Homework 7 – Due 5/18 at 9 AM Eastern Time – Prepared by Michael Wacey

1. Exam Scores are normally distributed with a mean of 75 and a standard deviation of 8.
   1. What is the probability of getting less than 70%?
   2. What is the probability of getting more than 90%?
   3. What is the probability of getting between 70% and 80%?

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| Problem 1 | |  |  |  | Formulas |
|  | Distribution |  |  | Normal |  |
|  | Mean |  |  | 75% |  |
|  | Standard Deviation |  |  | 8% |  |
|  |  |  |  |  |  |
|  | a. Probability of getting less than 70%? | 70% |  | 27% | =NORM.DIST($C6,E$3,E$4,TRUE) |
|  | b. What is the probability of getting more than 90%? | 90% |  | 3% | =1-NORM.DIST($C7,E$3,E$4,TRUE) |
|  | c. What is the probability of getting between 70% and 80%? | 70% | 80% | 47% | =NORM.DIST($D8,E$3,E$4,TRUE)-NORM.DIST($C8,E$3,E$4,TRUE) |

1. The time between lightning strikes is exponentially distributed with an average time between occurrences of 2 days.
   1. What is the probability of lightning occurring within one day of a prior strike?
   2. What is the probability of lightning occurring within three days of a prior strike?
   3. What is the probability of lightning occurring more than five days after a strike?

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| Problem 2 | |  |  |  | Formulas |
|  | Distribution |  |  | Exponential |  |
|  | lambda |  |  | 0.50 | =1/2 |
|  |  |  |  |  |  |
|  | a. What is the probability of lightning occurring within one day of a prior strike? | 1 |  | 39% | =EXPON.DIST($C14, E$12,TRUE ) |
|  | b. What is the probability of lightning occurring within three days of a prior strike? | 3 |  | 78% | =EXPON.DIST($C15, E$12,TRUE ) |
|  | c. What is the probability of lightning occurring more than five days after a strike? | 5 |  | 8% | =1-EXPON.DIST($C16, E$12,TRUE ) |

1. The speed you are driving is uniformly distributed between 40 and 60 on a city road.
   1. What is the probability you are driving faster than 45?
   2. If you go faster than 55, your probability of getting a ticket is 30%. The ticket fee is uniformly distributed between $100 and $300. If you are driving normally on the road, what is the probability you will pay more than $250 for a ticket?

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| Problem 3 | |  |  |  | Formulas |
|  | Distribution |  |  | Uniform |  |
|  | Minimum |  |  | 40 |  |
|  | Maximum |  |  | 60 |  |
|  | Range |  |  | 20 | =E21-E20 |
|  | Probability |  |  | 0.05 | =1/E22 |
|  |  |  |  |  |  |
|  | a. What is the probability you are driving faster than 45? | 45 |  | 0.75 | =(E$21-$C25)\*E$23 |
|  | b. If you go faster than 55, your probability of getting a ticket is 30%. The ticket fee is uniformly distributed between $100 and $300. If you are driving normally on the road, what is the probability you will pay more than $250 for a ticket? |  |  |  |  |
|  | Probability of driving faster than 55 MPH? | 55 |  | 0.25 | =(E$21-$C27)\*E$23 |
|  | Probability of getting a ticket? |  |  | 0.3 | Given |
|  | Probability of paying more than $250? |  |  | 0.25 | =(300-250)/(300-100) |
|  | Final probability. |  |  | 1.88% | =E27\*E28\*E29 |

1. What is the correlation between A and B? What is the correlation between A and C? What is the correlation between B and C? Which data sets are most positively correlated?

|  |  |  |
| --- | --- | --- |
| A | B | C |
| 91 | 95 | 93 |
| 69 | 74 | 76 |
| 8 | 3 | 20 |
| 15 | 13 | 49 |
| 58 | 56 | 55 |
| 28 | 30 | 38 |
| 90 | 93 | 8 |
| 92 | 91 | 98 |
| 92 | 92 | 27 |
| 6 | 9 | 20 |
| 56 | 57 | 84 |
| 31 | 32 | 35 |
| 40 | 41 | 16 |
| 5 | 2 | 45 |

