work has improved or encourage a student who has made the same mistakes this time as last to take note! I try to find something to praise for each TMA, then I pick two or three points which would benefit from some attention. I enclose an update with each TMA. This tells the student what they will meet in the next few Units, gives details of tutorials and also any other useful information, like parts of the module that are more challenging or hints on how they could be using their Handbook.

**Andy**

**First assignments on Level 1 modules**

Assessment feedback is crucial in first level mathematics and statistics modules. Over the year students will need to gain an understanding of what mathematics is and how to communicate it effectively.

Students of MU123 *Discovering mathematics* usually range widely in their mathematical background and experiences, but there is always a significant proportion lacking confidence with no recent study of the subject. For those who can attend the first tutorial there is an opportunity to explore their understanding of the early units and to discuss how to structure their explanations and layout. For those intending to submit assignments electronically I encourage them to send a completed unit activity to trial the eTMA process. This is effective in not only allowing me to provide feedback on their mathematical communication of answers but also to reinforce the requirements of eTMA submission such as using the correct file format. For students and tutors this helps to ensure the first TMA submission process flows smoothly and that answers arrive with clear explanations.

Early TMAs usually involve students getting used to unfamiliar software, for example the eTMA system, or module-specific software, or both. Encouragement to use the student forums is great for these sorts of issues and usually results in quick responses and engages the student with the forum.

Some students will hang onto mathematical approaches which have got them though in the past such as working through percentage calculations using multiples or fractions of a calculated 10%. Although tutors are encouraged to award marks for any correct method it is important to emphasise that for developing mathematical skills and progressing on the module, the way we arrive at the answer is as, if not more, important than the answer itself.

It is also especially important to delve into the detail of methods within early TMAs, as there will be many occasions for making a learning point; even within what, on first glance, may appear to be a correct solution. For example \((-2.5)^2\) is often written as \(-2.5^2\). Such errors are so common that I may spend a little time crafting an explanation for pasting into different scripts. However, particularly on early TMAs, there is a balance to be struck between providing encouragement and not being over critical. I always seek opportunities for praise.

Despite the OU’s best efforts some students still find their way onto modules without sufficient underpinning knowledge. On MST124 and MST125 *Essential mathematics 2* I need to make an early assessment of the student’s suitability for the module. The algebra questions in this first TMA are ideal for this purpose and marking the TMA quickly means that, if I really think she/he needs to study MU123 first, I can contact the student and if necessary the Student Support Team (SST) to help with an early transfer. Early TMAs are also great for starting to establish the importance of good mathematical communication and the detail so needed in later modules. For example, many students misuse the equals sign and provide poor layout in showing values that satisfy an equation.
I always agonise over making my comments on the PT3 complementary to the ones on the script. I want to encourage and, most of all, make learning points. I don’t want to repeat comments or talk about minor slips but instead try to identify some common themes in errors, illustrated by signposting to specific corrections or a specimen answer on the script. For example, these could be rounding errors, lack of explanations or, more rarely, too much explanation.

**Frances Tutoring at different levels**

I tutor the 30-point modules MST124 and MST125, mentioned by Andy and Felicity, and the 60-point pure mathematics modules M208 *Level 2 Pure mathematics* and M303 *Level 3 Further pure mathematics*.

My approach to marking Level 1 scripts is just as described by Andy and Felicity. I bear in mind that many – probably the majority – of my Level 1 students have the ultimate aim of higher-level studies in science, economics or social science rather than mathematics itself, and are taking MST124 and/or MST125 in order to gain the underpinning knowledge of ‘essential mathematics’ that they’ll need. The emphasis in many TMA questions in the Level 1 modules is on using mathematical methods to find numerical answers to real-world problems, rounded to a realistic and practically-useful degree of precision.

As we move to M208 the ethos changes subtly, and some students find it difficult at first to make the necessary adjustment. The mathematical objects, structures and operations we’re dealing with may well have real-world applications, but we’re studying them and their properties for their own sake; the emphasis is on clear and careful reasoning from precise definitions and axioms, with each step fully justified.

Students who have taken MST125 will have been introduced to the concept of a mathematical proof, and to various methods of constructing such proofs, but won’t have had a great deal of practice in doing so, and will need very clear and thorough guidance on their scripts.

In questions where a numerical answer is required, this should be given exactly, in terms of surds, $\pi$, $e$ and/or other irrationals if necessary; decimal approximations are never appropriate. Indeed, the use of calculators is prohibited in the exams for M208 and M303; I encourage students to prepare for this by trying to manage without them when working on their TMAs! No TMA marks are explicitly allocated to GMC, but tutors may deduct marks at their discretion for lack of clarity and rigour.

Many students, even those who have obtained excellent results in M208, find the step up to M303 to be rather steep; answering the TMA questions requires significant independent thought rather than the application of standard strategies or algorithms.

Half of each TMA is formative, in which the questions are designed to deepen and extend the student’s understanding of the subject-matter; students are encouraged to discuss these questions with their tutor and their fellow students, at tutorials or on the module forum, and direct help is permitted. The other half is summative, in which the questions place more emphasis on assessing understanding. The student’s recorded score for each TMA is that for the summative questions only; so students need encouragement to attempt the formative questions, and an explanation of the value of doing so in terms of their learning and their subsequent exam performance. All questions submitted are marked, and teaching comments given, in the usual way.

As in M208, the emphasis in M303 TMAs is on the construction of rigorous arguments, expressed by means of clear and coherent mathematical writing. In many cases, there will be more than one valid way of reaching the required result; if a student uses an approach markedly different from the model solution given in the marking scheme, the tutor will need to use his/her professional judgement in deciding whether the student’s argument is watertight, and
how many of the available marks to award if it isn't. In case of difficulty in making such a
decision, the Tutors' Forum is an invaluable resource. The details can be discussed with fellow
tutors and members of the Module Team; often it turns out that other tutors have seen the
same 'different' approach used in one of their scripts, and a consensus can be reached on how
to deal with it.

I've been tutoring at all of Levels 1, 2 and 3 throughout most of my 20 years with the OU
and find dealing with the variety of subject matter, and students' mathematical backgrounds
and motivation for studying each particular module, most stimulating and rewarding. There
have been many students whom I've tutored at all three levels, and it has been a privilege to
see them develop as mathematicians, and sometimes to go on to take higher degrees. At least
three of my students have later become my colleagues as OU tutors!

Joe An Experienced Novice

Every year is different: and for me, this year has certainly been no exception. For a number of
years, I have tutored on two undergraduate modules: the second and third level pure modules
M208 and M303 that have been very well described by Frances. I also tutor the MSc mod-
ule M820 Calculus of variations and advanced calculus. Rather than repeat all the excellent
points the others have already made, this is a slightly more subjective reflection on my own
experiences.

I plan my M208 face-to-face tutorials in conjunction with another tutor, so that they offer
excellent coverage of the module material. They are well attended and take place in well-
equipped, pleasant teaching rooms. This is my comfort zone. I enjoy the personal contact
and confess to an attraction to the 'theatre' (perhaps there is more to traditional methods than
some critics allow). But the real reason is probably that this is the way I have always done
things. At any event, planning and delivery usually go smoothly. In this respect, I see myself
as an experienced tutor.

On the other hand, with M303 all my tutorials have been online and I have certainly not been
in my comfort zone as I wrestle with an array of new methods and methodologies. Managing
online tutorials has been a journey of discovery for me. In this sense, I see myself as a complete
novice.

I am gradually adopting new perspectives on how best to run these tutorials and re-thinking
the tools needed, ranging from rudimentary matters such as basic time management, to the
much more thorny issue of encouraging genuine, meaningful, mathematical interaction. Lucky-
ly, a number of colleagues have been very generous in sharing and discussing alternative
approaches. A simple device that I've adopted has also helped: immediately after an online
tutorial, I jot down a few notes – perhaps four or six points at most – recording my immediate
impressions of what went well, and where things could have been better. I then paste these
notes into the first slides of the session just given and the next scheduled tutorial. Then, I go
and have a glass of wine! I don't dwell on things, but I have put in place simple reminders of
the principal points to consider when I'm next online.

I am tempted to describe tutorials for M820 (all online) as less structured, but that would be
inaccurate. More resembling seminar discussions, they are less predictable but still require as
much in the way of background preparation. It helps – it really helps – that the Module Team
have a comprehensive programme of module-wide tutorials and screencasts leaving me free
to be more flexible in my own sessions.

One small point: I never embark on a tutorial without checking the excellent 'Mathematician
of the Day' at the St Andrews History of Maths site [4]. Sometimes there's nothing of interest,
but often you can find an interesting link to a current topic or discussion.
My approach to student questions also varies across these three modules. For M208, I can usually send a complete reply to the query by return. This is not because I have a special, deep encyclopaedic knowledge of the topics; it simply reflects the fact that over the decades I have probably come across all likely issues. With the more advanced topics in M303, I have taken to sending a holding reply, to let the student know I have seen their message, but deliberately take some time to make sure I have taken on board all implications of the query. Finally, queries on the MSc module M820 can, as you might expect, enter rather tricky territory. Here is where the module forum is invaluable. Very occasionally, I have taken the question to the Module Team, whom I have always found very approachable. This might happen once in two or three years.

