Midterm Exam R12522615 王邑安 ID:2

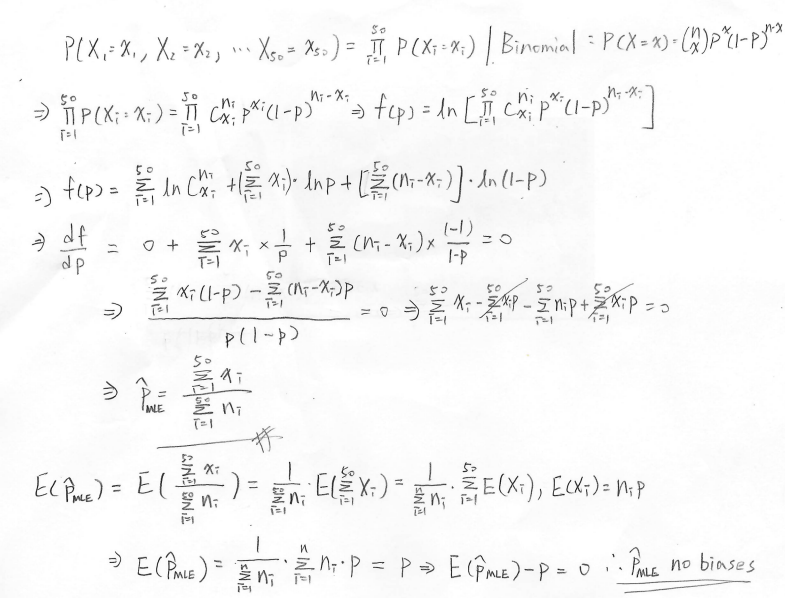


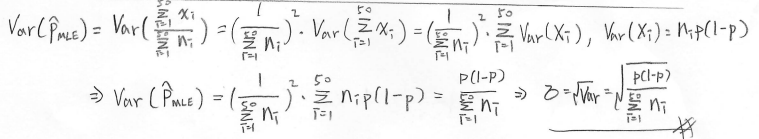
Assumption:

* IDD assumption in each term: Every winning set has identical probability to be chosen independently each term.
* IDD assumption in choosing a number each time: Every number has the identical probability to be chosen independently each time.

There are totally outcomes in Big Lotto. To win the fifth prize, four of six numbers should be the winning numbers in the first set, and the rest should not be the winning numbers. Also, the rest numbers should not be the special number. The probability of fifth prize will be:







|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 開獎日 | 金額 | 注數 | 5獎中獎數 | 開獎日 | 金額 | 注數 | 5獎中獎數 |
| 2024/4/23 | 94533100.00 | 1890662 | 1659 | 2024/2/16 | 188302250.00 | 3766045 | 2846 |
| 2024/4/19 | 91260750.00 | 1825215 | 1736 | 2024/2/15 | 197336000.00 | 3946720 | 3977 |
| 2024/4/16 | 93796550.00 | 1875931 | 1750 | 2024/2/14 | 272001450.00 | 5440029 | 5332 |
| 2024/4/12 | 94919950.00 | 1898399 | 2037 | 2024/2/13 | 190351800.00 | 3807036 | 3120 |
| 2024/4/9 | 110857850.00 | 2217157 | 2101 | 2024/2/12 | 248903050.00 | 4978061 | 3965 |
| 2024/4/9 | 101158800.00 | 2023176 | 1686 | 2024/2/11 | 271083500.00 | 5421670 | 4520 |
| 2024/4/2 | 102237750.00 | 2044755 | 1676 | 2024/2/10 | 311420200.00 | 6228404 | 6475 |
| 2024/3/29 | 98140150.00 | 1962803 | 1608 | 2024/2/9 | 289130550.00 | 5782611 | 5955 |
| 2024/3/26 | 98682250.00 | 1973645 | 1758 | 2024/2/8 | 183653950.00 | 3673079 | 3322 |
| 2024/3/22 | 100908850.00 | 2018177 | 1537 | 2024/2/7 | 147109300.00 | 2942186 | 2488 |
| 2024/3/19 | 102852250.00 | 2057045 | 1907 | 2024/2/6 | 215438650.00 | 4308773 | 3845 |
| 2024/3/15 | 102625750.00 | 2052515 | 1607 | 2024/2/2 | 108994850.00 | 2179897 | 2302 |
| 2024/3/12 | 147291700.00 | 2945834 | 2391 | 2024/1/30 | 106791850.00 | 2135837 | 1842 |
| 2024/3/8 | 132588250.00 | 2651765 | 2237 | 2024/1/26 | 102419000.00 | 2048380 | 1604 |
| 2024/3/5 | 134655600.00 | 2693112 | 2565 | 2024/1/23 | 92997300.00 | 1859946 | 1712 |
| 2024/3/1 | 119882400.00 | 2397648 | 1873 | 2024/1/19 | 102906750.00 | 2058135 | 2054 |
| 2024/2/27 | 114267850.00 | 2285357 | 1923 | 2024/1/16 | 104587000.00 | 2091740 | 1969 |
| 2024/2/24 | 140742000.00 | 2814840 | 2466 | 2024/1/12 | 104749750.00 | 2094995 | 1719 |
| 2024/2/23 | 154793450.00 | 3095869 | 2878 | 2024/1/9 | 104402400.00 | 2088048 | 1759 |
| 2024/2/22 | 136989650.00 | 2739793 | 2445 | 2024/1/5 | 101273350.00 | 2025467 | 1686 |
| 2024/2/21 | 138635750.00 | 2772715 | 2418 | 2024/1/2 | 94153750.00 | 1883075 | 1708 |
| 2024/2/20 | 156102700.00 | 3122054 | 3003 | 2023/12/29 | 157827150.00 | 3156543 | 2843 |
| 2024/2/19 | 148157600.00 | 2963152 | 2844 | 2023/12/26 | 97816250.00 | 1956325 | 1782 |
| 2024/2/18 | 151708250.00 | 3034165 | 2970 | 2023/12/22 | 92432900.00 | 1848658 | 1366 |
| 2024/2/17 | 164832950.00 | 3296659 | 2931 | 2023/12/19 | 96200900.00 | 1924018 | 1501 |

