Learning to Learn in your Subject (Mathematics)

Task station instructions for students (A – E)

Activity A - Study Skills and Effective Strategies

This activity is designed to get you talking about and sharing your study skills. Starting anything new is a great time to do a stock-take (like a mini personal review). So during this activity we want you to think about how you learn.

Part 1 – Discussion points

Spend about 5 minutes thinking about and discussing the statements below within your group. Think about whether they apply to you or not and to what degree (e.g. completely, mostly, somewhat, a little, not at all). If they do apply to you, why?

- I read the statement of a problem carefully to fully understand it and determine what the goal is
- Once a result is obtained, I check to see that it agrees with what I expected.
- Once I know how to solve a problem, I put more time into understanding the concepts involved
- I spend little time on problems that I am not sure I can solve
- I plan how to solve a problem before I actually start solving it (mentally or on paper)
- If I don’t know how to solve a problem, I immediately try to guess the answer
- If a problem takes several attempts and I cannot get it right, I get someone to do it for me and I try to memorize the procedure.

Part 2 – How to Learn Math

In this part, we will ask you to watch a short video about ‘How to Learn Math: Session 3.2: Mistakes and Persistence’ by Jo Boaler from Stanford University

(https://www.youtube.com/watch?v=yysOlVWDzoU)

After watching the video, look back at the last two statements in Part 1. Have your answers to these twos statements now changed in any way?

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Part 3 – Time Sponges

This part is about identifying your biggest time-sponge and getting tips and ideas about how to shrink it! A **time-sponge** is anything that distracts you from doing a task (e.g. homework, the washing up, preparing for lectures). It’s the sort of thing that you’ll spend 5 mins doing (e.g. surfing the web before bed), but before you know it an hour or two has gone past! We all have them and we often don’t realise what they are doing until we run out of time.

Each member of the group needs a post it note

- On the post it note, write your biggest time sponge
- Pass it on to the person on the left (everyone should now have someone else’s time-sponge)
- On the post-it note in front of you, write a tip that could minimise or kill the time-sponge
- Pass the post-it note to the left
- Write a tip on the new post-it note in front of you
- Repeat passing to the left and writing a tip until there are at least three tips for each time-sponge
- Find your time-sponge and look at the tips
- Go round the group and say what tip you will try to shrink your time-sponge
Activity B – Communication

This activity is about demonstrating your group-communication skills. You will need to work as a group to either formulate a set of instructions or use instructions to build a model.

If your group has a model, complete Part 1 of the activity. If your group has a set of instructions, complete Part 2 of the activity.

Part 1 – Formulating Instructions

On the table is a model constructed from plastic blocks. Your challenge as a group is to produce a set of instructions that another group will use to try to build the same model.

The catch: your instructions cannot include diagrams or pictures. You can only use words in your instructions.

Your group has 12 minutes to discuss and produce a set of written instructions on the whiteboard to be left for the next group.

Part 2 – Following Instructions

On the table is a set of written instructions from the previous group on how to produce a model from plastic blocks.

As a group, follow the instructions to create the model, using the plastic blocks provided. Highlight any instruction that is not clear and generate discussion within your group. Provide an alternative instruction on another whiteboard and clearly indicate which one it is replacing.

A variant of this activity includes showing the students the model (or a photo of the model) the instructions were supposed to enable the group to build. The group can then give constructive feedback on how accurate, helpful and clear the instructions were.
Activity C – Reading and Writing Mathematics

This activity is designed to help you think about the difficulties that mathematics students often face when reading a mathematics textbook and writing their own mathematical work.

Part 1 – Reading Mathematics

1. In pairs or threes, read the articles aloud, trying to fill in the missing words.

2. Why is the maths article more difficult to read? Write down your group’s thoughts on the whiteboard.

3. What does this tell you about the mathematical writing and how best to read it? Write down your thoughts on the whiteboard.

Part 2 – Writing Mathematics

1. On the Writing Mathematics sheet you will find two calculations. The author of each is trying to find the indefinite integral of $\sin^4 x \, dx$. Do not focus on whether you can find a different (perhaps better) way of doing the calculation. Instead, think of yourself as a reader, and pay attention to how much work you have to do to follow the author’s thinking.

