TASK: Road to the Stanley Cup

Level 4 Sample Response

1-2. Simulated Leafs Series are modeled using the TI 83 feature : **randInt**(1, 10, 7) . The results for 20 simulations are listed below. The results reflect a 50% probably of winning a home game and a 40% probably of winning an away game based on the Leafs record in the 82 regular season games.

In the simulation, for a home game, the Leafs win if the numbers 1 - 5 appear, and lose if 6 -10 appear – i.e., 50% probability. For an away game, the Leafs win if the numbers 1 - 4 appear, and lose if 5 – 10 appear, i.e., 40% probability.

The Leafs have three home games (Nos. 3, 4 and 6) since they are playing a team with a better record.

Example: In the simulation {1, 3, 7, 4, 5, 4, 3} Leafs win the series 4 – 1, and series lasts 5 games.

Series	Leafs Result
1	Won 4-1
2	Lost 1-4
3	Lost 3-4
4	Won 4-2
5	Won 4-0
6	Lost 0-4
7	Lost 3-4
8	Lost 2-4
9	Lost 1-4
10	Lost 0-4

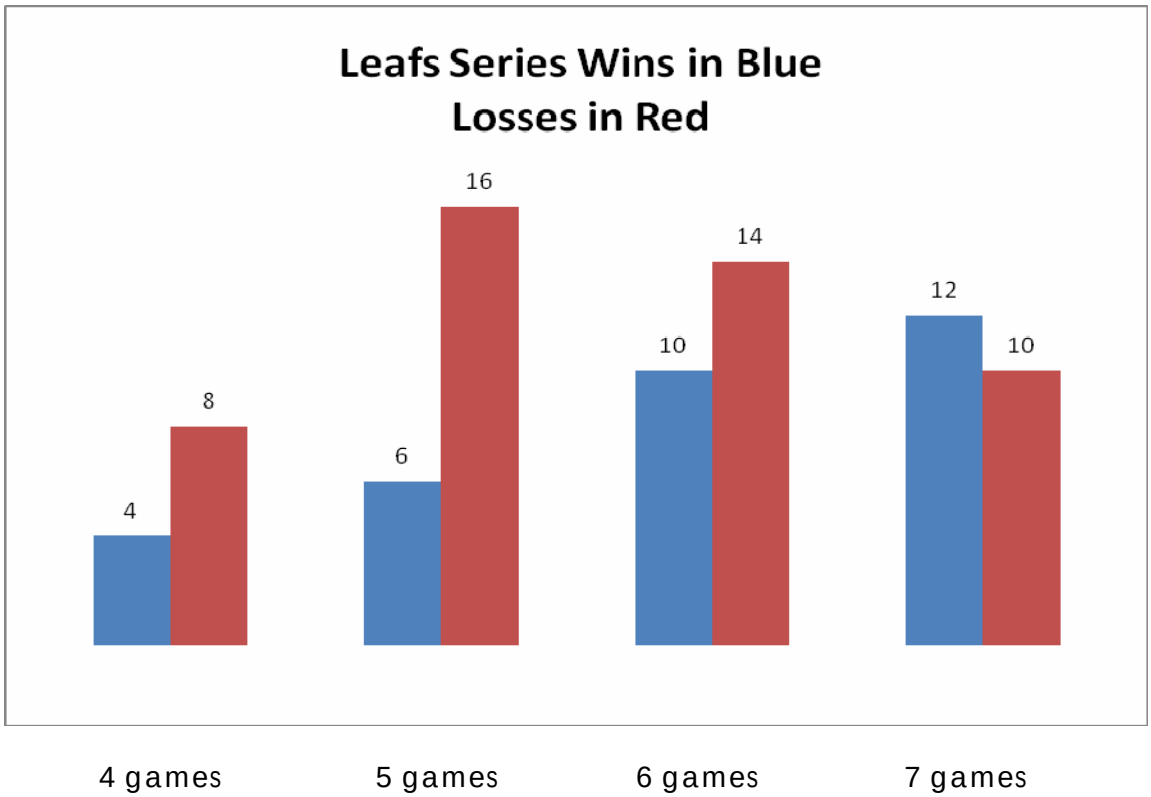
Series	Leafs Result
11	Won 4-3
12	Lost 3-4
13	Lost 2-4
14	Won 4-2
15	Lost 0-4
16	Lost 1-4
17	Lost 2-4
18	Won 4-3
19	Won 4-3
20	Lost 1-4

3. This is a tally chart and frequency table of the 80 simulated results for my group of 4 students.

Leafs Series Results	Tally	Frequency
1. Won 4 - 0	////	4
2. Won 4 - 1	~~///~~ /	6
3. Won 4 - 2	~~///~~ ~~///~~	10
4. Won 4 - 3	~~///~~ ~~///~~ //	12
5. Lost 0 - 4	~~///~~ ///	8
6. Lost 1 - 4	~~///~~ ~~///~~ ~~///~~ /	16
7. Lost 2 - 4	~~///~~ ~~///~~ ////	14
8. Lost 3 - 4	~~///~~ ~~///~~	10

So the Leafs won 32 and lost 48 series in this set of simulated data.

