
Импорт исходных связей

```
In[ ]:= data = Import[NotebookDirectory[] <> "data/ID.xls", {"Data", 1}];  
  
In[ ]:= data[[All, 5]] = StringTrim[StringReplace[#, "-" → " "]] & /@ data[[All, 5]];  
(*обработка названий воздушных судов*)
```

Исходные данные

```
In[ ]:= numberOfCrew = <|  
  1 → <|"ВВЛ" → 125.54, "МВЛ" → 119.88, "СНГ" → 122.03|>,  
  2 → <|"ВВЛ" → 122.84, "МВЛ" → 117.30, "СНГ" → 119.41|>,  
  3 → <|"ВВЛ" → 129.97, "МВЛ" → 124.10, "СНГ" → 126.33|>,  
  4 → <|"ВВЛ" → 127.26, "МВЛ" → 121.51, "СНГ" → 123.69|>,  
  5 → <|"ВВЛ" → 123.32, "МВЛ" → 117.76, "СНГ" → 119.87|>,  
  6 → <|"ВВЛ" → 130.64, "МВЛ" → 124.75, "СНГ" → 126.99|>|>;
```

Расчет идеальных значений

```
In[ ]:= K = numberOfCrew // Length; (*число групп*)  
  
In[ ]:= c = Transpose[numberOfCrew]; (*количество БП доступных для планирования*)  
  
In[ ]:= V = Keys[numberOfCrew[[1]]]; (*тип сообщения*)  
  
In[ ]:= U = Position[data, #, 2] [[All, 1]] & /@ V; (*множества номеров связей,  
относящихся к одному из типов сообщения,соответственно,ВВЛ,МВЛ и СНГ*)  
  
In[ ]:= Clear[stringToMinutes]  
stringToMinutes[str_] := ToExpression[StringReplace[str, ":" → "*60+"]];  
  
In[ ]:= Clear[nightQ]  
nightQ[time_] :=  
  Module[{minutes = stringToMinutes[time]}, If[minutes ≥ 1320 ∨ minutes < 360, True, False]]  
  
In[ ]:= nightU = Table[Select[u, nightQ[data[[#, 2]]] &], {u, U}];  
(*множества номеров ночных связей,  
относящихся к одному из типов сообщения,соответственно,ВВЛ,МВЛ и СНГ*)  
  
In[ ]:= yMeans = {};  
  
In[ ]:= yMeans =  
  Join[yMeans, Table[ $\frac{\text{Sum}[\text{data}[[i, 8]] * \text{stringToMinutes}[\text{data}[[i, 7]]], \{i, \text{U}[[\alpha]]\}}{\text{Sum}[\text{c}[[\alpha, k]], \{k, K\}]}$ , {\alpha, 3}]]];  
(*1. Средний налет на одного БП по типу сообщения*)
```

```

In[ ]:= yMeans = Join[yMeans,
  Table[ $\frac{\text{Sum}[\text{data}[[i, 8]] * \text{stringToMinutes}[\text{data}[[i, 7]]], \{i, \text{nightU}[\alpha]\}]}{\text{Sum}[\text{c}[\alpha, k]], \{k, K\}]}, \{\alpha, 3\}]]];$ 
```

(*2. Средний ночной налет на одного БП по типу сообщения*)

```

In[ ]:= yMeans = Join[yMeans, Table[ $\frac{\text{Total}[\text{data}[[#, 8]] \& /@ \text{U}[\alpha]]}{\text{Sum}[\text{c}[\alpha, k]], \{k, K\}]}, \{\alpha, 3\}]]];$ 
```

(*3. Среднее количество связей на одного БП по типу сообщения*)

```

In[ ]:= M = Length[data] - 1; (*общее число связей*)
```

```

In[ ]:= nightM = Length[Select[data, nightQ[#[[2]]] &]]; (*общее число ночных связей*)
```

```

In[ ]:= yMeans = Join[yMeans, { $\frac{\text{nightM}}{K}$ }]; (*4. Общее количество ночных связей на рабочем столе*)
```

```

In[ ]:= T = DeleteDuplicates[data[[All, 1]] [[2 ;;]]];
```

```

In[ ]:= setD = Table[FirstPosition[data, #] [[1]] & /@ Select[data, MatchQ[#, {day, ___}]] &], {day, T}];
```

```

In[ ]:= yMeans = Join[yMeans, Table[ $\frac{\text{Length}[\text{setD}[\alpha]]}{K}$ , { $\alpha$ , Length@T}]]];
```

(*5. Общее количество связей в день для рабочего стола*)

```

In[ ]:= L = DeleteDuplicates[data[[All, 5]] [[2 ;;]]];
```

```

In[ ]:= A = Position[data, #] [[All, 1]] & /@ L;
```

```

In[ ]:= yMeans = Join[yMeans, Table[ $\frac{\text{Length}[A[\alpha]]}{K}$ , { $\alpha$ , Length@L}]]];
```

(*6. Общее количество связей по типу ВС для рабочего стола*)

```

In[ ]:= R = DeleteDuplicates[data[[All, 4]] [[2 ;;]]];
```

```

In[ ]:= S = Position[data, #] [[All, 1]] & /@ R;
```

```

In[ ]:= yMeans = Join[yMeans, Table[ $\frac{\text{Length}[S[\alpha]]}{K}$ , { $\alpha$ , Length@R}]]];
```

(*7. Общее количество связей по направлениям для рабочего стола*)

```

In[ ]:= yMeans
```

```

Out[ ]:= {1962.47, 1008.02, 315.615, 425.063, 505.494, 20.4789, 6.3062, 2.53964, 0.625745,  $\frac{203}{2}$ , 11,
 $\frac{34}{3}, \frac{23}{2}, \frac{67}{6}, \frac{35}{3}, \frac{35}{3}, \frac{73}{6}, 11, \frac{34}{3}, \frac{23}{2}, \frac{67}{6}, \frac{35}{3}, \frac{35}{3}, \frac{73}{6}, 11, \frac{34}{3}, \frac{23}{2}, \frac{67}{6}, \frac{35}{3}, \frac{35}{3}, \frac{73}{6}, 11,$ 
 $\frac{34}{3}, \frac{23}{2}, \frac{67}{6}, \frac{35}{3}, \frac{35}{3}, \frac{73}{6}, 11, \frac{34}{3}, \frac{23}{2}, \frac{227}{2}, \frac{727}{3}, \frac{9}{2}, \frac{31}{6}, \frac{88}{3}, \frac{31}{6}, \frac{31}{6}, \frac{31}{6}, \frac{31}{6}, \frac{23}{6},$ 
 $\frac{23}{6}, \frac{31}{2}, \frac{31}{6}, \frac{9}{2}, \frac{31}{2}, \frac{31}{6}, \frac{11}{3}, \frac{31}{6}, \frac{5}{3}, \frac{31}{6}, \frac{23}{6}, \frac{20}{3}, 19, \frac{31}{6}, \frac{11}{3}, \frac{31}{6}, \frac{31}{6}, \frac{31}{6}, \frac{31}{6}, \frac{31}{6}, \frac{31}{6},$ 
 $\frac{31}{6}, \frac{83}{6}, \frac{31}{6}, 26, \frac{19}{6}, \frac{13}{6}, \frac{31}{6}, \frac{31}{6}, \frac{31}{6}, \frac{31}{6}, \frac{31}{6}, \frac{31}{6}, \frac{31}{6}, \frac{31}{6}, \frac{26}{3}, \frac{31}{6}, \frac{17}{6}, \frac{3}{2}, \frac{4}{3}}$ 
```

```
ln[6]:= n = Length[yMeans];
```

