Data and Chance Syllabus

Day/Time		Topics to be covered	Activities to support topics
1	Morning	1. Introductions 2. Class Expectations 3. Pre-Assessment	1. Students complete "Getting to Know You" Survey. Discuss results as a class. 2. Instructor and student create class rules and expectations and submit signed copies of the Honor Code. 3. Students complete pre-assessment.
	Afternoon	4. Use two-circle and three-circle Venn diagrams to compare and contrast two- and three-student groups. Venn Diagrams with three overlapping sets 5. Introduce Pascal's Triangle	4. Students work on determining values that fit in each of the two circles and four intersections for a given problem. Students complete "Two Examples and Two Challenges" questions on three-set Venn diagrams. 5. Instructor draws out first few rows of Pascal's Triangle. Have students draw additional rows and determine patterns they seen in the triangle.
	Late Afternoon	6. Weighted Means 7. Harmonic Means	6. Have students work example of computing a final grade based on weights of test average, homework average, and final exam. 7. Pose question regarding average speed for a given round-trip drive. Discuss results as a class. Introduce harmonic means to students. Have students complete as many questions as possible from the "More Mean Questions" packet.
2	Morning	8. Data collection 9. Computing measures of spread: range, interquartile range.	8. Have students record data on each other: number of finger snaps within a 15-second time period. 9. Have students create strips of data with finger-snapping results. Introduce quartiles through folding of paper strips. Introduce interquartile

			range as difference between first and third quartiles.
	Afternoon	10. Shifting elements data sets to create new means	10. Explore "Mean Mean Questions": have students create two sets of data where moving one data point to the other set causes both sets means to increase or decrease. Discuss results as a class.
	Late Afternoon	11. Introduction of challenging questions	11. Have students work on questions from *Mathematics Teaching in the Middle School* (*MTMS*) database.
3	Morning	12. Mean Absolute Deviation 13. Standard Deviation	12. Instructor introduces concept of Mean Absolute Deviation (MAD). Instructor and students work through computation of MAD in the four questions from "MAD Data Examples" 13. Instructor introduces concept of standard deviation to students. Class works through examples together. Students complete "Why Use Standard Deviation…" worksheet.
	Afternoon	14. Data Analysis of Real-World Data	14. Play game with UNAG-A and UNAG-B. Compute percentages of people who fit the data provided for combined classes. Have students analyze selected data from world countries to explore the inequality in resources in the world.
	Late Afternoon	15. Data Analysis of World Countries 16. Continuation of Challenging Questions	15. Students return analyses of selected countries' statistics on life expectancy, levels of education, and population 16. When students complete previous activity, students attempt to answer challenging questions from *MTMS* database.
4	Morning	17. Stem-and-Leaf Plots 18. Double Stem-and-Leaf Plots	17. Students complete "Stem and Leaf Plots" and "Students and

		19. Histograms	Basketball Players" stem and leaf plot construction. 18. Students complete "Roger Maris vs. Babe Ruth" double stem and leaf plot construction. 19. Class works constructing a histogram together
	Afternoon	20. Permutations and Combinations 21. Connection between combinations and Pascal's Triangle	20. Students complete "Adjacent Circles" activity. Use the "A Four-Topping Pizza Problem", "Ankur's Challenge", and "Adjacent Circles" activities. 21. Instructor illustrates patterns of combinations found in Pascal's Triangle.
	Late Afternoon	22. Return to completion of challenging questions	22. Have students complete additional questions from *MTMS* packet.
5	Morning	23. Experimental and theoretical probability 24. Expected Value	23. Students play game of SKUNK (or PIG). After game, discuss strategy of playing game. Discuss "Law of Averages" fallacy 24. Students play game show "Deal or No Deal". Explore results. Discuss strategy to game.
	Afternoon	25. Introduction to Conditional Probability 26. Introduction to Carnival games	25. Students play game show "Let's Make a Deal". Explore results. Discuss strategy to game. 26. Discuss rules to creating carnival games.
	Late Afternoon	27. Creating games of chance	27. Students create their carnival games. Students submit rules of game to Instructor and TA.
6	Morning	28. Developing games of chance	28. Students create own games of chance for Carnival.
	Afternoon	29. Introduction to sequences 30. Exploration of Quadratic and Cubic Regressions	29. Students complete "Hexagons and Dots", "Super Sequences!", and "Crazy Insane Sequences". Students perform M & M Lab on exponential regressions. 30. Students complete "Charlie