2. Discuss in your group which you think is better? Why is it better? Write down some thoughts on your whiteboard.

3. Think about your own mathematical writing. What improvements could you make? Write down some tips for yourselves and others.
2 Definition of Inverse Functions

Let \( y = f(x) \) be a function, defined for \( x \) in some interval \( a \leq x \leq b \). Then we can define an inverse function \( f^{-1}(y) \) for all \( y \) in the range of \( f \), such that

\[ f(f^{-1}(y)) = y \quad \text{and} \quad f^{-1}(f(x)) = x \]  

for all \( y \) in the range of \( f \) and \( x \) in the domain of \( f \).

Example 1: Consider the function \( y = x^2 \), which we view as being

only for \( x \geq 0 \) — a positive number (or 0). Hence, we can write

- as the

function, which will also be defined for \( y > 0 \), but not for \( y < 0 \). It is

nothing but the

root function.

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Missing words

Mathematicians like to express themselves as clearly as possible. They

compete with each other to produce definitions which are as clear as

possible. This is considered the highest

of mathematical elegance. This

siness in the use of words and the absence of

cleary.

Just making the students aware of the subject matter helps to overcome it.

Give the students the modified newspaper article first and when they have had

time to read it ask someone to read it aloud filling in the gaps with words which

they consider appropriate. This will be very easy to do. (The exercise could

also be done by asking students to fill in the gaps by selecting words from a

list of alternatives, which you have defined.) Then repeat the exercise with the

same article, this time using the words which you have not used in the first

exercise. This exercise should make the students aware of the importance of

using words which are appropriate to the context and which are easy to

understand.
Activity D – Talking about Mathematics

This is an activity designed to get you talking about talking. How can we talk about Mathematics effectively? This is a timed activity – find someone in your group that has a device with a timer.

Part 1- Talking Points Activity

You have exactly ten minutes to discuss as many talking points (listed on the next page) as you can, following the instructions below. For each talking point, have one member of the group read the statement aloud. There are three rounds for each talking point.

1. Now, each person in the group must state whether they agree, disagree or are unsure about the statement and why. Even if you are unsure, you must state a reason why you are unsure. You will be able to change your mind in the next round.

2. Each person in the group must now say whether they agree, disagree or are unsure about their own original statement or someone else’s argument and why. You will be able to change your mind in the next round.

3. Each member of the group now gives their final decisions of agree, disagree or unsure. Count the votes and write them in the A/D/U column in the table below.

When the ten minutes are up, you must stop discussing the talking points and move on to part 2.

Part 2- Group Self-Assessment

You now have exactly two minutes to complete the group self-assessment form
### Activity D – Talking about Mathematics

<table>
<thead>
<tr>
<th>Talking points</th>
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<tbody>
<tr>
<td>Talking is more important than listening</td>
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<tr>
<td>If you help people solve problems, it is cheating.</td>
<td></td>
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<tr>
<td>If you think someone is wrong about something, it is more important to tell them right away than listen to their reasoning.</td>
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<tr>
<td>When other people in the conversation talk, you can be thinking about what you will say next.</td>
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</tr>
<tr>
<td>Listening and thinking are different things.</td>
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<tr>
<td>If you share what you know out loud, other people will do better than you.</td>
<td></td>
</tr>
<tr>
<td>If you ask a question, it means that you do not understand anything.</td>
<td></td>
</tr>
<tr>
<td>Talking and thinking are the same thing.</td>
<td></td>
</tr>
<tr>
<td>You can think without words.</td>
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<tr>
<td>Everyone can be part of a learning conversation.</td>
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<tr>
<td>Group activity can be good for learning.</td>
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<tr>
<td>People will make fun of you if you let them know what you really think.</td>
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## Activity D – Talking about Mathematics

<table>
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<tr>
<th>Group Self-Assessment</th>
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**One helpful question**
- was asked by…
- was helpful because...

**Who in your group changed their mind?**
- About what?
- Whose ideas persuaded them?

**How easy or difficult was it for your group to agree? Why?**
Activity E – Mathspals Taster Session

This station is entirely student run. PALS (Peer Assisted Learning Schemes) Leaders introduce themselves and PALS to the new students. PALS Leaders also run a short activity that allows the new students to experience the benefits of peer learning directly e.g. working together as a group on a problem or a ‘think, pair share’ style activity. PALS Leaders then answer any questions that new students may have.