The estimated is slightly smaller than . If the sample size is bigger, the difference between and may become smaller.



|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 開獎日 | 注數 | 5獎中獎數 | p\_0 | Binom\_0.05(lb) | Binom\_0.95(ub) | H\_0 | p value |
| 4月23日 | 1890662 | 1659 | 0.000924 | 1678 | 1815 | reject | 0.036783212 |
| 4月19日 | 1825215 | 1736 | 0.000924 | 1618 | 1753 | accept | 0.216631994 |
| 4月16日 | 1875931 | 1750 | 0.000924 | 1664 | 1801 | accept | 0.663771119 |
| 4月12日 | 1898399 | 2037 | 0.000924 | 1685 | 1822 | reject | 3.53433E-11 |
| 4月9日 | 2217157 | 2101 | 0.000924 | 1974 | 2122 | accept | 0.234795063 |
| 4月9日 | 2023176 | 1686 | 0.000924 | 1798 | 1940 | reject | 1.86386E-05 |
| 4月2日 | 2044755 | 1676 | 0.000924 | 1817 | 1960 | reject | 6.63184E-07 |
| 3月29日 | 1962803 | 1608 | 0.000924 | 1743 | 1883 | reject | 1.00443E-06 |
| 3月26日 | 1973645 | 1758 | 0.000924 | 1753 | 1893 | accept | 0.130612747 |
| 3月22日 | 2018177 | 1537 | 0.000924 | 1793 | 1935 | reject | 6.25301E-15 |
| 3月19日 | 2057045 | 1907 | 0.000924 | 1828 | 1972 | accept | 0.857172953 |
| 3月15日 | 2052515 | 1607 | 0.000924 | 1824 | 1967 | reject | 1.07401E-11 |
| 3月12日 | 2945834 | 2391 | 0.000924 | 2635 | 2807 | reject | 1.15881E-10 |
| 3月8日 | 2651765 | 2237 | 0.000924 | 2368 | 2531 | reject | 1.43869E-05 |
| 3月5日 | 2693112 | 2565 | 0.000924 | 2406 | 2570 | accept | 0.117698208 |
| 3月1日 | 2397648 | 1873 | 0.000924 | 2137 | 2292 | reject | 9.86589E-14 |
| 2月27日 | 2285357 | 1923 | 0.000924 | 2035 | 2186 | reject | 3.5491E-05 |
| 2月24日 | 2814840 | 2466 | 0.000924 | 2516 | 2684 | reject | 0.008462791 |
| 2月23日 | 3095869 | 2878 | 0.000924 | 2772 | 2947 | accept | 0.716620647 |
| 2月22日 | 2739793 | 2445 | 0.000924 | 2448 | 2613 | reject | 0.090174759 |
| 2月21日 | 2772715 | 2418 | 0.000924 | 2478 | 2644 | reject | 0.004561883 |
| 2月20日 | 3122054 | 3003 | 0.000924 | 2795 | 2972 | reject | 0.026085194 |
| 2月19日 | 2963152 | 2844 | 0.000924 | 2651 | 2823 | reject | 0.040168196 |
| 2月18日 | 3034165 | 2970 | 0.000924 | 2716 | 2890 | reject | 0.001622759 |
| 2月17日 | 3296659 | 2931 | 0.000924 | 2954 | 3136 | reject | 0.039197372 |
| 2月16日 | 3766045 | 2846 | 0.000924 | 3382 | 3575 | reject | 1.86567E-28 |
| 2月15日 | 3946720 | 3977 | 0.000924 | 3546 | 3745 | reject | 5.60725E-08 |
