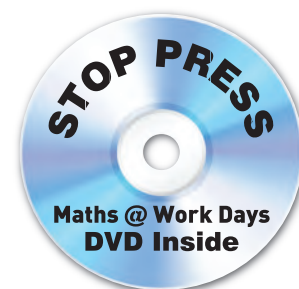
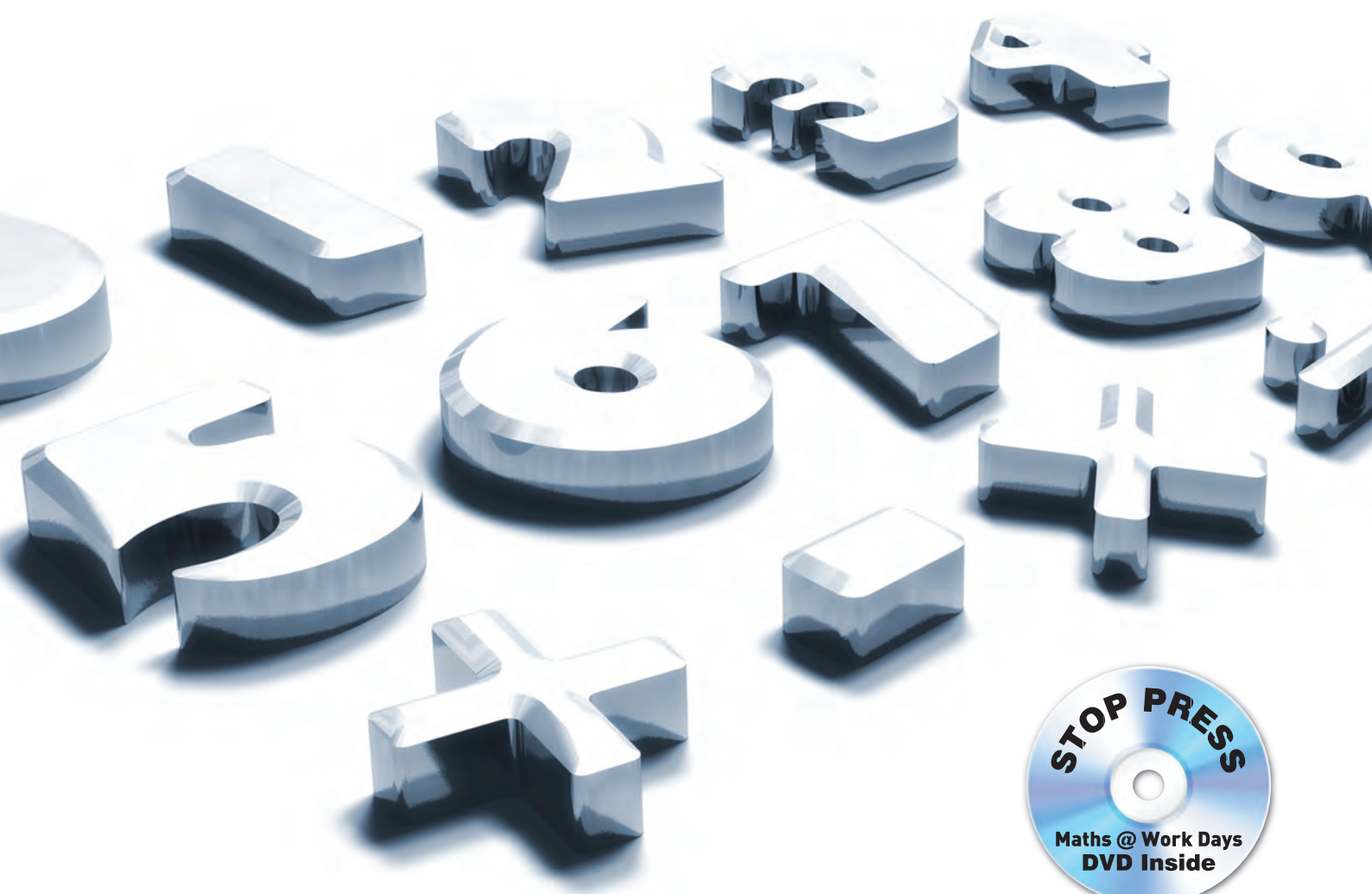




Maths @ Work Days



A comprehensive guide
to hands-on maths workshops
run by employers.



Watch the Maths @ Work Day held at Salford University, including interviews of the employers, students and HEI staff.

MATHS AT WORK DAYS

A comprehensive guide

What is a ‘Maths at Work Day’?