Формирование тензора приращений

```
ln[7]:= Δ = Table[
  Table[
    j = Position[U, i][[1, 1]];
    (* какому типу сообщения относится связка i *)
    y1 = ConstantArray[0, 3];
    y1[[j]] =  $\frac{\text{data}[[i, 8]] * \text{stringToMinutes}[\text{data}[[i, 7]]]}{c[[j, k]]}$ ;
    (*1. Средний налет на одного БП
      по типу сообщения для связки i при попадании в группу k*)
    j = Position[nightU, i];
    (* какому типу сообщения относится связка i *)
    y2 = ConstantArray[0, 3];
    If[j == {}, , j = j[[1, 1]];
    y2[[j]] =  $\frac{\text{data}[[i, 8]] * \text{stringToMinutes}[\text{data}[[i, 7]]]}{c[[j, k]]}$ ];
    (*2. Средний ночной налет на одного
      БП по типу сообщения для связки i при попадании в группу k*)
    j = Position[U, i][[1, 1]];
    y3 = ConstantArray[0, 3];
    y3[[j]] =  $\frac{\text{data}[[i, 8]]}{c[[j, k]]}$ ;
    (*3. Среднее количество связей на одного
      БП по типу сообщения для связки i при попадании в группу k*)
    If[nightQ[data[[i, 2]]], y4 = {1}, y4 = {0}];
    (*4. Приращение количества ночных связей при попадании связки i в группу k*)
    y5 = If[MemberQ[#, i], 1, 0] & /@ setD;
    y6 = If[MemberQ[#, i], 1, 0] & /@ A;
    y7 = If[MemberQ[#, i], 1, 0] & /@ S;
    Join[y1, y2, y3, y4, y5, y6, y7],
    {k, K} (* группа *)
  ] // Transpose,
  {i, 2, M + 1} (* связка *)
]; (* тензор приращений *)
```

Импорт и первичная обработка решения эксперта

```

In[ ]:= Clear[expertDecisionFromExcelToGroups]
expertDecisionFromExcelToGroups[expertData_] := Module[{
  expertGroups = ConstantArray[{}, 6],
  expertDataHeader = expertData[[1]],
  expertDataRowLength = Length[expertData[[1]],
  expertDataInfoColumns = 3,
  expertDataInfo, groupNumber, date, airplaneType, bundle
},
Do[
  expertDataInfo = expertData[[expertDataRow]][[2 ;; expertDataInfoColumns]];
  Do[
    groupNumber =
      Interpreter["Integer"][expertData[[expertDataRow]][[expertDataRowColumn]]];
    date = Interpreter["Integer"][expertDataHeader[[expertDataRowColumn]]];
    airplaneType = StringTrim[expertDataInfo[[3]]];
    bundle = SelectFirst[data, #[[1]] == date &&
      #[[3]] == expertDataInfo[[1]] && #[[2]] == expertDataInfo[[2]] && #[[5]] == airplaneType &];
    If[IntegerQ[groupNumber], expertGroups = Insert[expertGroups,
      bundle, {groupNumber, -1}]],
    {expertDataRowColumn, expertDataInfoColumns + 1, expertDataRowLength}
  ],
  {expertDataRow, 3, Length[expertData]}
];
expertGroups
]

In[ ]:= expertData = Import[NotebookDirectory[] <> "data/Expert.xls", {"Data", 1}];

In[ ]:= expertGroups = expertDecisionFromExcelToGroups[expertData];

In[ ]:= expertGroupsWithProperties = Table[{expertGroups[[k]],
  Total[Δ[(FirstPosition[data, #][[1]] - 1)][All, k] & /@ (expertGroups[[k])]}], {k, K}];

In[ ]:= expertProperties = expertGroupsWithProperties[[All, 2]];

```

Сортировка связей

```

In[ ]:= sortData1 = data[[#]] & /@ Flatten[
  Table[ReverseSortBy[day, stringToMinutes[data[[#, 7]] * data[[#, 8]] &], {day, setD}]]];
(*сортировка связей по первому правилу*)

```

Реализация эвристических алгоритмов

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```

In[ ]:= Clear[getNumberOfGroupAndDelta]
getNumberOfGroupAndDelta[groups_, ideal_, candidate_, weights_] :=
  MinimalBy[
    Table[
      {numberOfGroup, Dot[weights,  $\frac{1}{ideal^2}$  candidate[[All, numberOfGroup]]
        (2 (- ideal + groups[[numberOfGroup]][[2]]) + candidate[[All, numberOfGroup]])]},
      {numberOfGroup, Length@groups}
    ],
    Last
  ][[1]]

In[ ]:= groups = ConstantArray[{{}}, ConstantArray[0, n]], K];

In[ ]:= w = Normalize[Table[ $\frac{1}{n}$ , {j, n}], Total]; (*Весовой коэффициент для каждой характеристики*)

In[ ]:= (*algorithm1=
  Nest[
    Module[
      {grs=#[[1]], candidates=#[[2]], numgr,delta,
        candidate,candidateNum,candidateVectors,candidateVector,gr},
      {numgr,delta,candidateVector,candidate}=First@MinimalBy[
        Table[
          candidateNum=(FirstPosition[Rest@data,candidate][[1]]);
          candidateVectors= $\Delta$ [[candidateNum]];
          gr=getNumberOfGroupAndDelta[grs,yMeans,candidateVectors,w];
          {gr[[1]],gr[[2]],candidateVectors[[All,gr[[1]]],candidate},
          {candidate,candidates}
        ],
        #[[2]]
      ];
      grs[[numgr,2]]+=candidateVector;
      AppendTo[grs[[numgr,1],candidate];
      {grs>DeleteCases[candidates,candidate,1,1]}
    ]&,
    {groups,data[[2;;101]]},
    100
  ]; //AbsoluteTiming*)

```

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```

In[ ]:= Clear[getNumberOfGroup]
getNumberOfGroup[groups_, ideal_, candidateVectors_, weights_] :=
  First@Ordering[Table[Dot[weights,  $\left(1 - \frac{\text{groups}[[\text{group}][[2]] + \text{candidateVectors}[[\text{All}, \text{group}]]}{\text{ideal}}\right)^2 -$ 
     $\left(1 - \frac{\text{groups}[[\text{group}][[2]]}{\text{ideal}}\right)^2$ ], {group, Length[groups]}], {1}]

In[ ]:= groups = ConstantArray[{{}}, ConstantArray[0, Length[yMeans]]], K];

In[ ]:= algorithm[initialData_, modifiedData_, ideal_, weights_] := Fold[
  Module[
    {bundle = #2, grs = #1, numgr, candidateNum, candidateVectors},
    candidateNum = (FirstPosition[initialData, bundle][[1]]);
    candidateVectors = Δ[candidateNum];
    numgr = getNumberOfGroup[grs, ideal, candidateVectors, weights];
    grs[[numgr, 2]] += candidateVectors[[All, numgr]];
    AppendTo[grs[[numgr, 1]], bundle];
    grs
  ] &,
  groups, modifiedData
]

In[ ]:= w = Normalize[Table[ $\frac{1}{n}$ , {j, n}], Total]; (*Весовой коэффициент для каждой характеристики*)

```

Алгоритм ЭА-2 (сортированные данные)

```

In[ ]:= algorithmGroupsWithProperties1 = algorithm[Rest@data, sortData1, yMeans, w];

In[ ]:= algorithmProperties1 = algorithmGroupsWithProperties1[[All, 2]];

```

Алгоритм ЭА-2 (не сортированные данные)

```

In[ ]:= algorithmGroupsWithProperties2 = algorithm[Rest@data, Rest@data, yMeans, w];

In[ ]:= algorithmProperties2 = algorithmGroupsWithProperties2[[All, 2]];