As far as actually meeting other mathematics tutors, each year there is usually at least one ‘live’ event and I always find these very useful to discuss, face-to-face, the issues of the day. But the online forums are also friendly and welcoming: invaluable for teasing out any tricky points during the presentation. I have picked up so many useful tips and, occasionally, deeper understanding through forum discussions.

And if you asked me why I do it, the answer would be easy: the immeasurable satisfaction in helping students and the deep sense of reward that comes from this. By comparison, the few frustrations (and there are some) are insignificant. In this short essay, I have tried to offer a flavour of my work as a tutor and my underlying philosophy: whether you have years of experience or are just setting out as a tutor, there will always be new things to think about, new approaches to try. As I said at the beginning – every year is different!

3 Grading

Marking correct work is usually easy – it is when the student goes wrong or shows insufficient work that difficulties arise. Tutor Notes\(^2\) try to indicate the proportion of marks to give to different sections, and detail what the marks are for. Nevertheless you will find many occasions when you have to use your discretion if the Tutor Notes do not cover the type of answers given, and the Tutor Notes may very occasionally be incorrect\(^3\). It is more important that you can justify the marks you have given than that you blindly obey the Tutor Notes.

Grading is, in practice, an inexact science. A difference of a small number of marks between tutors is the norm and it is only when a tutor differs from the average by a considerable amount, over all the scripts as a whole for a particular TMA, that alarm bells might start to ring; in particular, your Staff Tutor is given reports about your average scores in comparison to the average scores of all other tutors on the module.

There are key points to bear in mind when marking:

- It is important for the student to know why marks have been lost. In some cases it will be sufficient simply to correct an arithmetic error but, in all other cases, any loss of marks must be supported by an explanation to the student.

- Some indication of where the loss has occurred must also be indicated on the script. There are many ways of doing this depending on how the question is structured. It is usual to enter part marks next to each section of a question in line with how the marks are delineated in the question e.g. 3/5 for a part with 5 marks available and 3 awarded. This is particularly important if the student is having difficulty with many aspects of the question. Occasionally, if the student is getting almost everything correct, a simple ‘−1’ (with explanatory comments), and a total mark for the question at the end, may

\(^2\)Tutor Notes are provided by the Module Team and contain the marking scheme and guidance.

\(^3\)Errata are usually posted on the tutors' forum for the module.
be appropriate. The practice of always using part marks is probably the best, and is encouraged, as it does provide a check that all parts of the solution have been marked.

- You may use abbreviations when marking scripts as long as the first time you use them you explain to the student the code you are using. The most common are ‘b.d.’ (benefit of the doubt) when you feel the student has provided a correct answer but misinterpreted or misread a fairly trivial aspect, and ‘f.t.’ (follow through) when you have had to follow through an incorrect solution to see what effects the initial error may have had on other parts of a question, in order to avoid over-penalising a student for a single error.

- Non-standard but correct work, unless contrary to the wording of the question or the spirit of the module, usually gets full marks.

- In many cases, if no working is shown full marks cannot be awarded. The Tutor Notes should make the practice clear. It is often worth reminding students to look at the part of the module which explains what level of detail is needed when words such as ‘write down’, ‘calculate’ or ‘prove’ are used in a question.

- If a wrong answer is obtained with no working given, then, of course, neither method nor answer marks should be given.

- It is important to notice the process a student has gone through to achieve an answer, as well as the final result. A correct numerical result obtained via false steps should not receive full marks.

- Marks can always be split as you feel appropriate; e.g. if part of a question has 3 answer marks you can give between 0 and 3 depending on how good you think the answer is. Often the Tutor Notes will give a mark scheme with a detailed breakdown. On some modules you can even give half a mark if you wish, so long as you round up half marks to give an integer mark for the whole question.

- You can give credit for a particularly well-executed piece of work to mitigate minor slips elsewhere. Conversely, you can deduct credit for a combination of minor misdemeanours, none of which alone would justify a penalty. Where either of these occurs only a very small adjustment in terms of marks awarded should be considered, and this may only be done without exceeding the marks available for part of a question, as defined by the TMA. This process relies on your professional judgement and you should be confident that you can justify your decision if challenged.

- If you notice that two scripts are virtually identical, and you suspect that the two students concerned have collaborated more than is appropriate, or that one student has copied from the other or obtained a solution from an internet source, please consult your Staff Tutor before returning the scripts.

Finally, it is worth double-checking that you have added up all the part marks correctly and that you have copied the marks for each question to the PT3 correctly. There is a fairly high percentage of assignments submitted where the overall grade is incorrect, even on mathematics and statistics modules. Naturally, in our case it is only due to tiredness!

In the example that follows the tutor has provided part marks. Note that, as shown in this example, a total mark for the question should appear next to the solution as well as on the PT3.
example 3.1 MST125 03

(i) Show that the velocity (in ms$^{-1}$) of the ball is given by

$v = 0.6\sqrt{1 - e^{-3x}}$.

Using the equation $a = \frac{dv}{dx}$ gives $0.54e^{-3x} = \frac{dv}{dx}$. Separating the variables gives $\int v\,dv = \int 0.54\,e^{-3x}\,dx$. Performing the integrations gives

\[
v^2 \over 2 = -0.18e^{-3x} + c \text{ where } c \text{ is an arbitrary constant}
\]

\[
C = 0.18; \quad v^2 \over 2 = -0.18e^{-3x} + 0.18
\]

\[
v^2 \over 2 = 0.18(1 - e^{-3x}); \quad v^2 = 0.36(1 - e^{-3x})
\]

\[
v = \sqrt{0.36}X\sqrt{1 - e^{-3x}}; \quad v = 0.6\sqrt{1 - e^{-3x}}
\]

(ii) How fast is the ball travelling when it has moved 0.1 metres?

Give your answer to two significant figures. [7]

When $x = 0.1$, $v = 0.6\sqrt{1 - e^{-0.3}}$

$V = 0.3054593926; \quad 0.31\text{ ms}^{-1}$

Total $\frac{5}{6}$

Notice also how the fairly brief comment lets the student know why the mark was lost; furthermore, it is useful for guidance on future questions that ask the student to ‘show’ something.

In this example the tutor keeps a tally down the right-hand side of the script, making it explicitly clear where marks have been lost, using a $(-1)$ on the left-hand side. This is in addition to showing the more important part mark of $5/6$.

In the following example, the solution in the Tutor Notes starts by showing the denominator, $\sqrt{42}$, can be replaced by $\sqrt{14}\sqrt{3}$ thus reducing the fraction to $\sqrt{3}$. The tutor chose to dock a mark because the student has not done this, even though the question did not specify that this approach was needed explicitly. Given that the solution is perfectly clear, full marks would have been more appropriate, while keeping the comments which direct the student to a similar example, and highlight that it is usually easier to break surds into factors when simplifying. The tutor might have commented on the use of $\ast$ to represent multiplication, in keeping with encouraging GMC.

example 3.2 MU123 02

\[
\frac{\sqrt{9} \ast \sqrt{14}}{\sqrt{42}} = \frac{\sqrt{9} \ast 14}{\sqrt{42}} = \frac{3\sqrt{14}}{\sqrt{14}\sqrt{3}}
\]

Finally I can use the rule $\frac{\sqrt{a}}{\sqrt{b}} = \sqrt{\frac{a}{b}}$ and simplify to give the answer..
It can become obvious that a question was unclear if most students make the same mistake. Unfortunately, it is usually not obvious until after you have marked quite a few scripts. For this reason, it is wise to retain early scripts until you are happy that your own application of the marking scheme is correct and consistent.

In the following example the tutor has included no part marks on the script and has simply put a score of 3/9 on the PT3. The student will have difficulty in knowing where and why 6 marks were lost. When so many marks have been lost on a question the tutor should provide sufficient notes to allow the student to see where they have gone wrong, and what they need to do to improve. The two brief notes below are unlikely to assist the student to fully assess their mistakes on M249 Practical modern statistics.

example 3.3 M249 02

The partial correlogram shows that all the sample partial autocorrelations lie within the significance bounds. This shows little evidence that the partial autocorrelations for all the lags are non-zero.

The white noise model is a plausible ARIMA model for ice as the ACF shows that the lags are all zero and the PACF also shows this.

not at key 8 which looks reasonably significant

The Autoregressive model is also a plausible ARIMA model for ice as the ACF could be argued to show a tailing off to zero rather than all zero, due to lag 8 exceeding the significance bounds.

Using the principle of parsimony, white noise is the ‘best’ choice as it has the smallest value of p+q (0)

with your plots you were not able to give a very sensible analysis

Compare with the following, where the tutor explains fully why a mark has been lost.

example 3.4 M249 02

Looking at the correlogram, apart from lag 1, all the correlations are well within the significant bounds and can be considered as zero, showing the correlogram is zero after lag 1. The partial correlogram could be seen as tailing off to zero. This suggests a moving average model, as the correlogram is zero after lag 1, this suggests q = 1. This gives a possible model of MA(1) or ARMA(0,1).