Maths at Work Days are where students get to experience hands on maths workshops run by employers; featuring maths problems that are used in real life employment. The students don’t just hear about why maths is important – they see it first hand by having a go at the problems themselves. There are of course lots of different formats you could use in running a Maths at Work Day, but this guide will focus on the most common way in which they have run.

Usually four employers are sourced from a variety of sectors which use mathematics, showing students that studying maths doesn’t lead to a narrow range of careers but actually opens up a huge array of possibilities.

Most of the days have taken place at a Higher Education Institution, however they have also taken place at secondary schools which have invited partner schools to take part in the day.

What is the aim?

It is a common problem that students don’t know where studying maths will take them - they probably know about accountancy and teaching but that’s often where their knowledge will end. Meeting employers who use maths day to day can demonstrate effectively that maths can lead to a wide range of interesting and exciting careers. It also provides students with positive role models who have studied maths and are normal, interesting and successful people.

Has a Maths at Work Day been tried and tested?

The pilot project More Maths Grads ran many of these days for both Year 10 and Year 12 students in conjunction with the Further Maths Support Programme and there was good feedback regarding changed perceptions regarding mathematics.

The idea for Maths at Work Days did however originally come from Dr Rod Bond in Loughborough at the Further Maths Support Programme.

Can they be run for other subjects?

Several days have been run successfully with engineering employers under the title ‘Think you know what an engineer does?’ and would most probably be successful in other disciplines.

PRACTICAL INFORMATION

When running a Maths at Work Day there are several things which you will need to decide on before you start:

Age Group

The More Maths Grads project ran days either for Year 10 or Year 12 students. Year 10 students will soon be deciding whether to choose A-Level maths and Year 12 students deciding on their choice of degree subject. There is quite a substantial difference between running a day for Year 10 and running a day for Year 12.

Number of students

The More Maths Grads project ran days either for 50 or 100 students. With Year 10 we asked four different schools to bring a maximum of 25 students. With Year 12 many sixth forms had smaller numbers of students so we recruited small groups until we had filled the day.

Employers

You will need to find a minimum of four employers to present. If there are 100 students each employer will need to repeat the session four times, each time to 25 students. If there are 50 students, employers will need to only repeat the session twice and stay for only half the day. More on working with employers in section 3.

Rooms

You will need to find four suitable rooms which are close to each other as well as a lecture theatre or larger space where the introduction and plenary can be conducted. This can be no mean feat in a university, meaning that we always held maths at work days outside of university term time.

Student Ambassadors

The employers, teachers and students will be unfamiliar with the location of the Maths at Work Day, therefore it is useful to have one or preferably two students ambassadors staying with each group for the whole day. If they are maths students then this is even better as they will be able to help the students in the sessions and act as role models.

Student refreshments

It is important to have a pre booked space in which students can eat their lunches. We asked students to bring their own lunch as it would have taken too long for 100 students and their teachers to queue up and purchase lunch. It is also really helpful if the employers can eat their lunch separate from the students in order to give them a proper break.

We also provided drinks and a snack in the morning break time. If this isn't possible it would be good to at least provide some way of obtaining water.

Employer refreshments

It is important to look after your employers well and it can be quite exhausting presenting to students for the first time. We provided a buffet lunch and tea & coffee in the break. We also put bottled water in each room for the presenters.

Students transport

If you have the funds you may wish to provide the offer of booking a coach for the schools which are attending. This is often a good incentive for schools to attend outreach events, however we found that maths at work days were very popular and over subscribed, so this may not be necessary.

CRB Checks

We made sure that all our student ambassadors were CRB checked, however it is unlikely that the employers will have CRB checks. This shouldn't be a problem for most schools as teachers are in charge of the groups and employers should never be left alone with students. If, however you choose to run a Maths at Work Day in a local school this could be a problem as some schools have a policy of not letting anyone without a CRB check into the school. This is something to talk about initially with the school.

Photo Permissions

If you want to take photos at the Maths at Work Day then you will need to get written permission from the schools (which usually hold copies of permissions given by parents).

Health and safety

It is of course important to make sure that you complete risk assessments for the day and that copies of these are given to the school in good time. In particular it is important to liaise with employers regarding risk assessments for their activities. Maths activities are on the whole low risk, however when working with other STEM employers, there may be many more risks to be looked at.

Lunchtime Quiz

As a bit of fun we have given out a mathematical quiz question for students to complete during the lunch break and presented prizes for this in the plenary session.