| 2月14日 | 5440029 | 5332 | 0.000924 | 4908 | 5141 | reject | 1.63267E-05 |
| 2月13日 | 3807036 | 3120 | 0.000924 | 3419 | 3614 | reject | 1.0295E-11 |
| 2月12日 | 4978061 | 3965 | 0.000924 | 4486 | 4709 | reject | 1.2913E-21 |
| 2月11日 | 5421670 | 4520 | 0.000924 | 4891 | 5124 | reject | 2.63272E-12 |
| 2月10日 | 6228404 | 6475 | 0.000924 | 5628 | 5877 | reject | 0 |
| 2月9日 | 5782611 | 5955 | 0.000924 | 5221 | 5461 | reject | 0 |
| 2月8日 | 3673079 | 3322 | 0.000924 | 3297 | 3488 | accept | 0.229797903 |
| 2月7日 | 2942186 | 2488 | 0.000924 | 2632 | 2803 | reject | 8.50784E-06 |
| 2月6日 | 4308773 | 3845 | 0.000924 | 3876 | 4083 | reject | 0.032867625 |
| 2月2日 | 2179897 | 2302 | 0.000924 | 1940 | 2087 | reject | 2.85147E-10 |
| 1月30日 | 2135837 | 1842 | 0.000924 | 1900 | 2046 | reject | 0.003079375 |
| 1月26日 | 2048380 | 1604 | 0.000924 | 1821 | 1964 | reject | 1.17243E-11 |
| 1月23日 | 1859946 | 1712 | 0.000924 | 1650 | 1786 | accept | 0.901597212 |
| 1月19日 | 2058135 | 2054 | 0.000924 | 1829 | 1973 | reject | 0.000493624 |
| 1月16日 | 2091740 | 1969 | 0.000924 | 1860 | 2004 | accept | 0.391054525 |
| 1月12日 | 2094995 | 1719 | 0.000924 | 1863 | 2007 | reject | 6.04172E-07 |
| 1月9日 | 2088048 | 1759 | 0.000924 | 1857 | 2001 | reject | 9.47733E-05 |
| 1月5日 | 2025467 | 1686 | 0.000924 | 1800 | 1942 | reject | 1.49963E-05 |
| 1月2日 | 1883075 | 1708 | 0.000924 | 1671 | 1808 | accept | 0.463315118 |
| 12月29日 | 3156543 | 2843 | 0.000924 | 2827 | 3004 | accept | 0.18270576 |
| 12月26日 | 1956325 | 1782 | 0.000924 | 1737 | 1877 | accept | 0.569173341 |
| 12月22日 | 1848658 | 1366 | 0.000924 | 1640 | 1776 | reject | 1.24202E-17 |
| 12月19日 | 1924018 | 1501 | 0.000924 | 1708 | 1847 | reject | 1.88994E-11 |



|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  | CL | UCL | LCL |
| 0.000895935 | 2805962.42 | 1.78609E-05 | 0.000896 | 0.00095 | 0.000842 |

|  |  |  |
| --- | --- | --- |
|  | 1-B(n\*UCL;n\_bar,p\_hat) | B(n\*LCL;n\_bar,p\_hat) |
| binomial dist | 0.001451429 | 0.001224758 |



One of the chosen numbers should be the special number, and the other four number should be the winning numbers. The rest of it should not be either special or winning numbers. The probability in this situation is:



|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 開獎日 | 注數 | 5獎中獎數 | p\_0 | Binom\_0.05(lb) | Binom\_0.95(ub) | P\_new(lb) | P\_new(ub) | β |
| 4月23日 | 1890662 | 1659 | 0.000924 | 1678 | 1815 | 1 | 1 | 0 |
| 4月19日 | 1825215 | 1736 | 0.000924 | 1618 | 1753 | 1 | 1 | 0 |
| 4月16日 | 1875931 | 1750 | 0.000924 | 1664 | 1801 | 1 | 1 | 0 |
| 4月12日 | 1898399 | 2037 | 0.000924 | 1685 | 1822 | 1 | 1 | 0 |
| 4月9日 | 2217157 | 2101 | 0.000924 | 1974 | 2122 | 1 | 1 | 0 |
| 4月9日 | 2023176 | 1686 | 0.000924 | 1798 | 1940 | 1 | 1 | 0 |
| 4月2日 | 2044755 | 1676 | 0.000924 | 1817 | 1960 | 1 | 1 | 0 |
| 3月29日 | 1962803 | 1608 | 0.000924 | 1743 | 1883 | 1 | 1 | 0 |
| 3月26日 | 1973645 | 1758 | 0.000924 | 1753 | 1893 | 1 | 1 | 0 |
| 3月22日 | 2018177 | 1537 | 0.000924 | 1793 | 1935 | 1 | 1 | 0 |
| 3月19日 | 2057045 | 1907 | 0.000924 | 1828 | 1972 | 1 | 1 | 0 |
| 3月15日 | 2052515 | 1607 | 0.000924 | 1824 | 1967 | 1 | 1 | 0 |
| 3月12日 | 2945834 | 2391 | 0.000924 | 2635 | 2807 | 1 | 1 | 0 |
| 3月8日 | 2651765 | 2237 | 0.000924 | 2368 | 2531 | 1 | 1 | 0 |
| 3月5日 | 2693112 | 2565 | 0.000924 | 2406 | 2570 | 1 | 1 | 0 |
| 3月1日 | 2397648 | 1873 | 0.000924 | 2137 | 2292 | 1 | 1 | 0 |
| 2月27日 | 2285357 | 1923 | 0.000924 | 2035 | 2186 | 1 | 1 | 0 |
| 2月24日 | 2814840 | 2466 | 0.000924 | 2516 | 2684 | 1 | 1 | 0 |
| 2月23日 | 3095869 | 2878 | 0.000924 | 2772 | 2947 | 1 | 1 | 0 |
| 2月22日 | 2739793 | 2445 | 0.000924 | 2448 | 2613 | 1 | 1 | 0 |
| 2月21日 | 2772715 | 2418 | 0.000924 | 2478 | 2644 | 1 | 1 | 0 |
| 2月20日 | 3122054 | 3003 | 0.000924 | 2795 | 2972 | 1 | 1 | 0 |
| 2月19日 | 2963152 | 2844 | 0.000924 | 2651 | 2823 | 1 | 1 | 0 |
| 2月18日 | 3034165 | 2970 | 0.000924 | 2716 | 2890 | 1 | 1 | 0 |
| 2月17日 | 3296659 | 2931 | 0.000924 | 2954 | 3136 | 1 | 1 | 0 |
| 2月16日 | 3766045 | 2846 | 0.000924 | 3382 | 3575 | 1 | 1 | 0 |
| 2月15日 | 3946720 | 3977 | 0.000924 | 3546 | 3745 | 1 | 1 | 0 |
| 2月14日 | 5440029 | 5332 | 0.000924 | 4908 | 5141 | 1 | 1 | 0 |
| 2月13日 | 3807036 | 3120 | 0.000924 | 3419 | 3614 | 1 | 1 | 0 |
| 2月12日 | 4978061 | 3965 | 0.000924 | 4486 | 4709 | 1 | 1 | 0 |
| 2月11日 | 5421670 | 4520 | 0.000924 | 4891 | 5124 | 1 | 1 | 0 |
| 2月10日 | 6228404 | 6475 | 0.000924 | 5628 | 5877 | 1 | 1 | 0 |
| 2月9日 | 5782611 | 5955 | 0.000924 | 5221 | 5461 | 1 | 1 | 0 |
| 2月8日 | 3673079 | 3322 | 0.000924 | 3297 | 3488 | 1 | 1 | 0 |
| 2月7日 | 2942186 | 2488 | 0.000924 | 2632 | 2803 | 1 | 1 | 0 |
| 2月6日 | 4308773 | 3845 | 0.000924 | 3876 | 4083 | 1 | 1 | 0 |
| 2月2日 | 2179897 | 2302 | 0.000924 | 1940 | 2087 | 1 | 1 | 0 |
| 1月30日 | 2135837 | 1842 | 0.000924 | 1900 | 2046 | 1 | 1 | 0 |
| 1月26日 | 2048380 | 1604 | 0.000924 | 1821 | 1964 | 1 | 1 | 0 |
| 1月23日 | 1859946 | 1712 | 0.000924 | 1650 | 1786 | 1 | 1 | 0 |
| 1月19日 | 2058135 | 2054 | 0.000924 | 1829 | 1973 | 1 | 1 | 0 |
| 1月16日 | 2091740 | 1969 | 0.000924 | 1860 | 2004 | 1 | 1 | 0 |
| 1月12日 | 2094995 | 1719 | 0.000924 | 1863 | 2007 | 1 | 1 | 0 |
| 1月9日 | 2088048 | 1759 | 0.000924 | 1857 | 2001 | 1 | 1 | 0 |
| 1月5日 | 2025467 | 1686 | 0.000924 | 1800 | 1942 | 1 | 1 | 0 |
| 1月2日 | 1883075 | 1708 | 0.000924 | 1671 | 1808 | 1 | 1 | 0 |
| 12月29日 | 3156543 | 2843 | 0.000924 | 2827 | 3004 | 1 | 1 | 0 |
| 12月26日 | 1956325 | 1782 | 0.000924 | 1737 | 1877 | 1 | 1 | 0 |
| 12月22日 | 1848658 | 1366 | 0.000924 | 1640 | 1776 | 1 | 1 | 0 |
| 12月19日 | 1924018 | 1501 | 0.000924 | 1708 | 1847 | 1 | 1 | 0 |



