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MYP Years 4&5

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**Probability Summative Task** – **Criterion D**

Student name:

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**Statement of Inquiry:**

*Mathematicians use data to understand events in real life and generalise. Can we make reliable predictions for future events?*

There are two tasks in this assessment.

**Task 1**: **Toss a coin until it comes up “heads”**

All the students in the maths class will conduct the same experiment: toss a coin until the first Head appears. For example, if you get a Head after the first toss the experiment ends and you will record the result as H. You may record TTH if the first Head appears after the third toss. The investigation tasks are: what is the proportion of number of heads to tails? What is the mean number of tosses per round?

***Warm up question***: What is the ratio from your gut feelings? You are welcome to briefly explain your ratio.

***Activity 1***: Write the possible combinations of heads (H) and tails (T) for toss numbers 1 to 10 in the table below.

|  |  |  |
| --- | --- | --- |
| The total number of tosses | Tails | Heads |
| 1 |  | H |
| 2 | T | H |
| 3 |  |  |
| 4 |  |  |
| 5 |  |  |
| 6 |  |  |
| 7 |  |  |
| 8 |  |  |
| 9 |  |  |
| 10 |  |  |
| Total number |  |  |

***Question 2***: Use the data from the table above, answer questions below.

1. What is the total number of tails?
2. What is the total number of heads?
3. Now, back to Question 1, what do you think the ratio would be?
4. If you conduct this experiment what do you think would be the average/mean number of tosses until the first Head?

***Activity 2***: import random

You are now going to conduct this experiment. To save your time we will use a random number generator. You can either choose GDC or Python to work as a random number generator. Please ask your teacher for instructions.

Form a group (maximum number of 3). One person in your group will generate the random numbers and one needs to record the tallies. Make sure the round ends once ‘1’ is generated. You need to do 50 rounds per group. Use the table provided to summerise your data and then combine your data with the class data and copy onto the ‘Class data results table’.

Group Results Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Type | Tally | Number of this type | Total number of tails | Total number of heads | Total number of tosses |
| 1 |  |  |  |  |  |
| 01 |  |  |  |  |  |
| 001 |  |  |  |  |  |
|  |  |  |  |  |  |
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|  |  |  |  |  |  |
| Total | 50 | 50 |  |  |  |

Class Results Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Type | Number of this type | Total number of tails | Total number of heads | Total number of tosses |
| 1 |  |  |  |  |
| 01 |  |  |  |  |
| 001 |  |  |  |  |
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|  |  |  |  |  |
|  |  |  |  |  |
| Total |  |  |  |  |

Use the class data table answer questions 2 and 3.

***Question 2***: What is the ratio of number of heads to tails?

***Question 3***: How does this ratio compare with yours in Question 1? Discuss on your findings.

***Activity 3***: Finding the mean number of tosses per round using the class data table. Compare this calculated mean number with yours in Question 2(d). Discuss on your findings.

**Task 2: Two tosses at most**

In this task, you will still be tossing coins (virtually with a random number generator). If you get a Head after the first toss, you stop tossing and move to another round. If the result after the first toss is a Tail, then you toss the coin for one more time. No more tosses afterwards. Therefore, there are only three results to be recorded: H, TT, and TH.

***Question 1***: What do you expect the proportion of number of heads to tails to be?

We will repeat the same process as in Task 1.

Group Results Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Type | Tally | Number of this type | Total number of tails | Total number of heads | Total number of tosses |
| 1 |  |  |  |  |  |
| 00 |  |  |  |  |  |
| 01 |  |  |  |  |  |
| Total | 50 | 50 |  |  |  |

Class Results Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Type | Number of this type | Total number of tails | Total number of heads | Total number of tosses |
| 1 |  |  |  |  |
| 00 |  |  |  |  |
| 01 |  |  |  |  |
| Total |  |  |  |  |

Use the class data table answer questions 2 and 3.

***Question 2***: What is the ratio of number of heads to tails?

***Question 3***: How does this ratio compare with yours in Question 1? Discuss on your findings.

***Activity 3***: Finding the mean number of tosses per round using the class data table. Compare this calculated mean number with yours in Task 1 Question 2(d). Discuss on your findings.

***Question 4***: Compare the two tasks, comment on the difference of results.

***Question 5***: Comment on the use of random generator to model real-world problems. Is it useful and reliable in the problem modelling?

Criterion D: Applying mathematics in real-life contexts

Students should be able to:

i. **identify** relevant elements of authentic real-life situations

ii. **select** appropriate mathematical strategies when solving authentic real-life situations

iii. **apply** the selected mathematical strategies successfully to reach a solution

iv. **explain** the degree of accuracy of a solution

v. **justify** whether a solution makes sense in the context of the authentic real-life situation.

|  |  |
| --- | --- |
| Achievement level | Level descriptor |
| 0 | The student does not reach a standard described by any of the descriptors below. |
| 1-2 | The student is able to:  i. identify some of the elements of the toss until heads experiment  ii. apply mathematical strategies to model the problem. |
| 3-4 | The student is able to:  i. identify the relevant elements of the toss until heads experiment  ii. select, with some success, adequate mathematical strategies to model this problem  iii. apply mathematical strategies to estimate the ratios and means. |
| 5-6 | The student is able to:  i. identify the relevant elements of the toss until heads experiment  ii. select adequate mathematical strategies to model this problem  iii. apply the selected mathematical strategies to correctly estimate the ratios and means  iv. explain the degree of accuracy of the solution. |
| 7-8 | The student is able to:  i. identify the relevant elements of the toss until heads experiment  ii. select adequate mathematical strategies to model this problem  iii. apply the selected mathematical strategies to correctly estimate the ratios and means  iv. explain the degree of accuracy of the solution  v. justify whether the solution makes sense in the context of this problem. |