Timings of the Day

These are suggested timings of the day for Year 10 students. Each session is 45 minutes long.

| | | |
|-------|---|-----------------------------------|
| 9:30 | : | Registration |
| 9:40 | : | Welcome/Introduction |
| 9:55 | : | Session 1 |
| 10:40 | : | Change over |
| 10:45 | : | Session 2 |
| 11:30 | : | Break (drinks and snack provided) |
| 11:45 | : | Session 3 |
| 12:30 | : | Lunch and Quiz |
| 13:15 | : | Session 4 |
| 14:00 | : | Plenary Session |
| 14:30 | : | Close |

These are suggested timings of the day for Year 12 students. Each session is one hour long.

| | | |
|-------|---|----------------------|
| 9:30 | : | Registration |
| 9:40 | : | Welcome/Introduction |
| 9:55 | : | Session 1 |
| 10:55 | : | Break |
| 11:10 | : | Session 2 |
| 12:10 | : | Lunch and Quiz |
| 13:00 | : | Session 3 |
| 14:00 | : | Change over |
| 14:05 | : | Session 4 |
| 15:05 | : | Plenary Session |
| 15:30 | : | Close |

Working with employers

Recruiting employers can be a lengthy process and it is best to start as far in advance as possible. Employers agree to be part of Maths at Work days for a number of reasons including the following:

1. There is a shortage of graduates entering their industry and they generally want to increase the numbers of applicants to mathematics and awareness of their industry.
2. They have Corporate Social Responsibility targets and this helps them on their way to meeting them.
3. They want to develop their staff and delivering a workshop to 30 young people is excellent personal development.
4. They have a dedicated education team which have targets to meet in terms of numbers of students worked with.
5. They want to build better links with the HEI hosting the Maths at Work Day.
6. They like to be known as a generally philanthropic company in the community.

There are many potential ways of contacting employers. The following worked to varying extents.

1. Visit a careers fair at your HEI – it is likely that the people on the stand will know the relevant people in their company who would be willing to work with schools.
2. Contact the person in charge of organising STEMNET ambassadors in your region.
3. Contact the Business School at your institution, it is likely that they will have an external relations manager who may know companies who are willing to do this kind of thing.
4. Think of prominent local companies and e-mail the contacts on their page for corporate social responsibility.
5. Utilise any staff at your institution who have links with business. For example we used a PhD student who was sponsored industrially.
6. Utilise any personal contacts who might be able to present.
7. E-mail your local branch of the CBI, they may be willing to e-mail out a request to their members.
8. Contact the professional bodies for subjects which could be relevant, for example the Institute of Maths and its Applications, Institute of Civil Engineers, Royal Statistical Society.

What types of employers have been worked with or could be approached?

Here are some ideas for types of company:

- Finance Companies
- Medical Statisticians
- Engineers
- The Armed Forces
- The Retail Sector
- Manufacturing Companies
- Transport Planners

Most large companies will have roles which use a significant amount of maths, so there are many possibilities for who can be approached. Be creative.

For ideas about which type of roles use a significant amount of maths look at the career profile section in www.mathscareers.org.uk.

Things to remember in developing a session with an employer

It can be a daunting experience to run a session for twenty five young people and there are several things which can be done to assist an employer in producing a good presentation.

- a) Visit the employer in advance to discuss their involvement.
- b) Give them any advice which they need on the level of maths which should be included. This may require some research into the school curriculum.
- c) It is very important to receive a copy of their activity far in advance as sometimes employers can produce activities which are too difficult, long or are unclear and this will allow time for the activities to be refined and modified. In particular it is worth actually working through the activities to check for any necessary corrections.

It is important to note that it is not usually possible to use exact maths examples which are used in a company. However if the activities give a flavour or a simplified picture of what goes on, then this can be really useful for the students. For example one session delivered by medical statisticians involved students optimising a paper aeroplane using the principals of a three way crossover trial.

A general brief for an employer workshop could be:

“You could begin with a general presentation about the company and the work involved, ideally including a description of the career paths of the presenters. The presentation shouldn’t take any longer than ten minutes. The main activity should then be something which relates to maths which is actually used in the company. The activity should involve the students working in a hands on way and it is often a good idea to get students working in groups or in pairs, as this will help them have confidence in completing the unfamiliar maths activities. Students may need a maths problem broken down into stages or smaller steps to help them work through it.”

