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This is a **90 minute exam, there will be no additional time**. **Open book open note, even internet, any software allowed, personal flash drive, keyboard, mouse allowed. Staff should install Excel Add-in Analysis ToolPak if students cannot.** The exam is to be taken individually, no help from others during the exam, you must select the exam files for the questions and entering answers matching the last 2 digits of your student ID. You must enter answers into the Excel Answer file in the appropriate locations. You must enter the answers in the appropriate Answer Excel File called "answer-file-...ID-XX.xlsx" in the specific cells provided and return the file at the end of the exam. **Save often to be safe. Also, graphs are required on the Excel sheets labeled graphs for the question numbers shown in the sheet names.**

Four decimal place accuracy for answers. Questions on proportions, the calculations must be done same as done for the online homework. There is no continuity correction factor this is slightly different than some software.

Questions 1-180 will be worth 4 points each. The 6 graphs you need to do will be worth 18 points each for a total of 108 points. Question 181, selecting the best test, what to do when, each part (a-f) will be worth 18 points each for a total of 108 points. A percentage is calculated using points from correct answers points divided by total points possible. Points will be deducted for not following directions. **Do your best and good luck.**

Contents

1 Calculations

1.1 Descriptive Statistics

Problem 1. Solve for the sample min, max, mean, median, variance, and standard deviation of the following stock prices of the following companies:

	y
1	15.30
2	21.40
3	18.60
4	21.80
5	15.20

Table 1: The stock prices.

end{longtable}$

Problem 2. Solve for the sample min, max, mean, median, variance, and standard deviation of the following stock prices of the following companies:

	y
1	18.30
2	20.10
3	22.60
4	16.10
5	34.90
6	13.60
7	25.20
8	18.80
9	18.80
10	22.40
11	16.70
12	10.30

Table 2: The stock prices.

end{longtable}$

Problem 3. Solve for the sample min, max, mean, median, variance, and standard deviation of the following stock prices of the following companies:

	y
1	10.30
2	17.10
3	15.90
4	10.10
5	24.40
6	16.50

Table 3: The stock prices.

end{longtable}$

Problem 4. Solve for the sample min, max, mean, median, variance, and standard deviation of the following stock prices of the following companies:

	y
1	16.20
2	21.80
3	20.00
4	19.60
5	10.20

Table 4: The stock prices.

end{longtable}$

Problem 5. Solve for the sample min, max, mean, median, variance, and standard deviation of the following stock prices of the following companies:

	y
1	24.00
2	26.20
3	34.40
4	19.60
5	25.50
6	20.20
7	20.40

Table 5: The stock prices.

end{longtable}$

Problem 6. Solve for the sample min, max, mean, median, variance, and standard deviation of the following stock prices of the following companies:

	y
1	21.10
2	13.60
3	15.90
4	25.50
5	13.30
6	26.90
7	24.00
8	22.90
9	10.70

Table 6: The stock prices.

end{longtable}$

Problem 7. Solve for the sample min, max, mean, median, variance, and standard deviation of the following stock prices of the following companies:

	y
1	33.10
2	22.40
3	17.20
4	22.20
5	16.80
6	13.60
7	25.80
8	15.50

Table 7: The stock prices.

end{longtable}$

Problem 8. Solve for the sample min, max, mean, median, variance, and standard deviation of the following stock prices of the following companies:

	y
1	25.80
2	19.60
3	18.30
4	19.40
5	24.10
6	18.70
7	30.00

Table 8: The stock prices.

end{longtable}$

Problem 9. Solve for the sample min, max, mean, median, variance, and standard deviation of the following stock prices of the following companies:

	y
1	16.60
2	13.80
3	32.30
4	10.10
5	25.40
6	27.10
7	10.90
8	14.00
9	20.10
10	12.40
11	29.00

Table 9: The stock prices.

end{longtable}$

Problem 10. Solve for the sample min, max, mean, median, variance, and standard deviation of the following stock prices of the following companies:

	y
1	10.20
2	14.20
3	25.90
4	32.00
5	10.60

Table 10: The stock prices.

end{longtable}$

Problem 11. Solve for the sample min, max, mean, median, variance, and standard deviation of the following stock prices of the following companies:

	y
1	24.40
2	13.20
3	17.40
4	17.00

Table 11: The stock prices.

end{longtable}$

Problem 12. Solve for the sample min, max, mean, median, variance, and standard deviation of the following stock prices of the following companies:

	y
1	16.50
2	15.00
3	27.40
4	14.30
5	19.80
6	17.90
7	17.80

Table 12: The stock prices.

end{longtable}$

Problem 13. Solve for the sample min, max, mean, median, variance, and standard deviation of the following stock prices of the following companies:

	y
1	22.60
2	19.10
3	16.00
4	20.90
5	10.30
6	28.70
7	13.00

Table 13: The stock prices.

end{longtable}$

Problem 14. Solve for the sample min, max, mean, median, variance, and standard deviation of the following stock prices of the following companies:

	y
1	19.60
2	15.20
3	17.60
4	22.70
5	15.70
6	27.70
7	30.10
8	16.20

Table 14: The stock prices.

end{longtable}$

Problem 15. Solve for the sample min, max, mean, median, variance, and standard deviation of the following stock prices of the following companies:

	y
1	18.20
2	13.90
3	19.40
4	16.00

Table 15: The stock prices.

end{longtable}$

Problem 16. Solve for the sample min, max, mean, median, variance, and standard deviation of the following stock prices of the following companies:

	y
1	10.70
2	12.30
3	27.80
4	21.10
5	23.50
6	16.00
7	26.50

Table 16: The stock prices.

end{longtable}$

Problem 17. Solve for the sample min, max, mean, median, variance, and standard deviation of the following stock prices of the following companies:

	y
1	11.90
2	12.10
3	14.90

Table 17: The stock prices.

end{longtable}$

Problem 18. Solve for the sample min, max, mean, median, variance, and standard deviation of the following stock prices of the following companies:

	y
1	10.90
2	14.30
3	14.00
4	22.90
5	10.60
6	21.20

Table 18: The stock prices.

end{longtable}$

1.2 Binomial Distribution

Problem 19. Assume the random variable(s) is from a binomial distribution with $n = 2$ and $\pi = 0.5$, and X is the number of successes. Answer the following:

(a) What is the probability $X \leq 0$:

(b) What is the probability $X > 0$:

(c) What is the probability $X \geq 0$:

(d) What is the probability $0 < X \leq 2$:

Problem 20. Assume the random variable(s) is from a binomial distribution with $n = 2$ and $\pi = 0.8$, and X is the number of successes. Answer the following:

(a) What is the probability $X \leq 1$:

(b) What is the probability $X > 1$:

(c) What is the probability $X \geq 1$:

(d) What is the probability $1 < X \leq 2$:

Problem 21. Assume the random variable(s) is from a binomial distribution with $n = 8$ and $\pi = 0.8$, and X is the number of successes. Answer the following:

(a) What is the probability $X \leq 5$:

(b) What is the probability $X > 5$:

(c) What is the probability $X \geq 5$:

(d) What is the probability $5 < X \leq 6$:

Problem 22. Assume the random variable(s) is from a binomial distribution with $n = 12$ and $\pi = 0.1$, and X is the number of successes. Answer the following:

(a) What is the probability $X \leq 1$:

(b) What is the probability $X > 1$:

(c) What is the probability $X \geq 1$:

(d) What is the probability $1 < X \leq 2$:

Problem 23. Assume the random variable(s) is from a binomial distribution with $n = 7$ and $\pi = 0.5$, and X is the number of successes. Answer the following:

(a) What is the probability $X \leq 4$:

(b) What is the probability $X > 4$:

(c) What is the probability $X \geq 4$:

(d) What is the probability $4 < X \leq 5$:

Problem 24. Assume the random variable(s) is from a binomial distribution with $n = 5$ and $\pi = 0.6$, and X is the number of successes. Answer the following:

(a) What is the probability $X \leq 3$:

(b) What is the probability $X > 3$:

(c) What is the probability $X \geq 3$:

(d) What is the probability $3 < X \leq 4$:

Problem 25. Assume the random variable(s) is from a binomial distribution with $n = 10$ and $\pi = 0.3$, and X is the number of successes. Answer the following:

(a) What is the probability $X \leq 2$:

(b) What is the probability $X > 2$:

(c) What is the probability $X \geq 2$:

(d) What is the probability $2 < X \leq 3$:

Problem 26. Assume the random variable(s) is from a binomial distribution with $n = 5$ and $\pi = 0.8$, and X is the number of successes. Answer the following:

(a) What is the probability $X \leq 4$:

(b) What is the probability $X > 4$:

(c) What is the probability $X \geq 4$:

(d) What is the probability $4 < X \leq 5$:

Problem 27. Assume the random variable(s) is from a binomial distribution with $n = 3$ and $\pi = 0.6$, and X is the number of successes. Answer the following:

(a) What is the probability $X \leq 1$:

(b) What is the probability $X > 1$:

(c) What is the probability $X \geq 1$:

(d) What is the probability $1 < X \leq 2$:

Problem 28. Assume the random variable(s) is from a binomial distribution with $n = 11$ and $\pi = 0.5$, and X is the number of successes. Answer the following:

(a) What is the probability $X \leq 2$:

(b) What is the probability $X > 2$:

(c) What is the probability $X \geq 2$:

(d) What is the probability $2 < X \leq 6$:

Problem 29. Assume the random variable(s) is from a binomial distribution with $n = 11$ and $\pi = 0.3$, and X is the number of successes. Answer the following:

(a) What is the probability $X \leq 2$:

(b) What is the probability $X > 2$:

(c) What is the probability $X \geq 2$:

(d) What is the probability $2 < X \leq 3$:

Problem 30. Assume the random variable(s) is from a binomial distribution with $n = 3$ and $\pi = 0.7$, and X is the number of successes. Answer the following:

(a) What is the probability $X \leq 1$:

(b) What is the probability $X > 1$:

(c) What is the probability $X \geq 1$:

(d) What is the probability $1 < X \leq 3$:

Problem 31. Assume the random variable(s) is from a binomial distribution with $n = 4$ and $\pi = 0.9$, and X is the number of successes. Answer the following:

(a) What is the probability $X \leq 3$:

(b) What is the probability $X > 3$:

(c) What is the probability $X \geq 3$:

(d) What is the probability $3 < X \leq 4$:

Problem 32. Assume the random variable(s) is from a binomial distribution with $n = 2$ and $\pi = 0.4$, and X is the number of successes. Answer the following:

(a) What is the probability $X \leq 0$:

(b) What is the probability $X > 0$:

(c) What is the probability $X \geq 0$:

(d) What is the probability $0 < X \leq 1$:

Problem 33. Assume the random variable(s) is from a binomial distribution with $n = 3$ and $\pi = 0.7$, and X is the number of successes. Answer the following:

(a) What is the probability $X \leq 1$:

(b) What is the probability $X > 1$:

(c) What is the probability $X \geq 1$:

(d) What is the probability $1 < X \leq 3$:

Problem 34. Assume the random variable(s) is from a binomial distribution with $n = 4$ and $\pi = 0.5$, and X is the number of successes. Answer the following:

(a) What is the probability $X \leq 2$:

(b) What is the probability $X > 2$:

(c) What is the probability $X \geq 2$:

(d) What is the probability $2 < X \leq 3$:

Problem 35. Assume the random variable(s) is from a binomial distribution with $n = 9$ and $\pi = 0.6$, and X is the number of successes. Answer the following:

(a) What is the probability $X \leq 7$:

(b) What is the probability $X > 7$:

(c) What is the probability $X \geq 7$:

(d) What is the probability $7 < X \leq 8$:

Problem 36. Assume the random variable(s) is from a binomial distribution with $n = 7$ and $\pi = 0.7$, and X is the number of successes. Answer the following:

(a) What is the probability $X \leq 6$:

(b) What is the probability $X > 6$:

(c) What is the probability $X \geq 6$:

(d) What is the probability $6 < X \leq 7$:

1.3 Hypergeometric Distribution

Problem 37. Assume the random variable(s) is from a hypergeometric distribution with $A = 6$ number of success and population size $N = 12$, and X is the number of successes you select. You select from the population $n = 4$ items without replacement. Answer the following:

(a) What is the probability $X \leq 2$:

(b) What is the probability $X > 2$:

(c) What is the probability $X \geq 2$:

(d) What is the probability $2 < X \leq 3$:

Problem 38. Assume the random variable(s) is from a hypergeometric distribution with $A = 6$ number of success and population size $N = 13$, and X is the number of successes you select. You select from the population $n = 13$ items without replacement. Answer the following:

(a) What is the probability $X \leq 6$:

(b) What is the probability $X > 6$:

(c) What is the probability $X \geq 6$:

(d) What is the probability $6 < X \leq 7$:

Problem 39. Assume the random variable(s) is from a hypergeometric distribution with $A = 6$ number of success and population size $N = 16$, and X is the number of successes you select. You select from the population $n = 9$ items without replacement. Answer the following:

(a) What is the probability $X \leq 4$:

(b) What is the probability $X > 4$:

(c) What is the probability $X \geq 4$:

(d) What is the probability $4 < X \leq 5$:

Problem 40. Assume the random variable(s) is from a hypergeometric distribution with $A = 6$ number of success and population size $N = 14$, and X is the number of successes you select. You select from the population $n = 8$ items without replacement. Answer the following:

(a) What is the probability $X \leq 3$:

(b) What is the probability $X > 3$:

(c) What is the probability $X \geq 3$:

(d) What is the probability $3 < X \leq 4$:

Problem 41. Assume the random variable(s) is from a hypergeometric distribution with $A = 9$ number of success and population size $N = 18$, and X is the number of successes you select. You select from the population $n = 4$ items without replacement. Answer the following:

(a) What is the probability $X \leq 1$:

(b) What is the probability $X > 1$:

(c) What is the probability $X \geq 1$:

(d) What is the probability $1 < X \leq 2$:

Problem 42. Assume the random variable(s) is from a hypergeometric distribution with $A = 9$ number of success and population size $N = 15$, and X is the number of successes you select. You select from the population $n = 4$ items without replacement. Answer the following:

(a) What is the probability $X \leq 1$:

(b) What is the probability $X > 1$:

(c) What is the probability $X \geq 1$:

(d) What is the probability $1 < X \leq 2$:

Problem 43. Assume the random variable(s) is from a hypergeometric distribution with $A = 6$ number of success and population size $N = 16$, and X is the number of successes you select. You select from the population $n = 6$ items without replacement. Answer the following:

(a) What is the probability $X \leq 3$:

(b) What is the probability $X > 3$:

(c) What is the probability $X \geq 3$:

(d) What is the probability $3 < X \leq 5$:

Problem 44. Assume the random variable(s) is from a hypergeometric distribution with $A = 6$ number of success and population size $N = 12$, and X is the number of successes you select. You select from the population $n = 9$ items without replacement. Answer the following:

(a) What is the probability $X \leq 4$:

(b) What is the probability $X > 4$:

(c) What is the probability $X \geq 4$:

(d) What is the probability $4 < X \leq 5$:

Problem 45. Assume the random variable(s) is from a hypergeometric distribution with $A = 6$ number of success and population size $N = 12$, and X is the number of successes you select. You select from the population $n = 2$ items without replacement. Answer the following:

(a) What is the probability $X \leq 2$:

(b) What is the probability $X > 2$:

(c) What is the probability $X \geq 2$:

(d) What is the probability $2 < X \leq 3$:

Problem 46. Assume the random variable(s) is from a hypergeometric distribution with $A = 8$ number of success and population size $N = 16$, and X is the number of successes you select. You select from the population $n = 16$ items without replacement. Answer the following:

(a) What is the probability $X \leq 8$:

(b) What is the probability $X > 8$:

(c) What is the probability $X \geq 8$:

(d) What is the probability $8 < X \leq 9$:

Problem 47. Assume the random variable(s) is from a hypergeometric distribution with $A = 5$ number of success and population size $N = 15$, and X is the number of successes you select. You select from the population $n = 7$ items without replacement. Answer the following:

(a) What is the probability $X \leq 2$:

(b) What is the probability $X > 2$:

(c) What is the probability $X \geq 2$:

(d) What is the probability $2 < X \leq 3$:

Problem 48. Assume the random variable(s) is from a hypergeometric distribution with $A = 9$ number of success and population size $N = 14$, and X is the number of successes you select. You select from the population $n = 5$ items without replacement. Answer the following:

(a) What is the probability $X \leq 3$:

(b) What is the probability $X > 3$:

(c) What is the probability $X \geq 3$:

(d) What is the probability $3 < X \leq 5$:

Problem 49. Assume the random variable(s) is from a hypergeometric distribution with $A = 5$ number of success and population size $N = 12$, and X is the number of successes you select. You select from the population $n = 12$ items without replacement. Answer the following:

(a) What is the probability $X \leq 5$:

(b) What is the probability $X > 5$:

(c) What is the probability $X \geq 5$:

(d) What is the probability $5 < X \leq 6$:

Problem 50. Assume the random variable(s) is from a hypergeometric distribution with $A = 5$ number of success and population size $N = 13$, and X is the number of successes you select. You select from the population $n = 2$ items without replacement. Answer the following:

(a) What is the probability $X \leq 1$:

(b) What is the probability $X > 1$:

(c) What is the probability $X \geq 1$:

(d) What is the probability $1 < X \leq 2$:

Problem 51. Assume the random variable(s) is from a hypergeometric distribution with $A = 8$ number of success and population size $N = 14$, and X is the number of successes you select. You select from the population $n = 7$ items without replacement. Answer the following:

(a) What is the probability $X \leq 4$:

(b) What is the probability $X > 4$:

(c) What is the probability $X \geq 4$:

(d) What is the probability $4 < X \leq 6$:

Problem 52. Assume the random variable(s) is from a hypergeometric distribution with $A = 9$ number of success and population size $N = 17$, and X is the number of successes you select. You select from the population $n = 10$ items without replacement. Answer the following:

(a) What is the probability $X \leq 6$:

(b) What is the probability $X > 6$:

(c) What is the probability $X \geq 6$:

(d) What is the probability $6 < X \leq 7$:

Problem 53. Assume the random variable(s) is from a hypergeometric distribution with $A = 7$ number of success and population size $N = 16$, and X is the number of successes you select. You select from the population $n = 8$ items without replacement. Answer the following:

(a) What is the probability $X \leq 2$:

(b) What is the probability $X > 2$:

(c) What is the probability $X \geq 2$:

(d) What is the probability $2 < X \leq 3$:

Problem 54. Assume the random variable(s) is from a hypergeometric distribution with $A = 8$ number of success and population size $N = 17$, and X is the number of successes you select. You select from the population $n = 16$ items without replacement. Answer the following:

(a) What is the probability $X \leq 7$:

(b) What is the probability $X > 7$:

(c) What is the probability $X \geq 7$:

(d) What is the probability $7 < X \leq 8$:

1.4 Normal Distribution

Problem 55. Assume the random variable(s) is from a normal distribution with $\mu = 7$ and $\sigma = 2.7$. Answer the following:

(a) What is the probability $X \leq 4.89$:

(b) What is the probability $X \geq 4.89$:

(c) What is the probability $4.89 \leq X \leq 6.71$:

Problem 56. Assume the random variable(s) is from a normal distribution with $\mu = 8.1$ and $\sigma = 2.6$. Answer the following:

(a) What is the probability $X \leq 10.81$:

(b) What is the probability $X \geq 10.81$:

(c) What is the probability $10.81 \leq X \leq 11.5$:

Problem 57. Assume the random variable(s) is from a normal distribution with $\mu = 4$ and $\sigma = 1.2$. Answer the following:

(a) What is the probability $X \leq 2.7$:

(b) What is the probability $X \geq 2.7$:

(c) What is the probability $2.7 \leq X \leq 4.77$:

Problem 58. Assume the random variable(s) is from a normal distribution with $\mu = 2.6$ and $\sigma = 1.8$. Answer the following:

(a) What is the probability $X \leq 3.36$:

(b) What is the probability $X \geq 3.36$:

(c) What is the probability $3.36 \leq X \leq 6.18$:

Problem 59. Assume the random variable(s) is from a normal distribution with $\mu = 0.8$ and $\sigma = 2.2$. Answer the following:

(a) What is the probability $X \leq -0.68$:

(b) What is the probability $X \geq -0.68$:

(c) What is the probability $-0.68 \leq X \leq -0.18$:

Problem 60. Assume the random variable(s) is from a normal distribution with $\mu = 2.7$ and $\sigma = 2.9$. Answer the following:

(a) What is the probability $X \leq 1.95$:

(b) What is the probability $X \geq 1.95$:

(c) What is the probability $1.95 \leq X \leq 5.33$:

Problem 61. Assume the random variable(s) is from a normal distribution with $\mu = 5.5$ and $\sigma = 2.1$. Answer the following:

(a) What is the probability $X \leq 5.88$:

(b) What is the probability $X \geq 5.88$:

(c) What is the probability $5.88 \leq X \leq 7.33$:

Problem 62. Assume the random variable(s) is from a normal distribution with $\mu = 1.7$ and $\sigma = 1.8$. Answer the following:

(a) What is the probability $X \leq -2.22$:

(b) What is the probability $X \geq -2.22$:

(c) What is the probability $-2.22 \leq X \leq 1.93$:

Problem 63. Assume the random variable(s) is from a normal distribution with $\mu = 8.4$ and $\sigma = 0.5$. Answer the following:

(a) What is the probability $X \leq 8.79$:

(b) What is the probability $X \geq 8.79$:

(c) What is the probability $8.79 \leq X \leq 9.07$:

Problem 64. Assume the random variable(s) is from a normal distribution with $\mu = 5.5$ and $\sigma = 1$. Answer the following:

(a) What is the probability $X \leq 4.84$:

(b) What is the probability $X \geq 4.84$:

(c) What is the probability $4.84 \leq X \leq 6.47$:

Problem 65. Assume the random variable(s) is from a normal distribution with $\mu = 5$ and $\sigma = 2.5$. Answer the following:

(a) What is the probability $X \leq 0.85$:

(b) What is the probability $X \geq 0.85$:

(c) What is the probability $0.85 \leq X \leq 4.49$:

Problem 66. Assume the random variable(s) is from a normal distribution with $\mu = 4.2$ and $\sigma = 1.5$. Answer the following:

(a) What is the probability $X \leq 2.54$:

(b) What is the probability $X \geq 2.54$:

(c) What is the probability $2.54 \leq X \leq 6.24$:

Problem 67. Assume the random variable(s) is from a normal distribution with $\mu = 0.2$ and $\sigma = 2.8$. Answer the following:

(a) What is the probability $X \leq 0.98$:

(b) What is the probability $X \geq 0.98$:

(c) What is the probability $0.98 \leq X \leq 3.59$:

Problem 68. Assume the random variable(s) is from a normal distribution with $\mu = 1.3$ and $\sigma = 2.1$. Answer the following:

(a) What is the probability $X \leq 2.29$:

(b) What is the probability $X \geq 2.29$:

(c) What is the probability $2.29 \leq X \leq 4.65$:

Problem 69. Assume the random variable(s) is from a normal distribution with $\mu = 9.4$ and $\sigma = 2.8$. Answer the following:

(a) What is the probability $X \leq 9.37$:

(b) What is the probability $X \geq 9.37$:

(c) What is the probability $9.37 \leq X \leq 11.69$:

Problem 70. Assume the random variable(s) is from a normal distribution with $\mu = 8$ and $\sigma = 2.8$. Answer the following:

(a) What is the probability $X \leq 8.38$:

(b) What is the probability $X \geq 8.38$:

(c) What is the probability $8.38 \leq X \leq 10.3$:

Problem 71. Assume the random variable(s) is from a normal distribution with $\mu = 2.2$ and $\sigma = 0.4$. Answer the following:

(a) What is the probability $X \leq 1.89$:

(b) What is the probability $X \geq 1.89$:

(c) What is the probability $1.89 \leq X \leq 1.97$:

Problem 72. Assume the random variable(s) is from a normal distribution with $\mu = 2.7$ and $\sigma = 2.8$. Answer the following:

(a) What is the probability $X \leq 2.47$:

(b) What is the probability $X \geq 2.47$:

(c) What is the probability $2.47 \leq X \leq 3.4$:

1.5 One-Sample Test of Proportions Examples

Problem 73. You are investigating the probability of the stock market having a positive day. A positive day is defined as the SET (Stock Exchange of Thailand) rises. You randomly select 114 days from the past 20 years and find 61 positive days. You assume each day is independent of one another and that the true unknown probably that the SET rises is constant although unknown for the past 20 years.

Test if the true probability the SET rises π is *less than* 0.58. Use $\alpha = 0.05$. Do not use a continuity correction factor.

Problem 74. You are investigating the probability of the stock market having a positive day. A positive day is defined as the SET (Stock Exchange of Thailand) rises. You randomly select 104 days from the past 20 years and find 43 positive days. You assume each day is independent of one another and that the true unknown probably that the SET rises is constant although unknown for the past 20 years.

Test if the true probability the SET rises π is *less than* 0.46. Use $\alpha = 0.05$. Do not use a continuity correction factor.

Problem 75. You are investigating the probability of the stock market having a positive day. A positive day is defined as the SET (Stock Exchange of Thailand) rises. You randomly select 98 days from the past 20 years and find 43 positive days. You assume each day is independent of one another and that the true unknown probably that the SET rises is constant although unknown for the past 20 years.

Test if the true probability the SET rises π is *not equal to* 0.6. Use $\alpha = 0.05$. Do not use a continuity correction factor.

Problem 76. You are investigating the probability of the stock market having a positive day. A positive day is defined as the SET (Stock Exchange of Thailand) rises. You randomly select 111 days from the past 20 years and find 39 positive days. You assume each day is independent of one another and that the true unknown probably that the SET rises is constant although unknown for the past 20 years.

Test if the true probability the SET rises π is *not equal to* 0.57. Use $\alpha = 0.05$. Do not use a continuity correction factor.

Problem 77. You are investigating the probability of the stock market having a positive day. A positive day is defined as the SET (Stock Exchange of Thailand) rises. You randomly select 89 days from the past 20 years and find 38 positive days. You assume each day is independent of one another and that the true unknown probably that the SET rises is constant although unknown for the past 20 years.

Test if the true probability the SET rises π is *not equal to* 0.47. Use $\alpha = 0.05$. Do not use a continuity correction factor.

Problem 78. You are investigating the probability of the stock market having a positive day. A positive day is defined as the SET (Stock Exchange of Thailand) rises. You randomly select 102 days from the past 20 years and find 49 positive days. You assume each day is independent of one another and that the true unknown probably that the SET rises is constant although unknown for the past 20 years.

Test if the true probability the SET rises π is *not equal to* 0.42. Use $\alpha = 0.05$. Do not use a continuity correction factor.