For a possible autoregressive model the correlogram could be said to be a damped sinusoidal pattern, and the partial correlogram may be considered to decreasing to zero correlation after lag 2. Giving a possible model of AR(2) or ARMA(2,0)
4 Correction and explanation

Even more important than accurate grading is the teaching which you do on an assignment. There are many ways of teaching, and we show examples of a variety of techniques. In most cases, you can put appropriate comments and corrections on the student's script. If you are marking a paper script and there is not room for your comments, you may wish to attach a separate sheet with further comments, or a model solution, referencing the point to which it applies. If you are marking a script electronically, you might insert a blank page for your comments.

Copies of Tutor Notes should not be sent to students. Increasingly, Module Teams provide specimen solutions to help support electronic marking, and short extracts of these may be given to students. These should be used sparingly, and ideally should be annotated to help the student address his or her particular misunderstandings. In the following example from MST210 Mathematical methods, models and modelling, the tutor has enclosed part of a specimen solution (typeset) and shown the student how and why the correct approach works (handwritten), but has left the student to complete the question on their own.

example 4.1 MST210 01

(b) Noting Procedure 7 on page 53 of Unit 1 we may try to find a particular integral by using the method of undetermined coefficients, taking the trial solution \( y = m_2 x^3 + m_1 x + m_0 \). Differentiating yields

\[
\frac{dy}{dx} = 2m_2 x + m_1,
\]

and again

\[
\frac{d^2 y}{dx^2} = 2m_2.
\]

Substituting these into the differential equation gives

\[ 5(2m_2) + 4(2m_2 x + m_1) + (m_2 x^2 + m_1 x + m_0) = x^2. \]

Equating the coefficients of \( x^2 \), \( x \) and the constant terms, respectively, gives three equations

\[ m_2 = 1, \quad 8m_2 + m_1 = 0, \quad 10m_2 + 4m_1 + m_0 = 0. \]
Specimen solutions can be very useful, but they should be regarded as an addition to, rather than a substitute for, direct comments on the student’s own work. Students may sometimes omit all or part of a question; the above points apply and you may need to make a judgement as to how much explanation and how much of a specimen solution you give, if any.

After reading your comments, the student should understand

- which parts have been done well;
- which parts are incorrect, or could have been done better, and why;
- how to correct the faulty parts;
- where to get further help, if necessary.

In the first example below, from M208, the student has not understood how to show that the set \( T = \{ (a, b, 2a - b) : a, b \in \mathbb{R} \} \) is a subspace of the vector space \( \mathbb{R}^3 \). The tutor has explained what is required, given a reference and part of a model answer; this is very thorough teaching. Notice that the reference is very specific. A particular page in the module material is indicated, making it far more likely that the student will actually look at it.

**example 4.2 M208 03**

\[
\begin{align*}
(b) & \quad a, b \in \mathbb{R} \\
\text{Hence} & \quad (2a-b) \in \mathbb{R} \\
\text{So} & \quad (a,b,2a-b) \text{ is a subspace of } \mathbb{R}^3 \\
\text{i.e.} & \quad T \text{ is a subspace of } \mathbb{R}^3
\end{align*}
\]

To show that \( T \) is a subspace of \( \mathbb{R}^3 \) you need to show that the zero vector belongs to \( T \), and that \( T \) is closed under vector addition and scalar multiplication. (See Theorem 4.1, handbook p50 and Strategy 4.1.)
The next example, from M248 Analysing data, is another case where the tutor has explained what needs to be done to improve the student’s solution, as well as giving a reference to the module materials.

**example 4.3 M248 03**

<table>
<thead>
<tr>
<th>Number of accidents</th>
<th>( O_i )</th>
<th>( E_i )</th>
<th>( (O_i-E_i)^2/E_i )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>447</td>
<td>406.32</td>
<td>0.073</td>
</tr>
<tr>
<td>1</td>
<td>132</td>
<td>189.00</td>
<td>17.216</td>
</tr>
<tr>
<td>2</td>
<td>42</td>
<td>44.00</td>
<td>0.091</td>
</tr>
<tr>
<td>3</td>
<td>21</td>
<td>6.79</td>
<td>31.738</td>
</tr>
<tr>
<td>4 or more</td>
<td>5</td>
<td>0.84</td>
<td>20.602</td>
</tr>
</tbody>
</table>

Test statistic is 71.72 on 3 df. It is very unlikely that the data is from a Poisson distribution.

Please note, if \( E \) expected frequencies not to be \( >5 \). Be wary of \( \leq 5 \) in each cell.

You need to say why you are making this conclusion – for 3 d.f. the critical value of the 5% significance level is \( \chi^2 = 7.81 \), considerably smaller than the test statistic.

The next example, from M208, shows that good teaching does not always mean you have to write a lot! The comments are brief but very effective. If the student repeats his working with \( n^3 \) used in place of \( n^2 \) he will immediately be able to solve the problem correctly. And the tutor has taken advantage of an opportunity to remind the student about what appears to
have become a bad habit. The comment about writing is a more fundamental mistake which can arise in other aspects of the module and may be worth signposting on the PT3 to make a learning point. Perhaps the tutor could also specify that $n^3$ is the dominant term, together with a reference to the module materials.

**example 4.4 M208 04**

\[
\frac{n^3 + n}{2n^3 - n} = \frac{n + \frac{1}{n}}{2n - \frac{1}{n}}
\]

(dividing top & bottom by $n^2$)

\[
\to \quad \frac{\infty}{\infty} = 1 \quad \text{as} \quad n \to \infty.
\]

Neil - if only you'd divided top and bottom by $n^3$!

And please see my earlier comment about writing things like " $\infty/\infty = 1$ ".

Next we show a different method of teaching: this student, on MST125, had the right idea, but did not explain it well. The tutor annotated the student's proof and added a comment to explain why the additions were necessary.

**example 4.5 MST125 01**

\[
Q1. \text{ (a) } f(x) = 3x - 7
\]

\[
f(x_1) = f(x_2)
\]

Then

\[
3x_1 - 7 = 3x_2 - 7
\]

and hence

\[
3x_1 = 3x_2
\]

\[
x_1 = x_2
\]

so $f$ is one to one.

We need to show that for all real numbers $x_1, x_2$ that if $f(x_1) = f(x_2)$ then $x_1 = x_2$.

You have the right ideas, but see my additions. It is important that you say what you doing (communication) and give your answer mathematical rigour.

In the following example, the tutor has explained why the student's method does not work, pointed out some incorrect notation, and given a reference and guidelines on how to construct a solution. The tutor has encouraged the student to complete the solution. This approach pro-actively engages the student with the comments left by the tutor, making it far more likely that the student will learn from the feedback.
Next we show a few examples where the tutor has not been so helpful. In the first, from MU123, the student has substituted in the value 41 but there is insufficient explanation in words to explain they are showing it satisfies the equation; this has been marked without comment. An omission has been pointed out by the tutor, but the student does not recognise the type of equation and has therefore not expected two solutions. The tutor has missed the opportunity to comment and make a more general learning point about dividing by a factor that may be zero and/or about factorising. Both of these points have wider relevance and may be worth bringing into the PT3.

**Example 4.6  MST124 02**

\[
\text{Solve the inequality } \frac{2-x}{3x+1} \leq 0
\]

So \(2-x \leq 0\) or \(3x+1 \leq 0\)

but as the denominator \(\neq 0\), we must have \(3x+1 < 0\).

For \(2-x \leq 0\), \(x \geq 2\)

For \(3x+1 < 0\), \(x < \frac{-1}{3}\)

So \(x \geq 2\) or \(x < \frac{-1}{3}\)

\[
\begin{array}{|c|c|c|c|c|}
\hline
x & \infty & (-\infty, \frac{-1}{3}) & (\frac{-1}{3}, 2) & 2 & 2, \infty \\
\hline
2-x & + & + & + & 0 & - \\
\hline
3x+1 & + & - & - & 0 & + \\
\hline
\frac{2-x}{3x+1} & \text{undefined} & - & + & 0 & - \\
\hline
\end{array}
\]

Next we show a few examples where the tutor has not been so helpful. In the first, from MU123, the student has substituted in the value 41 but there is insufficient explanation in words to explain they are showing it satisfies the equation; this has been marked without comment. An omission has been pointed out by the tutor, but the student does not recognise the type of equation and has therefore not expected two solutions. The tutor has missed the opportunity to comment and make a more general learning point about dividing by a factor that may be zero and/or about factorising. Both of these points have wider relevance and may be worth bringing into the PT3.

