Maths Starters and Enders

Welcome to the pack

The Education and Training Foundation has produced some cards with maths activities that you can use at the start or end of prison workshops, training or education sessions.

All the problems are also intended to help people to develop their communication skills, especially their verbal communication skills. This is particularly important for employability. Being skilful when communicating verbally supports people to seek and keep job and training opportunities and navigate their lives and learning.

You will find the following in this p

Toolbox

You'll need the following resources in your maths communication 'toolbox':





Employability skills valued by employers

Research by the University of Kent¹ has identified the top ten employability skills:

- 1. Verbal communication
- 2. Teamwork
- 3. Commercial awareness
- 4. Analysing and investigating
- 5. Self-motivation
- 6. Drive
- 7. Written communication
- 8. Planning and organising
- 9. Flexibility
- 10. Time management

Good verbal communication sits at the top of this list because: "Almost every job will involve talking to colleagues or customers at some point and employees should be able to express themselves clearly, confidently and concisely, tailoring their style to their audience. Communication is not all about talking, the best employees will be able to listen to what people are saying, process it and act on it."



¹ <u>www.kent.ac.uk/careers/sk/top-ten-skills.htm</u>

Principles – the Bishop I deas

In 1991, Alan Bishop² suggested that six types of - often overlapping - activity tend to lead to the development of mathematics in all cultures. Here's his list, with some notes to explain his thinking. We've included all these types of mathematical activity in the pack:

Counting: numbers; place value; fractions; number names Locating: north/south/east/west; up/down; angles; circle; backwards/forwards Measuring: faster/slower; area; money; heavy/light; centimetre Designing: properties of shapes; symmetry; ratio; proportion Playing: puzzles; paradoxes; imagined reality; rule-bound activity Explaining: similarities; logical explanation; generalisations

Tips for tackling the activities:

- Drawing a sketch might help; or jotting down any mathematical words that come to mind as you read the activity.
- Does this activity remind you of others you have done? What ideas did you use then?
- If you're stuck, try making up a problem which is like our activity, but easier; then go back to the original problem.
- Some are slow-burn; have a go, discuss it with other people, look for inspiration in the library, have another go.

² Bishop, A. (1991) Mathematical Enculturation - A Cultural Perspective on Mathematics Education, Dordrecht: Kluwer Academic Publishers



Activity 1 – Favourite number

You will need...

Think of a number you like / find interesting / really do not like.

Write it down.

Now think about what that number means to you / why you chose it. Personal stuff, mathematical stuff, personal mathematical stuff, whatever. Maybe it's your birthday, the biggest prime number yet discovered, a useful irrational number, the biggest even number under 1 million, the number of the first house you lived

Activity 2 – Drawing

Activity 3 - Tomasz went to the gym



This activity will probably involve the Bishop ideas C and M

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Activity 4 – What's the question?











This activity will probably involve the Bishop ideas C, M

I and E



You will need...

Work with two teams. Teams can have one or more people; it doesn't really matter. Pick a number – anything from 0 to 10,000. Tell the teams your number, and tell them that this is "the answer". Ask each team to write down what the question might be. Give them a time fimit and challenge them to write down as many questions as possible. For example, if your number is 15, the "questions" might be "8 + 7" or "50% of 30" or "297.– 282" or "the length of a rectangle with area 30cm² and width 2cm". Tell the teams that they will be checking each (u) -0.2 ve1hms."qu((u) -0.) -0.2 (c () 0.2 ki) -0.2 s Activity 5 – Asking about work

This activity will probably involve the Bishop ideas C , D , and E

You will need...

Somebody offers you a job which will pay £1,000,000 for 20 days' work.

At the start of Day 1, they offer you a choice. You can have the £1,000,000 at the end of Day 1, or you can get paid £1 at the end of Day 1, £2 at the end of Day 2 and so on, doubling your pay each day. What will you choose?

Could you explain your thinking using a graph of some kind?

Activity 6 - Juggling jugs





This activity will probably involve the Bishop ideas ${\bf C}$, ${\bf M}$, ${\bf L}$, ${\bf D}$, and ${\bf E}$



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You will need...

You've got a jug that holds 5 litres and another that holds 3 litres. Could you use them to measure out 4 litres? You can fill either jug from a tap as often as you like.

Some more problems to try:

- Using these two jugs, could you measure out 1, 2, 6, 7 etc litres?
- You have four jugs of 9, 7, 4 and 2 litres capacity. The 9 litre jug is full of wine, the others are empty. Can you divide the wine into three equal quantities?

Activity 7 – Reading between the lines

This activity will probably involve the Bishop ideas **C** and **E**

Activity 8 - Trade magazines



Bishop Ideas: This activity will involve C and E



Activity 9 – Talking numbers

one, two, three, four, five, six, seven, eight, nine, ten één, twee, drie, vier, vijf, zes, zeven, acht, negen, tien aon, dó, trí, ceathair, cúig, sé, seacht, ocht, naoi, deich один, два, три, чотири, п'ять, шість, сім, вісім, дев'

In a group (this works best if you arrange yourselves in a circle or a line), in turn say the number "0" in whatever languages you know. Then go round again, with everybody saying the number "1" etc. Can you hear any similarities between the languages?

Move together with people whose number words sound most similar - you might be surprised by some of the connections. For example, some French and Italian number words sound fairly similar, as do Bengali and Irish number words. Any ideas about why this might be?

If you know how to write the numbers "0" to "10" in different scripts, make a list in your script and compare with other people's scripts.





Activity 10 – Clocking the time

This activity will probably involve the Bishop ideas ${\bf C}$, ${\bf M}$, and ${\bf E}$

- 1. 1 January 2006 was a Sunday. What day was 1 January 2007? 2008? 2009? When did 1 January fall on Sunday again?
- One clock is running one minute per hour too fast. Another is running two minutes too slow. They are synchronised at noon on Sunday. How long will it take before one of them is an

Using the digits 1 to 9 once each, together with any symbols like +, x etc, can you make 100?

Spread the number cards out on the table to show your ideas to other people or to work with other people to find more solutions to this puzzle.

There are many solutions to this puzzle; how many can you find?





Activity 12 - Painting cubes in your head

This activity will probably involve the Bishop ideas ${\bf C}$, ${\bf L}$, ${\bf D}$, ${\bf E}$



We hope you've enjoyed these activities.

Here are some others you might enjoy:

- ATM has a huge range of free and priced resources. Many also have teacher notes. https://www.atm.org.uk
- nrich also has a huge range of delightful problems. All have teacher notes; and all have solutions, some of which come from learners.

http://nrich.maths.org

 "Maths4Prisons Mathematical Magic" is a free download with dozens of puzzles and tricks, each with notes to guide the person introducing or supporting the activity. Available as a free download from The Learning and Work Institute www.learningandwork.org.uk (search for Maths4prisons).

We have suggested that a tape measure should be part of the toolkit as it is a useful resource. Can you think of activities that would need a tape measure and submit them to our online problem-solving maths community (coming soon!).



Maths on the Excellence Gateway's Offender Learning Exhibition Site

There are many helpful resources to support maths development in secure estates on the Excellence Gateway, in the Offender Learning Exhibition Site.

You can access this at http://offenderlearning.excellencegateway.org.uk/maths.