**Protect Pure Maths Campaign – Advanced Research and Intervention Agency (ARIA) Bill**

**Briefing Note**

## About the Campaign

The Protect Pure Maths campaign seeks to safeguard the future of all maths and is a positive campaign that reiterates the value of UK maths and the celebrate the achievements of the UK's world-leading mathematicians. Mathematical sciences are central to today's most urgent technological developments. As you will be aware, artificial intelligence is at the vanguard of that innovation and, of course, it's underpinned by pure maths. You can find out more about the campaign and our supporters here.

## Tabled amendment

Our amendment aims to extend the definition of "scientific knowledge" and "scientific research" to explicitly cover the mathematical sciences. Our tabled amendment is:

Clause 11 – Interpretation:

in page 5 line 2 after "social" insert "and the mathematical"

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## The effect of this amendment

"Unknown unknowns" - risks that come from situations that are so unexpected that they would not be considered - are becoming increasingly important, which mathematics is a major contributor to. Likewise, mathematics' ability and capacity to contribute to and improve significantly crucial issues that are more clearly on the horizon, such as the mathematical contribution to sectors such as security and risk.

As you may be aware, the 2004 Guidelines on Research and Development currently limit the definition of mathematics in Research and Development as the "physical and material universe". We are keen to ensure that the ARIA Bill does not make the same mistake, and that the focus and capacity of the Bill's provisions also explicitly includes the mathematical sciences, including "blue skies" maths (sometimes referred to as 'pure' maths).

Mathematical sciences contribute successfully to key government issues across a broad spectrum, including on security, computing, astronomy, and economics, all areas which will be impacted by the ARIA Bill. In addition, while much of the research is, by its nature, potential for "unknown unknowns", mathematics has visibly been at the core of important aspects for the government, as we have outlined in more detail below:

*Socially: Covid-19:*

In the past year, we have seen through Covid-19 and influential models for the epidemiological dynamics of Covid-19, the huge contribution that mathematics and statistics has made and continues to make to the whole STEM ecosystem and the UK as a whole. For centuries, discoveries in mathematical sciences have led to applications and achievements in every area of science and technology. But progress is not always easy to predict and can take many years. Radon Transforms (1917) were crucial to the patent that enabled x-rays to see cancers and won a Nobel Prize in 1979.

PROTECT <PURE> MATHS

This year, we have seen mathematical sciences underpinning the vital vaccine rollout during Covid-19, as well as assisting in the modelling and mapping of the pandemic itself.

*Economically: Game Theory:*

Game Theory enables the finding of the best strategy for a situation and, thus, help to form a solution. Developed in the 1940s by US mathematicians it was then later progressed by mathematicians and economists around the world. These strategic answers can be applied to nuclear deterrence, evolutionary biology, and all sorts of questions in economics. For example, in 2000 the UK Government auctioned radio spectrum capacity for the soon-to-be launched new generation of 3G mobile phones, offering five telecom licenses to bidders. Using game theory, a team at the ESRC Centre for Economic Learning and Social Evolution advised on how the auction should be designed to ensure spectrum efficiency and maximise profitability. The auction ended up raising a total of £22.5 billion – four and a half times more than the original estimate of £5 billion, and seven times more than the likely outcome of a conventional auction.

*Technically: Quantum Computing Algorithms:*

The mathematical sciences are the fundamental building block for artificial intelligence. The mathematical sciences enable today's most exciting and dynamic technological developments, including driverless cars, the development of quantum computers, and superfast broadband. Quantum computing refers to using the principles of quantum mechanics to manipulate information and perform computations. Quantum computing will have enormous practical implications in a wide variety of fields including cryptography, computational chemistry, mathematics, and computer science. For example, quantum algorithms would be able to efficiently factor products of large prime numbers, thus breaking RSA encryption, which is widely used to protect online data. Quantum computers would also be superior at modelling quantum systems like the interactions of molecules.

**Contact**

If you would like further information, or to arrange a meeting with the campaign, please contact Sophie Brownlee at s.brownlee@connectpa.co.uk