SAM LABS education

invent samthing...

PROBABILITY

COMPUTER SCIENCE, MATHS

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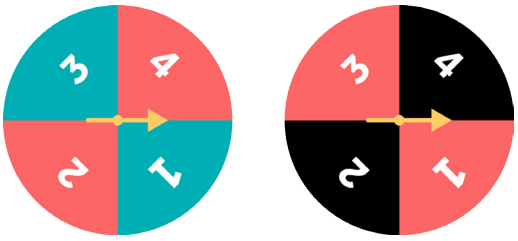


Probability is the measure of how likely it is for something to occur. This lesson determines the logic behind comparing, judging, and finding this.

SUBJECTS

Computer Science, Maths

GRADE LEVEL

KS3

LEARNING OBJECTIVES

• Learn about probability: theoretical and conditional

LEARNING OUTCOMES

To set up and increase understanding of theoretical and conditional probability through an experiment using SAM DC Motors.

RECOMMENDED PRIOR KNOWLEDGE

• Basic understanding of SAM

GROUP SIZE

2-3 students

COMPUTATIONAL THINKING FRAMEWORK

AL, GE, AB

TIME REQUIRED

20 minutes to create

30 minutes to observe and record

10 minutes to reflect, peer review and plenary

MATERIALS REQUIRED

• SAM DC motors x 2
• SAM Buttons x 2
• SAM Space Education app
• Computer
• Mathematical compass
• Cardboard
• Markers
• Small lump of plastic adhesive
• Camera to record stages and progress

ACTIVITIES

• Discuss probability, theoretical and conditional and how it will be recorded.
• Set up a system using SAM Motors to test probability.
• Draw a table to record the results.
• Storyboard process and take a photo of each stage of the process.
• Peer review and teacher feedback on the final product/results.
• Student reflection: strengths, weakness, difficulties, suggested modifications.
• Plenary, including other ways this system can be used.

STAGE 1

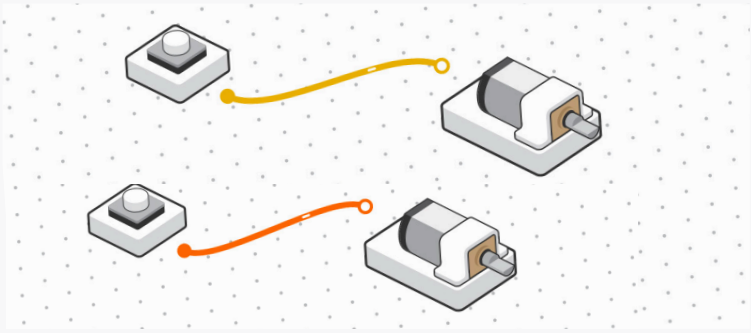
Gather the materials.

STAGE 2

Create two round spinners, each divided into quarters, numbered one to four. Use a mathematical compass with radius of approximately 10 cm.
The arrows should be quite stiff cardboard or ice cream sticks.
Make them different colours: One red/black, one red blue

STAGE 3

Open the SAM Space Education app. Turn on and drag the SAM Buttons and the SAM DC Motors onto the canvas. Connect the SAM Button to a SAM DC Motor.



STAGE 4

Place each SAM DC Motor block on its side in the middle of the cardboard circle. Attach the arrow to the top of the SAM DC Motor axel with a lump of plastic adhesive.

STAGE 5

Spin the arrow 12 times. Record the results on a chart. The total is the number from each spinner added together.

For example:

RED	BLUE	TOTAL
1	0	1
1	1	2
1	2	3
1	3	4
2	0	2

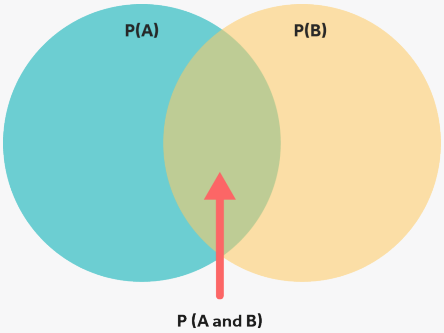
STAGE 6

How many different possible outcomes are there?
How many outcomes gave a total score of 2?
What is the probability of getting a total score of 2?
How many outcomes gave a total score of 4?
What is the probability of getting a total score of 4?

Theoretical probability is the likeliness of an event happening based on all the possible outcomes. The ratio for the probability of an event 'P' occurring is P (event) = number of favourable outcomes divided by number of possible outcomes.

The **conditional probability** of an event B in relationship to an event A is the probability that event B occurs given that event A has already occurred. The notation for conditional probability is P(B|A), read as the probability of B given A. The formula for conditional probability is:

The Venn Diagram below illustrates P(A), P(B), and P(A and B).



STAGE 7

- Students report back to the class on their task
    - What do the results mean?
- Peer review (students comment on each other's work eg. Were there any difficulties encountered during the experiment?
- Did each group get the same results? If not, why not?

DIFFERENTIATE

Use different spinners, divided into more segments/numbers.
Introduce a SAM Timer software block to the system.

TEACHER FEEDBACK AND PLENARY

Successes - weaknesses - future modifications

Please contact SAM Labs at:
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APPENDIX

COMPUTER SCIENCE, MATHS

NATIONAL CURRICULUM EDUCATIONAL STANDARDS

MATHS

KS3

Probability

Pupils should be taught to:

Record, describe and analyse the frequency of outcomes of simple probability experiments involving randomness, fairness, equally and unequally likely outcomes, using appropriate language and the 0-1 probability scale.

Understand that the probabilities of all possible outcomes sum to 1.

Enumerate sets and unions/intersections of sets systematically, using tables, grids and Venn diagrams generate theoretical sample spaces for single and combined events with equally likely, mutually exclusive outcomes and use these to calculate theoretical probabilities.

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/239058/SECONDARY_national_curriculum_-_Mathematics.pdf

NATIONAL CURRICULUM EDUCATIONAL STANDARDS

COMPUTER SCIENCE

KS3

Pupils should be taught to:

Design, use and evaluate computational abstractions that model the state and behaviour of real-world problems and physical systems.

Design and develop modular programs that use procedures or functions.

Undertake creative projects that involve selecting, using, and combining multiple applications, preferably across a range of devices, to achieve challenging goals, including collecting and analysing data and meeting the needs of known users.

Create, re-use, revise and re-purpose digital artefacts for a given audience, with attention to trustworthiness, design and usability.

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/239067/SECONDARY_national_curriculum_-_Computing.pdf

PROGRESSION PATHWAYS/ COMPUTATIONAL THINKING CONCEPT

Hardware and processing

Knows that processors have instruction sets and that these relate to low-level instructions carried out by a computer. (AB) (AL) (GE)

https://community.computingatschool.org.uk/resources/1692

Computational Thinking Concept: AB = Abstraction; DE = Decomposition; AL = Algorithmic Thinking; EV = Evaluation; GE = Generalisation