Problem 79. You are investigating the probability of the stock market having a positive day. A positive day is defined as the SET (Stock Exchange of Thailand) rises. You randomly select 99 days from the past 20 years and find 34 positive days. You assume each day is independent of one another and that the true unknown probably that the SET rises is constant although unknown for the past 20 years.

Test if the true probability the SET rises π is *less than* 0.48. Use $\alpha = 0.05$. Do not use a continuity correction factor.

Problem 80. You are investigating the probability of the stock market having a positive day. A positive day is defined as the SET (Stock Exchange of Thailand) rises. You randomly select 97 days from the past 20 years and find 48 positive days. You assume each day is independent of one another and that the true unknown probably that the SET rises is constant although unknown for the past 20 years.

Test if the true probability the SET rises π is *not equal to* 0.5. Use $\alpha = 0.05$. Do not use a continuity correction factor.

Problem 81. You are investigating the probability of the stock market having a positive day. A positive day is defined as the SET (Stock Exchange of Thailand) rises. You randomly select 104 days from the past 20 years and find 51 positive days. You assume each day is independent of one another and that the true unknown probably that the SET rises is constant although unknown for the past 20 years.

Test if the true probability the SET rises π is *greater than* 0.46. Use $\alpha = 0.05$. Do not use a continuity correction factor.

Problem 82. You are investigating the probability of the stock market having a positive day. A positive day is defined as the SET (Stock Exchange of Thailand) rises. You randomly select 93 days from the past 20 years and find 43 positive days. You assume each day is independent of one another and that the true unknown probably that the SET rises is constant although unknown for the past 20 years.

Test if the true probability the SET rises π is *not equal to* 0.46. Use $\alpha = 0.05$. Do not use a continuity correction factor.

Problem 83. You are investigating the probability of the stock market having a positive day. A positive day is defined as the SET (Stock Exchange of Thailand) rises. You randomly select 104 days from the past 20 years and find 54 positive days. You assume each day is independent of one another and that the true unknown probably that the SET rises is constant although unknown for the past 20 years.

Test if the true probability the SET rises π is *greater than* 0.46. Use $\alpha = 0.05$. Do not use a continuity correction factor.

Problem 84. You are investigating the probability of the stock market having a positive day. A positive day is defined as the SET (Stock Exchange of Thailand) rises. You randomly select 105 days from the past 20 years and find 48 positive days. You assume each day is independent of one another and that the true unknown probably that the SET rises is constant although unknown for the past 20 years.

Test if the true probability the SET rises π is *greater than* 0.41. Use $\alpha = 0.05$. Do not use a continuity correction factor.

Problem 85. You are investigating the probability of the stock market having a positive day. A positive day is defined as the SET (Stock Exchange of Thailand) rises. You randomly select 104 days from the past 20 years and find 59 positive days. You assume each day is independent of one another and that the true unknown probably that the SET rises is constant although unknown for the past 20 years.

Test if the true probability the SET rises π is *not equal to* 0.46. Use $\alpha = 0.05$. Do not use a continuity correction factor.

Problem 86. You are investigating the probability of the stock market having a positive day. A positive day is defined as the SET (Stock Exchange of Thailand) rises. You randomly select 102 days from the past 20 years and find 49 positive days. You assume each day is independent of one another and that the true unknown probably that the SET rises is constant although unknown for the past 20 years.

Test if the true probability the SET rises π is *not equal to* 0.48. Use $\alpha = 0.05$. Do not use a continuity correction factor.

Problem 87. You are investigating the probability of the stock market having a positive day. A positive day is defined as the SET (Stock Exchange of Thailand) rises. You randomly select 95 days from the past 20 years and find 35 positive days. You assume each day is independent of one another and that the true unknown probably that the SET rises is constant although unknown for the past 20 years.

Test if the true probability the SET rises π is *less than* 0.42. Use $\alpha = 0.05$. Do not use a continuity correction factor.

Problem 88. You are investigating the probability of the stock market having a positive day. A positive day is defined as the SET (Stock Exchange of Thailand) rises. You randomly select 98 days from the past 20 years and find 59 positive days. You assume each day is independent of one another and that the true unknown probably that the SET rises is constant although unknown for the past 20 years.

Test if the true probability the SET rises π is *greater than* 0.5. Use $\alpha = 0.05$. Do not use a continuity correction factor.

Problem 89. You are investigating the probability of the stock market having a positive day. A positive day is defined as the SET (Stock Exchange of Thailand) rises. You randomly select 101 days from the past 20 years and find 56 positive days. You assume each day is independent of one another and that the true unknown probably that the SET rises is constant although unknown for the past 20 years.

Test if the true probability the SET rises π is *greater than* 0.49. Use $\alpha = 0.05$. Do not use a continuity correction factor.

Problem 90. You are investigating the probability of the stock market having a positive day. A positive day is defined as the SET (Stock Exchange of Thailand) rises. You randomly select 98 days from the past 20 years and find 41 positive days. You assume each day is independent of one another and that the true unknown probably that the SET rises is constant although unknown for the past 20 years.

Test if the true probability the SET rises π is *less than* 0.47. Use $\alpha = 0.05$. Do not use a continuity correction factor.

1.6 Two-Sample Test of Proportions Examples

Problem 91. You are investigating the probability of the stock market having a positive day. A positive day is defined as the SET (Stock Exchange of Thailand) for $\hat{p}_1$ and for $\hat{p}_2$ the TWSE (Taiwan Stock Exchange) rises. You randomly select 105 days from the past 20 years for the SET and find 50 positive days. You also sample 106 days from the past 20 years for the TWSE and find 49 positive days. You assume each day is independent of one another, the stock exchanges movements are independent and that the true unknown probably that the SET rises and the TWSE rises is constant although unknown for the past 20 years.

Test if the true probability the SET rises is *greater than* the TWSE. Use $\alpha = 0.05$. Do not use a continuity correction factor.

Problem 92. You are investigating the probability of the stock market having a positive day. A positive day is defined as the SET (Stock Exchange of Thailand) for $\hat{p}_1$ and for $\hat{p}_2$ the TWSE (Taiwan Stock Exchange) rises. You randomly select 85 days from the past 20 years for the SET and find 46 positive days. You also sample 99 days from the past 20 years for the TWSE and find 58 positive days. You assume each day is independent of one another, the stock exchanges movements are independent and that the true unknown probably that the SET rises and the TWSE rises is constant although unknown for the past 20 years.

Test if the true probability the SET rises is *not equal to* the TWSE. Use $\alpha = 0.05$. Do not use a continuity correction factor.

Problem 93. You are investigating the probability of the stock market having a positive day. A positive day is defined as the SET (Stock Exchange of Thailand) for $\hat{p}_1$ and for $\hat{p}_2$ the TWSE (Taiwan Stock Exchange) rises. You randomly select 101 days from the past 20 years for the SET and find 46 positive days. You also sample 86 days from the past 20 years for the TWSE and find 39 positive days. You assume each day is independent of one another, the stock exchanges movements are independent and that the true unknown probably that the SET rises and the TWSE rises is constant although unknown for the past 20 years.

Test if the true probability the SET rises is *greater than* the TWSE. Use $\alpha = 0.05$. Do not use a continuity correction factor.

Problem 94. You are investigating the probability of the stock market having a positive day. A positive day is defined as the SET (Stock Exchange of Thailand) for $\hat{p}_1$ and for $\hat{p}_2$ the TWSE (Taiwan Stock Exchange) rises. You randomly select 95 days from the past 20 years for the SET and find 46 positive days. You also sample 91 days from the past 20 years for the TWSE and find 42 positive days. You assume each day is independent of one another, the stock exchanges movements are independent and that the true unknown probably that the SET rises and the TWSE rises is constant although unknown for the past 20 years.

Test if the true probability the SET rises is *greater than* the TWSE. Use $\alpha = 0.05$. Do not use a continuity correction factor.

Problem 95. You are investigating the probability of the stock market having a positive day. A positive day is defined as the SET (Stock Exchange of Thailand) for $\hat{p}_1$ and for $\hat{p}_2$ the TWSE (Taiwan Stock Exchange) rises. You randomly select 102 days from the past 20 years for the SET and find 57 positive days. You also sample 92 days from the past 20 years for the TWSE and find 41 positive days. You assume each day is independent of one another, the stock exchanges movements are independent and that the true unknown probably that the SET rises and the TWSE rises is constant although unknown for the past 20 years.

Test if the true probability the SET rises is *greater than* the TWSE. Use $\alpha = 0.05$. Do not use a continuity correction factor.

Problem 96. You are investigating the probability of the stock market having a positive day. A positive day is defined as the SET (Stock Exchange of Thailand) for $\hat{p}_1$ and for $\hat{p}_2$ the TWSE (Taiwan Stock Exchange) rises. You randomly select 100 days from the past 20 years for the SET and find 54 positive days. You also sample 92 days from the past 20 years for the TWSE and find 46 positive days. You assume each day is independent of one another, the stock exchanges movements are independent and that the true unknown probably that the SET rises and the TWSE rises is constant although unknown for the past 20 years.