4. I used Microsoft Excel to show the results of the of the group simulations using a comparative bar graph.



5. From the tally chart, the mean number of games that the Leafs played to win the Stanley Cup is given by: $(4 \times 4 + 6 \times 5 + 10 \times 6 + 12 \times 7) \div 32 = 5.94$.

So using the 80 simulations of the group results, it took about 6 games on average for the Leafs to win the Stanley Cup.

From the group simulated results, the median number of games that the Leafs played to win the cup is 6 games.

{4, 4, 4, 4, 5, 5, 5, 5, 5, 5, 6, 6, 6, 6, 6, **6, 6,** 6, 6, 6, 7, 7, 7, 7, 7, 7, 7, 7, 7, 7, 7, 7}

The mode for the simulated group results for the number of games that the Leafs took to win the cup is 7 games.

The best measure of central tendency is the mean because the frequencies for 6 and 7 games are much higher than for 4 or 5 games.

6. From my simulation using **randInt**, the Leafs won 7 series and lost 13 series. Therefore the experimental probability of winning the series is $7 \div 20 = 35\%$. From the tally sheet of results for the whole group, the experimental probability of the Leafs winning the series is $32 \div 80 = 40\%$. From both sets of data, it is clear that the Leafs have about a 40% chance of winning the series.

7. It would be unlikely that the Leafs would win all 4 seven game series needed to become Stanley Cup champions, when they have only a 40% chance of winning each series.

Compare the probability to that of tossing a head 4 times in a row – which has a theoretical probability of $0.5 \times 0.5 \times 0.5 \times 0.5 = 0.625 = 6.25\%$; in this case with a probability of winning each series with a probability of 40%, the probability of winning 4 consecutive series would be

$0.4 \times 0.4 \times 0.4 \times 0.4 = 0.0256 = 2.56\%$.

However, there are many human variables that could affect the actual results, such as injuries to key players, loss of form, a hot goaltender, and luck! Go Leafs!

Level 4 Notes

Look for the following:

• appropriate choice of graph with detailed justification to compare the number of times the Leafs win the series to the number of times they lose the series

• thorough understanding of the measures of central tendency and which measures best represent the data

• highly effective understanding of problem-solving techniques

• highly organised presentation of information with clear justification provided for choices and predictions

• highly effective use of probability and statistics terminology

Level 3 Sample Solution

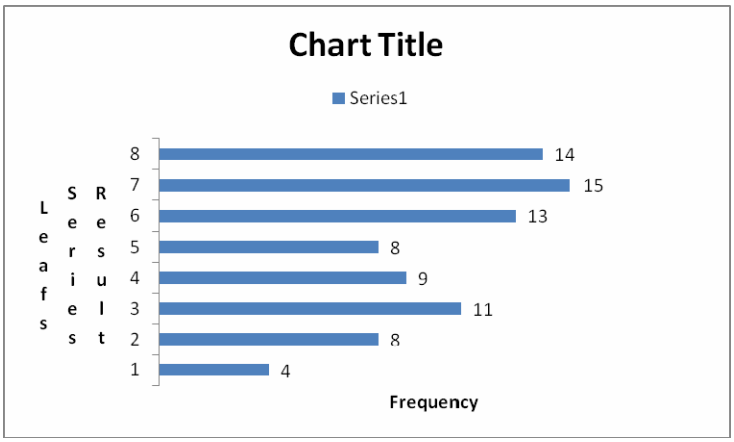
1-2. The results of 20 simulated Leafs series using: **randInt**(1, 10, 7) are shown below.