```

Генерация отчета для решения и сравнительной таблицы решений

```

In[ ]:= Clear[grid, span]
span[isTranspose_] := If[isTranspose, SpanFromAbove, SpanFromLeft]
grid[criteria_, typeColumns_, columns_, ourProperty_, ourPropertyLabel_,
  expertProperty_, expertPropertyLabel_, ideals_, isTranspose_ : False] := Module[
{K = ourProperty // Length,
  idealsWithTotal, table, criteriaOurGroup, criteriaExpertGroup, means, grid,},
idealsWithTotal = Join[Flatten[{ideals}], {Total[ideals]}];
idealsWithTotal = Map[N[Round[#, 10-2]] &, idealsWithTotal, {1}];
table = N[Table[
  criteriaOurGroup = Join[Flatten[{ourProperty[[group]]}], {Total[ourProperty[[group]]}]];
  criteriaExpertGroup =
    Join[Flatten[{expertProperty[[group]]}], {Total[expertProperty[[group]]}]];
  Join[{group}, Riffle[Riffle[criteriaOurGroup, criteriaExpertGroup], Riffle[
    criteriaOurGroup - idealsWithTotal, criteriaExpertGroup - idealsWithTotal]]],
  {group, K}
], 2];
table = Map[N[Round[#, 10-2]] &, table, {2}];
means = Max[#] - Min[#] & /@ Transpose[table[[All, 2 ;;]]];
means = means[[;; 2]];
means = Map[N[Round[#, 10-2]] &, means, {1}];
means = Flatten[If[Abs[#[[1]]] == Abs[#[[2]]], #, If[Abs[#[[1]]] < Abs[#[[2]]],
  {Item[#[[1]], Background → Green], Item[#[[2]], Background → Pink}}, {Item[#[[1]],
  Background → Pink], Item[#[[2]], Background → Green}}]] & /@ Partition[means, 2]];
means = Riffle[means, ConstantArray[span[isTranspose], Length@means]];
grid = {
  Join[{Rotate[Item[criteria, Alignment → Center], If[isTranspose, 90, 0] Degree]},
    ConstantArray[span[isTranspose], Length[table[[1]]] - 1]},
  Join[{typeColumns}, Flatten[Join[{#}, ConstantArray[span[isTranspose], 3]] & /@
    Join[columns, {"Bcero"}]]],
  Join[{"Идеальное"}, Flatten[Join[{#}, ConstantArray[span[isTranspose], 3]] & /@
    idealsWithTotal]],
  Join[{"№ группы"}, Flatten[Table[{ourPropertyLabel, "Δ", expertPropertyLabel, "Δ"},
    {Length@idealsWithTotal}]]],
  table[[1]], table[[2]], table[[3]], table[[4]], table[[5]], table[[6]],
  Join[{"max Δ - min Δ"}, means]
];
TextGrid[If[isTranspose, Transpose@grid, grid], Dividers → Automatic,
  Spacings → {1.2, 0.5}, ItemSize → Full, Alignment → {Center, Center}]
]

In[ ]:= Clear[report]
report[algorithmFirstProperties_, algorithmFirstLabel_, algorithmSecondProperties_,

```

```

algorithmSecondLabel_, ideals_, isTranspose_ : False] := Module[{column},
column = {
  grid["Налет на БП по типу сообщения", "Тип сообщения", V,
    algorithmFirstProperties[All, 1 ;; 3], algorithmFirstLabel, algorithmSecondProperties[
      All, 1 ;; 3], algorithmSecondLabel, ideals[;; 3], isTranspose],
  grid["Ночной налет на БП по типу сообщения", "Тип сообщения", V,
    algorithmFirstProperties[All, 4 ;; 6], algorithmFirstLabel, algorithmSecondProperties[
      All, 4 ;; 6], algorithmSecondLabel, ideals[4 ;; 6], isTranspose],
  grid["Среднее число связей на БП", "Тип сообщения", V, algorithmFirstProperties[
    All, 7 ;; 9], algorithmFirstLabel, algorithmSecondProperties[All, 7 ;; 9],
    algorithmSecondLabel, ideals[7 ;; 9], isTranspose],
  grid["Количество ночных связей", "", "По группам", algorithmFirstProperties[All, 10],
    algorithmFirstLabel, algorithmSecondProperties[All, 10],
    algorithmSecondLabel, ideals[10], isTranspose],
  grid["Количество связей по типу воздушного судна", "Тип судна", L,
    algorithmFirstProperties[All, 11 + Length@T ;; 10 + Length@T + Length@L],
    algorithmFirstLabel, algorithmSecondProperties[All,
      11 + Length@T ;; 10 + Length@T + Length@L], algorithmSecondLabel,
    ideals[11 + Length@T ;; 10 + Length@T + Length@L], isTranspose],
  grid["Количество связей в день", "Дни", T, algorithmFirstProperties[All,
    11 ;; 10 + Length@T], algorithmFirstLabel, algorithmSecondProperties[All,
    11 ;; 10 + Length@T], algorithmSecondLabel, ideals[11 ;; 10 + Length@T], True],
  grid[
    "Количество связей по направлениям",
    "Направление",
    R,
    algorithmFirstProperties[All,
      11 + Length@T + Length@L ;; 10 + Length@T + Length@L + Length@R],
    algorithmFirstLabel,
    algorithmSecondProperties[All,
      11 + Length@T + Length@L ;; 10 + Length@T + Length@L + Length@R],
    algorithmSecondLabel,
    ideals[11 + Length@T + Length@L ;; 10 + Length@T + Length@L + Length@R],
    True
  ]
};
DocumentNotebook[
  Riffle[
    TextCell[#, "Section"] & /@ {"Налет на БП по типу сообщения",
      "Ночной налет на БП по типу сообщения", "Среднее число связей на БП",
      "Количество ночных связей", "Количество связей по типу воздушного судна",
      "Количество связей в день", "Количество связей по направлениям"},
    CellGroup[#,] & /@ column
  ]
]
]

```



```
ln[ ]:= report[algorithmProperties1, "ЭА-2", expertProperties, "Эксперт", yMeans];
(*Алгоритм ЭА-2 (не сортированные данные) vs Распределение эксперта*)
```

```
ln[ ]:= report[algorithmProperties1, "ЭА-2", algorithmProperties2, "ЭА-2 Сорт", yMeans, True];
(*Алгоритм ЭА-2 (сортированные данные) vs Алгоритм ЭА-2 (не сортированные данные)*)
```

```
ln[ ]:= report[algorithmProperties2, "ЭА-2 Сорт", expertProperties, "Эксперт", yMeans]
(*Алгоритм ЭА-2 (сортированные данные) vs Распределение эксперта*)
```



Налет на БП по типу сообщения

| Налет на БП по типу сообщения | | | | | | | | |
|-------------------------------|-----------|--------|---------|--------|-----------|--------|---------|--------|
| Тип сообщения | ВВЛ | | | | МВЛ | | | |
| Идеальное | 1962.47 | | | | 1008.02 | | | |
| № группы | ЭА-2 Сорт | Δ | Эксперт | Δ | ЭА-2 Сорт | Δ | Эксперт | Δ |
| 1. | 1969.65 | 7.18 | 2048.63 | 86.16 | 1012.1 | 4.08 | 1003.09 | -4.93 |
| 2. | 2021.65 | 59.18 | 1975.9 | 13.43 | 1015.43 | 7.41 | 1048.12 | 40.1 |
| 3. | 1915.56 | -46.91 | 1888.05 | -74.42 | 1013.13 | 5.11 | 921.47 | -86.55 |
| 4. | 1951.71 | -10.76 | 1953.17 | -9.3 | 999.01 | -9.01 | 1033.82 | 25.8 |
| 5. | 2040.75 | 78.28 | 1985.69 | 23.22 | 1012.7 | 4.68 | 1060.59 | 52.57 |
| 6. | 1883.19 | -79.28 | 1928.24 | -34.23 | 996.43 | -11.59 | 986.41 | -21.61 |
| max Δ – min Δ | 157.56 | | 160.58 | | 19. | | 139.12 | |

Ночной налет на БП по типу сообщения

| Ночной налет на БП по типу сообщения | | | | | | | | |
|--------------------------------------|-----------|-------|---------|--------|-----------|--------|---------|--------|
| Тип сообщения | ВВЛ | | | | МВЛ | | | |
| Идеальное | 425.06 | | | | 505.49 | | | |
| № группы | ЭА-2 Сорт | Δ | Эксперт | Δ | ЭА-2 Сорт | Δ | Эксперт | Δ |
| 1. | 423.61 | -1.45 | 410.83 | -14.23 | 506.84 | 1.35 | 493.08 | -12.41 |
| 2. | 417.86 | -7.2 | 401.21 | -23.85 | 523.44 | 17.95 | 501.53 | -3.96 |
| 3. | 430.79 | 5.73 | 479.92 | 54.86 | 509.23 | 3.74 | 417.93 | -87.56 |
| 4. | 419.02 | -6.04 | 423.42 | -1.64 | 504.86 | -0.63 | 618.92 | 113.43 |
| 5. | 440.48 | 15.42 | 385.58 | -39.48 | 506.11 | 0.62 | 506.75 | 1.26 |
| 6. | 418.86 | -6.2 | 445.46 | 20.4 | 483.65 | -21.84 | 496.59 | -8.9 |
| max Δ – min Δ | 22.62 | | 94.34 | | 39.79 | | 200.99 | |