|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | ) | β |  |
| 4.51E-05 | 1 | 1 | 0 | 1 |



Death in a month = sum of number of death from New Taipei, Taipei, …, Keelung

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **n** | | **max death number** | | **min death number** | | | **k** |
| 84 | | 139 | | 64 | | | 78 |
| **death number** | **x\_i** | | **frequence** | | **p\_i(poisson, λ=10)** | | **np\_i** | **(X\_i-np\_i)^2/np\_i** | | |
| ~63 | 0 | | 0 | | 1 | | 84 | 84 | | |
| 64 | 2 | | 0.02381 | | 3.578E-30 | | 3.01E-28 | 1.33089E+28 | | |
| 65 | 0 | | 0 | | 5.505E-31 | | 4.62E-29 | 4.62386E-29 | | |
| 66 | 0 | | 0 | | 8.34E-32 | | 7.01E-30 | 7.00584E-30 | | |
| 67 | 0 | | 0 | | 1.245E-32 | | 1.05E-30 | 1.04565E-30 | | |
| 68 | 1 | | 0.011905 | | 1.831E-33 | | 1.54E-31 | 6.50315E+30 | | |
| 69 | 0 | | 0 | | 2.653E-34 | | 2.23E-32 | 2.22858E-32 | | |
| 70 | 2 | | 0.02381 | | 3.79E-35 | | 3.18E-33 | 1.25641E+33 | | |
| 71 | 0 | | 0 | | 5.338E-36 | | 4.48E-34 | 4.48406E-34 | | |
| 72 | 1 | | 0.011905 | | 7.414E-37 | | 6.23E-35 | 1.60569E+34 | | |
| 73 | 0 | | 0 | | 1.016E-37 | | 8.53E-36 | 8.53131E-36 | | |
| 74 | 4 | | 0.047619 | | 1.372E-38 | | 1.15E-36 | 1.38783E+37 | | |
| 75 | 1 | | 0.011905 | | 1.83E-39 | | 1.54E-37 | 6.50545E+36 | | |
| 76 | 1 | | 0.011905 | | 2.408E-40 | | 2.02E-38 | 4.94414E+37 | | |
| 77 | 2 | | 0.02381 | | 3.127E-41 | | 2.63E-39 | 1.5228E+39 | | |
| 78 | 0 | | 0 | | 4.009E-42 | | 3.37E-40 | 3.36763E-40 | | |
| 79 | 7 | | 0.083333 | | 5.075E-43 | | 4.26E-41 | 1.14947E+42 | | |
| 80 | 3 | | 0.035714 | | 6.343E-44 | | 5.33E-42 | 1.68902E+42 | | |
| 81 | 2 | | 0.02381 | | 7.831E-45 | | 6.58E-43 | 6.08049E+42 | | |
| 82 | 1 | | 0.011905 | | 9.551E-46 | | 8.02E-44 | 1.2465E+43 | | |
| 83 | 1 | | 0.011905 | | 1.151E-46 | | 9.67E-45 | 1.03459E+44 | | |
| 84 | 2 | | 0.02381 | | 1.37E-47 | | 1.15E-45 | 3.47624E+45 | | |
| 85 | 1 | | 0.011905 | | 1.612E-48 | | 1.35E-46 | 7.38701E+45 | | |
| 86 | 0 | | 0 | | 1.874E-49 | | 1.57E-47 | 1.5741E-47 | | |
| 87 | 3 | | 0.035714 | | 2.154E-50 | | 1.81E-48 | 4.97426E+48 | | |
| 88 | 0 | | 0 | | 2.448E-51 | | 2.06E-49 | 2.05604E-49 | | |
| 89 | 0 | | 0 | | 2.75E-52 | | 2.31E-50 | 2.31016E-50 | | |
| 90 | 0 | | 0 | | 3.056E-53 | | 2.57E-51 | 2.56684E-51 | | |
| 91 | 1 | | 0.011905 | | 3.358E-54 | | 2.82E-52 | 3.54522E+51 | | |
| 92 | 4 | | 0.047619 | | 3.65E-55 | | 3.07E-53 | 5.21856E+53 | | |
| 93 | 3 | | 0.035714 | | 3.925E-56 | | 3.3E-54 | 2.72996E+54 | | |
| 94 | 5 | | 0.059524 | | 4.175E-57 | | 3.51E-55 | 7.12822E+55 | | |
| 95 | 0 | | 0 | | 4.395E-58 | | 3.69E-56 | 3.69177E-56 | | |
| 96 | 2 | | 0.02381 | | 4.578E-59 | | 3.85E-57 | 1.04015E+57 | | |
| 97 | 1 | | 0.011905 | | 4.72E-60 | | 3.96E-58 | 2.52236E+57 | | |
| 98 | 0 | | 0 | | 4.816E-61 | | 4.05E-59 | 4.04544E-59 | | |