Test if the true probability the SET rises is *greater than* the TWSE. Use $\alpha = 0.05$. Do not use a continuity correction factor.

Problem 97. You are investigating the probability of the stock market having a positive day. A positive day is defined as the SET (Stock Exchange of Thailand) for $\hat{p}_1$ and for $\hat{p}_2$ the TWSE (Taiwan Stock Exchange) rises. You randomly select 91 days from the past 20 years for the SET and find 49 positive days. You also sample 97 days from the past 20 years for the TWSE and find 47 positive days. You assume each day is independent of one another, the stock exchanges movements are independent and that the true unknown probably that the SET rises and the TWSE rises is constant although unknown for the past 20 years.

Test if the true probability the SET rises is *not equal to* the TWSE. Use $\alpha = 0.05$. Do not use a continuity correction factor.

Problem 98. You are investigating the probability of the stock market having a positive day. A positive day is defined as the SET (Stock Exchange of Thailand) for $\hat{p}_1$ and for $\hat{p}_2$ the TWSE (Taiwan Stock Exchange) rises. You randomly select 107 days from the past 20 years for the SET and find 51 positive days. You also sample 112 days from the past 20 years for the TWSE and find 60 positive days. You assume each day is independent of one another, the stock exchanges movements are independent and that the true unknown probably that the SET rises and the TWSE rises is constant although unknown for the past 20 years.

Test if the true probability the SET rises is *not equal to* the TWSE. Use $\alpha = 0.05$. Do not use a continuity correction factor.

Problem 99. You are investigating the probability of the stock market having a positive day. A positive day is defined as the SET (Stock Exchange of Thailand) for $\hat{p}_1$ and for $\hat{p}_2$ the TWSE (Taiwan Stock Exchange) rises. You randomly select 97 days from the past 20 years for the SET and find 50 positive days. You also sample 94 days from the past 20 years for the TWSE and find 47 positive days. You assume each day is independent of one another, the stock exchanges movements are independent and that the true unknown probably that the SET rises and the TWSE rises is constant although unknown for the past 20 years.

Test if the true probability the SET rises is *greater than* the TWSE. Use $\alpha = 0.05$. Do not use a continuity correction factor.

Problem 100. You are investigating the probability of the stock market having a positive day. A positive day is defined as the SET (Stock Exchange of Thailand) for $\hat{p}_1$ and for $\hat{p}_2$ the TWSE (Taiwan Stock Exchange) rises. You randomly select 109 days from the past 20 years for the SET and find 47 positive days. You also sample 91 days from the past 20 years for the TWSE and find 43 positive days. You assume each day is independent of one another, the stock exchanges movements are independent and that the true unknown probably that the SET rises and the TWSE rises is constant although unknown for the past 20 years.

Test if the true probability the SET rises is *not equal to* the TWSE. Use $\alpha = 0.05$. Do not use a continuity correction factor.

Problem 101. You are investigating the probability of the stock market having a positive day. A positive day is defined as the SET (Stock Exchange of Thailand) for $\hat{p}_1$ and for $\hat{p}_2$ the TWSE (Taiwan Stock Exchange) rises. You randomly select 109 days from the past 20 years for the SET and find 54 positive days. You also sample 94 days from the past 20 years for the TWSE and find 44 positive days. You assume each day is independent of one another, the stock exchanges movements are independent and that the true unknown probably that the SET rises and the TWSE rises is constant although unknown for the past 20 years.

Test if the true probability the SET rises is *greater than* the TWSE. Use $\alpha = 0.05$. Do not use a continuity correction factor.

Problem 102. You are investigating the probability of the stock market having a positive day. A positive day is defined as the SET (Stock Exchange of Thailand) for $\hat{p}_1$ and for $\hat{p}_2$ the TWSE (Taiwan Stock Exchange) rises. You randomly select 96 days from the past 20 years for the SET and find 43 positive days. You also sample 97 days from the past 20 years for the TWSE and find 55 positive days. You assume each day is independent of one another, the stock exchanges movements are independent and that the true unknown probably that the SET rises and the TWSE rises is constant although unknown for the past 20 years.

Test if the true probability the SET rises is *not equal to* the TWSE. Use $\alpha = 0.05$. Do not use a continuity correction factor.

Problem 103. You are investigating the probability of the stock market having a positive day. A positive day is defined as the SET (Stock Exchange of Thailand) for $\hat{p}_1$ and for $\hat{p}_2$ the TWSE (Taiwan Stock Exchange) rises. You randomly select 97 days from the past 20 years for the SET and find 51 positive days. You also sample 107 days from the past 20 years for the TWSE and find 50 positive days. You assume each day is independent of one another, the stock exchanges movements are independent and that the true unknown probably that the SET rises and the TWSE rises is constant although unknown for the past 20 years.

Test if the true probability the SET rises is *greater than* the TWSE. Use $\alpha = 0.05$. Do not use a continuity correction factor.

Problem 104. You are investigating the probability of the stock market having a positive day. A positive day is defined as the SET (Stock Exchange of Thailand) for $\hat{p}_1$ and for $\hat{p}_2$ the TWSE (Taiwan Stock Exchange) rises. You randomly select 104 days from the past 20 years for the SET and find 53 positive days. You also sample 98 days from the past 20 years for the TWSE and find 49 positive days. You assume each day is independent of one another, the stock exchanges movements are independent and that the true unknown probably that the SET rises and the TWSE rises is constant although unknown for the past 20 years.

Test if the true probability the SET rises is *greater than* the TWSE. Use $\alpha = 0.05$. Do not use a continuity correction factor.

Problem 105. You are investigating the probability of the stock market having a positive day. A positive day is defined as the SET (Stock Exchange of Thailand) for $\hat{p}_1$ and for $\hat{p}_2$ the TWSE (Taiwan Stock Exchange) rises. You randomly select 93 days from the past 20 years for the SET and find 41 positive days. You also sample 109 days from the past 20 years for the TWSE and find 53 positive days. You assume each day is independent of one another, the stock exchanges movements are independent and that the true unknown probably that the SET rises and the TWSE rises is constant although unknown for the past 20 years.

Test if the true probability the SET rises is *less than* the TWSE. Use $\alpha = 0.05$. Do not use a continuity correction factor.

Problem 106. You are investigating the probability of the stock market having a positive day. A positive day is defined as the SET (Stock Exchange of Thailand) for $\hat{p}_1$ and for $\hat{p}_2$ the TWSE (Taiwan Stock Exchange) rises. You randomly select 101 days from the past 20 years for the SET and find 51 positive days. You also sample 109 days from the past 20 years for the TWSE and find 49 positive days. You assume each day is independent of one another, the stock exchanges movements are independent and that the true unknown probably that the SET rises and the TWSE rises is constant although unknown for the past 20 years.

Test if the true probability the SET rises is *greater than* the TWSE. Use $\alpha = 0.05$. Do not use a continuity correction factor.

Problem 107. You are investigating the probability of the stock market having a positive day. A positive day is defined as the SET (Stock Exchange of Thailand) for $\hat{p}_1$ and for $\hat{p}_2$ the TWSE (Taiwan Stock Exchange) rises. You randomly select 110 days from the past 20 years for the SET and find 51 positive days. You also sample 101 days from the past 20 years for the TWSE and find 45 positive days. You assume each day is independent of one another, the stock exchanges movements are independent and that the true unknown probably that the SET rises and the TWSE rises is constant although unknown for the past 20 years.

Test if the true probability the SET rises is *not equal to* the TWSE. Use $\alpha = 0.05$. Do not use a continuity correction factor.

Problem 108. You are investigating the probability of the stock market having a positive day. A positive day is defined as the SET (Stock Exchange of Thailand) for $\hat{p}_1$ and for $\hat{p}_2$ the TWSE (Taiwan Stock Exchange) rises. You randomly select 96 days from the past 20 years for the SET and find 42 positive days. You also sample 100 days from the past 20 years for the TWSE and find 54 positive days. You assume each day is independent of one another, the stock exchanges movements are independent and that the true unknown probably that the SET rises and the TWSE rises is constant although unknown for the past 20 years.

Test if the true probability the SET rises is *less than* the TWSE. Use $\alpha = 0.05$. Do not use a continuity correction factor.

1.7 One-Sample T-test Examples

Problem 109. Use the data below to answer the following questions.

	y
1	503.70
2	506.12
3	509.83
4	506.00

Table 19: Randomly selected bank savings account data in U.S. dollars

Test if the population mean is *not equal to* $\mu = 507.73$. Use $\alpha = 0.05$.

Problem 110. Use the data below to answer the following questions.

	y
1	495.93
2	491.79
3	500.85
4	496.28
5	470.76

Table 20: Randomly selected bank savings account data in U.S. dollars

Test if the population mean is *greater than* $\mu = 495.38$. Use $\alpha = 0.05$.

Problem 111. Use the data below to answer the following questions.

	y
1	521.01
2	497.16
3	482.61
4	490.04
5	497.28
6	503.88

Table 21: Randomly selected bank savings account data in U.S. dollars

Test if the population mean is *not equal to* $\mu = 488.62$. Use $\alpha = 0.05$.