Среднее число связей на БП

| Среднее число связей на БП | | | | | | | | | |
|----------------------------|-----------|------|---------|------|-----------|------|---------|------|----|
| Тип сообщения | ВВЛ | | | | МВЛ | | | | |
| Идеальное | 6.31 | | | | 2.54 | | | | |
| № группы | ЭА-2 Сорт | Δ | Эксперт | Δ | ЭА-2 Сорт | Δ | Эксперт | Δ | ЭА |
| 1. | 6.32 | 0.01 | 6.41 | 0.1 | 2.54 | 0. | 2.55 | 0.01 | |
| 2. | 6.57 | 0.26 | 6.42 | 0.11 | 2.55 | 0.01 | 2.7 | 0.16 | |

| | | | | | | | | | |
|-----------------------------|------|-------|------|-------|------|-------|------|-------|--|
| 3. | 6.09 | -0.22 | 6.18 | -0.13 | 2.55 | 0.01 | 2.36 | -0.18 | |
| 4. | 6.28 | -0.03 | 6.2 | -0.11 | 2.53 | -0.01 | 2.53 | -0.01 | |
| 5. | 6.54 | 0.23 | 6.47 | 0.16 | 2.55 | 0.01 | 2.58 | 0.04 | |
| 6. | 6.06 | -0.25 | 6.17 | -0.14 | 2.53 | -0.01 | 2.53 | -0.01 | |
| max Δ – min Δ | 0.51 | | 0.3 | | 0.02 | | 0.34 | | |

Количество ночных связей

| Количество ночных связей | | | | | | | | |
|-----------------------------|------------|----------|---------|----------|-----------|----------|---------|----------|
| | По группам | | | | Всего | | | |
| Идеальное | 101.5 | | | | 101.5 | | | |
| № группы | ЭА–2 Сорт | Δ | Эксперт | Δ | ЭА–2 Сорт | Δ | Эксперт | Δ |
| 1. | 100. | -1.5 | 100. | -1.5 | 100. | -1.5 | 100. | -1.5 |
| 2. | 99. | -2.5 | 100. | -1.5 | 99. | -2.5 | 100. | -1.5 |
| 3. | 103. | 1.5 | 101. | -0.5 | 103. | 1.5 | 101. | -0.5 |
| 4. | 103. | 1.5 | 108. | 6.5 | 103. | 1.5 | 108. | 6.5 |
| 5. | 102. | 0.5 | 95. | -6.5 | 102. | 0.5 | 95. | -6.5 |
| 6. | 102. | 0.5 | 105. | 3.5 | 102. | 0.5 | 105. | 3.5 |
| max Δ – min Δ | 4. | | 13. | | 4. | | 13. | |

Количество связей по типу воздушного судна

| Количество связей по типу воздушного судна | | | | | | | | | |
|--|-----------|----------|---------|----------|-----------|----------|---------|----------|------|
| Тип судна | А 320 | | | | А 319 | | | | |
| Идеальное | 113.5 | | | | 242.33 | | | | |
| № группы | ЭА–2 Сорт | Δ | Эксперт | Δ | ЭА–2 Сорт | Δ | Эксперт | Δ | ЭА–2 |
| 1. | 114. | 0.5 | 122. | 8.5 | 240. | -2.33 | 236. | -6.33 | 35 |
| 2. | 111. | -2.5 | 116. | 2.5 | 245. | 2.67 | 239. | -3.33 | 35 |
| 3. | 115. | 1.5 | 102. | -11.5 | 241. | -1.33 | 254. | 11.67 | 35 |
| 4. | 115. | 1.5 | 109. | -4.5 | 241. | -1.33 | 245. | 2.67 | 35 |
| 5. | 111. | -2.5 | 116. | 2.5 | 246. | 3.67 | 237. | -5.33 | 35 |
| 6. | 115. | 1.5 | 116. | 2.5 | 241. | -1.33 | 243. | 0.67 | 35 |
| max Δ – min Δ | 4. | | 20. | | 6. | | 18. | | |

Количество связей в день

| | Дни | Идеальное | № группы | 1. | 2. | 3. | 4. | 5. | 6. | max Δ – min Δ |
|----|-------|-----------|-----------|-------|-------|-------|-------|-------|-------|-----------------------------|
| 1. | 11. | | ЭА–2 Сорт | 11. | 11. | 11. | 11. | 11. | 11. | 0. |
| | | | Δ | 0. | 0. | 0. | 0. | 0. | 0. | |
| | | | Эксперт | 13. | 11. | 10. | 11. | 9. | 12. | 4. |
| | | | Δ | 2. | 0. | -1. | 0. | -2. | 1. | |
| 2. | 11.33 | | ЭА–2 Сорт | 11. | 12. | 11. | 11. | 12. | 11. | 1. |
| | | | Δ | -0.33 | 0.67 | -0.33 | -0.33 | 0.67 | -0.33 | |
| | | | Эксперт | 11. | 9. | 14. | 12. | 11. | 11. | 5. |
| | | | Δ | -0.33 | -2.33 | 2.67 | 0.67 | -0.33 | -0.33 | |

| | | | | | | | | | |
|-----|-------|-----------|-------|-------|-------|-------|-------|-------|----|
| 3. | 11.5 | ЭА-2 Сорт | 13. | 11. | 11. | 11. | 12. | 11. | 2. |
| | | Δ | 1.5 | -0.5 | -0.5 | -0.5 | 0.5 | -0.5 | |
| | | Эксперт | 9. | 16. | 11. | 8. | 13. | 12. | 8. |
| | | Δ | -2.5 | 4.5 | -0.5 | -3.5 | 1.5 | 0.5 | |
| 4. | 11.17 | ЭА-2 Сорт | 11. | 12. | 11. | 11. | 11. | 11. | 1. |
| | | Δ | -0.17 | 0.83 | -0.17 | -0.17 | -0.17 | -0.17 | |
| | | Эксперт | 13. | 10. | 12. | 12. | 8. | 12. | 5. |
| | | Δ | 1.83 | -1.17 | 0.83 | 0.83 | -3.17 | 0.83 | |
| 5. | 11.67 | ЭА-2 Сорт | 12. | 11. | 11. | 12. | 12. | 12. | 1. |
| | | Δ | 0.33 | -0.67 | -0.67 | 0.33 | 0.33 | 0.33 | |
| | | Эксперт | 10. | 13. | 12. | 13. | 12. | 10. | 3. |
| | | Δ | -1.67 | 1.33 | 0.33 | 1.33 | 0.33 | -1.67 | |
| 6. | 11.67 | ЭА-2 Сорт | 11. | 12. | 13. | 11. | 11. | 12. | 2. |
| | | Δ | -0.67 | 0.33 | 1.33 | -0.67 | -0.67 | 0.33 | |
| | | Эксперт | 13. | 11. | 10. | 11. | 13. | 12. | 3. |
| | | Δ | 1.33 | -0.67 | -1.67 | -0.67 | 1.33 | 0.33 | |
| 7. | 12.17 | ЭА-2 Сорт | 12. | 12. | 12. | 12. | 13. | 12. | 1. |
| | | Δ | -0.17 | -0.17 | -0.17 | -0.17 | 0.83 | -0.17 | |
| | | Эксперт | 12. | 12. | 12. | 12. | 11. | 14. | 3. |
| | | Δ | -0.17 | -0.17 | -0.17 | -0.17 | -1.17 | 1.83 | |
| 8. | 11. | ЭА-2 Сорт | 11. | 11. | 11. | 12. | 11. | 10. | 2. |
| | | Δ | 0. | 0. | 0. | 1. | 0. | -1. | |
| | | Эксперт | 11. | 10. | 12. | 13. | 10. | 10. | 3. |
| | | Δ | 0. | -1. | 1. | 2. | -1. | -1. | |
| 9. | 11.33 | ЭА-2 Сорт | 11. | 12. | 11. | 11. | 12. | 11. | 1. |
| | | Δ | -0.33 | 0.67 | -0.33 | -0.33 | 0.67 | -0.33 | |
| | | Эксперт | 11. | 13. | 11. | 10. | 12. | 11. | 3. |
| | | Δ | -0.33 | 1.67 | -0.33 | -1.33 | 0.67 | -0.33 | |
| 10. | 11.5 | ЭА-2 Сорт | 12. | 12. | 11. | 11. | 12. | 11. | 1. |
| | | Δ | 0.5 | 0.5 | -0.5 | -0.5 | 0.5 | -0.5 | |
| | | Эксперт | 11. | 10. | 11. | 13. | 13. | 11. | 3. |
| | | Δ | -0.5 | -1.5 | -0.5 | 1.5 | 1.5 | -0.5 | |
| 11. | 11.17 | ЭА-2 Сорт | 11. | 12. | 11. | 11. | 11. | 11. | 1. |
| | | Δ | -0.17 | 0.83 | -0.17 | -0.17 | -0.17 | -0.17 | |
| | | Эксперт | 12. | 10. | 12. | 12. | 11. | 10. | 2. |
| | | Δ | 0.83 | -1.17 | 0.83 | 0.83 | -0.17 | -1.17 | |
| 12. | 11.67 | ЭА-2 Сорт | 12. | 11. | 12. | 12. | 12. | 11. | 1. |
| | | Δ | 0.33 | -0.67 | 0.33 | 0.33 | 0.33 | -0.67 | |
| | | Эксперт | 12. | 12. | 11. | 10. | 12. | 13. | 3. |
| | | Δ | 0.33 | 0.33 | -0.67 | -1.67 | 0.33 | 1.33 | |
| | | ЭА-2 Сорт | 11. | 12. | 11. | 12. | 12. | 12. | 1. |

