**SA ROBOT MURDER MYSTERY SOLUTIONS**

**Case File #1**

**The Alamo** – this is a binomial probability problem B(7, 0.773) P( x ≤ 3) = **0.0513**

**(**Use calculator : ***binomcdf* (7, .773, 3)**

**Fiesta, Texas** – this is a discrete probability distribution problem. We know that Flibbergibit took 3 or 4 minutes to park & walk to the entrance. If he took 3 minutes to park & walk, it took 1 minute to wait in line. If he took 4 minutes to park & walk, he waited 0 minutes in line. We use our probability rules now:

$P(X=3)∩P(X=1)$ OR $P(X=4)∩P(X=0)$ 🡪 (0.31)(0.22) + (0.35)(0.03) = **0.0787**

**Eliminate The Alamo**.

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**Case File #2**

We are looking at a Normal model, so we can use the formula: $z=\frac{x-μ}{σ}$

**Null Zero** – $z=\frac{111-100}{14}≈0.7857$ 🡪$0.7857×500≈392.857$

**MMM** - $z=\frac{x-μ}{σ} \rightarrow x=σz+μ \rightarrow x=\left(37\right)\left(0.7838\right)+366≈395$

**Stickbody** - $z=\frac{x-μ}{σ}\rightarrow μ=x-σz\rightarrow μ=55.4-\left(4.3\right)\left(0.7909\right)≈52; \left(52\right)\left(7\right)=364$

**Persnickety** - $z=\frac{x-μ}{σ}\rightarrow σ=\frac{x-μ}{z}\rightarrow σ=\frac{1324-1238}{0.78076}≈110.172; 110.172+250=360.172$

**Eliminate Mean Mrs. Median**

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**Case File #3**

**Oil** – the density of oil is normally distributed, so we can use a Normal model, N(8.5, 2.5). We are looking for the ***complement*** of the probability that the density is between 3 and 11 mg of oil per cubic cm. This will be:

**P(x ≤ 3) + P(x ≥ 11) = 1 – P(3 ≤ x ≤ 11) = 0.17256**

**Water** – This is a binomial situation B(12, 0.2), but finding water in ***at least*** 4 of the 12 places means we use the ***complement*** rule: P(x ≥ 4) = 1 – P(x ≤ 3) = 1 – 0.7946 = 02054

**Eliminate oil**

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**Case File #4**

When subtracting in the order RR tracks – Riverwalk, resulting confidence interval is $(0.213, 4.501)$

Because 0 is not contained in the interval, there is not a significant difference in the means.

Haunted RR tracks has 

Riverwalk has 

**Eliminate Riverwalk**

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**Case File #5**

This is a one-proportion *z*-test for each suspect:

|  |  |
| --- | --- |
| **Prudence Hattersfield** | **Melvin Stickbody** |
| $H\_{0}:p=0.35 $ $H\_{A}:p<0.35$  | $H\_{0}:p=0.85 $ $$H\_{A}:p<0.85$$ |
| $n=35; p=\frac{10}{35}≈0.286$  | $n=43; p=\frac{31}{43}≈0.721$  |
| $z=\frac{0.286-0.35}{\sqrt{\frac{\left(0.35\right)(0.65)}{35}}}≈-0.794$  | $z=\frac{0.721-0.85}{\sqrt{\frac{\left(0.85\right)(0.15)}{43}}}≈-2.369$  |
| $$P(z<-0.794)≈0.213$$ | P( x < -2.369) = .0089 |

**Eliminate Stickbody**

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**Elimination Task #1 NOT PRUDENCE**

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**Case File #6**

|  |  |  |  |
| --- | --- | --- | --- |
|  | ***n*** | $$\hat{p}$$ | $$\hat{q}$$ |
| **Electrical Surges** | 257 | $$\frac{31}{257}$$ | $$\frac{226}{257}$$ |
| **Stress Points** | 167 | $$\frac{10}{167}$$ | $$\frac{157}{167}$$ |
| **Cold Temperature** | 223 | $$\frac{21}{223}$$ | $$\frac{202}{223}$$ |

1. Electrical Surges – Stress Points = (-0.1058, -0.0157) Zero is not in the interval.

2. Electrical Surges – Cold Temperature = (-0.728, 0.0199) Zero is in the interval.

3. Cold Temperature – Stress Points = (-0.0784, 0.0098) Zero is in the interval.

**Eliminate Stress Points**

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**Elimination Task #2 NOT COLD**

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**Case File #7**

**Fiesta, Texas** –  test, but given quantities must be changed so that we have integer counts.

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| --- | --- | --- | --- | --- |
|  | **Midway** | **Rides** | **Shows & Attractions** | **Travel Time** |
| **Time** | 84 | 240 | 246 | 30 |
| **Expected Time** | 108 | 216 | 162 | 54 |
|  **Contribution** | 5.33 | 2.67 | 43.56 | 10.67 |



Haunted RR tracks:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Train #1** | **Train #2** | **Train #3** | **Train #4** | **Train #5** |
| **Number of Trains** | 41 | 38 | 47 | 39 | 43 |
| **Expected Time** | 41.6 | 41.6 | 41.6 | 41.6 | 41.6 |
|  **Contribution** |  |  |  |  |  |



**Eliminate Fiesta, Texas**

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**Case File #8**

**Water**  - **Electrical Surges** -

 **IQR = 11.5 – 5.5 = 6 IQR = 129 – 115 = 14**

Outlier boundaries are found by: (*Q*1 – 1.5[IQR], *Q*3 + 1.5[IQR])

 **(-3.5, 20.5) (94, 150)**

**Outliers: 21, 23, 24 Outliers: 92**

**Eliminate water**

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**Case File #9**

For Null Zero, put **Amount Bet** into *L*1 and **Diastolic Measure** into *L*2. Run a linear regression test (#8) to get the *r*-value:

Do the same thing for Ford Persnickety:

**Eliminate Ford Persnickety**

Results:

|  |  |  |
| --- | --- | --- |
| Suspect | Location | Weapon |
| Null Zero | Haunted RR Tracks | Electrical Surges |