Problem 112. Use the data below to answer the following questions.

	y
1	488.97
2	512.83
3	486.40
4	488.01
5	493.17
6	484.79
7	517.16
8	503.48
9	515.18

Table 22: Randomly selected bank savings account data in U.S. dollars

Test if the population mean is *not equal to* $\mu = 476.27$. Use $\alpha = 0.05$.

Problem 113. Use the data below to answer the following questions.

	y
1	491.90
2	502.38
3	500.61
4	487.64
5	499.77
6	496.66
7	508.78

Table 23: Randomly selected bank savings account data in U.S. dollars

Test if the population mean is *greater than* $\mu = 486.86$. Use $\alpha = 0.05$.

Problem 114. Use the data below to answer the following questions.

	y
1	502.88
2	504.55
3	496.29
4	496.48
5	504.66

Table 24: Randomly selected bank savings account data in U.S. dollars

Test if the population mean is *less than* $\mu = 493.54$. Use $\alpha = 0.05$.

Problem 115. Use the data below to answer the following questions.

	y
1	502.78
2	522.77
3	494.47
4	488.39
5	491.74
6	503.71

Table 25: Randomly selected bank savings account data in U.S. dollars

Test if the population mean is *not equal to* $\mu = 514.62$. Use $\alpha = 0.05$.

Problem 116. Use the data below to answer the following questions.

	y
1	491.18
2	491.56
3	506.02
4	495.00
5	505.77
6	506.40
7	482.66

Table 26: Randomly selected bank savings account data in U.S. dollars

Test if the population mean is *not equal to* $\mu = 514.42$. Use $\alpha = 0.05$.

Problem 117. Use the data below to answer the following questions.

	y
1	510.91
2	500.78
3	482.34

Table 27: Randomly selected bank savings account data in U.S. dollars

Test if the population mean is *not equal to* $\mu = 457.63$. Use $\alpha = 0.05$.

Problem 118. Use the data below to answer the following questions.

	y
1	500.38
2	488.29
3	510.16
4	504.22
5	498.45
6	501.35

Table 28: Randomly selected bank savings account data in U.S. dollars

Test if the population mean is *greater than* $\mu = 509.98$. Use $\alpha = 0.05$.

Problem 119. Use the data below to answer the following questions.

	y
1	497.32
2	501.21
3	502.19
4	487.42
5	512.20
6	482.14
7	503.43
8	492.31
9	502.91
10	501.72
11	495.04
12	503.42
13	510.71
14	484.57

Table 29: Randomly selected bank savings account data in U.S. dollars

Test if the population mean is *less than* $\mu = 506.42$. Use $\alpha = 0.05$.

Problem 120. Use the data below to answer the following questions.

	y
1	493.67
2	499.32
3	498.37
4	491.68
5	499.57

Table 30: Randomly selected bank savings account data in U.S. dollars

Test if the population mean is *greater than* $\mu = 486.32$. Use $\alpha = 0.05$.

Problem 121. Use the data below to answer the following questions.

	y
1	506.01
2	511.21
3	498.97
4	492.84
5	511.84
6	510.72

Table 31: Randomly selected bank savings account data in U.S. dollars

Test if the population mean is *not equal to* $\mu = 510.58$. Use $\alpha = 0.05$.

Problem 122. Use the data below to answer the following questions.

	y
1	499.56
2	484.87
3	504.77
4	511.55
5	509.35

Table 32: Randomly selected bank savings account data in U.S. dollars

Test if the population mean is *not equal to* $\mu = 491.69$. Use $\alpha = 0.05$.

Problem 123. Use the data below to answer the following questions.

	y
1	502.22
2	496.09
3	506.88
4	518.43

Table 33: Randomly selected bank savings account data in U.S. dollars

Test if the population mean is *not equal to* $\mu = 490.03$. Use $\alpha = 0.05$.

Problem 124. Use the data below to answer the following questions.

	y
1	498.13
2	497.80
3	482.43
4	522.53
5	487.48

Table 34: Randomly selected bank savings account data in U.S. dollars

Test if the population mean is *not equal to* $\mu = 499.55$. Use $\alpha = 0.05$.

Problem 125. Use the data below to answer the following questions.

	y
1	491.50
2	487.01
3	517.27

Table 35: Randomly selected bank savings account data in U.S. dollars

Test if the population mean is *not equal to* $\mu = 483.67$. Use $\alpha = 0.05$.

Problem 126. Use the data below to answer the following questions.

	y
1	489.29
2	507.99
3	511.04
4	515.16

Table 36: Randomly selected bank savings account data in U.S. dollars

Test if the population mean is *not equal to* $\mu = 494.75$. Use $\alpha = 0.05$.

1.8 Two Sample T-test - Equal variances assumed Examples

Problem 127. Use the data below to answer the following questions. Assume the data comes from a normal distribution. Also assume the variances are equal.

	y
1	7334.47
2	7535.39
3	7860.15
4	7624.32
5	7586.52
6	7581.16
7	7144.51

Table 37: Randomly selected bank savings account data in U.S. dollars of women.

	x
1	7648.25
2	8429.93
3	7955.88
4	7610.89
5	7597.50
6	7470.67
7	7767.20
8	7565.33
9	8029.09

Table 38: Randomly selected bank savings account data in U.S. dollars of men.

Test if the population mean savings of women is *not equal to* men. Use $\alpha = 0.05$.

Problem 128. Use the data below to answer the following questions. Assume the data comes from a normal distribution. Also assume the variances are equal.

	y
1	7291.63
2	7628.50
3	7377.57
4	7507.96
5	7437.07
6	7745.26
7	7544.37
8	7551.28
9	7323.37

Table 39: Randomly selected bank savings account data in U.S. dollars of women.

	x
1	7258.15
2	7778.20
3	7588.29
4	7435.82
5	7602.18

Table 40: Randomly selected bank savings account data in U.S. dollars of men.

Test if the population mean savings of women is *less than* men. Use $\alpha = 0.05$.

Problem 129. Use the data below to answer the following questions. Assume the data comes from a normal distribution. Also assume the variances are equal.

	y
1	7454.15
2	7934.17
3	7560.18

Table 41: Randomly selected bank savings account data in U.S. dollars of women.

	x
1	7629.47
2	7289.62
3	7330.98
4	7692.76

Table 42: Randomly selected bank savings account data in U.S. dollars of men.

Test if the population mean savings of women is *greater than* men. Use $\alpha = 0.05$.

Problem 130. Use the data below to answer the following questions. Assume the data comes from a normal distribution. Also assume the variances are equal.

	y
1	7580.18
2	7504.75
3	7397.05
4	7571.72
5	7305.87
6	7151.03

Table 43: Randomly selected bank savings account data in U.S. dollars of women.

	x
1	7389.41
2	7967.91
3	7577.15
4	7532.09

Table 44: Randomly selected bank savings account data in U.S. dollars of men.

Test if the population mean savings of women is *less than* men. Use $\alpha = 0.05$.

Problem 131. Use the data below to answer the following questions. Assume the data comes from a normal distribution. Also assume the variances are equal.

	y
1	7494.23
2	7680.58
3	7713.14
4	7287.35
5	8088.99

Table 45: Randomly selected bank savings account data in U.S. dollars of women.

	x
1	8069.19
2	7443.07
3	7860.28
4	7872.33
5	8069.96
6	7523.39
7	7895.39
8	7517.39

Table 46: Randomly selected bank savings account data in U.S. dollars of men.

Test if the population mean savings of women is *greater than* men. Use $\alpha = 0.05$.

Problem 132. Use the data below to answer the following questions. Assume the data comes from a normal distribution. Also assume the variances are equal.

	y
1	7361.83
2	7195.10
3	7707.37
4	7394.57
5	7513.74
6	7544.16

Table 47: Randomly selected bank savings account data in U.S. dollars of women.

	x
1	7934.76
2	7423.54
3	7439.84
4	7464.08
5	7761.71
6	7585.64

Table 48: Randomly selected bank savings account data in U.S. dollars of men.

Test if the population mean savings of women is *less than* men. Use $\alpha = 0.05$.

Problem 133. Use the data below to answer the following questions. Assume the data comes from a normal distribution. Also assume the variances are equal.

	y
1	7600.19
2	7646.54
3	7612.56
4	7201.34

Table 49: Randomly selected bank savings account data in U.S. dollars of women.

	x
1	7611.22
2	7442.58
3	7992.76
4	7609.64
5	7405.74
6	7554.90
7	7410.78

Table 50: Randomly selected bank savings account data in U.S. dollars of men.

Test if the population mean savings of women is *less than* men. Use $\alpha = 0.05$.

Problem 134. Use the data below to answer the following questions. Assume the data comes from a normal distribution. Also assume the variances are equal.

	y
1	7337.53
2	7212.56
3	7267.81
4	7586.44
5	7668.40
6	7305.24

Table 51: Randomly selected bank savings account data in U.S. dollars of women.

	x
1	7557.62
2	7483.56
3	7805.23
4	7227.38
5	7524.98

Table 52: Randomly selected bank savings account data in U.S. dollars of men.