Timeline

The timings below constitute a rough time line for the major milestones in organising a Maths at Work Day. These are not prescriptive and they assume you have seven months to arrange the day. Please see appendix 1 for a sample check list with many more detailed actions. In general it is better to allow more time rather than less.

| Time till Maths at Work Day | Action |
|-----------------------------|---|
| 7 months | Book Rooms and set a date (check the date is suitable for the school and HEI calendar). Book lunch areas for employers and students. |
| 6-7 months | Make initial contact with companies. |
| 6-4 months | Conduct preliminary company visits. |
| 6 months | Advertise the day to schools. |
| 3 months | Confirm final list of schools and send out paperwork – risk assessments, code of conduct and timings of the day etc. |
| 3 months | Book refreshments for employers. |
| 2 months | Arrange students ambassadors (2 per group). |
| 1-2 months | Work with employers on the final drafts of their activities. |
| 1 months | Check technology and room set ups. |
| 1 months | Confirm final details with presenters and schools. |

Risks to the day running smoothly

Below are a few things which could easily go wrong and how to avoid them

1. The main organiser being ill or unable to attend the day

It is very helpful to run a Maths at Work Day in collaboration with other members of HEI staff who could take over in such a situation.

2. Employers dropping out at the last minute

The pressures businesses face mean this is a very real risk - employers may not be able to attend if business priorities change. Having a back up plan is very useful - for example is there someone in the department who could deliver a session on a topic of their research which is linked to industrial applications?

3. Schools dropping out last minute

It is useful to have a clause stating that the activity is free unless a school doesn't turn up, in which case a fee per student will be applied. Regular e-mail contact in the run up to the event should also avoid this happening.

4. Bad students behaviour

Having a document which sets out expectations to the school in advance can be useful. In particular a document which states that the teacher is solely in charge of discipline issues can make this point clear. It can also be helpful to point out to students at the beginning of the day that the employers have given up a lot of time to be here and that they aren't used to presenting to young people.

5. Technology going wrong

One of the most common hiccups is for technology to go wrong on the day. It is definitely worth checking the projectors and sound in all the rooms in advance. Encouraging presenters to bring their presentation on a memory stick (even if they bring a laptop) and if possible having a spare laptop for the day can be really useful. Encouraging presenters to arrive in plenty of time is also valuable as it enables any problems to be ironed out before the schools arrive.

Appendix

The following appendices contain some examples of past documents which may be of use:

1. Sample check list of actions
2. Sample programme for teachers
3. Sample programme for employers

Further Questions

If you have any further questions about running a Maths at Work Day please contact www.mathscareers.org.uk

TEACHERS

'Maths at Work' Day Programme

Staff and students will be met at the coach drop-off point which is the main entrance to the University of Leeds (Parkinson steps), and escorted to the Roger Stevens Building where the introductory session will be held.

| | | |
|-------|---|---|
| 9:30 | : | Registration |
| 9:40 | : | Welcome/Introduction |
| 9:55 | : | Session 1 |
| 10:40 | : | Change over |
| 10:45 | : | Session 2 |
| 11:30 | : | Break (drinks and snack provided) |
| 11:45 | : | Session 3 |
| 12:30 | : | Lunch and Quiz (visitors to bring a packed lunch) |
| 13:15 | : | Session 4 |
| 14:00 | : | Plenary Session |
| 14:30 | : | Close |

Students will be expected to bring a pen, pencil, ruler, calculator and a packed lunch. They may also buy food at the university, however, we would strongly advise that students bring a packed lunch due to the short amount of time available.

If you need to contact us please phone:

EMPLOYERS

'Maths at Work' Day Programme

| | | |
|-------|---|---|
| 8:00 | : | Rooms will be available to set-up for workshops (please aim to arrive no later than 9:00am) |
| 9:30 | : | Student Registration |
| 9:40 | : | Welcome/Introduction |
| 9:55 | : | Session 1 |
| 10:40 | : | Change over |
| 10:45 | : | Session 2 |
| 11:30 | : | Break (drinks and snack provided) |
| 11:45 | : | Session 3 |
| 12:30 | : | Lunch and Student Quiz (buffet lunch will be provided for presenters in red area outside Reading Room on Level 9) |
| 13:15 | : | Session 4 |
| 14:00 | : | Plenary Session |
| 14:30 | : | Close |

Students will be expected to bring a pen, pencil, ruler and calculator.

