

Survey on Mathematics Used by Engineers

Department of Design and Innovation, NUI Maynooth

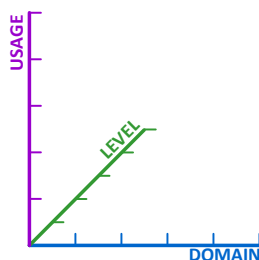
This survey is part of NUI Maynooth's research into the role mathematics plays in the working life of engineers. We anticipate the outcome of this study will contribute to enhancing the structure and content of engineering education, particularly in regard to mathematics quantity, level and conceptual approach.

For further information, please feel free to contact Eileen Goold at eileen.goold@nuim.ie, (m) 086 179 8175.

Your participation in this survey is important and is much appreciated. All contributions are confidential. The results will be published in early 2012.

INSTRUCTIONS

In this survey, we ask for comments on the use of mathematics in engineering, with preference to **3 dimensions**, as follows:



- DOMAIN** There are 5 (topics) domains ...
Statistics and Probability; Geometry and Trigonometry; Number; Algebra; Functions
- LEVEL** There are 5 (academic progression) levels ...
Junior secondary; Intermediate secondary; Senior secondary; Engineering; B.A. / BSc.
- USAGE** There are 5 usage types ...
Reproducing; Connecting; Mathematising; Thinking; Engaging

THE WHOLE SURVEY IS CONTAINED IN PAGES 2– 10. Completion time is approx. 10-15 mins.

- PART A (p2)** First, we request some brief biographical details.
- PART B (p3-7)** We ask for your separate entries for each mathematics domain, in each case for the first 3 usage types (reproducing, connecting, mathematising).
- PART C (p8-10)** The two remaining usage types (thinking, engaging) are entered separately.

Please note the specific completion instructions at the beginning of each PART. *Completion instructions are always in blue italics.*

The 5 USAGE types are defined in the support document attached, **“Survey INFO.”** Information on mathematics TOPICS at the various LEVELS and examples of different USAGE types are also included in this support document. It may be useful to open this supplementary document alongside the survey document for ease of reference.

PART A - BIOGRAPHICAL DETAILS

Instructions: Select your responses from the options available in the radio buttons or dropdown menus.

A.01	Your gender	Male <input type="checkbox"/>	Female <input type="checkbox"/>
A.02	Do you have a Chartered Engineer status or equivalent? (i.e. level 8 engineering degree, e.g. B.Eng., + four years relevant professional experience)	Yes <input type="checkbox"/>	No <input type="checkbox"/>
A.03	Your engineering discipline?	<input style="width: 100%;" type="text"/>	
	Other discipline? <i>Please state</i>	<input style="width: 100%;" type="text"/>	
A.04	Your engineering role?	<input style="width: 100%;" type="text"/>	
	Other role? <i>Please state</i>	<input style="width: 100%;" type="text"/>	
A.05	Your company?	<input style="width: 100%;" type="text"/>	
	Multinational company?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
A.06	Your current position?	<input style="width: 100%;" type="text"/>	
A.07	Your Leaving Cert maths level and grade?	<input style="width: 50%;" type="text"/>	<input style="width: 50%;" type="text"/>
	Year of Leaving Cert? <i>Please state</i>	<input style="width: 100%;" type="text"/>	
A.08	Do you agree that you could perform satisfactorily in your current job <u>without</u> higher level Leaving Cert Maths?	<input style="width: 100%;" type="text"/>	
A.09	Did you enjoy maths in secondary school?	<input style="width: 100%;" type="text"/>	
A.10	Only a minority of students sit higher level Leaving Cert maths and many of those subsequently choose not to stay with numerate studies. How, in your view, could young people's affective engagement (e.g. enjoyment) with maths be improved?		

PART B (i) - STATISTICS & PROBABILITY

B.10 QUESTION:

To what extent have you used Statistics & Probability in your work in the last 6 months?