| | | | | | | | | | | |
|--------------------------|-----|-------|-----------|-------|-------|-------|-------|-------|-------|----|
| Количество связей в день | 13. | 11.67 | Δ | -0.67 | 0.33 | -0.67 | 0.33 | 0.33 | 0.33 | |
| | | | Эксперт | 11. | 11. | 12. | 11. | 11. | 14. | 3. |
| | | | Δ | -0.67 | -0.67 | 0.33 | -0.67 | -0.67 | 2.33 | |
| | 14. | 12.17 | ЭА-2 Сорт | 12. | 12. | 12. | 13. | 12. | 12. | 1. |
| | | | Δ | -0.17 | -0.17 | -0.17 | 0.83 | -0.17 | -0.17 | |
| | | | Эксперт | 12. | 13. | 11. | 12. | 11. | 14. | 3. |
| | | | Δ | -0.17 | 0.83 | -1.17 | -0.17 | -1.17 | 1.83 | |
| | 15. | 11. | ЭА-2 Сорт | 11. | 10. | 12. | 11. | 11. | 11. | 2. |
| | | | Δ | 0. | -1. | 1. | 0. | 0. | 0. | |
| | | | Эксперт | 12. | 12. | 10. | 10. | 12. | 10. | 2. |
| | | | Δ | 1. | 1. | -1. | -1. | 1. | -1. | |
| | 16. | 11.33 | ЭА-2 Сорт | 11. | 11. | 12. | 11. | 11. | 12. | 1. |
| | | | Δ | -0.33 | -0.33 | 0.67 | -0.33 | -0.33 | 0.67 | |
| | | | Эксперт | 11. | 11. | 14. | 12. | 10. | 10. | 4. |
| | | | Δ | -0.33 | -0.33 | 2.67 | 0.67 | -1.33 | -1.33 | |
| | 17. | 11.5 | ЭА-2 Сорт | 11. | 11. | 12. | 12. | 11. | 12. | 1. |
| | | | Δ | -0.5 | -0.5 | 0.5 | 0.5 | -0.5 | 0.5 | |
| | | | Эксперт | 10. | 12. | 12. | 13. | 10. | 12. | 3. |
| | | | Δ | -1.5 | 0.5 | 0.5 | 1.5 | -1.5 | 0.5 | |
| | 18. | 11.17 | ЭА-2 Сорт | 11. | 11. | 11. | 11. | 12. | 11. | 1. |
| | | | Δ | -0.17 | -0.17 | -0.17 | -0.17 | 0.83 | -0.17 | |
| | | | Эксперт | 12. | 10. | 10. | 11. | 13. | 11. | 3. |
| | | | Δ | 0.83 | -1.17 | -1.17 | -0.17 | 1.83 | -0.17 | |
| | 19. | 11.67 | ЭА-2 Сорт | 12. | 11. | 12. | 12. | 11. | 12. | 1. |
| | | | Δ | 0.33 | -0.67 | 0.33 | 0.33 | -0.67 | 0.33 | |
| | | | Эксперт | 11. | 11. | 11. | 12. | 14. | 11. | 3. |
| | | | Δ | -0.67 | -0.67 | -0.67 | 0.33 | 2.33 | -0.67 | |
| | 20. | 11.67 | ЭА-2 Сорт | 11. | 12. | 12. | 11. | 12. | 12. | 1. |
| | | | Δ | -0.67 | 0.33 | 0.33 | -0.67 | 0.33 | 0.33 | |
| | | | Эксперт | 12. | 12. | 12. | 11. | 10. | 13. | 3. |
| | | | Δ | 0.33 | 0.33 | 0.33 | -0.67 | -1.67 | 1.33 | |
| | 21. | 12.17 | ЭА-2 Сорт | 12. | 12. | 12. | 12. | 12. | 13. | 1. |
| | | | Δ | -0.17 | -0.17 | -0.17 | -0.17 | -0.17 | 0.83 | |
| | | | Эксперт | 12. | 15. | 12. | 11. | 12. | 11. | 4. |
| | | | Δ | -0.17 | 2.83 | -0.17 | -1.17 | -0.17 | -1.17 | |
| | 22. | 11. | ЭА-2 Сорт | 11. | 11. | 11. | 11. | 11. | 11. | 0. |
| | | | Δ | 0. | 0. | 0. | 0. | 0. | 0. | |
| | | | Эксперт | 13. | 10. | 11. | 11. | 11. | 10. | 3. |
| | | | Δ | 2. | -1. | 0. | 0. | 0. | -1. | |
| | 23. | 11.33 | ЭА-2 Сорт | 11. | 12. | 12. | 12. | 10. | 11. | 2. |
| | | | Δ | -0.33 | 0.67 | 0.67 | 0.67 | -1.33 | -0.33 | |
| | | | Эксперт | 9. | 12. | 13. | 11. | 11. | 12. | |