			Cheesemaker" and "Cake Cutting Problem" activities.
	Late Afternoon	31. Hosting games of chance	31. Students play Carnival games designed by INDE. Discuss determination of fairness of games afterwards. Students host Carnival with INDE-A and INDE-B classes.
7	Morning	32. Linear Relationships 33. Introduce linear relationships on graphing calculator	32. Introduce "Bungee Barbie" activity to students. Have students perform 33. Using already collected data, have students use graphing calculator to determine linear regressions for that data. Discuss results as a class.
	Afternoon	34. Identify components of linear regression model Use linear relationships as prediction tool	34. Explain to students how to interpret the values of *a*, *b*, and *r* from the output of linear regressions on a graphing calculator. Have students estimate the number of rubber bands needed for Barbie to fall from a second- or third-story landing, first by guessing and second by interpreting information from a linear regression.
	Late Afternoon	35. Application of linear relationships	35. Students conjecture Bungee Barbie's status of falling from large distances. Students to release Barbie from second and third story landings to test conjectures.
8	Morning	36. Introduction to Maze Game 37. Sequences	36. Explanation of game with INDE. 37. Students continue work on "Super Sequences!", "Super Duper Sequences", and "Crazy Insane Sequences".
	Afternoon	38. Sequences 39. Introduction to exponential regressions	38. Students work on "Fox's Sequences, Part 1". 39. Students complete M & M Lab on exponential decay. Students use graphing

			calculator to create exponential regression to model the data.
	Late Afternoon	40. Maze Game	40. Students compete in Maze Game versus INDE and "Dream Team".
9	Morning	41. The Birthday Problem 42. Combinations and probability	41. Exploration on the number of people needed to have the probability of two people sharing a birthday to be greater than 0.5 Use Microsoft Excel spreadsheet to show that only 23 people are needed to have the probability of two people share a birthday is 0.5. 42. Students play game "Hawaii Hold 'em". Students determine best possible card configurations. Students complete "The World Series Problem" activity.
	Afternoon	43. Introduce binomial probability	43. Students take "Great Canadian Art Quiz". Explore results among class members. Determine probability of students "passing" quiz solely on guessing.
	Late Afternoon	44. Introduction to Microsoft Excel	44. Have students begin to work with Microsoft Excel. Have students enter basic commands into the spreadsheet.
10	Morning	45. Introduction to Pi Day 46. Buffon's Needle and other statistical approximations of pi	45. Students watch video on pi. Students watch INDE presentation on history of pi. 46. Students perform Buffon's Needle experiment. Students also randomly plot points on a square circumscribing a circle to approximate pi by experimental probability.
	Afternoon	47. Applications of conditional probability in actual situations	47. Students are given three episodes of the game show *Jeopardy!*, and asked to guess what each contestant would wager in order to get the best

			possible outcome. Students then discuss the answers as a class.
	Late Afternoon	48. Completion of Pi Day activities	48. Students watch dramatic reading of *Sir Cumference and the Dragon of Pi*. Students play *CTY Catch Phrase* with INDE class. Students listen to Pi-kus written by WRIT classes.
11	Morning	49. Review Histograms 50. Introduce normal distributions and the Empirical Rule 51. Introduce z-scores	49. TA provides data on a histogram to discuss results with students. 50. TA provides brief overview of the bell curve and Empirical Rule. 51. TA introduces z scores as number of standard deviations a data point is away (either below or above) the mean.
	Afternoon	52. Graphing calculators and z-scores 53. Introduction to percentiles	52. TA demonstrates how to use normal cumulative distribution function to compute percent of data less than and greater than a particular z-score. Extension problems are between to two z-scores. 53. Students compute the percentiles for students making certain scores on mathematics section of SAT.
	Late Afternoon	54. Margin of Error	54. Identify margin of errors in polls in popular publications. Compute margin of errors with 95% confidence for various sample sizes, including students' survey projects.
12	Morning	55. Continue Margin of Error 56. Introduction to odds	55. Create own survey with class as sample. Collect data from class. Use sample data and margin of error to estimate population data. Identify margin of errors in popular publications.

			56. Using one of the *MTMS* problems, introduce students to odds, by converting probability to odds.
	Afternoon	57. Collection of survey data 58. Completion of challenging questions	57. Have students tally responses from collected surveys. 58. Have students answer more questions from *MTMS* database.
	Late Afternoon	59. Introduction to Pareto charts	59. Using data from Summer Olympics, have students create Pareto charts of various countries winning metals.
13	Morning	60. Extrapolation of Data 61. Poster Session Work 62. Capture-Recapture Method	60. Students explore unrealistic values for extrapolated data collected from Statistics Canada. 61. Students compile data from surveys 62. Students collect data of marked and unmarked beans. Students analyze data and reports results to the class.
	Afternoon	63. Simpson's Paradox	63. Read and discuss "AP Statistics Worksheet 3D" handout. Have students complete "Extra Examples" worksheet.
	Late Afternoon	64. Poster session work	64. Students use Microsoft Excel to analyze data.
14	Morning	65. Chi-Square Distribution 66. Conclusion of poster session work	65. Skittles Lab with Chi-Square Distribution 66. Students finish designing posters for tomorrow's activity.
	Afternoon	67. Review Session	67. Go over material covered in past three weeks
	Late Afternoon	68. Post-test 69. Student Program Evaluations	68. Students complete Post-Assessment 69. Students complete SRTE with only TA in the room.
15	Morning	70. Poster session 71. Final comments	70. Students present information from their surveys. 71. Students present students with certificates.