| 99 | 3 | | 0.035714 | | 4.865E-62 | | 4.09E-60 | 2.20248E+60 | | |
| 100 | 1 | | 0.011905 | | 4.865E-63 | | 4.09E-61 | 2.4472E+60 | | |
| 101 | 1 | | 0.011905 | | 4.816E-64 | | 4.05E-62 | 2.47167E+61 | | |
| 102 | 1 | | 0.011905 | | 4.722E-65 | | 3.97E-63 | 2.5211E+62 | | |
| 103 | 1 | | 0.011905 | | 4.585E-66 | | 3.85E-64 | 2.59674E+63 | | |
| 104 | 2 | | 0.02381 | | 4.408E-67 | | 3.7E-65 | 1.08024E+65 | | |
| 105 | 1 | | 0.011905 | | 4.198E-68 | | 3.53E-66 | 2.83564E+65 | | |
| 106 | 2 | | 0.02381 | | 3.961E-69 | | 3.33E-67 | 1.20231E+67 | | |
| 107 | 2 | | 0.02381 | | 3.702E-70 | | 3.11E-68 | 1.28647E+68 | | |
| 108 | 2 | | 0.02381 | | 3.427E-71 | | 2.88E-69 | 1.38939E+69 | | |
| 109 | 1 | | 0.011905 | | 3.144E-72 | | 2.64E-70 | 3.78609E+69 | | |
| 110 | 0 | | 0 | | 2.858E-73 | | 2.4E-71 | 2.40114E-71 | | |
| 111 | 3 | | 0.035714 | | 2.575E-74 | | 2.16E-72 | 4.16053E+72 | | |
| 112 | 1 | | 0.011905 | | 2.299E-75 | | 1.93E-73 | 5.17755E+72 | | |
| 113 | 2 | | 0.02381 | | 2.035E-76 | | 1.71E-74 | 2.34025E+74 | | |
| 114 | 0 | | 0 | | 1.785E-77 | | 1.5E-75 | 1.49931E-75 | | |
| 115 | 2 | | 0.02381 | | 1.552E-78 | | 1.3E-76 | 3.06807E+76 | | |
| 116 | 0 | | 0 | | 1.338E-79 | | 1.12E-77 | 1.12392E-77 | | |
| 117 | 0 | | 0 | | 1.144E-80 | | 9.61E-79 | 9.60618E-79 | | |
| 118 | 0 | | 0 | | 9.691E-82 | | 8.14E-80 | 8.14083E-80 | | |
| 119 | 1 | | 0.011905 | | 8.144E-83 | | 6.84E-81 | 1.46177E+80 | | |
| 120 | 2 | | 0.02381 | | 6.787E-84 | | 5.7E-82 | 7.01648E+81 | | |
| 121 | 2 | | 0.02381 | | 5.609E-85 | | 4.71E-83 | 8.48994E+82 | | |
| 122 | 0 | | 0 | | 4.597E-86 | | 3.86E-84 | 3.86185E-84 | | |
| 123 | 1 | | 0.011905 | | 3.738E-87 | | 3.14E-85 | 3.185E+84 | | |
| 124 | 0 | | 0 | | 3.014E-88 | | 2.53E-86 | 2.53203E-86 | | |
| 125 | 0 | | 0 | | 2.411E-89 | | 2.03E-87 | 2.02562E-87 | | |
| 126 | 0 | | 0 | | 1.914E-90 | | 1.61E-88 | 1.60764E-88 | | |
| 127 | 0 | | 0 | | 1.507E-91 | | 1.27E-89 | 1.26586E-89 | | |
| 128 | 0 | | 0 | | 1.177E-92 | | 9.89E-91 | 9.8895E-91 | | |
| 129 | 0 | | 0 | | 9.127E-94 | | 7.67E-92 | 7.66628E-92 | | |
| 130 | 0 | | 0 | | 7.02E-95 | | 5.9E-93 | 5.89714E-93 | | |
| 131 | 0 | | 0 | | 5.359E-96 | | 4.5E-94 | 4.50163E-94 | | |
| 132 | 0 | | 0 | | 4.06E-97 | | 3.41E-95 | 3.41033E-95 | | |
| 133 | 1 | | 0.011905 | | 3.053E-98 | | 2.56E-96 | 3.89992E+95 | | |
| 134 | 0 | | 0 | | 2.28E-99 | | 1.91E-97 | 1.91355E-97 | | |
| 135 | 0 | | 0 | | 1.69E-100 | | 1.42E-98 | 1.41744E-98 | | |
| 136 | 0 | | 0 | | 1.24E-101 | | 1E-99 | 1.0422E-99 | | |
| 137 | 0 | | 0 | | 9.06E-103 | | 7.6E-101 | 7.6076E-101 | | |
| 138 | 1 | | 0.011905 | | 6.56E-104 | | 5.5E-102 | 1.814E+101 | | |
| 139 | 1 | | 0.011905 | | 4.72E-105 | | 4E-103 | 2.5214E+102 | | |
| 140~ | 0 | | 0 | | 0 | | 0 | infinity | | |