INSTRUCTIONS:

Select your response from the options presented in EACH of the dropdown menus to indicate your usage of Probability & Statistics at each LEVEL and for each USAGE type. Usage types are mutually independent.

For guidance, definitions and sample topics in Probability & Statistics, at various levels and usage types are provided in the support document attached, “**Survey INFO.**”

You should make an entry in ALL (yellow) answer boxes.

STATISTICS & PROBABILITY

USAGE TYPE	<i>e.g. facts or applying routine algorithms</i>	<i>e.g. use of different tools & problem solving strategies</i>	<i>e.g. interpreting & developing models, translating into real world solutions</i>
	Type 1 usage Reproducing	Type 2 usage Connecting	Type 3 usage Mathematising
SUBJECT LEVEL			
Junior – secondary			
Intermediate – secondary			
Senior – secondary			
Engineering			
B.A. / B.Sc.			

PART B (ii) - GEOMETRY & TRIGONOMETRY

B.20 QUESTION:

To what extent have you used Geometry & Trigonometry in your work in the last 6 months?

INSTRUCTIONS:

Select your response from the options presented in EACH of the dropdown menus to indicate your usage of Geometry & Trigonometry at each LEVEL and for each USAGE type. Usage types are mutually independent.

For guidance, definitions and sample topics in Geometry & Trigonometry, at various levels and usage types, are provided in the support document attached, "**Survey INFO.**"

You should make an entry in ALL (yellow) answer boxes.

GEOMETRY & TRIGONOMETRY

USAGE TYPE	<i>e.g. facts or applying routine algorithms</i>	<i>e.g. use of different tools & problem solving strategies</i>	<i>e.g. interpreting & developing models, translating into real world solutions</i>
	Type 1 usage Reproducing	Type 2 usage Connecting	Type 3 usage Mathematising
SUBJECT LEVEL			
Junior – secondary			
Intermediate – secondary			
Senior – secondary			
Engineering			
B.A. / B.Sc.			

PART B (iii) - NUMBER

B.30 QUESTION:

To what extent have you used Number in your work in the last 6 months?

INSTRUCTIONS:

Select your response from the options presented in EACH of the dropdown menus to indicate your usage of Number at each LEVEL and for each USAGE type. Usage types are mutually independent.

For guidance, definitions and sample topics in Number, at various levels and usage types, are provided in the support document attached, “**Survey INFO.**”

You should make an entry in ALL (yellow) answer boxes.

NUMBER

		<i>e.g. facts or applying routine algorithms</i>	<i>e.g. use of different tools & problem solving strategies</i>	<i>e.g. interpreting & developing models, translating into real world solutions</i>
	USAGE TYPE	Type 1 usage Reproducing	Type 2 usage Connecting	Type 3 usage Mathematising
SUBJECT LEVEL				
	Junior – secondary			
	Intermediate – secondary			
	Senior – secondary			
	Engineering			
	B.A. / B.Sc.			

PART B (iv) - ALGEBRA

B.40 QUESTION:

To what extent have you used Algebra in your work in the last 6 months?

INSTRUCTIONS:

Select your response from the options presented in EACH of the dropdown menus to indicate your usage of Algebra at each LEVEL and for each USAGE type. Usage types are mutually independent.

For guidance, definitions and sample topics in Algebra, at various levels and usage types, are provided in the support document attached, "Survey INFO."

You should make an entry in ALL (yellow) answer boxes.

ALGEBRA

		<i>e.g. facts or applying routine algorithms</i>	<i>e.g. use of different tools & problem solving strategies</i>	<i>e.g. interpreting & developing models, translating into real world solutions</i>
	USAGE TYPE	Type 1 usage Reproducing	Type 2 usage Connecting	Type 3 usage Mathematising
SUBJECT LEVEL				
	Junior – secondary			
	Intermediate – secondary			
	Senior – secondary			
	Engineering			
	B.A. / B.Sc.			