| | | | | | | | | | |
|-------|--------|-----------|-------|-------|-------|-------|-------|-------|----|
| | | Δ | -2.33 | 0.67 | 1.67 | -0.33 | -0.33 | 0.67 | 4. |
| 24. | 11.5 | ЭА-2 Сорт | 12. | 13. | 11. | 11. | 11. | 11. | 2. |
| | | Δ | 0.5 | 1.5 | -0.5 | -0.5 | -0.5 | -0.5 | |
| | | Эксперт | 12. | 10. | 11. | 12. | 11. | 13. | 3. |
| | | Δ | 0.5 | -1.5 | -0.5 | 0.5 | -0.5 | 1.5 | |
| 25. | 11.17 | ЭА-2 Сорт | 11. | 11. | 11. | 11. | 11. | 12. | 1. |
| | | Δ | -0.17 | -0.17 | -0.17 | -0.17 | -0.17 | 0.83 | |
| | | Эксперт | 12. | 10. | 9. | 13. | 12. | 11. | 4. |
| | | Δ | 0.83 | -1.17 | -2.17 | 1.83 | 0.83 | -0.17 | |
| 26. | 11.67 | ЭА-2 Сорт | 12. | 11. | 12. | 11. | 12. | 12. | 1. |
| | | Δ | 0.33 | -0.67 | 0.33 | -0.67 | 0.33 | 0.33 | |
| | | Эксперт | 10. | 14. | 13. | 9. | 12. | 12. | 5. |
| | | Δ | -1.67 | 2.33 | 1.33 | -2.67 | 0.33 | 0.33 | |
| 27. | 11.67 | ЭА-2 Сорт | 11. | 11. | 12. | 13. | 11. | 12. | 2. |
| | | Δ | -0.67 | -0.67 | 0.33 | 1.33 | -0.67 | 0.33 | |
| | | Эксперт | 13. | 12. | 12. | 11. | 10. | 12. | 3. |
| | | Δ | 1.33 | 0.33 | 0.33 | -0.67 | -1.67 | 0.33 | |
| 28. | 12.17 | ЭА-2 Сорт | 12. | 13. | 12. | 12. | 12. | 12. | 1. |
| | | Δ | -0.17 | 0.83 | -0.17 | -0.17 | -0.17 | -0.17 | |
| | | Эксперт | 12. | 10. | 13. | 13. | 12. | 13. | 3. |
| | | Δ | -0.17 | -2.17 | 0.83 | 0.83 | -0.17 | 0.83 | |
| 29. | 11. | ЭА-2 Сорт | 11. | 11. | 11. | 11. | 11. | 11. | 0. |
| | | Δ | 0. | 0. | 0. | 0. | 0. | 0. | |
| | | Эксперт | 10. | 12. | 12. | 12. | 10. | 10. | 2. |
| | | Δ | -1. | 1. | 1. | 1. | -1. | -1. | |
| 30. | 11.33 | ЭА-2 Сорт | 12. | 11. | 11. | 11. | 12. | 11. | 1. |
| | | Δ | 0.67 | -0.33 | -0.33 | -0.33 | 0.67 | -0.33 | |
| | | Эксперт | 12. | 11. | 11. | 9. | 15. | 10. | 6. |
| | | Δ | 0.67 | -0.33 | -0.33 | -2.33 | 3.67 | -1.33 | |
| 31. | 11.5 | ЭА-2 Сорт | 11. | 11. | 11. | 12. | 12. | 12. | 1. |
| | | Δ | -0.5 | -0.5 | -0.5 | 0.5 | 0.5 | 0.5 | |
| | | Эксперт | 14. | 10. | 9. | 13. | 11. | 12. | 5. |
| | | Δ | 2.5 | -1.5 | -2.5 | 1.5 | -0.5 | 0.5 | |
| Всего | 355.83 | ЭА-2 Сорт | 354. | 356. | 356. | 356. | 357. | 356. | 3. |
| | | Δ | -1.83 | 0.17 | 0.17 | 0.17 | 1.17 | 0.17 | |
| | | Эксперт | 358. | 355. | 356. | 354. | 353. | 359. | 6. |
| | | Δ | 2.17 | -0.83 | 0.17 | -1.83 | -2.83 | 3.17 | |

Количество связей по направлениям

| Направление | Идеальное | № группы | 1. | 2. | 3. | 4. | 5. | 6. | max Δ |
|-------------|-----------|----------|----|----|----|----|----|----|--------------|
| ЭА-2 Сорт | | | 5 | 4 | 5 | 4 | 5 | 4 | |

Out[]:=

| | | | | | | | | | |
|---------|-------|-----------|-------|-------|-------|-------|-------|-------|--|
| city 61 | 4.5 | ЭА-2 Сорт | 5. | 4. | 5. | 4. | 5. | 4. | |
| | | Δ | 0.5 | -0.5 | 0.5 | -0.5 | 0.5 | -0.5 | |
| | | Эксперт | 4. | 2. | 7. | 4. | 4. | 6. | |
| city 60 | 5.17 | ЭА-2 Сорт | 5. | 5. | 5. | 6. | 5. | 5. | |
| | | Δ | -0.17 | -0.17 | -0.17 | 0.83 | -0.17 | -0.17 | |
| | | Эксперт | 6. | 8. | 2. | 5. | 3. | 7. | |
| city 23 | 29.33 | ЭА-2 Сорт | 28. | 32. | 28. | 29. | 31. | 28. | |
| | | Δ | -1.33 | 2.67 | -1.33 | -0.33 | 1.67 | -1.33 | |
| | | Эксперт | 23. | 30. | 30. | 27. | 41. | 25. | |
| city 32 | 5.17 | ЭА-2 Сорт | 5. | 6. | 5. | 5. | 5. | 5. | |
| | | Δ | -0.17 | 0.83 | -0.17 | -0.17 | -0.17 | -0.17 | |
| | | Эксперт | 3. | 4. | 6. | 8. | 8. | 2. | |
| city 8 | 10.33 | ЭА-2 Сорт | 10. | 11. | 10. | 10. | 10. | 11. | |
| | | Δ | -0.33 | 0.67 | -0.33 | -0.33 | -0.33 | 0.67 | |
| | | Эксперт | 15. | 7. | 17. | 8. | 8. | 7. | |
| city 47 | 5.17 | ЭА-2 Сорт | 5. | 5. | 5. | 6. | 5. | 5. | |
| | | Δ | -0.17 | -0.17 | -0.17 | 0.83 | -0.17 | -0.17 | |
| | | Эксперт | 7. | 3. | 5. | 7. | 3. | 6. | |
| city 52 | 5.17 | ЭА-2 Сорт | 6. | 5. | 5. | 5. | 5. | 5. | |
| | | Δ | 0.83 | -0.17 | -0.17 | -0.17 | -0.17 | -0.17 | |
| | | Эксперт | 7. | 4. | 3. | 6. | 6. | 5. | |
| city 1 | 5.17 | ЭА-2 Сорт | 5. | 5. | 6. | 5. | 5. | 5. | |
| | | Δ | -0.17 | -0.17 | 0.83 | -0.17 | -0.17 | -0.17 | |
| | | Эксперт | 3. | 9. | 6. | 3. | 5. | 5. | |
| city 50 | 3.83 | ЭА-2 Сорт | 3. | 4. | 4. | 4. | 4. | 4. | |
| | | Δ | -0.83 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | |
| | | Эксперт | 1. | 6. | 3. | 5. | 4. | 4. | |
| city 34 | 3.83 | ЭА-2 Сорт | 4. | 4. | 4. | 3. | 4. | 4. | |
| | | Δ | 0.17 | 0.17 | 0.17 | -0.83 | 0.17 | 0.17 | |
| | | Эксперт | 4. | 5. | 5. | 1. | 3. | 5. | |
| | | ЭА-2 Сорт | 15. | 16. | 15. | 15. | 16. | 16. | |
| | | Δ | -0.5 | 0.5 | -0.5 | -0.5 | 0.5 | 0.5 | |