Simulated Series	Leafs Result	Simulated Series	Leafs Result
1	Win 4-2	11	Win 4-2
2	Win 4-1	12	Lose 2-4
3	Lose 3-4	13	Lose 1-4
4	Win 4-2	14	Win 4-1
5	Lose 1-4	15	Lose 2-4
6	Lose 2-4	16	Lose 2-4
7	Win 4-3	17	Lose 0-4
8	Lose 3-4	18	Win 4-3
9	Lose 2-4	19	Win 4-2
10	Lose 3-4	20	Lose 2-4

3. This is a tally chart and frequency table of the 82 simulated results of my group.

Leafs Series Results	Tally	Frequency
1. Win 4 - 0	////	4
2. Win 4 - 1	~~////~~ ///	8
3. Win 4 - 2	~~////~~ ~~////~~ /	11
4. Win 4 - 3	~~////~~ ////	9
5. Lose 0 - 4	~~////~~ ///	8
6. Lose 1 - 4	~~////~~ ~~////~~ ///	13
7. Lose 2 - 4	~~////~~ ~~////~~ ~~////~~	15
8. Lose 3 - 4	~~////~~ ~~////~~ ////	14

4. I created a bar graph using Microsoft Excel to show the results of the of the group simulations.



5. From the tally chart, the mean number of games that the Leafs played to win the Stanley Cup is given by $\{4 \times 4 + 8 \times 5 + 11 \times 6 + 9 \times 7\} \div 32 = 5.78$. So using all the group results, it took about 6 games on average for the Leafs to win the Stanley Cup.

From the group simulated results, the median number of games that the Leafs played to win the cup is 6 games.

4, 4, 4, 4, 5, 5, 5, 5, 5, 5, 5, 5, 6, 6, 6, **6, 6,** 6, 6, 6, 6, 6, 6, 7, 7, 7, 7, 7, 7, 7, 7, 7

The mode (most frequent number) in the simulated group results for the number of games that the Leafs took to win the cup is 6 games.

The best measure of central tendency is the mean because the frequencies for the 5, 6 and 7 games are close in number.

6. From my simulation using **randInt**, the Leafs won 8 series and lost 12 series. Therefore the experimental probability of winning the series is $8 \div 20 = 40\%$. From the tally sheet of results for the whole group, the experimental probability of the Leafs winning the cup is $32 \div 82 \approx 39\%$.

7. It would be unlikely that the Leafs would win all 4 seven game series needed to become Stanley Cup champions, when they have only a 40% chance of winning each series.

Level 3 Notes
Look for the following:

- appropriate choice of graph to compare the number of times the Leafs win the series to the number of times they lose the series
- understanding of the measures of central tendency and which measures best represent the data
- understanding of problem-solving techniques
- organised presentation of information with clear justification provided for choices and predictions
- effective use of probability and statistics terminology

Level 2 Sample Response

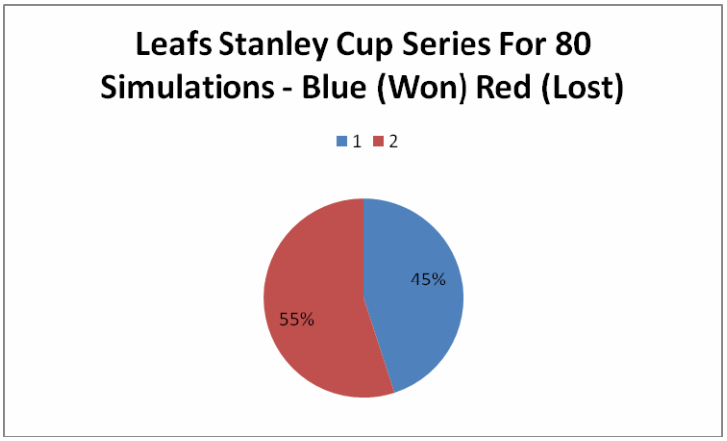
2. Here are the scores of the 20 simulated Leafs Series from randInt(1, 10, 7).

Simulation No.	G1	G2	G3	G4	G5	G6	G7	Leafs Result
1	W	L	L	W	W	W		Won 4-2
2	L	W	L	L	L			Lost 1-4
3	L	W	W	L	W	W		Won 4-2
4	W	L	L	W	L	L		Lost 2-4
5	W	L	W	L	W	W		Won 4-2
6	L	L	L	W	W	L		Lost 2-4
7	L	W	W	L	L	L		Lost 2-4
8	L	W	W	L	W	L	W	Won 4 -3
9	L	W	L	L	L			Lost 1-4
10	L	L	L	W	W	L		Lost 2-4
11	L	W	W	L	W	W		Won 4-2
12	W	W	L	L	L	W	L	Lost 3-4
13	L	W	W	L	L	L		Lost 2-4
14	L	W	W	L	W	W		Won 4-2
15	W	L	W	W	L	L	L	Lost 3-4
16	W	L	L	W	W	W		Won 4-2
17	W	L	W	L	L	L		Lost 2-4
18	L	W	L	W	W	W		Won 4-2
19	L	L	L	W	W	W	W	Won 4-3
20	L	L	W	L	W	W	L	Lost 3-4