**Example 4.7  MU123 03**

When \(x = 41\)

\[41^2 - 41^2 = 0\]
The previous example showed little tutor engagement with the student’s work. In the next one, from MST125, the tutor has explained how the student could have earned more marks if he had correctly followed through after an algebraic slip. This is good tuition but there is no mention of the student’s division by 4 at the start of part (c) or the relevance of completing the square to find a minimum. Further explanation or referral to a unit example would be useful here. It would have been even better if the tutor had noticed the further errors in the student’s work in part (c) – can you find them and in particular can you see a learning point about collecting positives and negatives together?

example 4.8 MST125 01

\[ \text{Solve} \]

\[ \begin{align*}
  x^2 - 41x &= 0 \\
  x^2 &= 41x \\
  x &= 41
\end{align*} \]

With a weak student, it may not be appropriate to comment on every single detail (this can demoralise students) but the tutor could have done some of the following: (you may have thought of other things too, but do bear in mind that it would not be appropriate to make quite this many comments on one solution):

- pointed out that in part (b) the student has simplified \((8 - t - (t + 1))^2\) to \(7^2\); perhaps she wrote \((8 - (t - t) - 1)^2\) as an intermediate step?
- pointed out that this kind of error was repeated when calculating \(-6.25 + \frac{37}{2}\); she computed this as \(-\left(6.25 + \frac{37}{2}\right)\);
- in fact, the tutor made a couple of small mistakes here: in part (b), the tutor has not collected terms correctly; in part (c), the factor of 8 is not removed from the 74;
- pointed out that the student took the square root of a negative number in part (c);
- pointed out the lack of accuracy in rounding as the student has used \(\sqrt{24.7}\) and not...
\[ \sqrt{24.75}; \]

- pointed out the incorrect use of another point \( (t = 2) \) to justify the minimum;
- encouraged the student that her overall approach was valid, and that she had followed most of the right steps;
- acknowledged that she did correctly expand \((-2t + 5)^2\) in part (b);
- awarded more marks; admittedly there were several errors, but the student did appear to understand some of the method.

Finally, here is an example where a tutor has given some helpful advice but could have highlighted a number of errors. The question comes from MU123 and asks the student to find the \( x \)-intercepts of a parabola.

The tutor has missed, or has chosen not to comment on, a number of points. Can you identify these points? Which, if any, would you have chosen to highlight? Do you think that the tutor should have awarded full marks?

**example 4.9 MU123 04**

\[
y = -\frac{x^2}{16} + \frac{21x}{16} + \frac{11}{8} = -x^2 + 21x + 22
\]

\[
x = \frac{-21 \pm \sqrt{21^2 - 4 \cdot (-1)(22)}}{2\cdot(-1)}
\]

\[
x = \frac{-21 \pm \sqrt{441 - 88}}{-2}
\]

\[
x = \frac{-21 \pm \sqrt{353}}{-2}
\]

\[
x = -11.5 \text{ or } -1.5
\]

Here are some of the mistakes that the tutor could have identified:

- In the first line the student has multiplied the right-hand side of the equation by 16, but has not done the same to \( y \) on the left-hand side.
- The student has failed to say that the \( x \)-intercepts are the solutions to the equation \( y = 0 \), so the use of the quadratic formula does not follow.
- Throughout the working, the student has failed to enclose the numerator of the fraction in brackets so the working as it stands is incorrect.

This student appears to be capable of doing the maths so some help improving their communication would be valuable. Maybe all of the points above should be identified. The student should certainly have lost one mark because the Tutor Notes specified that one of the four marks available was given specifically for saying that the \( x \)-intercepts are the solutions to the equation \( y = 0 \), and probably either half a mark or a whole mark for writing incorrect mathematics, though this depends on how this is assessed in the module.

Here is an attempt by another student at the same question. This student is not confident in
his use of maths but he has still managed to reach the correct answers. How would you mark this?

\[ \frac{-x^2}{16} + \frac{21x}{16} + \frac{1}{8} = 0 \]

\[ x^2 - 21x - 22 = 0 \]

\[ (x - 22) \text{ or } (x + 1) \]

\[ = x - 22 \text{ or } x = -1 \]

\[ x\text{-intercepts } (22, 0) \text{ and } (-1, 0) \]

5 Asking questions, giving hints and encouraging checks

It is not generally good practice just to provide a complete answer. It is often more appropriate to ask questions and give hints as to how the student can re-assess the question, and then go on to solve it. Clearly, if you are asking the student a question you should expect, and indeed encourage them, to contact you if they can’t find an answer. Such questions and hints must allow the student to progress and therefore the question(s) that you ask must be chosen in the light of your judgement of the student’s knowledge and ability. It can also be useful to use questions with students who are finding the module easy in order to maintain their interest and spur them on to greater understanding. In many ways this area is one of the most difficult to prescribe, since it is very dependent on what you feel the individual student’s requirements are, and your estimation of their ability.

In the example that follows the tutor has started the solution and given some hints, but has left the student to complete it. A useful reference is provided to a similar example in the book, together with an offer of additional support.

Example 5.1 MST124 02

ii) Using the double angle identity for tangent to find the exact value of \( \tan \left( \frac{\pi}{12} \right) \)

\[ \tan(2\theta) = \frac{2 \tan \theta}{1 - \tan^2 \theta} \]

\[ = 0.004569293096 \]

\[ \tan \frac{\pi}{12} \text{ would equal } 0.0046 \text{ (2.s.f.)} \]
In the next example, the student has answered the question correctly but the tutor has given a hint about how presentation could be improved.

example 5.2 MST124 03

Looking ahead to typesetting in MST125, can you work out how to write $\ln 2x$ rather than $\ln 2x$? (That is no italics for $\ln$?)

A question can encourage a student to think more carefully about their answer. In the following example, the student has made an error in their mathematical communication, and the tutor has, instead of correcting the problem, invited the student to provide the answer.

example 5.3 MST125 01

Incorrect use of = here - can you see why?

$$P + F - 100g \cos 60^\circ = 0$$

$$P + 10g\sqrt{3} = \frac{1}{2}100g$$

$$\equiv \frac{1}{2}100g - 10g\sqrt{3}$$

$$= 320.26 \text{ (2 d.p.)}$$

It is important to encourage students to check their work both in terms of making sure that they
have answered the question, and checking that their answer is both correct and reasonable. In the following example the tutor has cleverly pointed out that the student’s final result was not a sensible answer to the question.

**example 5.4 MU123 02**

The amount of teaching you provide on a script will vary enormously depending on the quality of the student’s script and how a question and subsequent answer affords you the opportunity to intervene. In the next example, the tutor points out a quick way of checking the signs in a sign table.

**example 5.5 MST124 02**
Deciding when a lengthy response is required and when a more succinct comment will do is one of the key features of effective assignment tuition.

6 Alternative methods

You may sometimes find that a student has used a different method from the one given in the Tutor Notes. What you do about this will depend on the module and on the way the question is worded. If any method is permitted, then of course you can give full marks to any correct working – you may still wish to explain the expected method, especially if it is preferable for some reason, as the tutor has shown in the following example from MST124. Note, also, how clearly the tutor has annotated this work.

example 6.1 MST124 01

\[
\frac{2-x}{3x+1} \leq 0 \quad \forall x \in (-\infty, -\frac{1}{3}) \cup [2, \infty) \quad \text{Well done!}
\]

2 - x is a linear expression, decreasing because the coefficient of x is negative, so it can't change sign suddenly from + to - then back to +. Or maybe this was just a typo?

However, sometimes a specific method is stated in the question, or is part of the philosophy of the module, and in this case you will need to deduct some marks and explain how the question should have been tackled.

In the M248 example below, the question specified that the student was required to obtain the solution by hand. The tutor has made an effective, succinct comment drawing the student’s attention to the need to show sufficient working to justify that this is what has been done. The correct answer has been achieved, but the student might, for example, have used the module’s statistics software to obtain it; of course there’s nothing wrong with using Minitab or other
software to check one's hand calculation.

**Example 6.2** M248 02

In the MST124 example below, the student has used the quadratic formula to solve the equation \(x^2 - 3x = 0\). The tutor has just ticked the answer and made no comment at all. How might you have advised this student? Would you use another example to illustrate the points you may make?

**Example 6.3** MST124 01

In the next example, from MST124, the student was asked to write the quadratic expression in completed square form, and hence to find the values of \(x\) that made the expression equal to 0. In fact, the student chose to use the quadratic formula; the tutor has given a thorough response, including an explanation of how to interpret the word 'hence', together with a model solution.

**Example 6.4** MST124 01

4.

a) \(2x^2 - 8x + 5 = 0\)

Cameron, in part (a) the question asks you to write the quadratic expression in completed square form and 'hence' to find the values of \(x\) when the expression was equal to 0. When you see the word 'hence' in a question it means that you have to start with the result that you have just produced and use this to show whatever is required in the question. You have not completed the square and therefore your solution cannot follow on from that result. Consequently, although you have correctly
Tutor Notes will often contain statements such as Accept alternative correct working, but if ever you are not sure, you can post your thoughts and questions to the module tutor forum or otherwise ask for guidance from your mentor or Staff Tutor.

As a general point, the colour in which you choose to mark can have a significant effect on the student’s reception to your feedback. Some students find it hard to read feedback written in red; indeed, for some of our students with additional requirements, the colour choice can have a detrimental effect on their ability to study. In general, we recommend that you use a colour which contrasts with that used by the student and that you avoid using red.

7 Supporting weak students
Most students on modules in Mathematics and Statistics obtain fairly high TMA scores (75% upwards) and it can be very demoralising for those who don’t. Often, weak students don’t or can’t attend tutorials and their written work is the only opportunity you have for providing encouragement; your success in providing such encouragement may well influence a student’s decision as to whether to continue with the module. Below are two examples which demonstrate responses to efforts by weaker students.