| | | | | | | | | | |
|---------|------|-----------|-------|-------|-------|-------|-------|-------|--|
| city 9 | 15.5 | Эксперт | 14. | 20. | 13. | 11. | 13. | 22. | |
| | | Δ | -1.5 | 4.5 | -2.5 | -4.5 | -2.5 | 6.5 | |
| city 39 | 5.17 | ЭА-2 Сорт | 5. | 5. | 5. | 5. | 5. | 6. | |
| | | Δ | -0.17 | -0.17 | -0.17 | -0.17 | -0.17 | 0.83 | |
| | | Эксперт | 6. | 7. | 7. | 0. | 5. | 6. | |
| | | Δ | 0.83 | 1.83 | 1.83 | -5.17 | -0.17 | 0.83 | |
| city 46 | 4.5 | ЭА-2 Сорт | 4. | 5. | 5. | 4. | 5. | 4. | |
| | | Δ | -0.5 | 0.5 | 0.5 | -0.5 | 0.5 | -0.5 | |
| | | Эксперт | 6. | 3. | 4. | 7. | 2. | 5. | |
| | | Δ | 1.5 | -1.5 | -0.5 | 2.5 | -2.5 | 0.5 | |
| city 20 | 15.5 | ЭА-2 Сорт | 15. | 16. | 16. | 15. | 16. | 15. | |
| | | Δ | -0.5 | 0.5 | 0.5 | -0.5 | 0.5 | -0.5 | |
| | | Эксперт | 12. | 13. | 16. | 18. | 16. | 18. | |
| | | Δ | -3.5 | -2.5 | 0.5 | 2.5 | 0.5 | 2.5 | |
| city 31 | 5.17 | ЭА-2 Сорт | 5. | 5. | 6. | 5. | 5. | 5. | |
| | | Δ | -0.17 | -0.17 | 0.83 | -0.17 | -0.17 | -0.17 | |
| | | Эксперт | 4. | 3. | 4. | 9. | 6. | 5. | |
| | | Δ | -1.17 | -2.17 | -1.17 | 3.83 | 0.83 | -0.17 | |
| city 55 | 3.67 | ЭА-2 Сорт | 4. | 3. | 4. | 4. | 3. | 4. | |
| | | Δ | 0.33 | -0.67 | 0.33 | 0.33 | -0.67 | 0.33 | |
| | | Эксперт | 2. | 4. | 3. | 5. | 5. | 3. | |
| | | Δ | -1.67 | 0.33 | -0.67 | 1.33 | 1.33 | -0.67 | |
| city 33 | 5.17 | ЭА-2 Сорт | 5. | 5. | 5. | 5. | 5. | 6. | |
| | | Δ | -0.17 | -0.17 | -0.17 | -0.17 | -0.17 | 0.83 | |
| | | Эксперт | 8. | 7. | 5. | 1. | 7. | 3. | |
| | | Δ | 2.83 | 1.83 | -0.17 | -4.17 | 1.83 | -2.17 | |
| city 42 | 1.67 | ЭА-2 Сорт | 2. | 1. | 2. | 1. | 2. | 2. | |
| | | Δ | 0.33 | -0.67 | 0.33 | -0.67 | 0.33 | 0.33 | |
| | | Эксперт | 0. | 2. | 3. | 0. | 3. | 2. | |
| | | Δ | -1.67 | 0.33 | 1.33 | -1.67 | 1.33 | 0.33 | |
| city 36 | 5.17 | ЭА-2 Сорт | 5. | 5. | 6. | 5. | 5. | 5. | |
| | | Δ | -0.17 | -0.17 | 0.83 | -0.17 | -0.17 | -0.17 | |
| | | Эксперт | 3. | 6. | 5. | 4. | 7. | 6. | |
| | | Δ | -2.17 | 0.83 | -0.17 | -1.17 | 1.83 | 0.83 | |
| city 44 | 3.83 | ЭА-2 Сорт | 4. | 4. | 3. | 4. | 4. | 4. | |
| | | Δ | 0.17 | 0.17 | -0.83 | 0.17 | 0.17 | 0.17 | |
| | | Эксперт | 4. | 3. | 6. | 6. | 0. | 4. | |
| | | Δ | 0.17 | -0.83 | 2.17 | 2.17 | -3.83 | 0.17 | |
| city 45 | 6.67 | ЭА-2 Сорт | 6. | 7. | 7. | 7. | 6. | 7. | |
| | | Δ | -0.67 | 0.33 | 0.33 | 0.33 | -0.67 | 0.33 | |
| | | Эксперт | 9. | 5. | 6. | 8. | 4. | 8. | |

| | | | | | | | | | | |
|-----------------------------------|---------|-------|-----------|-------|-------|-------|-------|-------|-------|--|
| Количество связей по направлениям | | | Δ | 2.33 | -1.67 | -0.67 | 1.33 | -2.67 | 1.33 | |
| | city 6 | 19. | ЭА-2 Сорт | 19. | 19. | 18. | 20. | 19. | 19. | |
| | | | Δ | 0. | 0. | -1. | 1. | 0. | 0. | |
| | | | Эксперт | 15. | 18. | 21. | 21. | 22. | 17. | |
| | | | Δ | -4. | -1. | 2. | 2. | 3. | -2. | |
| | city 58 | 5.17 | ЭА-2 Сорт | 5. | 6. | 5. | 5. | 5. | 5. | |
| | | | Δ | -0.17 | 0.83 | -0.17 | -0.17 | -0.17 | -0.17 | |
| | | | Эксперт | 5. | 6. | 4. | 5. | 5. | 6. | |
| | | | Δ | -0.17 | 0.83 | -1.17 | -0.17 | -0.17 | 0.83 | |
| | city 37 | 3.67 | ЭА-2 Сорт | 4. | 3. | 4. | 3. | 4. | 4. | |
| | | | Δ | 0.33 | -0.67 | 0.33 | -0.67 | 0.33 | 0.33 | |
| | | | Эксперт | 3. | 4. | 3. | 5. | 4. | 3. | |
| | | | Δ | -0.67 | 0.33 | -0.67 | 1.33 | 0.33 | -0.67 | |
| | city 24 | 10.33 | ЭА-2 Сорт | 10. | 10. | 10. | 11. | 10. | 11. | |
| | | | Δ | -0.33 | -0.33 | -0.33 | 0.67 | -0.33 | 0.67 | |
| | | | Эксперт | 13. | 9. | 9. | 10. | 11. | 10. | |
| | | | Δ | 2.67 | -1.33 | -1.33 | -0.33 | 0.67 | -0.33 | |
| | city 41 | 5.17 | ЭА-2 Сорт | 5. | 5. | 5. | 6. | 5. | 5. | |
| | | | Δ | -0.17 | -0.17 | -0.17 | 0.83 | -0.17 | -0.17 | |
| | | | Эксперт | 6. | 5. | 5. | 5. | 5. | 5. | |
| | | | Δ | 0.83 | -0.17 | -0.17 | -0.17 | -0.17 | -0.17 | |
| | city 2 | 10.33 | ЭА-2 Сорт | 11. | 10. | 10. | 11. | 10. | 10. | |
| | | | Δ | 0.67 | -0.33 | -0.33 | 0.67 | -0.33 | -0.33 | |
| | | | Эксперт | 8. | 9. | 12. | 12. | 10. | 11. | |
| | | | Δ | -2.33 | -1.33 | 1.67 | 1.67 | -0.33 | 0.67 | |
| | city 15 | 10.33 | ЭА-2 Сорт | 11. | 11. | 10. | 10. | 10. | 10. | |
| | | | Δ | 0.67 | 0.67 | -0.33 | -0.33 | -0.33 | -0.33 | |
| | | | Эксперт | 16. | 11. | 3. | 8. | 13. | 11. | |
| | | | Δ | 5.67 | 0.67 | -7.33 | -2.33 | 2.67 | 0.67 | |
| | city 3 | 5.17 | ЭА-2 Сорт | 5. | 5. | 5. | 5. | 5. | 6. | |
| | | | Δ | -0.17 | -0.17 | -0.17 | -0.17 | -0.17 | 0.83 | |
| | | | Эксперт | 7. | 2. | 4. | 9. | 7. | 2. | |
| | | | Δ | 1.83 | -3.17 | -1.17 | 3.83 | 1.83 | -3.17 | |
| | city 7 | 10.33 | ЭА-2 Сорт | 10. | 10. | 10. | 11. | 11. | 10. | |
| | | | Δ | -0.33 | -0.33 | -0.33 | 0.67 | 0.67 | -0.33 | |
| | | | Эксперт | 11. | 8. | 13. | 12. | 9. | 9. | |
| | | | Δ | 0.67 | -2.33 | 2.67 | 1.67 | -1.33 | -1.33 | |
| | city 59 | 5.17 | ЭА-2 Сорт | 5. | 5. | 5. | 6. | 5. | 5. | |
| | | | Δ | -0.17 | -0.17 | -0.17 | 0.83 | -0.17 | -0.17 | |
| | | | Эксперт | 3. | 6. | 6. | 3. | 7. | 6. | |
| | | | Δ | -2.17 | 0.83 | 0.83 | -2.17 | 1.83 | 0.83 | |
| | | | ЭА-2 Сорт | 11. | 11. | 11. | 11. | 11. | 11. | |