Test if the population mean savings of women is *less than* men. Use $\alpha = 0.05$.

Problem 135. Use the data below to answer the following questions. Assume the data comes from a normal distribution. Also assume the variances are equal.

	y
1	7289.21
2	7377.72

Table 53: Randomly selected bank savings account data in U.S. dollars of women.

	x
1	7411.94
2	7728.33
3	7587.07
4	7903.65
5	7315.69
6	7636.12
7	7588.46

Table 54: Randomly selected bank savings account data in U.S. dollars of men.

Test if the population mean savings of women is *less than* men. Use $\alpha = 0.05$.

Problem 136. Use the data below to answer the following questions. Assume the data comes from a normal distribution. Also assume the variances are equal.

	y
1	7193.22
2	7396.11
3	7195.90
4	7542.17
5	7296.16
6	7527.38
7	7185.09
8	7605.11
9	7571.50

Table 55: Randomly selected bank savings account data in U.S. dollars of women.

	x
1	7708.10
2	7508.19
3	8131.92
4	7875.43
5	7644.54
6	7542.00
7	7680.40

Table 56: Randomly selected bank savings account data in U.S. dollars of men.

Test if the population mean savings of women is *less than* men. Use $\alpha = 0.05$.

Problem 137. Use the data below to answer the following questions. Assume the data comes from a normal distribution. Also assume the variances are equal.

	y
1	7397.17
2	7361.14
3	7516.81
4	7532.94
5	7297.18
6	7712.34
7	7516.89
8	7303.97

Table 57: Randomly selected bank savings account data in U.S. dollars of women.

	x
1	7622.11
2	7534.71
3	7537.75
4	7528.89
5	7658.11
6	7722.40
7	7794.02

Table 58: Randomly selected bank savings account data in U.S. dollars of men.

Test if the population mean savings of women is *less than* men. Use $\alpha = 0.05$.

Problem 138. Use the data below to answer the following questions. Assume the data comes from a normal distribution. Also assume the variances are equal.

	y
1	7577.02
2	7562.21
3	7486.49
4	7373.27
5	7518.79
6	7307.79

Table 59: Randomly selected bank savings account data in U.S. dollars of women.

	x
1	7234.70
2	7322.23
3	7497.31
4	7636.43
5	7531.03

Table 60: Randomly selected bank savings account data in U.S. dollars of men.

Test if the population mean savings of women is *greater than* men. Use $\alpha = 0.05$.

Problem 139. Use the data below to answer the following questions. Assume the data comes from a normal distribution. Also assume the variances are equal.

	y
1	7418.83
2	7537.74
3	7692.50
4	7442.59
5	7542.10
6	7399.96
7	7576.73

Table 61: Randomly selected bank savings account data in U.S. dollars of women.

	x
1	7339.19
2	7571.66
3	7880.87
4	7345.59

Table 62: Randomly selected bank savings account data in U.S. dollars of men.

Test if the population mean savings of women is *greater than* men. Use $\alpha = 0.05$.

Problem 140. Use the data below to answer the following questions. Assume the data comes from a normal distribution. Also assume the variances are equal.

	y
1	7378.57
2	7699.59

Table 63: Randomly selected bank savings account data in U.S. dollars of women.

	x
1	7562.63
2	7463.68
3	7321.19
4	7299.27
5	7563.61
6	7129.61

Table 64: Randomly selected bank savings account data in U.S. dollars of men.

Test if the population mean savings of women is *not equal to* men. Use $\alpha = 0.05$.

Problem 141. Use the data below to answer the following questions. Assume the data comes from a normal distribution. Also assume the variances are equal.

	y
1	7790.45
2	7743.19
3	7809.53
4	7289.82

Table 65: Randomly selected bank savings account data in U.S. dollars of women.

	x
1	7654.56
2	7760.05
3	7634.11
4	7804.58
5	7428.61

Table 66: Randomly selected bank savings account data in U.S. dollars of men.

Test if the population mean savings of women is *greater than* men. Use $\alpha = 0.05$.

Problem 142. Use the data below to answer the following questions. Assume the data comes from a normal distribution. Also assume the variances are equal.

	y
1	7194.71
2	7470.77
3	7708.78
4	7274.66
5	7336.19
6	7514.94

Table 67: Randomly selected bank savings account data in U.S. dollars of women.

	x
1	7822.85
2	7239.17
3	7422.10
4	7236.87

Table 68: Randomly selected bank savings account data in U.S. dollars of men.

Test if the population mean savings of women is *less than* men. Use $\alpha = 0.05$.

Problem 143. Use the data below to answer the following questions. Assume the data comes from a normal distribution. Also assume the variances are equal.

	y
1	7748.15
2	7544.96
3	7760.37

Table 69: Randomly selected bank savings account data in U.S. dollars of women.

	x
1	6837.75
2	7081.33
3	7040.63
4	7397.79
5	6900.19

Table 70: Randomly selected bank savings account data in U.S. dollars of men.

Test if the population mean savings of women is *less than* men. Use $\alpha = 0.05$.

Problem 144. Use the data below to answer the following questions. Assume the data comes from a normal distribution. Also assume the variances are equal.

	y
1	7262.23
2	7419.17
3	7204.97
4	7658.37
5	7701.28
6	7771.73

Table 71: Randomly selected bank savings account data in U.S. dollars of women.

	x
1	7385.27
2	7577.68
3	7347.39
4	7735.31
5	7609.05
6	7584.18
7	7296.33
8	7452.62
9	7644.56

Table 72: Randomly selected bank savings account data in U.S. dollars of men.

Test if the population mean savings of women is *less than* men. Use $\alpha = 0.05$.

1.9 Paired T-test Examples

Problem 145. Use the data below to answer the following questions.

	Before	After
1	81.38	82.38
2	76.57	77.78
3	80.59	85.43

Table 73: Before and after training exam scores.

Test if the population mean exam score after is *greater than* before training. Use $\alpha = 0.05$.

Problem 146. Use the data below to answer the following questions.

	Before	After
1	75.21	75.92
2	75.69	75.84
3	78.70	81.07
4	74.92	78.77
5	75.75	75.83
6	76.67	78.26

Table 74: Before and after training exam scores.

Test if the population mean exam score after is *greater than* before training. Use $\alpha = 0.05$.

Problem 147. Use the data below to answer the following questions.

	Before	After
1	78.24	88.37
2	73.61	76.56
3	77.86	79.36
4	80.35	80.94
5	72.91	75.61
6	81.64	82.12
7	80.10	87.82
8	72.91	78.99

Table 75: Before and after training exam scores.

Test if the population mean exam score after is *not equal to* before training. Use $\alpha = 0.05$.

Problem 148. Use the data below to answer the following questions.

	Before	After
1	73.18	78.93
2	77.14	79.59
3	71.44	76.96
4	78.13	81.21

Table 76: Before and after training exam scores.

Test if the population mean exam score after is *not equal to* before training. Use $\alpha = 0.05$.

Problem 149. Use the data below to answer the following questions.

	Before	After
1	77.30	80.89
2	71.13	75.41
3	75.53	76.94
4	76.56	77.94
5	75.54	76.18
6	80.90	82.29

Table 77: Before and after training exam scores.

Test if the population mean exam score after is *greater than* before training. Use $\alpha = 0.05$.

Problem 150. Use the data below to answer the following questions.

	Before	After
1	68.13	72.22
2	78.39	84.45
3	75.95	77.28
4	70.00	74.43
5	80.52	82.55
6	78.57	89.41
7	74.00	83.93

Table 78: Before and after training exam scores.

Test if the population mean exam score after is *not equal to* before training. Use $\alpha = 0.05$.

Problem 151. Use the data below to answer the following questions.

	Before	After
1	72.93	77.26
2	74.80	78.57
3	72.46	76.49
4	70.55	72.73
5	71.05	71.17
6	71.91	72.59
7	73.55	74.64

Table 79: Before and after training exam scores.

Test if the population mean exam score after is *not equal to* before training. Use $\alpha = 0.05$.

Problem 152. Use the data below to answer the following questions.

	Before	After
1	74.24	85.09
2	82.34	83.13
3	77.53	87.17
4	73.64	76.11
5	78.44	80.14

Table 80: Before and after training exam scores.

Test if the population mean exam score after is *not equal to* before training. Use $\alpha = 0.05$.

Problem 153. Use the data below to answer the following questions.

	Before	After
1	73.08	79.16
2	73.42	78.12
3	75.26	77.65
4	76.63	77.05
5	75.79	79.94
6	80.10	82.29
7	76.60	80.29
8	80.60	80.94

Table 81: Before and after training exam scores.

Test if the population mean exam score after is *greater than* before training. Use $\alpha = 0.05$.

Problem 154. Use the data below to answer the following questions.

	Before	After
1	69.63	72.75
2	84.83	97.08
3	70.13	70.83
4	67.51	72.52
5	78.21	81.66
6	71.76	78.66
7	69.34	77.83
8	73.46	84.80
9	77.25	89.93

Table 82: Before and after training exam scores.