In the first case, the student has actually done most of the question correctly, but has not communicated to the reader the points at which they have used Fermat’s Little Theorem. The tutor has engaged with the student by pointing out that no justification or conclusions have been given; note that the tutor has also given part marks, together with a question total, and finally a reference to the relevant module materials. As the tutor in this example, you might mention Good Mathematical Communication in the PT3 to your student.

\[
\begin{align*}
  a &= 2, b = -8, c = 5 \\
  x &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \\
  x &= \frac{8 \pm \sqrt{(-8)^2 - 4 \times 2 \times 5}}{2 \times 2} \\
  x &= \frac{8 \pm \sqrt{64 - 40}}{4} \\
  x &= \frac{8 \pm 2\sqrt{6}}{4} \\
  x &= \frac{8 - 2\sqrt{6}}{4} \checkmark
\end{align*}
\]
\[
\begin{align*}
  x &= 3.224744871, x = 0.7752551286 \\
  2x^2 - 8x + 5 &= 2((x - 2)^2 - 4) + 5 \\
  &= 2(x - 2)^2 - 8 + 5 \\
  &= 2(x - 2)^2 - 3.
\end{align*}
\]

So \(2x^2 - 8x + 5 = 0\) where
\[
\begin{align*}
  2(x - 2)^2 - 3 &= 0 \\
  2(x - 2)^2 &= 3 \\
  (x - 2)^2 &= \frac{3}{2}
\end{align*}
\]

\[
\begin{align*}
  x - 2 &= \pm \sqrt{\frac{3}{2}} \\
  x &= 2 + \frac{\sqrt{6}}{2}, \text{ or } x = 2 - \frac{\sqrt{6}}{2}.
\end{align*}
\]

Hence \(x = 2 + \frac{\sqrt{6}}{2}\), or \(x = 2 - \frac{\sqrt{6}}{2}\).

Note: your solutions and the ones given above are the same, just in a different form.

example 7.1 MST125 02

\[
\begin{align*}
  \text{a.} \\
  (\frac{1}{2})^{12} &\equiv 1 \pmod{13} \\
  \text{What theorem are you applying and are there any conditions that need satisfying?} \\
  \text{You also need a conclusion statement i.e. the least residue is 1}
\end{align*}
\]

\[
\begin{align*}
  \text{b.}
\end{align*}
\]
In the second example the student has misunderstood ‘change of subject’; the tutor explained what is wrong, provided a solution (not given here), and a reference to the module materials. To make the teaching here even stronger, the tutor could have encouraged the student to contact him/her if the proposed method caused difficulties.

example 7.2 MST124 01

e) \[ \frac{1}{f} = \frac{1}{u} + \frac{1}{v} \]

Moving the \( U \) over to the other side, changes its sign from \(+\) to \( -\); 
\[ \frac{u}{f} = 1 + \frac{1}{v} \]

Here you’ve multiplied \( 1/f \) and \( 1/u \) by \( u \), but haven’t multiplied \( 1/v \) by \( u \).

Moving the \( f \) over changes it from \(+\) to \( -\); 
\[ \frac{u}{v} = \frac{f}{1} + 1 \]

Now you’ve multiplied \( u/f \) and \( 1/v \) by \( f \), but haven’t multiplied \( 1 \) by \( f \).

"Moving over to the other side" is not a very helpful way to think about operations on equations, particularly those involving multiplication or division; you need to think of them in terms of "doing the same to both sides" - and you haven’t done this above. (See p77 Book A.) Here’s a solution:

It is easy to cover a poor script with coloured ink. Not only is this depressing for the recipient, but too many comments overall can detract from important feedback on key areas of work. It may sometimes be necessary to omit less crucial points in order to emphasise basic concepts.

Where a question has been left out, or has gone badly wrong, providing the solution alone may not help the student’s understanding. It can be useful to annotate it or refer the student to specific passages in the module materials where explanations can be found. In the following example from MST125, the student appears to have given up mid-question and has left out subsequent sections; the tutor not only provides a reference, but also tries to convince the student of the value of submitting even partial solutions.

example 7.3 MST125 02

I had no ideas!
The next example, from MST125, shows that the student has misunderstood the question; the student has almost proved the converse of the original statement, rather than the contrapositive. The tutor has included a specimen solution, but hasn't pointed out the misunderstanding, or the use of the same $k$ in two different roles in the working.
Contrast this with the much more supportive approach of the tutor in the example which follows.

example 7.5 MST125 03

Using the proof by contraposition we can prove that the following statement is true for all integers $n$

\[
\text{if } n^2 - 2n + 3 \text{ is even, then } n \text{ is odd}
\]

(3.3)

The contrapositive is:

if $n$ is even, then $n^2 - 2n + 3$ is odd

(3.4)

So let $n = 2k$

such that

This gives:

\[
\begin{align*}
 n^2 - 2n + 3 &= (2k)^2 - (2k) + 3 \\
 &= 4k^2 - 2k + 3 \\
 &= 2(2k^2 - k + 1) + 1
\end{align*}
\]

Thus $n$ since $2k^2$ and $2k$ is an integer. (?)

2/5

Comments:

The above argument shows that

if $n$ is even, then $n^2 - 2n + 3 = 2(2k^2 - 2k + 1) + 1$, which is odd.

Hence, by contraposition, if $n^2 - 2n + 3$ is even, $n$ is odd

[See Unit 9 Activity 38(a)]

The way in which you use the PT3 is particularly important for students with a lower overall TMA score, as this is the first thing they see.

Section 12 of this document contains a couple of very good PT3 examples [Examples 12.8 and 12.9] of ways in which tutors have responded to students with scores below 60%. Though very different in style, both start off with positive comments, both provide constructive suggestions
for improving general aspects of the students’ approaches and, most important, both encourage the students to contact them with problems related to either the current or the next TMA.

Sometimes students who are finding an assignment difficult may blame the questions or the module materials (see the examples in Section 11 on Student criticisms). You will need to use your knowledge of the student to decide how best to handle such a situation, though it may be that a telephone call or email will be easier than attempting to deal with it on the script.

Where you feel that some additional tuition would help a student over a difficult patch of the module or provide useful study skills, you should approach your Staff Tutor or Student Support Team. It may be possible to arrange one or two special sessions either face-to-face, by telephone or online, whichever is appropriate.

8 Challenges to good students

You will probably have some students whose work is very good, and you might like to encourage them to think beyond the confines of the question. Often you may think there’s not much you can do except tick their answers and give some words of praise. However, these students need your appreciation of their efforts just as weaker students do, and perhaps there are some places where you can stimulate them to further enquiry. Some modules have especially challenging problems which you can suggest they attempt; some students may respond eagerly to the idea that they are capable of tackling them. On the assignment, a hint or a question may lead the bright student into new paths. Here is an example of such a hint, from M303.

example 8.1 M303 04

Another approach is to invite the student to go beyond what was asked of them. In the example below, from M303, the student had easily dealt with the question, so the tutor engaged with the student by stretching their understanding a little further, and provided a useful hint to get them started. Emphasis that this was an additional challenge was put in comments on the PT3 form.

\[ \text{You need to put this over a common denominator of } b_1 b_2 \text{ - then you’ll have a rational number } A \text{ whose numerator may be divisible by } p, \text{ or a higher power (but this can only happen if } m_1 = m_2 = \text{ why?)} \]

Again, if either } x \text{ or } y \text{ is zero, the result is immediate.}
9 Good Mathematical Communication

In producing their answers, students may give arguments that are essentially correct but nonetheless flawed from a presentational point of view. For example, they may use the wrong notation, or they might not give enough written explanation to support their work. This is quite a common occurrence, particularly when a student is new to the subject, but the importance of developing good presentational skills should be stressed to all students; this includes discreet correction of the spelling of mathematical terms. You may still feel that an answer merits full marks; this will depend on the module and/or how essential the presentation is to the argument. Also, how much you correct may vary according to whether the student is weak or strong; to avoid detracting from the significant issues on a weak script, you might let a student get away with a slight misuse of notation which you would point out to a stronger student (who had not made other errors!). However, it is very important to explain the correct notation, or the correct logical form of an argument. This could be done by referencing the module material, handbook, etc.

This first example received full marks, but the tutor commented on what has probably become a bad habit, particularly given that the student is studying at Level 2.

**example 9.1 M208 03**

\[
\text{Let } \det(A - \lambda I) = \begin{vmatrix}
1 - \lambda & 0 & -3 \\
-5 & 3 - \lambda & -5 \\
-3 & 0 & 1 - \lambda \\
\end{vmatrix} = 0
\]
Expanding by the top row, we have

\[
\begin{vmatrix}
1 - \lambda & 3 - \lambda & -5 \\
0 & 1 - \lambda & -1 \\
-3 & -3 & 3 - \lambda
\end{vmatrix} = 0
\]

\[
\Rightarrow (3 - \lambda)(3 - \lambda)(6 - \lambda) - 9(3 - \lambda) = 0
\]

\[
\Rightarrow (3 - \lambda)(6 - \lambda - \eta)
\]

\[
\Rightarrow (3 - \lambda)(\lambda^2 - 2\lambda - 8)
\]

\[
\Rightarrow (3 - \lambda)(\lambda - 4)(\lambda + 2)
\]

So eigenvalues of \( A \) are \( \lambda = -2 \) and \( \lambda = 3 \) and \( \lambda = 4 \).