Since Poisson distribution is discrete model, and there isn’t Poisson inverse in Excel. I use the p-value to do the Hypothesis test. If the p-value is smaller than α=0.05, the death number in that month reject H0.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| month | death in Taoyuan | p-value | H\_0 | month | death in Taoyuan | p-value | H\_0 |
| 1-Jan | 7 | 0.4404413 | accept | 1-Mar | 18 | 0.01437301 | reject |
| 1-Feb | 7 | 0.4404413 | accept | 1-Apr | 16 | 0.05408322 | accept |
| 1-Mar | 5 | 0.1341719 | accept | 1-May | 18 | 0.01437301 | reject |
| 1-Apr | 4 | 0.0585054 | accept | 1-Jun | 7 | 0.44044129 | accept |
| 1-May | 9 | 0.9158594 | accept | 1-Jul | 15 | 0.09748081 | accept |
| 1-Jun | 7 | 0.4404413 | accept | 1-Aug | 14 | 0.16691695 | accept |
| 1-Jul | 10 | 0.8339205 | accept | 1-Sep | 15 | 0.09748081 | accept |
| 1-Aug | 6 | 0.2602828 | accept | 1-Oct | 13 | 0.27107115 | accept |
| 1-Sep | 14 | 0.1669169 | accept | 1-Nov | 18 | 0.01437301 | reject |
| 1-Oct | 6 | 0.2602828 | accept | 1-Dec | 22 | 0.00059147 | reject |
| 1-Nov | 13 | 0.2710712 | accept | 1-Jan | 18 | 0.01437301 | reject |
| 1-Dec | 5 | 0.1341719 | accept | 1-Feb | 10 | 0.8339205 | accept |
| 1-Jan | 21 | 0.0013993 | reject | 1-Mar | 24 | 9.3899E-05 | reject |
| 1-Feb | 13 | 0.2710712 | accept | 1-Apr | 13 | 0.27107115 | accept |
| 1-Mar | 13 | 0.2710712 | accept | 1-May | 12 | 0.41688705 | accept |
| 1-Apr | 11 | 0.6064477 | accept | 1-Jun | 13 | 0.27107115 | accept |
| 1-May | 22 | 0.0005915 | reject | 1-Jul | 19 | 0.00690868 | reject |
| 1-Jun | 17 | 0.0285552 | reject | 1-Aug | 9 | 0.91585943 | accept |
| 1-Jul | 9 | 0.9158594 | accept | 1-Sep | 15 | 0.09748081 | accept |
| 1-Aug | 16 | 0.0540832 | accept | 1-Oct | 24 | 9.3899E-05 | reject |
| 1-Sep | 22 | 0.0005915 | reject | 1-Nov | 14 | 0.16691695 | accept |
| 1-Oct | 16 | 0.0540832 | accept | 1-Dec | 12 | 0.41688705 | accept |
| 1-Nov | 11 | 0.6064477 | accept | 1-Jan | 18 | 0.01437301 | reject |
| 1-Dec | 17 | 0.0285552 | reject | 1-Feb | 15 | 0.09748081 | accept |
| 1-Jan | 21 | 0.0013993 | reject | 1-Mar | 23 | 0.00024024 | reject |
| 1-Feb | 24 | 9.39E-05 | reject |  |  |  |  |



