ROYAL STATISTICAL SOCIETY
DATA | EVIDENCE | DECISIONS

Sociable Cards

Activity Summary:

This activity uses a "magic trick" to demonstrate that statistical thinking can help to identify patterns in situations which may otherwise be considered unpredictable.

It is highly interactive and requires minimal resources.

Activity Learning Outcomes:

- Appreciate that probability can be used to identify patterns in a range of situations.
- Understand that skills in probability and statistics are highly transferrable.
- Appreciate the usefulness of this "trick" in real life applications.

Suggested Resources:

- One pack of playing cards (the larger the better!)
- Floor space (or table top) to lay out the cards.
- Between four and eight participants.
- Counters e.g. small bean bags (optional).

How to run the activity:

- Shuffle the cards and lay them in a path across the floor (or table top for small cards), snaking back and forth as necessary.
- Clearly identify the start and finish points of the path.
- Encourage the participants to stand at the start of the path. Each person should stand, or place a counter, on one card. With four players, each of the first four cards on the path will have one person/counter on them. Five people, the first five cards, and so on.
- At the facilitator's command, each player then moves forward the number shown on the card that they have started on. Aces count as 1; Jack, Queen and King all count as 5.
- Each player continues to move forward unprompted according to the value of the card they land on.
- Each player continues moving forward until they cannot move any further without travelling beyond the end of the path of cards.

Exploring the activity:

- Where do the players end up?
- What happens if the end of the path becomes the start?
- What happens if the cards are shuffled and a new path is laid out?
- What happens if the values of the picture cards are changed (increased or decreased)?

What's going on?

- Most of the time, all participants will finish on the same card.
- Even if the end of the path becomes the start, and/or the pack is reshuffled and laid out in a new path, most of the time all participants will still finish on the same card.
- The intuitive explanation is that, at some point, most (usually all) participants 'land' on the same card on the path – from then on, these participants will make the same moves forward, and so end up on the same card at the end of the path.
- This is a variant on a magic trick known as "Kruskal's Count", invented by Martin Kruskal, an American mathematician and physicist.
- If necessary the trick can be demonstrated by asking the group of participants to step through the game slowly, one move forward for each player in turn, at a time.

- The probability of all players landing on the same card depends on the number of players and the number of moves associated with the Jack, Queen and King picture cards.
    - The higher the number of participants the (slightly) lower the chance that all of them will end the game on the same card.
    - The higher the number of moves associated with the picture cards the (slightly) lower the chance that all participants will end the game on the same card.

- This has a real-life application in Pollard's Kangaroo method which is an efficient means of breaking certain codes and digital signature schemes.

Video demonstration:

A video demonstrating this activity is available on the RSS website at www.rss.org.uk/hands-on

Risk assessment:

Laminated playing cards can be slippery, particularly on carpet. Be mindful of slip hazards. Counters can be used as a lower risk alternative to participants standing on the cards.

Additional information and taking it further:

NRICH Sociable Cards (desktop version) with video: http://nrich.maths.org/7219
James Grime, Kruskal's Count – a magic trick version of the Sociable Cards game: http://www.singingbanana.com/Kruskal.pdf
James Grime performing the trick on YouTube: https://www.youtube.com/watch?v=uRI4XtnJxXo
Demonstration of Pollard's Kangaroo method: http://faculty.uml.edu/rmontenegro/research/kruskal_count/kangaroo.html

Credits:

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