Alternatively, say

\[
\det(A - \lambda I) = \ldots = (3 - \lambda)(\lambda - 4)(\lambda + 2)
\]

so\[\det(A - \lambda I) = 0\]

means \[ (3 - \lambda)(\lambda - 4)(\lambda + 2) = 0. \]

giving \[ \lambda = 3, \text{ or } \lambda = 4, \text{ or } \lambda = -2. \]

Here is another example, from the same TMA, which also received full marks. The tutor did not overlook the opportunity to make a teaching comment about the style of presentation of the work.

**example 9.2 M208 03**

\[
\begin{pmatrix}
2/5 & -4/5 \\
-4/5 & -3/5
\end{pmatrix}
\begin{pmatrix}
1 & 1 & 2 \\
0 & 1 & -1
\end{pmatrix}
\]

\[
= \begin{pmatrix}
3/5 & -7/5 & 2/5 & 4/5 \\
-4/5 & 1/5 & -11/5 & 3/5
\end{pmatrix}
\]

Since you use \( \Rightarrow \) on the left you should have an equation for each line here, i.e. include "=0" on each line. See below.
In this next example, no comments were given by the tutor at all. What might you have said?

Example 9.3 MST210 01

\[ \frac{x^3}{dx} \frac{dy}{dx} + 2x^2y = 5 \]

\[ \frac{dy}{dx} + \frac{2y}{x} = \frac{5}{x^3} \]

\[ p = e^{ \int \frac{2}{x} \, dx } \]

\[ = e^{ \ln|x| } \]

\[ = e^{ \ln|x| } \]

\[ = x^3 \]

\[ \Rightarrow x^2y = \int \frac{5}{x} \, dx \]

\[ = 5 \ln|x| + c \]

\[ \text{So } y = \frac{5}{2x^3} \ln|x| + \frac{c}{x^2} \]

The following points could have been addressed:

- The tutor might have given some encouragement, and some recognition that the student's answer is basically correct, and well presented.

- There is only one word in the student's answer! The tutor could have inserted a few phrases, such as, 'To find the integrating factor \( p \), proceed as follows ...' before the calculation for \( p \);

- The student should be encouraged to check that their \( p \) is correct, by checking that \( y = \frac{5}{2x^3} \ln(|x|) + \frac{c}{x^2} \) does indeed satisfy the original differential equation;

- The restriction \( x > 0 \) was given in the question, so there is no need for \( |x| \) here: just \( x \)
would do;

- There is no explanation as to what \( c \) represents.

When commenting on the correct use of notation, it will help the student if they can be shown why such conventions are important, as illustrated in the following example from MST210.

**example 9.4 MST210 02**

![Image of equations]

Even on modules not requiring it, many students may well produce their assignments on a computer. This can lead to presentation problems, as illustrated in this example from MST124, TMA 02.

**example 9.5 MST124 02**

So the time it will take for the number of trees to reach 1000 is .....
Take a moment to reflect upon the student’s answer and how it has been marked. Are there any things you might do differently?
Points that might be addressed include:

- Should reference be made to superscript failure? Would you deduct marks for this?
- Do you agree with the mark awarded and the feedback?
- Once you have read Section 13, imagine that if you were a monitor, what constructive comment might you make to the tutor?

10 Graphs, diagrams and computer output

Many questions will require the use of graphs, diagrams or computer outputs; they may also be useful even where they are not essential. You may wish to encourage students to use them where appropriate, check the outputs are sensible and sometimes to suggest alternatives.

First is an example from MST124 in which the students have been asked to sketch a parabola. The student has, instead, plotted it using computer software. The tutor has provided this feedback to the student, together with a reference to the appropriate module materials.

**example 10.1 MST124 01**

\[ y = 2x^2 - 8x + 5 \]

In the next example, from M249, the tutor has – by annotating the student’s graph with straight lines – justified his comment that it is possible to make a more detailed description of the graph than the simple one which the student made.
M249 uses the SPSS statistical software package, which frequently produces far more output in a given situation than is required to answer a particular question. Students are asked to extract and submit only those parts of the output which are used in their answer, (or if they do submit everything, to highlight the parts they are using), but some do not.

The next example illustrates a situation where the student has not been selective. The student has submitted, without comment, the following page of the output, leaving the tutor to identify which values constituted part of the student’s answer (the two ticked values in the upper table and the four in the ‘Estimates’ column on the lower table). The tutor had to identify the relevant values himself but awarded full marks.
Ideally, the tutor would have stressed to the student the need to extract the relevant values and present them as part of a coherent solution, possibly deducting a mark for the failure to do this. This might save the tutor a considerable amount of time and effort when marking the student’s later TMAs!

In the next example, there are several problems with the student’s Maxima input; the tutor has identified them, has explained the consequences in terms of Maxima’s interpretation, giving references to the Computer Algebra Guide (CAG) for the module, and has given some ‘follow-through’ marks for the use of correct commands.

example 10.4 MST124 04

With such examples, it is important that tutors, as well as indicating where errors have been made, follow through in the marking as far as possible (as above). If in doubt, it is worth raising the matter on the tutor forum; it is quite likely that other tutors will have come across the problem.

Look out for module-specific instructions concerning sketches and graphs. Some modules demand machine-produced plots; others explicitly require hand-drawn sketches. Exceptions may
be possible for disabled students on the grounds of a ‘reasonable adjustment’. In the following example, the monitor (in the text box) has added a gentle reminder to the tutor.

**example 10.5 MST124 02**

c) We are asked to plot the lines found in parts a) and b) onto the same set of axes:

![Graph showing two lines.]

A number of modules occasionally allocate explicit marks for presentation. It is important to recognise where these marks are deserved, even if the underlying mathematics has some flaws. The next example is taken from a modelling problem in MST210. Students were expected to model the behaviour of an object sliding down a roof and falling to ground. Here the tutor has, quite correctly, pointed to the (rather bizarre) flawed assumption concerning the motion of the object as it leaves the roof. But the presentation is impeccable and might even have warranted an additional explicit comment praising this.

**example 10.6 MST210 07**

![Diagram of particle's trajectory.]

*Figure 3: sketch of the particle’s trajectory from the roof to the ground*

In looking for more professional presentation, some students may learn \LaTeX, which is fine as long as it does not spoil the underlying mathematics. The following example, which resulted in unfortunate notation and attracted no comment from the tutor, was probably produced in such circumstances.
For the $e_\theta$ term

$$=-\cos \phi \cos \theta + \frac{r}{2}\cos \phi \sin \theta \cos \theta \sin \theta - \cos \phi \cos \theta$$

$$=2 \cos \phi \cos \theta - 2 \cos \phi \cos \theta$$

$$= 0$$

Even if a tutor is not familiar with \LaTeX, a short post to the tutor forum would enable the tutor to ascertain the source of the issue. Of course, the tutor could have been fully aware that this was a \LaTeX coding issue and chose not to comment upon it due to other errors on the assignment.

Even proficiency with \LaTeX is not without hazard. In MST210 TMA 07, the modelling report, (see Example 10.7 above), students are required to bring their analyses to a final conclusion, comprehensible to a lay person. The student who concluded the report with a fabulously baroque (and correct) \LaTeX formula drew a justified rebuke questioning the student’s view of the mathematical ability of the average citizen.

11 Student criticisms

In the following example from M820 Calculus of variations and advanced calculus, a student complains mildly about a TMA which the Module Team later acknowledged as problematic. The tutor responds by reassuring the student that he is not alone, and that some compensation will be made, while also providing support for the Module Team.

example 11.1 M820 01

I found this TMA really hard – it seemed to bear no resemblance to anything in the module materials and I couldn’t understand what most of the questions were asking. Was there a typo in Q2? I need face-to-face tuition here and don’t think it’s fair to have to struggle on by myself.

I am sorry that you found this hard. Your answers are not bad at all and in several places (eg Q1 and Q3(b)) you did very well and got very near to full marks. There was indeed a small typo in Q2, for which I apologise – this was reported on the module website (March 3rd) and I also sent an email round to everyone’s default email address. Do you check yours at least once a week? Please rest assured that I have marked your answer to Q2 with the typo in mind, and also this will be addressed by the Board when they meet to discuss the TMAs later on in the year; adjustments to scores on Q2 will be made if necessary.

I do appreciate that it’s hard without any face to face tuition. Are you making full use of the forums? You’ll find plenty of people willing to help there. And do remember that you’re always welcome to email me, or to ring within the times I set out in my introductory letter. I’d much rather you contacted me than struggled in silence!

By way of contrast, in the next example we see a much more strident complaint followed by a response that will hardly help matters. This M303 student has written to complain about what they see as an unacceptable level of typographical errors. Such errors are almost impossible to eliminate, but can be annoying. It’s even possible that the tutor shares the student’s frustration but that would still be no excuse for the response below.
How on earth it is acceptable to offer a course when the material is not yet complete and therefore is rushed to completion during the presentation is beyond me. The module team have lost sight of a few fundamental issues here. I don’t have the time to sift through the forum finding "possible errata" only for the official document to be published after we have already moved on -thereby making the errata document as much use as an ashtray on a motorbike for this year's cohort.

