Университет ИТМО

Факультет ФПИ и КТ

### Отчёт

### ДЗ 2

# «Теория Верятности»

Вариант 9

Студент:

Гр.P32111

Преподаватель:  
Селина Елена Георгиевна

**19.1**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 70 | 95 | 75 | 85 | 60 | 77 | 55 | 63 | 80 | 67 |
| 90 | 78 | 57 | 76 | 84 | 82 | 75 | 68 | 73 | 62 |
| 62 | 81 | 77 | 72 | 97 | 68 | 85 | 56 | 92 | 71 |
| 73 | 78 | 98 | 63 | 83 | 85 | 70 | 90 | 66 | 91 |
| 86 | 68 | 55 | 93 | 71 | 96 | 77 | 81 | 86 | 72 |
| 82 | 62 | 70 | 78 | 67 | 87 | 91 | 99 | 78 | 87 |
| 91 | 58 | 81 | 97 | 75 | 83 | 71 | 66 | 61 | 76 |
| 73 | 85 | 65 | 90 | 86 | 61 | 54 | 75 | 78 | 93 |
| 87 | 58 | 72 | 92 | 66 | 98 | 65 | 81 | 76 | 63 |
| 95 | 83 | 65 | 57 | 80 | 87 | 61 | 92 | 56 | 71 |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 54 | 55 | 55 | 56 | 56 | 57 | 57 | 58 | 58 | 60 |
| 61 | 61 | 61 | 62 | 62 | 62 | 63 | 63 | 63 | 65 |
| 65 | 65 | 66 | 66 | 66 | 67 | 67 | 68 | 68 | 68 |
| 70 | 70 | 70 | 71 | 71 | 71 | 71 | 72 | 72 | 72 |
| 73 | 73 | 73 | 75 | 75 | 75 | 75 | 76 | 76 | 76 |
| 77 | 77 | 77 | 78 | 78 | 78 | 78 | 78 | 80 | 80 |
| 81 | 81 | 81 | 81 | 82 | 82 | 83 | 83 | 83 | 84 |
| 85 | 85 | 85 | 85 | 86 | 86 | 86 | 87 | 87 | 87 |
| 87 | 90 | 90 | 90 | 91 | 91 | 91 | 92 | 92 | 92 |
| 93 | 93 | 95 | 95 | 96 | 97 | 97 | 98 | 98 | 99 |

Б)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Номер  Частичного интерваола | Границы интервала | Средина интервала | Частота интерваола | Относительная частота | Плотность относительной частоты |
| 1 | 54-59 | 56.5 | 9 | 0.09 | 0.018 |
| 2 | 59-64 | 61.5 | 10 | 0.1 | 0.02 |
| 3 | 64-69 | 66.5 | 11 | 0.11 | 0.022 |
| 4 | 69-74 | 71.5 | 13 | 0.13 | 0.026 |
| 5 | 74-79 | 76.5 | 15 | 0.15 | 0.03 |
| 6 | 79-84 | 81.5 | 11 | 0.11 | 0.22 |
| 7 | 84-89 | 86.5 | 12 | 0.12 | 0.06 |
| 8 | 89-94 | 91.5 | 11 | 0.11 | 0.055 |
| 9 | 94-99 | 96.5 | 8 | 0.08 | 0.016 |
| Sum |  |  | 100 |  |  |

в) Строим поли­он частот и ­исто­рамм‑ относительных

частот

Г)

Выброчное среднее:

Выборочная дисперсия:

Исправленная дисперсия:

Д)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| i | Границы  интервала | |  |  | Границы интервала | |
|
|  |  |  |  |
|
| 1 | 54 | 59 | - | -17.4 | - | -1.44 |
| 2 | 59 | 64 | -17.4 | -12.4 | -1.44 | -1.02 |
| 3 | 64 | 69 | -12.4 | -7.4 | -1.02 | -0.61 |
| 4 | 69 | 74 | -7.4 | -2.4 | -0.61 | -0.2 |
| 5 | 74 | 79 | -2.4 | 2.6 | -0.2 | 0.21 |
| 6 | 79 | 84 | 2.6 | 7.6 | 0.21 | 0.63 |
| 7 | 84 | 89 | 7.6 | 12.6 | 0.63 | 1.04 |
| 8 | 89 | 94 | 12.6 | 17.6 | 1.04 | 1.45 |
| 9 | 94 | 99 | 17.6 | - | 1.45 | - |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| i | Границаы Интервала | |  |  |  |  |
|  |  |
| 1 | - | -1.44 | -0.5 | -0.4251 | 0.0749 | 7.49 |
| 2 | -1.44 | -1.02 | -0.4251 | -0.3461 | 0.079 | 7.9 |
| 3 | -1.02 | -0.61 | -0.3461 | -0.2291 | 0.117 | 11.7 |
| 4 | -0.61 | -0.2 | -0.2291 | -0.0793 | 0.1498 | 14.98 |
| 5 | -0.2 | 0.21 | -0.0793 | 0.0832 | 0.1625 | 16.25 |
| 6 | 0.21 | 0.63 | 0.0832 | 0.2357 | 0.1525 | 15.25 |
| 7 | 0.63 | 1.04 | 0.2357 | 0.3508 | 0.1151 | 11.51 |
| 8 | 1.04 | 1.45 | 0.3508 | 0.4265 | 0.0757 | 7.57 |
| 9 | 1.45 | - | 0.4265 | 0.5 | 0.0735 | 7.35 |
| SUM |  |  |  |  | 1 | 100 |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| i |  |  |  |  |  |  |  |
| 1 | 9 | 7.49 | 1.51 | 2.2801 | 0.304419 | 81 | 10.81442 |
| 2 | 10 | 7.9 | 2.1 | 4.41 | 0.55823 | 100 | 12.65823 |
| 3 | 11 | 11.7 | -0.7 | 0.49 | 0.04188 | 121 | 10.34188 |
| 4 | 13 | 14.98 | -1.98 | 3.9204 | 0.261709 | 169 | 11.28171 |
| 5 | 15 | 16.25 | -1.25 | 1.5625 | 0.09615 | 225 | 13.84615 |
| 6 | 11 | 15.25 | -4.25 | 18.0625 | 1.184426 | 121 | 7.934426 |
| 7 | 12 | 11.51 | 0.49 | 0.2401 | 0.02086 | 144 | 12.51086 |
| 8 | 11 | 7.57 | 3.43 | 11.7649 | 1.554148 | 121 | 15.98415 |
| 9 | 8 | 7.35 | 0.65 | 0.4225 | 0.05748 | 64 | 8.707483 |
| sum | 100 | 100 |  |  |  |  | 104.079309 |

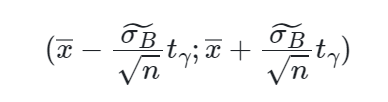
Контроль: 104.079309-100=4.079309

K=l-3=9-3=6

При таблице критических точек распределения , уровню значимости a=0.025 и число степеней свободы k=9-3=6 .

, то ­гипотеза о нормальном распределении ­енеральной совокупности принимается.

Е)



доверительный интервала для а будет (69.99965;82.80035)

При n=100, имеем q=0.143. Доверительным интервалом для ,будет (10.37378,13.83574)

**19.2**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | j | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| i | y  x | 0,2 | 0,4 | 0,6 | 0,8 | 1 | 1,2 | 1,4 | 1,6 |  |  |  |  |
| 1 | 250 | 3 | 4 | 5 |  |  |  |  |  | 12 | 3000 | 750000 | 1300 |
| 2 | 450 |  | 6 | 2 | 8 |  |  |  |  | 16 | 7200 | 3240000 | 4500 |
| 3 | 650 |  |  |  | 5 | 14 | 9 |  |  | 28 | 18200 | 11830000 | 18720 |
| 4 | 850 |  |  |  | 6 | 8 | 6 |  |  | 20 | 17000 | 14450000 | 17000 |
| 5 | 1050 |  |  |  |  | 5 | 7 | 4 |  | 16 | 16800 | 17640000 | 19950 |
| 6 | 1250 |  |  |  |  |  |  | 5 | 3 | 8 | 10000 | 12500000 | 14750 |
| 7 |  | 3 | 10 | 7 | 19 | 27 | 22 | 9 | 3 | 100 | 72200 | 60410000 | 76220 |
| 8 |  | 0,6 | 4 | 4,2 | 15,2 | 27 | 26,4 | 12,6 | 4,8 | 94,8 | - |  |  |
| 9 |  | 0,12 | 1,6 | 2,52 | 12,16 | 27 | 31,68 | 17,64 | 7,68 | 100,4 |  |  |  |
| 10 |  | 150 | 1480 | 1290 | 9560 | 21150 | 21960 | 14630 | 6000 | 76220 |  |  |  |