| Problem 4 | |  |  |  | Formulas |
| --- | --- | --- | --- | --- | --- |
|  |  | A | B | C |  |
|  |  | 91 | 95 | 93 |  |
|  |  | 69 | 74 | 76 |  |
|  |  | 8 | 3 | 20 |  |
|  |  | 15 | 13 | 49 |  |
|  |  | 58 | 56 | 55 |  |
|  |  | 28 | 30 | 38 |  |
|  |  | 90 | 93 | 8 |  |
|  |  | 92 | 91 | 98 |  |
|  |  | 92 | 92 | 27 |  |
|  |  | 6 | 9 | 20 |  |
|  |  | 56 | 57 | 84 |  |
|  |  | 31 | 32 | 35 |  |
|  |  | 40 | 41 | 16 |  |
|  |  | 5 | 2 | 45 |  |
|  |  |  |  |  |  |
|  | Correlation between A and B? |  |  | 0.997371568 | =CORREL($C$34:$C$47,$D$34:$D$47) |
|  | Correlation between A and C? |  |  | 0.419589861 | =CORREL($C$34:$C$47,$E$34:$E$47) |
|  | Correlation between B and C? |  |  | 0.416567064 | =CORREL($D$34:$D$47,$E$34:$E$47) |
|  | Which data sets are most positively correlated? |  |  | A and B |  |

| n | Formulas | Numerator |  | Denominator |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 14 | =COUNT(C34:C47) | 1942.377551 | =($C34-$G$38)\*($D34-$G$42) | 1794.127551 | 2102.877551 | =(($C34-$G$38)^2) | =($D34-$G$42)^2 |
| Sum of A |  | 506.0204082 | =($C35-$G$38)\*($D35-$G$42) | 414.4132653 | 617.877551 | =(($C35-$G$38)^2) | =($D35-$G$42)^2 |
| 681 | =SUM(C34:C47) | 1875.377551 | =($C36-$G$38)\*($D36-$G$42) | 1651.841837 | 2129.163265 | =(($C36-$G$38)^2) | =($D36-$G$42)^2 |
| Mean of A |  | 1215.94898 | =($C37-$G$38)\*($D37-$G$42) | 1131.841837 | 1306.306122 | =(($C37-$G$38)^2) | =($D37-$G$42)^2 |
| 48.64286 | =G36/G34 | 64.16326531 | =($C38-$G$38)\*($D38-$G$42) | 87.55612245 | 47.02040816 | =(($C38-$G$38)^2) | =($D38-$G$42)^2 |
| Sum of B |  | 395.1632653 | =($C39-$G$38)\*($D39-$G$42) | 426.127551 | 366.4489796 | =(($C39-$G$38)^2) | =($D39-$G$42)^2 |
| 688 | =SUM(D34:D47) | 1813.806122 | =($C40-$G$38)\*($D40-$G$42) | 1710.413265 | 1923.44898 | =(($C40-$G$38)^2) | =($D40-$G$42)^2 |
| Mean of B |  | 1814.806122 | =($C41-$G$38)\*($D41-$G$42) | 1879.841837 | 1752.020408 | =(($C41-$G$38)^2) | =($D41-$G$42)^2 |
| 49.14286 | =G40/G34 | 1858.163265 | =($C42-$G$38)\*($D42-$G$42) | 1879.841837 | 1836.734694 | =(($C42-$G$38)^2) | =($D42-$G$42)^2 |
|  |  | 1711.806122 | =($C43-$G$38)\*($D43-$G$42) | 1818.413265 | 1611.44898 | =(($C43-$G$38)^2) | =($D43-$G$42)^2 |
|  |  | 57.80612245 | =($C44-$G$38)\*($D44-$G$42) | 54.12755102 | 61.73469388 | =(($C44-$G$38)^2) | =($D44-$G$42)^2 |
|  |  | 302.4489796 | =($C45-$G$38)\*($D45-$G$42) | 311.2704082 | 293.877551 | =(($C45-$G$38)^2) | =($D45-$G$42)^2 |
|  |  | 70.37755102 | =($C46-$G$38)\*($D46-$G$42) | 74.69897959 | 66.30612245 | =(($C46-$G$38)^2) | =($D46-$G$42)^2 |
|  |  | 2057.44898 | =($C47-$G$38)\*($D47-$G$42) | 1904.69898 | 2222.44898 | =(($C47-$G$38)^2) | =($D47-$G$42)^2 |
|  |  | 15685.71429 | =SUM(I34:I47) | 15139.21429 | 16337.71429 | =SUM(K34:K47) | =SUM(L34:L47) |
|  |  |  |  | 15727.05177 |  | =SQRT(K48\*L48) |  |
| Manually calculated A and B. |  | 0.997371568 | =I48/K49 |  |  |  |  |