I totally agree! But we are where we are and we'll all just have to muddle through.

This response is neither helpful nor appropriate. A more appropriate approach would be to sympathise, invite the student to make frequent contact if typographical errors are suspected and to re-assure that the Module Team are aware of students’ concerns and intend to take these fully into account. It may be that the outburst over errata masks a deeper frustration with the underlying concepts. A telephone call as follow up might be useful here.

Students new to the OU may have preconceptions about the subject they have chosen to study. For example, students embarking on mathematics modules often remember the way they were taught at school and do not expect to have to do much descriptive work. Sometimes a reluctance to engage with specific aspects of the module can lead to more general criticisms. It is important to clarify expectations early on and to explain the reasoning behind the approach taken by the Module Team.

Occasionally criticisms indicate problems which go beyond the question or the module materials. The student may be having particular difficulties with the module, possibly exacerbated by problems that have little to do with mathematics. The following excerpt came from M820.

I am angry, frustrated and depressed. Based on my experience so far I really wish I had not wasted my time and money, because if this course is a reflection of the level that my mathematics
In such situations that indicate extreme anger or distress you should contact your Staff Tutor or the Student Support Team for help or advice before contacting the student.

In general you should find that you can deal with student criticisms effectively. However, if you feel that a criticism of the module has some foundation and may need to be taken further, talk to your Staff Tutor or contact the Module Team. In the event of a student criticising the way you've graded an assignment, you should follow the appeals procedure which is described on the Appeals website [1]. The student will find this in the Assessment Handbook (available here [2] and via their StudentHome), together with the more general procedure covering any decision which students may feel has affected their studies.

12 General comments and the PT3 form

Since you may have no contact with some of your students other than through TMAs, it is very important to phrase your comments as tactfully and helpfully as possible, especially to any who are very weak. If you are too critical or unsympathetic, a student who could struggle through and gain much from the module may drop out after receiving the feedback on a TMA. Do give praise where you can, and while you must, of course, be fair in your marking and realistic to your students about their prospects, please remember that most students spend much time and effort on their TMAs; to have a solution simply crossed out and ‘Rubbish’ written on it by their tutor will be upsetting, infuriating, or both. It is particularly important to be positive in your comments on the PT3 form, as you don’t want them to be deterred from even looking at the marked script.

There is much useful advice on the Tutoring website [7] about the use of the PT3 form, and we hope you will refer to this. Meanwhile, here are a few suggestions.

• Refer to the student by their preferred first name which helps set a friendly tone.
• If you possibly can, start and finish on an optimistic note.

• You may wish to mention a few specific points of difficulty, and suggestions for coping with them – e.g. a reference to a page or section of a unit or chapter – or to highlight the main points which the student will need to remember, or which would be useful for revision.

• You may also wish to refer to points that apply to a number of questions, e.g. solutions that have no words of explanation, misuse of brackets, etc.

• On TMA02 (and later assignments) you could check your comments on previous PT3s to note if any improvement has been made. However, do remember that sometimes students will not have received the previous TMA back before submitting the current one, so please don’t complain to students who don’t appear to have immediately followed your advice.

• If a student has dropped seriously behind with the module, you could suggest some strategies for catching up, together with a follow-up phone call once the TMA has been returned. Additionally, you might contact your Staff Tutor or Student Support Team to see if a special tuition session can be arranged.

• You could use the form to remind the student about tutorial dates, to mention any personal items the student has told you about, or to encourage further contact.

Here are some examples of comments on PT3 forms; they are in differing styles but the first two examples offer helpful, positive advice and support. The modules are M140 Introducing statistics and MST224 Mathematical methods.

**example 12.1 M140 03**

<table>
<thead>
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<th>Total</th>
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</thead>
<tbody>
<tr>
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<td>80</td>
</tr>
</tbody>
</table>

| 6 | 3 | 7 | 5 | 5 | 2 | 9 | 1 | 8 | 3 | 11 | 10 | 5 | 5 | 0 |   |   |   |   |   |   |

John :)  

*Another very good score, which is particularly impressive given that this TMA is very long, challenging and covers a lot more topics than previous assignments. Really good work here.*

*As usual here I’ll be concentrating on errors and weaknesses, but this must not detract from the overwhelming strengths shown in your solutions.*

*If you cast your mind back to the start of this module we talked about the need to modify answers to reflect the level of accuracy in the data provided. Yes, if you need to use an answer in a later part you take the most accurate value available, but for answers which don’t imply a level of accuracy that isn’t justified by the data.*

*Another general point is that when a hypothesis is rejected you should look at the original values to see whether you can suggest the likely comparison; e.g. Q7e.*

*Q4b - You need to appreciate the difference between expressing something in statistical terms and interpreting results for the ‘ordinary’ reader. This is particularly important for establishing hypotheses as these must clearly state the statistical measure involved and the value against which it is to be tested. Here and in c) you appear to be discussing two versions of the hypothesis neither of which match the sign test used. In d) again you need to state your statistical conclusion of the test and then interpret it.*

*Q9 - Make sure that you appreciate that a percentage and a probability are different;*
e.g. the latter is a value between 0 and 1!

Q11e - You got yourself into considerable confusion here. If you’re still unsure after reading my comment, then do contact me.

Q14c and d - If you are unsure about the interpretation of a question, then email me for clarification.

So, excellent progress here. Do contact me with any questions arising from me comments.

Well done

Mike

example 12.2 MST224 04

<table>
<thead>
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</thead>
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<td>84</td>
</tr>
<tr>
<td>23 4 28 24 5</td>
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</tr>
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</table>

Dear Rigo,

Many thanks for this, it’s a very good score for the final TMA.

You made several small slips in Q1, but the big one was having an F(t) that didn’t depend on t!

In Q2a, note how to build up the odd extension. Your one wasn’t periodic.

Q3 was answered very well, but you missed how \( \cos(kL) = 0 \) gives k.

Q4 was very good, and I’ve given you 5/5 for excellent presentation in Q5.

Do ask if you need any help with this, or if I can assist with revision.

Best wishes,

Cath

Here are some examples where the tutors have not been so helpful. The M208 student with a grade of 45 may find the comments demoralising, to say the least, while the comments to the M373 Optimization student are rather vague and dismissive of the substantial amount of work put in by the student, and are particularly unhelpful as this is the first TMA for the module. The MST124 and MU123 students, both with grades of 92, might appreciate a comment showing more insight into their work.

example 12.3 M208 05

TUTOR’S GENERAL SUMMARY

Group theory is clearly giving you problems. Really, you’ve done quite well in other units. I think you’ve no alternative but to work over some of it again, if you want to take group theory any further – for example, M336. I think it is a reasonable block on which to gain exam marks.
The previous two PT3s pose the problem of what you can say to a student who is doing very well. Here is an example of one tutor's praise of a student's excellent script. The student should not only be very pleased with the comment but also well motivated to keep up this high standard in subsequent TMAs.
determine the modulus of the gradient in spherical polar coordinates.) for you.

I think you could have saved yourself some work in Q6 if you had applied the double angle formulae earlier in your analysis - please see my comment. For greater clarity please underline the work ‘grad’ to emphasise that you are dealing with a vector quantity. My last small point is to ask you to use brackets to wrap around the integrands as in Q7, 8 and 9 - again for addition clarity.

These are small points however!

Please contact me if you would like to discuss any points arising from this TMA.

Ron

Here are two examples of encouraging comments on weaker TMAs; note the supportive and encouraging tone in both, and the individualised feedback to each student. Note also that both tutors encourage the student to follow-up for further discussion.

element 12.8 MST210 06

<table>
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</tr>
<tr>
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</tr>
</tbody>
</table>

Dear Mike,

Thank you for this TMA and I appreciate the hard work you have put into this and also the care you have taken with the presentation. Well done!

Your answer to Q3 is correct and your answers to Q1 and Q2 are largely correct. However in Q2 you made a mistake in evaluating the partial derivatives of the function h and you did not answer the final part. Q5 was also answered well but you needed to give more detail of the calculation to show that the curl of the vector field was zero. You began Q6 well but for an algebraic slip but then did not complete the answer. For questions 7, 8 and 9, which you didn’t attempt, I’ve given references on your script to similar examples in the units - I hope you’ll find these helpful.

I am very conscious that you did not answer the questions on multiple integration so I am keen that you go through these solutions and I would particularly welcome a call from you to discuss them.

Ron

In the next example from M303, questions 1 to 5 were formative; the student chose not to submit these questions, which is why they have not been commented upon.

element 12.9 M303 05

<table>
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<td>12</td>
</tr>
<tr>
<td>5 1 0 1 5</td>
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</tr>
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</table>

Jim - I’m sorry you have had trouble with this rather challenging TMA; rest assured that you’re by no means alone in this. Well done for submitting at least these part -questions; I hope my comments and included solutions will be helpful.

Q6(a) A good start here with AB, but your arguments for AC and BC are incomplete - I’ve shown how to finish them off, and included solutions for (b) and (c).

Q7 Many problems throughout, I’m afraid - see comments.
Q9(a) This construction isn’t possible, but you need to justify this. (b) I think you may have misinterpreted the question here? - we have got compasses - it’s just the extra mark on the ruler that’s different from the one in (a).