| | | | | | | | | | |
|---------|-------|-----------|-------|-------|-------|-------|-------|-------|--|
| city 14 | 13.83 | ЭА-2 Сорт | 14. | 14. | 14. | 14. | 14. | 13. | |
| | | Δ | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | -0.83 | |
| | | Эксперт | 15. | 13. | 14. | 14. | 13. | 14. | |
| | | Δ | 1.17 | -0.83 | 0.17 | 0.17 | -0.83 | 0.17 | |
| city 12 | 5.17 | ЭА-2 Сорт | 5. | 5. | 5. | 5. | 6. | 5. | |
| | | Δ | -0.17 | -0.17 | -0.17 | -0.17 | 0.83 | -0.17 | |
| | | Эксперт | 8. | 4. | 7. | 4. | 4. | 4. | |
| | | Δ | 2.83 | -1.17 | 1.83 | -1.17 | -1.17 | -1.17 | |
| city 4 | 26. | ЭА-2 Сорт | 25. | 27. | 26. | 26. | 26. | 26. | |
| | | Δ | -1. | 1. | 0. | 0. | 0. | 0. | |
| | | Эксперт | 27. | 28. | 26. | 25. | 19. | 31. | |
| | | Δ | 1. | 2. | 0. | -1. | -7. | 5. | |
| city 51 | 3.17 | ЭА-2 Сорт | 3. | 3. | 3. | 3. | 3. | 4. | |
| | | Δ | -0.17 | -0.17 | -0.17 | -0.17 | -0.17 | 0.83 | |
| | | Эксперт | 4. | 3. | 3. | 3. | 3. | 3. | |
| | | Δ | 0.83 | -0.17 | -0.17 | -0.17 | -0.17 | -0.17 | |
| city 48 | 2.17 | ЭА-2 Сорт | 3. | 2. | 2. | 2. | 2. | 2. | |
| | | Δ | 0.83 | -0.17 | -0.17 | -0.17 | -0.17 | -0.17 | |
| | | Эксперт | 6. | 1. | 0. | 1. | 1. | 4. | |
| | | Δ | 3.83 | -1.17 | -2.17 | -1.17 | -1.17 | 1.83 | |
| city 21 | 5.17 | ЭА-2 Сорт | 5. | 5. | 6. | 5. | 5. | 5. | |
| | | Δ | -0.17 | -0.17 | 0.83 | -0.17 | -0.17 | -0.17 | |
| | | Эксперт | 4. | 8. | 0. | 6. | 5. | 8. | |
| | | Δ | -1.17 | 2.83 | -5.17 | 0.83 | -0.17 | 2.83 | |
| city 29 | 5.17 | ЭА-2 Сорт | 6. | 5. | 5. | 5. | 5. | 5. | |
| | | Δ | 0.83 | -0.17 | -0.17 | -0.17 | -0.17 | -0.17 | |
| | | Эксперт | 4. | 3. | 6. | 9. | 5. | 4. | |
| | | Δ | -1.17 | -2.17 | 0.83 | 3.83 | -0.17 | -1.17 | |
| city 18 | 5.17 | ЭА-2 Сорт | 5. | 5. | 5. | 6. | 5. | 5. | |
| | | Δ | -0.17 | -0.17 | -0.17 | 0.83 | -0.17 | -0.17 | |
| | | Эксперт | 5. | 5. | 8. | 4. | 5. | 4. | |
| | | Δ | -0.17 | -0.17 | 2.83 | -1.17 | -0.17 | -1.17 | |
| city 53 | 5.17 | ЭА-2 Сорт | 5. | 5. | 6. | 5. | 5. | 5. | |
| | | Δ | -0.17 | -0.17 | 0.83 | -0.17 | -0.17 | -0.17 | |
| | | Эксперт | 4. | 8. | 6. | 3. | 6. | 4. | |
| | | Δ | -1.17 | 2.83 | 0.83 | -2.17 | 0.83 | -1.17 | |
| city 10 | 5.17 | ЭА-2 Сорт | 5. | 5. | 5. | 6. | 5. | 5. | |
| | | Δ | -0.17 | -0.17 | -0.17 | 0.83 | -0.17 | -0.17 | |
| | | Эксперт | 5. | 6. | 3. | 6. | 5. | 6. | |
| | | Δ | -0.17 | 0.83 | -2.17 | 0.83 | -0.17 | 0.83 | |
| | | ЭА-2 Сорт | 6. | 5. | 5. | 5. | 5. | 5. | |
| | | Δ | 0.83 | -0.17 | -0.17 | -0.17 | -0.17 | -0.17 | |

| | | | | | | | | | |
|---------|--------|-----------|-------|-------|-------|-------|-------|-------|--|
| city 16 | 5.17 | Эксперт | 4. | 5. | 4. | 12. | 3. | 3. | |
| | | Δ | -1.17 | -0.17 | -1.17 | 6.83 | -2.17 | -2.17 | |
| city 5 | 5.17 | ЭА-2 Сорт | 5. | 5. | 5. | 5. | 6. | 5. | |
| | | Δ | -0.17 | -0.17 | -0.17 | -0.17 | 0.83 | -0.17 | |
| | | Эксперт | 4. | 6. | 8. | 4. | 4. | 5. | |
| | | Δ | -1.17 | 0.83 | 2.83 | -1.17 | -1.17 | -0.17 | |
| city 13 | 5.17 | ЭА-2 Сорт | 5. | 5. | 5. | 5. | 5. | 6. | |
| | | Δ | -0.17 | -0.17 | -0.17 | -0.17 | -0.17 | 0.83 | |
| | | Эксперт | 7. | 5. | 5. | 4. | 6. | 4. | |
| | | Δ | 1.83 | -0.17 | -0.17 | -1.17 | 0.83 | -1.17 | |
| city 17 | 5.17 | ЭА-2 Сорт | 5. | 5. | 6. | 5. | 5. | 5. | |
| | | Δ | -0.17 | -0.17 | 0.83 | -0.17 | -0.17 | -0.17 | |
| | | Эксперт | 3. | 5. | 5. | 6. | 5. | 7. | |
| | | Δ | -2.17 | -0.17 | -0.17 | 0.83 | -0.17 | 1.83 | |
| city 19 | 5.17 | ЭА-2 Сорт | 6. | 5. | 5. | 5. | 5. | 5. | |
| | | Δ | 0.83 | -0.17 | -0.17 | -0.17 | -0.17 | -0.17 | |
| | | Эксперт | 7. | 5. | 5. | 5. | 5. | 4. | |
| | | Δ | 1.83 | -0.17 | -0.17 | -0.17 | -0.17 | -1.17 | |
| city 22 | 8.67 | ЭА-2 Сорт | 9. | 8. | 9. | 8. | 9. | 9. | |
| | | Δ | 0.33 | -0.67 | 0.33 | -0.67 | 0.33 | 0.33 | |
| | | Эксперт | 12. | 8. | 8. | 6. | 8. | 10. | |
| | | Δ | 3.33 | -0.67 | -0.67 | -2.67 | -0.67 | 1.33 | |
| city 11 | 5.17 | ЭА-2 Сорт | 5. | 6. | 5. | 5. | 5. | 5. | |
| | | Δ | -0.17 | 0.83 | -0.17 | -0.17 | -0.17 | -0.17 | |
| | | Эксперт | 4. | 7. | 5. | 6. | 4. | 5. | |
| | | Δ | -1.17 | 1.83 | -0.17 | 0.83 | -1.17 | -0.17 | |
| city 40 | 2.83 | ЭА-2 Сорт | 3. | 2. | 3. | 3. | 3. | 3. | |
| | | Δ | 0.17 | -0.83 | 0.17 | 0.17 | 0.17 | 0.17 | |
| | | Эксперт | 5. | 2. | 2. | 3. | 4. | 1. | |
| | | Δ | 2.17 | -0.83 | -0.83 | 0.17 | 1.17 | -1.83 | |
| city 30 | 1.5 | ЭА-2 Сорт | 2. | 1. | 2. | 1. | 1. | 2. | |
| | | Δ | 0.5 | -0.5 | 0.5 | -0.5 | -0.5 | 0.5 | |
| | | Эксперт | 2. | 2. | 3. | 0. | 0. | 2. | |
| | | Δ | 0.5 | 0.5 | 1.5 | -1.5 | -1.5 | 0.5 | |
| city 54 | 1.33 | ЭА-2 Сорт | 1. | 1. | 1. | 2. | 2. | 1. | |
| | | Δ | -0.33 | -0.33 | -0.33 | 0.67 | 0.67 | -0.33 | |
| | | Эксперт | 0. | 2. | 2. | 0. | 2. | 2. | |
| | | Δ | -1.33 | 0.67 | 0.67 | -1.33 | 0.67 | 0.67 | |
| Всего | 355.83 | ЭА-2 Сорт | 354. | 356. | 356. | 356. | 357. | 356. | |
| | | Δ | -1.83 | 0.17 | 0.17 | 0.17 | 1.17 | 0.17 | |
| | | Эксперт | 358. | 355. | 356. | 354. | 353. | 359. | |

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|--|--|--|----------|------|-------|------|-------|-------|------|--|
| | | | Δ | 2.17 | -0.83 | 0.17 | -1.83 | -2.83 | 3.17 | |
|--|--|--|----------|------|-------|------|-------|-------|------|--|

$\ln[f_*] :=$