Test if the population mean exam score after is *greater than* before training. Use $\alpha = 0.05$.

Problem 155. Use the data below to answer the following questions.

	Before	After
1	69.64	83.31
2	75.48	78.61
3	80.62	90.10
4	76.48	89.73
5	80.76	88.18

Table 83: Before and after training exam scores.

Test if the population mean exam score after is *greater than* before training. Use $\alpha = 0.05$.

Problem 156. Use the data below to answer the following questions.

	Before	After
1	65.87	75.95
2	79.75	91.97
3	72.02	74.64

Table 84: Before and after training exam scores.

Test if the population mean exam score after is *greater than* before training. Use $\alpha = 0.05$.

Problem 157. Use the data below to answer the following questions.

	Before	After
1	79.09	80.92
2	77.96	82.76
3	74.28	78.15
4	76.16	77.21
5	74.59	79.84

Table 85: Before and after training exam scores.

Test if the population mean exam score after is *less than* before training. Use $\alpha = 0.05$.

Problem 158. Use the data below to answer the following questions.

	Before	After
1	79.49	85.00
2	83.61	83.78
3	73.75	78.54
4	77.59	84.11
5	74.76	77.92
6	73.89	75.47
7	80.07	82.67

Table 86: Before and after training exam scores.

Test if the population mean exam score after is *greater than* before training. Use $\alpha = 0.05$.

Problem 159. Use the data below to answer the following questions.

	Before	After
1	74.52	76.70
2	78.37	83.82
3	77.41	79.20
4	74.89	81.53
5	70.03	74.48
6	76.09	78.72
7	77.47	80.13
8	74.48	84.30

Table 87: Before and after training exam scores.

Test if the population mean exam score after is *greater than* before training. Use $\alpha = 0.05$.

Problem 160. Use the data below to answer the following questions.

	Before	After
1	79.25	80.74
2	69.52	76.17
3	70.62	76.85
4	71.33	80.97
5	73.55	79.02

Table 88: Before and after training exam scores.

Test if the population mean exam score after is *less than* before training. Use $\alpha = 0.05$.

Problem 161. Use the data below to answer the following questions.

	Before	After
1	73.11	80.87
2	73.92	76.03
3	69.72	73.09
4	77.63	79.81

Table 89: Before and after training exam scores.

Test if the population mean exam score after is *not equal to* before training. Use $\alpha = 0.05$.

Problem 162. Use the data below to answer the following questions.

	Before	After
1	83.11	96.10
2	81.44	100.00
3	67.28	76.32
4	64.65	84.29

Table 90: Before and after training exam scores.

Test if the population mean exam score after is *greater than* before training. Use $\alpha = 0.05$.

1.10 Simple Linear Regression - Test $\beta_1 = 0$

Problem 163. Test if the slope equals zero or not for the simple linear regression model.

	x	y
1	6.00	-25.70
2	3.00	-0.70
3	7.00	4.00
4	3.00	1.10
5	4.00	14.00

Table 91: The independent and response variable.

Problem 164. Test if the slope equals zero or not for the simple linear regression model.

	x	y
1	5.00	-3.00
2	3.00	2.80
3	3.00	-7.50
4	6.00	3.70
5	1.00	16.50
6	8.00	-33.80

Table 92: The independent and response variable.

Problem 165. Test if the slope equals zero or not for the simple linear regression model.

	x	y
1	8.00	9.20
2	9.00	-18.80
3	5.00	2.50
4	3.00	-30.00
5	7.00	10.90
6	6.00	-36.10

Table 93: The independent and response variable.

Problem 166. Test if the slope equals zero or not for the simple linear regression model.

	x	y
1	3.00	-16.80
2	8.00	21.70
3	8.00	-0.20
4	1.00	-21.40
5	9.00	15.10
6	4.00	14.40

Table 94: The independent and response variable.

Problem 167. Test if the slope equals zero or not for the simple linear regression model.

	x	y
1	4.00	-20.10
2	9.00	-31.70
3	8.00	-15.30
4	1.00	16.10
5	5.00	23.20

Table 95: The independent and response variable.

Problem 168. Test if the slope equals zero or not for the simple linear regression model.

	x	y
1	1.00	-2.30
2	4.00	19.40
3	2.00	1.80
4	2.00	17.00
5	6.00	-13.50
6	8.00	34.90
7	8.00	-3.60

Table 96: The independent and response variable.

Problem 169. Test if the slope equals zero or not for the simple linear regression model.

	x	y
1	7.00	32.50
2	0.00	0.70
3	1.00	-10.10
4	5.00	8.20
5	0.00	-8.90
6	7.00	-28.70
7	4.00	-25.40

Table 97: The independent and response variable.

Problem 170. Test if the slope equals zero or not for the simple linear regression model.

	x	y
1	5.00	2.20
2	7.00	-43.70
3	3.00	-10.50
4	3.00	-3.60
5	9.00	-7.80
6	9.00	-47.90
7	2.00	16.90

Table 98: The independent and response variable.

Problem 171. Test if the slope equals zero or not for the simple linear regression model.

	x	y
1	4.00	-6.30
2	0.00	-2.60
3	8.00	-18.50
4	3.00	21.30
5	4.00	-12.00

Table 99: The independent and response variable.

Problem 172. Test if the slope equals zero or not for the simple linear regression model.

	x	y
1	9.00	-19.90
2	2.00	22.50
3	6.00	0.70
4	0.00	-2.80
5	5.00	-40.80

Table 100: The independent and response variable.

Problem 173. Test if the slope equals zero or not for the simple linear regression model.

	x	y
1	2.00	-13.50
2	9.00	-42.20
3	9.00	-57.20
4	1.00	-6.10
5	3.00	7.50
6	1.00	-12.70

Table 101: The independent and response variable.

Problem 174. Test if the slope equals zero or not for the simple linear regression model.

	x	y
1	6.00	5.00
2	1.00	9.50
3	5.00	-4.00
4	2.00	-6.50
5	6.00	12.80

Table 102: The independent and response variable.

Problem 175. Test if the slope equals zero or not for the simple linear regression model.

	x	y
1	9.00	14.80
2	4.00	-35.10
3	3.00	21.90
4	2.00	8.10
5	3.00	9.90

Table 103: The independent and response variable.

Problem 176. Test if the slope equals zero or not for the simple linear regression model.

	x	y
1	7.00	-27.40
2	0.00	-11.10
3	6.00	22.50
4	8.00	-14.90
5	4.00	-2.60

Table 104: The independent and response variable.

Problem 177. Test if the slope equals zero or not for the simple linear regression model.

	x	y
1	3.00	1.60
2	0.00	-11.70
3	2.00	22.10
4	5.00	-20.90
5	5.00	8.60

Table 105: The independent and response variable.

Problem 178. Test if the slope equals zero or not for the simple linear regression model.

	x	y
1	5.00	18.80
2	2.00	5.30
3	3.00	10.10
4	3.00	9.50
5	8.00	-13.30
6	2.00	-14.70

Table 106: The independent and response variable.

Problem 179. Test if the slope equals zero or not for the simple linear regression model.

	x	y
1	3.00	8.40
2	8.00	-60.10
3	7.00	-8.40
4	9.00	34.50
5	3.00	30.20
6	0.00	-17.50

Table 107: The independent and response variable.

Problem 180. Test if the slope equals zero or not for the simple linear regression model.

	x	y
1	9.00	0.70
2	8.00	-1.00
3	9.00	-8.00
4	4.00	27.70
5	8.00	-25.50
6	5.00	-9.00
7	3.00	0.10

Table 108: The independent and response variable.

2 What To Do When - Select the most appropriate

Problem 181. Select the most appropriate test for each part. Write the number.

A. One Sample t-test (or confidence interval)

B. Two Sample t-test (or confidence interval)

C. Paired t-test (or confidence interval)

D. Chi-squared Test

E. One sample z-test for a proportion

F. Two sample z-test for proportions

G. ANOVA

H. Regression/General Linear Model

(a) It is desired to determine if men and women living in Bangkok make on average the same salary. The salaries for a random sample of 100 men and 100 women is taken. Data collected gender and income.

(b) In families with exactly 2 children it is believed that the older child does better than the younger child in school. Better being defined as having a higher GPA (grade point average). Is the average GPA of the oldest child higher than that of the youngest child? Data collected the GPA of the oldest and youngest from 50 random selected families with two children. Thus 100 children in the survey from 50 families.

(c) Is the response rate to mail marketing campaign type I higher than the response rate to mail marketing campaign type II? Data collected: For each marketing campaign the number of people mailed and the number of responses.

(d) Understanding what might determine current salary. Data collected: Level of education (B.A., Masters, or Ph.D.), years of work experience, and current salary.

(e) You believe the average height of people in management positions is greater than that of people in non-management. You take a simple random sample of working people of 1,000 with about 20% of the 1,000 people happen to have management positions. Test if the population average height of individuals in management is taller than that of non-management.

(f) You believe the percent of men living in Bangkok is greater than the percent of women in Bangkok. You take a simple random sample of 1,000 people living in Bangkok.