3. Tally Sheet: I collected all the data from my group and put the 80 results in a tally chart.

No. of Series that the Leafs Won	No. of Series that the Leafs Lost
~~////~~	~~////~~
~~////~~	~~////~~
~~////~~	~~////~~
~~////~~	~~////~~
~~////~~	~~////~~
~~////~~	~~////~~
~~////~~	~~////~~
	~~////~~
	//

4. I used a pie graph to represent the number of series wins (35) and the number of series losses (42).



5. For my 20 simulations, the mean is [2×5 + 13×6 + 5×7] ÷ 20 = 133÷20 = 6.65 games.

The median is the middle value in the ordered list 5, 5, 6, 6, 6, 6, 6, 6, 6, 6, 6, 6, 6, 6, 6, 7, 7, 7, 7, 7. Since there are 20 results, the median is [6 + 6] ÷ 2 = 6.

The mode is the most frequent value - 6.
I think that the mean is the best measure for this data.

6. I would predict the Leafs would not win the series, because the simulation shows that they would win fewer times than they would lose.

7. Since the Leafs lost more times than they won in my simulation, they would likely lose a series.

Level 2 Notes:

Look for the following:

• some appropriate choice of graph to compare the number of times the Leafs win the series to the number of times they lose the series with some errors (*tally total is 77 not 80*)

• some understanding of the measures of central tendency and which measures best represent the data (*poor choice of best central tendency measure*)

• some understanding of problem-solving techniques, but difficulty in applying them (*experimental probability is not used)*

• somewhat organised presentation of information and some justification for choices and predictions

• somewhat effective use of probability and statistics terminology

Level 1 Sample Response

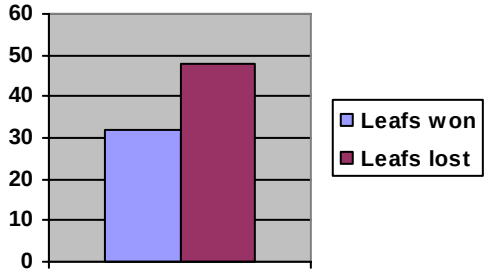
2. Here are the scores of the 20 simulated Leafs Series from **randInt**(1, 10, 7).

Simulation No.	G1	G2	G3	G4	G5	G6	G7	Result
1	W	L	W	W	W			W 4-1
2	L	W	L	W	L	L		L 2-4
3	L	W	W	L	W	W		W 4-2
4	W	W	L	W	L	L	L	L 3-4
5	L	L	W	L	L			L 1-4
6	L	L	L	L				L 0-4
7	L	W	W	L	L	L		L 2-4
8	L	W	L	L	W	W	L	L 3-4
9	L	W	W	L	W	W		W 4-2
10	W	W	L	W	W			W 4-1
11	L	W	W	L	W	W		W 4-2
12	W	W	L	L	L	W	W	W 4-3
13	L	W	W	L	L	L		L 2-4
14	L	W	L	L	W	L		L 2-4
15	W	L	W	W	L	L	L	L 3-4
16	W	L	L	L	W	L		L 2-4
17	W	L	W	L	L	L		L2-4
18	L	W	L	W	W	W		W 4-2
19	L	L	L	W	W	W	W	W 4-3
20	L	L	W	L	L			L 1-4

3. Tally Sheet for our group of four students:

LEAFS WON	LEAFS LOST
~~////~~	~~////~~
~~////~~	~~////~~
~~////~~	~~////~~
~~////~~	~~////~~
~~////~~	~~////~~
~~////~~	~~////~~
/	~~////~~
	~~////~~
	~~////~~
	//

4. I used a block graph.



5. The mean is the average number of games in each series.

For my answers it is 5 +6 +6 +7 +5 +4 +5 +7 +6 +5 +6 +7 +6 +6 +7 +6 +6 +6 +7 +5 = 118.

The median is the middle value in the list. It is 5.

The mode is the most often value. It is 6.

I think that the median is the best measure for this data.

6. I would predict the Leafs would not win the Stanley Cup.

7. Since the Leafs lost more times than they won in my simulation, they will probably lose.

Level 1 Notes:

Look for the following:

• simple choice of graph to compare the number of times the Leafs win the series to the number of times they lose the series with some errors (*tally sheet should total 80 entries*)

• limited understanding of the measures of central tendency and which measures best represent the data (*error in finding mean; list not ordered; incorrect median*)

• limited understanding of problem-solving techniques, and has difficulty in applying them (*experimental probability is not used)*

• presentation of information is ineffectively organised and has little justification for choices and predictions

• limited use of probability and statistics terminology