If you need to contact us please phone:

EMPLOYERS Before the day

| | |
|-------------------------------------|--------------------------|
| Send programme and risk assessments | <input type="checkbox"/> |
| Any addition to risk assessments | <input type="checkbox"/> |
| Arrange lunch for presenters | <input type="checkbox"/> |
| Parking permits: Number Required: | <input type="checkbox"/> |
| Parking permits: Number Required: | <input type="checkbox"/> |
| Company 1 | <input type="checkbox"/> |
| Company 2 | <input type="checkbox"/> |
| Company 3 | <input type="checkbox"/> |
| Company 4 | <input type="checkbox"/> |
| Extra Equipment needed: | <input type="checkbox"/> |
| | <input type="checkbox"/> |
| | <input type="checkbox"/> |
| | <input type="checkbox"/> |
| | <input type="checkbox"/> |
| Send a map to the employers | <input type="checkbox"/> |
| Explain photo arrangements | <input type="checkbox"/> |

SCHOOLS Before the day

| | |
|--|--------------------------|
| Send programme and risk assessments | <input type="checkbox"/> |
| Ask teachers for list of students and teachers attending event | <input type="checkbox"/> |
| Received list of students and teachers attending event: | <input type="checkbox"/> |
| School 1 | <input type="checkbox"/> |
| School 2 | <input type="checkbox"/> |
| School 3 | <input type="checkbox"/> |
| School 4 | <input type="checkbox"/> |
| Inform teachers about photographs | <input type="checkbox"/> |
| Get permission from schools for newspaper articles | <input type="checkbox"/> |
| Book coaches and inform school of times | <input type="checkbox"/> |

VISITORS Before the day

| | |
|-----------------------------------|--------------------------|
| Send programme | <input type="checkbox"/> |
| Any addition to risk assessments | <input type="checkbox"/> |
| Arrange lunch for visitors | <input type="checkbox"/> |
| Parking permits: Number Required: | <input type="checkbox"/> |
| Visitor 1 | <input type="checkbox"/> |
| Visitor 2 | <input type="checkbox"/> |
| Visitor 3 | <input type="checkbox"/> |
| Visitor 4 | <input type="checkbox"/> |
| Send a map to the visitors | <input type="checkbox"/> |

UNIVERSITY

| | |
|--|--------------------------|
| Contact security | <input type="checkbox"/> |
| Inform maths department | <input type="checkbox"/> |
| Confirm refectory arrangements for students and teachers | <input type="checkbox"/> |
| Arrange tea and coffee for employers and visitors (and teachers) | <input type="checkbox"/> |
| Arrange drink and snack for students, teachers and student hosts | <input type="checkbox"/> |
| Recruit Student hosts | <input type="checkbox"/> |
| Visit all 4 rooms - check: | <input type="checkbox"/> |
| Technology | <input type="checkbox"/> |
| Number of seats | <input type="checkbox"/> |
| Number of tables | <input type="checkbox"/> |
| Whiteboard presence | <input type="checkbox"/> |
| Book technology: | <input type="checkbox"/> |
| Laptops | <input type="checkbox"/> |
| Projectors | <input type="checkbox"/> |

ADDITIONAL Before the day

| | |
|---------------------------------|--------------------------|
| Book photographer if applicable | <input type="checkbox"/> |
|---------------------------------|--------------------------|

for the day

| | |
|--|--------------------------|
| Make badges for students, teachers, visitors and student hosts (inc. group A-D) and employers, and organisers. Include phone number for maths reception on badge and give reception a mobile contact number for the organisers | <input type="checkbox"/> |
| Set of instructions for hosts | <input type="checkbox"/> |
| Set of instructions for us | <input type="checkbox"/> |
| List of School phone numbers | <input type="checkbox"/> |
| Sort out info – programme & locations for staff | <input type="checkbox"/> |
| Quiz | <input type="checkbox"/> |
| Prizes | <input type="checkbox"/> |
| Evaluation (student, teacher and employer) | <input type="checkbox"/> |
| Sort out leaflets and postcards | <input type="checkbox"/> |
| Sort out plastic bags | <input type="checkbox"/> |
| Pick up laptops and flipcharts | <input type="checkbox"/> |
| Introduction (inc. fire safety) & plenary | <input type="checkbox"/> |
| Other Resources | <input type="checkbox"/> |
| White board, pens and erasers | <input type="checkbox"/> |
| Chalk for Hall 1 and 2 | <input type="checkbox"/> |
| Flipchart? For reading room | <input type="checkbox"/> |
| Paper | <input type="checkbox"/> |
| Flip chart paper and marker pens | <input type="checkbox"/> |

On the day

| | |
|--|--------------------------|
| Put up banners | <input type="checkbox"/> |
| Take photographs | <input type="checkbox"/> |
| Signs for each of 4 rooms | <input type="checkbox"/> |
| Show hosts where toilets are | <input type="checkbox"/> |
| Run through fire/emergency procedures with hosts | <input type="checkbox"/> |

After the day

| | |
|---------------------------|--------------------------|
| Articles for local papers | <input type="checkbox"/> |
| Evaluation report | <input type="checkbox"/> |
| Photographs for employers | <input type="checkbox"/> |
| Photographs for schools | <input type="checkbox"/> |

