Name: Date:

**We will be using this model of a colon crypt to collect data and make predictions about cell counts.**

**Part 1:** To set up the first simulations, follow these directions.

* Turn “mutated?” off.
* Set the “number of stem cells per crypt” to 2.
* Set the “rate of duplication” to 2.
* Set the “number of ticks” slider to 150.
* Press the “setup” button and wait for the picture to load your chosen settings.
* Then press the “go” button.
* Record in the chart below the number of daughter cells, goblet cells, endocrine cells, enterocyte cells, and the total cell count. After recording the data, press “setup” again to reset the model. Repeat this for a total of 5 simulations.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Simulation # | Daughter Cells | Goblet Cells | Endocrine Cells | Enterocyte Cells | Total Cell Count |
| Simulation 1 |  |  |  |  |  |
| Simulation 2 |  |  |  |  |  |
| Simulation 3 |  |  |  |  |  |
| Simulation 4 |  |  |  |  |  |
| Simulation 5 |  |  |  |  |  |

Use the information in the previous chart to calculate the mean, median, mode, and range for each cell type and the total number of cells.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Central Tendency | Daughter Cells | Goblet Cells | Endocrine Cells | Enterocyte Cells | Total Cell Count |
| Mean |  |  |  |  |  |
| Median |  |  |  |  |  |
| Mode |  |  |  |  |  |
| Range |  |  |  |  |  |

When picking a random cell from these crypts, what is the probability that the cell will be a daughter cell? A goblet cell? An endocrine cell?

An enterocyte cell?

**Part 2**: Now turn the “mutated?” button on. Set the “rate of duplication” to 2 and the number of stem cells per crypt to 2. Press “ setup” and then press “go”. Keep the “number of ticks” slider to 150. Then record the information in the chart.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Mutated Simulation | Daughter Cells | Goblet Cells | Endocrine Cells | Enterocyte Cells | Mutated Cells | Total Cell Count |
| Cell Count |  |  |  |  |  |  |

Describe what the mutated cells are doing in the model. How does this differ from the normal cells?

What is the difference between the daughter cell count in the mutated simulation and the mean of the daughter cells of the 5 non-mutated simulations?

What is the difference between the total cell count in the mutated simulation and the mean of the total cell count of the non-mutated simulations? Why do you think this is?

**Part 3:** For this part, turn off the “mutated?” button. Set the “number of stem cells” to 2 and the “number of ticks” slider to 120. Each of the 4 simulations you will run with these settings will have a different “rate of duplication” setting. Record the total cell count for each change in the rate of duplication.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Simulation/ Rate of Duplication | 1st Simulation  Rate of Duplication=2 | 2nd Simulation  Rate of Duplication= 4 | 3rd Simulation  Rate of Duplication= 6 | 4th Simulation  Rate of Duplication= 8 |
| Total Cell Count |  |  |  |  |

Using the information collected in the chart, graph the change in total cell count based on the different rates of duplication. Set an appropriate scale on the “total cell count” axis.

Total Cell Count vs Rate of Duplication

Total Cell Count

2 4 6 8

Rate of Duplication

Is the relationship between total cell count and rate of duplication linear or non-linear?

Based on the data collected in Part 3 and the graph created in Part 3, what would you expect the total cell count to be when the duplication rate is 10?

Now run the model with the duplication rate set at 10. Was your prediction close to the actual amount?