PART B (v) - FUNCTIONS

B.50 QUESTION:

To what extent have you used Functions in your work in the last 6 months?

INSTRUCTIONS:

Select your response from the options presented in EACH of the dropdown menus to indicate your usage of Functions at each LEVEL and for each USAGE type. Usage types are mutually independent.

For guidance, definitions and sample topics in Functions, at various levels and usage types, are provided in the support document attached, “**Survey INFO.**”

You should make an entry in ALL (yellow) answer boxes.

FUNCTIONS

		<i>e.g. facts or applying routine algorithms</i>	<i>e.g. use of different tools & problem solving strategies</i>	<i>e.g. interpreting & developing models, translating into real world solutions</i>
	USAGE TYPE	Type 1 usage Reproducing	Type 2 usage Connecting	Type 3 usage Mathematising
SUBJECT LEVEL				
	Junior – secondary			
	Intermediate – secondary			
	Senior – secondary			
	Engineering			
	B.A. / B.Sc.			

PART C (i) - THINKING USAGE (Type 4)

C.11 QUESTION:

To what extent, with or without direct application of mathematics, did your mathematics training (with its associated modes of thinking and analysis) directly influence your approach to your work?

INSTRUCTIONS:

Select your response from the options presented in EACH of the dropdown menus to indicate your thinking usage of maths in the last 6 months, within 2 years of graduating and within 10 years of graduating.

For guidance, definition and examples of THINKING USAGE are provided in the support document attached, "Survey INFO."

You should make an entry in ALL (yellow) answer boxes that represent your career.

THINKING USAGE

USAGE TYPE	e.g. reasoning, logical techniques problem solving strategies, sense of solution etc. Type 4 usage Thinking
WHEN	
in the last 6 months	
within 2 years of graduating	
within 3-5 years after graduating	
within 6-10 years after graduating	
greater than 6 years after graduating	

C.12 QUESTION:

What modes of thinking, resulting from your maths education, influence your work performance?

PART C (ii) - ENGAGING USAGE (Type 5)

C.21 QUESTION:

With regard to your work in the last 6 months, to what degree.....

INSTRUCTIONS:

Select your response from the options presented in EACH of the dropdown menus to indicate your affective usage of maths in the last 6 months and state why in EACH of the corresponding text fields.

For guidance, definition and examples of ENGAGING USAGE are provided in the support document attached, "Survey INFO."

You should make an entry in ALL (yellow) answer boxes.

ENGAGING USAGE

		<p>USAGE TYPE</p> <p><i>e.g. motivation, attitudes, beliefs, emotions, value, confidence and self-efficacy</i></p> <p>Type 5 usage Engaging</p>
QUESTION		
...was a specifically mathematical approach necessary?		
Why?		
...did you actively seek a mathematical approach?		
Why?		
 did you enjoy using maths?		
Why?		
...did you feel confident dealing with mathematics?		
Why?		
...did you have a negative experience when using mathematics?		
Why?		

PART C (iii) - ENGAGING USAGE (Type 5)

C.31 QUESTION:

What factors within and outside of school influence your engagement with mathematics?

FACTORS WITHIN SCHOOL	
...primary school	
...secondary – Years 1 & 2	
...secondary – Junior Cert	
...secondary – Leaving Cert	
FACTORS OUTSIDE SCHOOL	
... primary school years	
... secondary – Years 1 & 2	
...secondary – Junior Cert	
...secondary – Leaving Cert	

C.32 QUESTION:

To what degree did your feelings about mathematics impact your choice of engineering as a career?

C.33 ADDITIONAL COMMENTS:

Would you like to make any additional comments?

RETURNING YOUR COMPLETED SURVEY:

*INSTRUCTIONS: Many thanks for completing the survey. To return your completed questionnaire, please select the **SUBMIT FORM** option at the top right hand corner of your screen and follow the prompts. If you experience any difficulty, please contact Eileen Goold at eileen.goold@nuim.ie or at 086-1798175. Your participation is very much appreciated.*