Q10(a) You found some of the points of E, but not all of them - see comments. (b) Most of your calculations are correct, but you should have found that $16P = O$, the point at infinity. In fact the group $(E, +)$ is cyclic of order 16, generated by $(1, 1)$ - using this fact makes the calculations in the rest of the question a lot easier! But you have them correct anyway, so well done for that.

Do please get in touch with any queries about the Book F material; when you get to the revision/exam-preparation stage, don’t forget that recordings of many online tutorials, covering the whole module between them, will be available.

Best wishes - Frances

Whatever the quality of a TMA, there are some sorts of comment which should never be made on a PT3 form. The following three examples are, in turn, unprofessional, unsympathetic and ill-advised.

example 12.10

(a) ‘I am sorry to have returned this so late, but I have been very busy with other work.’

This immediately conveys to the student the impression that the tutor regards his / her OU work as of minimal importance. When a student has possibly burned the midnight oil to get a TMA in by cut-off day, this is not going to be received very enthusiastically.

(b) ‘If there is anything you do not understand or are not clear about YOU MUST CONTACT ME.’

This sounds far more like a military command than a sympathetic assurance that further help is available. In text comments, capitals come over as SHOUTING!

(c) On a TMA to which a total mark of 73 has been given: ‘This was a good score for a challenging assignment. Well done. As your technique improves, you will soon achieve 85%+.’

This is a rather rash assurance to give to the student, with possible unfortunate consequences.

Finally, here is an example that incorporates nearly all of our ‘good practice’ ideas. Make a note of the good points you can find here, and see if you have found more than we suggest after the PT3.

example 12.11

<table>
<thead>
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</tr>
</tbody>
</table>

David,

This is an excellent TMA, well presented, showing a mastery of MINITAB and a good understanding of the concepts and skills assessed.

In Q1(a) note that Pie Charts are used to represent data that is in the form of ‘proportions of a whole’.

Also in (c) notice the graph clearly shows the variability of the height increasing with age - this will be important in analysis of data later in the course.

Your solution to Q2 was excellent.
Hope to meet you at the tutorial on May 1st.

Best wishes, Alan

We noticed the following:

• It begins and ends with praise for a very good TMA;
• There are some pointers to notes on the script;
• The tutor uses the PT3 to remind the student about the next tutorial;
• The comments are well laid out and easy to read without being too detailed;
• Perhaps a comment encouraging the student to contact the tutor if necessary would have made this PT3 even better!

13 The monitoring process

In order to ensure an adequate standard of feedback and grading, and to help you develop your skills in effective assignment tuition, a sample of your work is monitored each module presentation. We hope that you will view monitoring as effective tuition on your own work as a tutor. Monitoring is a University-wide requirement with an important place in the Quality Assurance-Staff Development cycle. In the Department of Mathematics and Statistics, it is usually done by a member of the Module Team, a Staff Tutor, or an experienced Associate Lecturer.

Monitoring fulfils three main purposes:

• To maintain consistency of grading (scores) across all tutors on a module;
• To check that students are receiving prompt and adequate feedback;
• To help you enhance your teaching skills.

Below we have included a screenshot of the electronic monitoring form on which the monitor will tell you about your work; note that it makes the distinction between PT3 comments and script comments. You will see that it covers many of the points we have discussed, although it is not expected that all 15 areas will be covered in all assignments.
Consistency of marking
Students need to feel confident that the credit they gain for their work is not dependent on the tutor to whom they are allocated. The monitor will check that you are following the mark scheme and any guidelines in an appropriate way. If the marks you award are significantly out of line with those given by other tutors, this will be pointed out to you. Persistent leniency or harshness may be reported to the Module Team, which will consider adjusting the marks of the students affected.

Inconsistent marking across a tutorial group is of greater concern as it is more difficult to rectify. This is less likely to occur if you mark a number of scripts together and make a record on your Tutor Notes of any additions/amendments which could affect this.

Prompt feedback
It is important that students receive feedback as quickly as possible, so that it can benefit their continuing studies. There is a contractual obligation for tutors to mark and return TMAs within 10 working days of the assignment cut-off date or receipt. If you anticipate delays on a particular assignment you should warn your students and inform your Staff Tutor. In the event of a particularly long delay – or at your request, under certain circumstances – the Staff Tutor may consider making alternative arrangements for the marking. Even if you have alerted your students to a possible delay an apology on the PT3 may not go amiss.

Effective tuition
The remainder of the monitoring report form is concerned with those aspects of your work which have been covered elsewhere in this document.

The monitor may highlight additional teaching opportunities, or suggest different ways of dealing with a particular student problem or situation, illustrating the points made either with annotations on electronic files, or photocopies on paper versions from scripts you have marked.
Equally, the monitor may congratulate you on aspects of your work which deserve particular commendation.

We are well aware that you may have significant face-to-face teaching experience, and colleagues with whom you can discuss this aspect of your work. Effective tuition in assignments is, however, more likely to be new to you and opportunities to talk about it may be few. The monitoring form is one way in which we can invite such a dialogue. It can be a salutary experience to see a script several weeks after you have marked it and try to remember (or work out) why you wrote the comment that now seems less than helpful. Imagine how it must strike a student!

Your response to a monitoring report will in many ways mirror a student’s response to a marked TMA. We hope that our monitoring is done with the same degree of care and sensitivity that we expect of your marking and we aim to be friendly and supportive. Like tutors, monitors each have their own style. Some will write more than others; some will compliment marking that has impressed them, and some will offer suggestions for improvement.

**What happens to the report?**

**eTMAs** Electronic monitoring reports are e-mailed to your Staff Tutor, who reviews them, provides comments, and returns them to you via e-mail.

**Paper TMAs** The paper monitoring form has four copies, of which one is retained by the monitor and one returned to the Faculty. The other two are sent to your Staff Tutor, who will forward one copy to you, possibly with a covering note. The Staff Tutor will know of circumstances which may have affected your work, such as reasons for late marking or difficulties with a particular student, and can make a note of these to accompany the fourth copy, which will be retained on your file.

If you are unhappy with the monitoring report, or wish to discuss any of the points raised, you are encouraged to contact your Staff Tutor.

**Monitoring levels**

If you are new to the OU or to a particular module a sample of your work on most TMAs will be monitored. As soon as we are confident that your work is of an appropriate standard you will be moved up to the next grade, which usually involves the monitoring of two or three scripts from alternate TMAs: this is the most usual grade for monitoring. If your work is of a exceptional standard, you may be moved to the highest grade, involving a sample of two or three scripts on one or two TMAs. This general regime may occasionally be varied in the case of a specific module.

**Time scale of monitoring**

Although we will endeavour to send your monitoring report as soon as possible, several weeks can elapse between marking an assignment and receiving a monitoring report form.

**14 Conclusion**

We hope that this document has given you some insight into the possible range of styles of dialogue between students and tutors. The richness and variety of the differing backgrounds students bring with them into the Open University ensure that you will be presented with a challenging range of scripts. As you mark these you will develop your own style of effective assignment tuition and skills as a tutor. Through your continuing dialogue with each student you can create an atmosphere in which the student will feel comfortable, actively encouraged
and confident in his or her own learning process. We hope you find this as rewarding as we do.

**Links to tutor resources**

3. *Correspondence Tuition (general).* URL: http://www2.open.ac.uk/tutors/aspects-of-the-al-role/provide-correspondence-tuition.
5. *Supporting students: Keeping in contact, supporting academic development and understanding student specific requirements.* URL: http://www2.open.ac.uk/tutors/supporting-students.

We have provided the following summary, which you may like to print out and keep with your Tutor Notes.
Effective tuition in mathematics and statistics assignments

On the script

Praising the inclusion of appropriate content:
• praise good solutions and well-presented arguments;
• acknowledge relevant learning from module material.

Correcting mistakes:
• correct the points that are wrong – explain why, and indicate what would be suitable;
• correct inappropriate notation or style;
• identify inadequate or excessive amounts of material;
• do this in a sympathetic manner.

Awarding marks:
• explain how the marks were awarded and itemise part marks;
• show where and why marks were deducted;
• demonstrate how the marks could have been improved.

Stressing the use of module material:
• indicate the techniques that are being used;
• give references to Units / Exercise Books / Handbook where appropriate.

Developing the material:
• suggest further examples illustrating the concepts;
• show how solutions can be checked;
• ask questions which make the student reflect on the methods, concepts, etc.

On the PT3 Form

Style of comments:
• begin and end with ‘positive’ statements on content, style, etc;
• include a salutation at the start, and sign off by name at the end;
• stress ways of improving performance rather than criticising what is wrong;
• use a friendly tone; use the student’s name;
• offer support to those with low marks.

Advice on content and presentation:
• note the strengths in the assignment;
• praise good presentation and style;
• advise how the work could be improved;
• indicate any relevant sections of module material;
• note any improvements over previous assignments.

General advice:
• remind the student of tutorial dates, if appropriate;
• encourage the student to work through the next chunk of material and/or the next assignment;
• give any other relevant helpful information;
• encourage contact with queries or concerns.