**Pairs of Biased Dice: Investigation**

**Sample Report**

**Aims:**

To build up a clear understanding (depending on depth required and interest levels of students) of:

* experimental probabilities,
* constructing a probability space,
* bias,
* differentiating between bias and unequal probabilities,
* hypothesis testing,
* statistically significant experimental results.

**Setup:**

We know one of four dice is biased. We can even exert a limited influence on that bias. We then record successive sums for each pair of dice, to see how many rolls we need before the pair containing the biased die shows up clearly.

***Tip:***

*You can risk going over the maximum trials, because you can always use ‘undo’ to go back to a previous ‘nice number’ if a full-up value reoccurs before you get to the next 5 or 10!*

**Summary of Results:**

The raw data collected in the Appendix, shows clearly that:

* in Investigation1, the ……. pair of dice includes the biased dice,
* in Investigation2, the ……. pair of dice includes the biased dice,
* in Investigation3, the ……. pair of dice includes the biased dice,
* in Investigation4, the ……. pair of dice includes the biased dice.

This is clear because:

Questions for Teachers

**Re Investigation:**

Is a possible maximum of 70 trials on each pair too few? Should I include more trial spaces? (It is possible to overwrite 1s with 2s, 3s etc in the tallies, but you lose the pictorial representation of the skew if you do.)

Would the tally charts be clearer if they mirrored each other, so that the frequencies for both pairs were in the centre?

Should I restrict or expand the weighting options for the biased die? (eg allow no weighting, or only allow weighting above 3)

Any suggestions for a better weighting algorithm? (see top row of each sheet, for the current one)

Do you desperately need me to give the option of hiding / working out from scratch the probability space for all possible outcomes? (I’m trying to keep the option boxes to a minimum!)

**Re Sample Report / Lesson Plan:**

Anything to add?

Does it address key weaknesses / misconceptions in your curriculum?

(hopefully not, but …) Does it propagate any key weaknesses / misconceptions?

*Many thanks for your feedback and I hope you find this activity useful!*

*(feedback to:* [*Margaret@mgse.co.uk*](mailto:Margaret@mgse.co.uk) *)*

Appendix 1

**Example Raw Data:**

|  |  |  |
| --- | --- | --- |
|  | Biased Die Rolls More Over 3s | Biased Die Rolls More Over 4s |
| Weakest Bias |  |  |
| Weak Bias |  |  |
| Stronger Bias |  |  |
| Strongest Bias |  |  |