The upper bound in the Hypothesis test is 17, and the lower bound is 4.



|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **σ** | **CL** | **UCL** | **LCL** |
| 95 | 9.771908518 | 95 | 124.805922 | 66.17447053 |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | α |  |
| 0.002178917 | 0.000899138 | 0.003078 | 324.880425 |







|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| average | sample variance | standard error | estimated α | estimated β |
| 348.7412 | 138.1941 | 11.7556 | 880.0694 | 0.396266 |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| thickness | number x\_i | p\_i (gamma.dist) | np\_i | thickness | number x\_i | p\_i (gamma.dist) | np\_i |
| <334 | 1 | 0.087913 | 7.472574 | 347 | 5 | 0.03373 | 2.867063 |
| 334 | 1 | 0.015776 | 1.340944 | 348 | 2 | 0.033938 | 2.884713 |
| 335 | 1 | 0.017513 | 1.488584 | 349 | 10 | 0.0339 | 2.88148 |
| 336 | 0 | 0.019289 | 1.639587 | 350 | 6 | 0.033618 | 2.857553 |
| 337 | 0 | 0.021081 | 1.791899 | 351 | 12 | 0.033101 | 2.813561 |
| 338 | 0 | 0.022862 | 1.943262 | 352 | 9 | 0.032359 | 2.75055 |
| 339 | 0 | 0.024603 | 2.091256 | 353 | 5 | 0.031411 | 2.669941 |
| 340 | 1 | 0.026275 | 2.233372 | 354 | 4 | 0.030276 | 2.573474 |
| 341 | 1 | 0.027848 | 2.367076 | 355 | 2 | 0.028978 | 2.463154 |
| 342 | 0 | 0.029293 | 2.48989 | 356 | 4 | 0.027543 | 2.341175 |
| 343 | 2 | 0.030582 | 2.599466 | 357 | 4 | 0.025998 | 2.209855 |
| 344 | 5 | 0.03169 | 2.693662 | 358 | 1 | 0.024371 | 2.071564 |
| 345 | 4 | 0.032595 | 2.770613 | >358 | 1 | 0.214193 | 18.20639 |
| 346 | 4 | 0.03328 | 2.828792 | k=27 |  |  |  |



|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | sample variance | standard error σ | CL | UCL | LCL |
| 354.3911 | 26.34174 | 5.13242 | 354.3911 | 369.7884 | 338.9939 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | sample variance | standard error σ | CL | UCL | LCL |
| 9.822222 | 6.740404 | 2.596229 | 9.822222 | 17.61091 | 2.033536 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | sample variance | standard error σ | CL | UCL | LCL |
| 354.9707 | 6.561122 | 2.561469 | 354.9707 | 362.6551 | 347.2863 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | sample variance | standard error σ | CL | UCL | LCL |
| 9.902439 | 5.290244 | 2.300053 | 9.902439 | 16.8026 | 3.00228 |



|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| average | sample variance | standard error σ |  |  | Δ | α | β | accept (if lower) | accept (if higher) |
| 354.3911 | 26.34174 | 5.13242 | 350 | 341.7881 | -8.21187 | 0.003 | 0.2 | -17.9186 | 5.153057 |

Sequential likelihood ratio test shows that most of the are below the . It accepts and rejects .

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| average | sample variance | standard error σ |  | k | K | h | H |
| 354.3911 | 26.34174 | 5.13242 | 350 | 0.8 | 4.105936 | 6 | 30.79452 |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| average | sample variance | standard error σ |  | k | K | h | H |
| 354.3911 | 26.34174 | 5.13242 | 350 | 0.5 | 2.56621 | 5 | 25.6621 |

There is an out -of-control signal in Tabular CUSUM chart with (k,h)=(0.5,5). The new process mean is :



|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| shift | δ\* | k | h' |  |
| 0.5σ | 0.5 | 0.25 | 4.475606 | 10.59873 |
| 1.0σ | 1 | 0.5 | 4.475606 | 6.973656 |
| 1.5σ | 1.5 | 0.75 | 4.475606 | 5.079665 |
| 2.0σ | 2 | 1 | 4.475606 | 3.975671 |

There is an out -of-control signal in Tabular CUSUM chart with (k,h)=(0.5,5). The new process mean is :