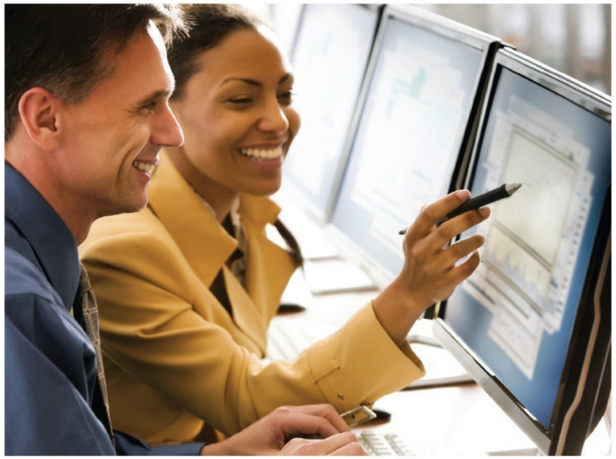
Conditional Data Selection

MATLAB® Fundamentals for Aerospace Applications



Outline

- Logical operations and variables
- Finding and counting
- Logical indexing

```
Leicester City          true
Arsenal                 true
Tottenham Hotspur       true
Manchester City         true
Manchester United      false
Southampton             true
West Ham United         true
Liverpool               true
Stoke City             false
Chelsea                 true
Everton                 true
Swansea City           false
Watford                false
West Bromwich Albion   false
Bournemouth            false
Crystal Palace         false
Sunderland             false
Newcastle United        true
Norwich City           false
Aston Villa            false
```

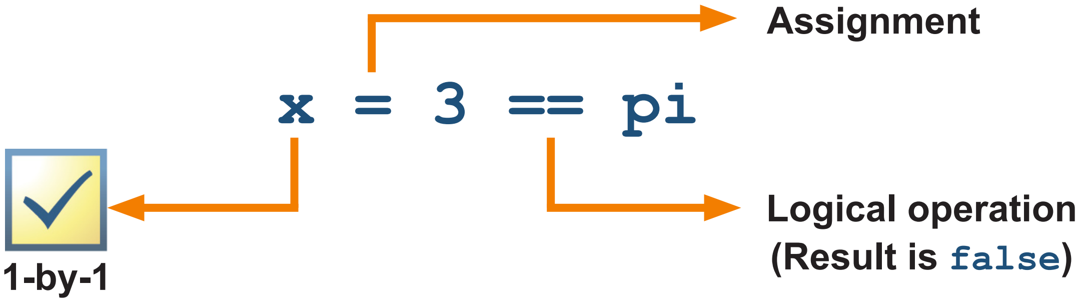
```
Leicester City
Arsenal
Tottenham Hotspur
Manchester City
Southampton
West Ham United
Liverpool
Chelsea
Everton
Newcastle United
```

Course Example: Investigating Premier League Scoring

Team	Home Wins	Home Draws	Home Losses	Home GF	Home GA	Away Wins	Away Draws	Away Losses	Away GF	Away GA	Total Wins	Total Draws	Total Losses	Points
Leicester City	12	6	1	35	18	11	6	2	33	18	23	12	3	81
Arsenal	12	4	3	31	11	8	7	4	34	25	20	11	7	71
Tottenham Hotspur	10	6	3	35	15	9	7	3	34	20	19	13	6	70
Manchester City	12	2	5	47	21	7	7	5	24	20	19	9	10	66
Manchester United	12	5	2	27	9	7	4	8	22	26	19	9	10	66
Southampton	11	3	5	39	22	7	6	6	20	19	18	9	11	63
West Ham United	9	7	3	34	26	7	7	5	31	25	16	14	8	62
Liverpool	8	8	3	33	22	8	4	7	30	28	16	12	10	60
Stoke City	8	4	7	22	24	6	5	8	19	31	14	9	15	51
Chelsea	5	9	5	32	30	7	5	7	27	23	12	14	12	50
Everton	6	5	8	35	30	5	9	5	24	25	11	14	13	47
Swansea City	8	6	5	20	20	4	5	10	22	32	12	11	15	47
Watford	6	6	7	20	19	6	3	10	20	31	12	9	17	45
West Bromwich Albion	6	5	8	20	26	4	8	7	14	22	10	13	15	43
Bournemouth	5	5	9	23	34	6	4	9	22	33	11	9	18	42
Crystal Palace	6	3	10	19	23	5	6	8	20	28	11	9	18	42
Sunderland	6	6	7	23	20	3	6	10	25	42	9	12	17	[illegible]9
Newcastle United	7	7	5	32	24	2	3	14	12	41	9	10	19	37
Norwich City	6	5	8	26	30	3	2	14	13	37	9	7	22	[illegible]
Aston Villa	2	5	12	14	35	1	3	15	13	41	3	8	27	17

Home vs. Away Scoring: Teams with Winning Home Records

Logical Operations and Variables

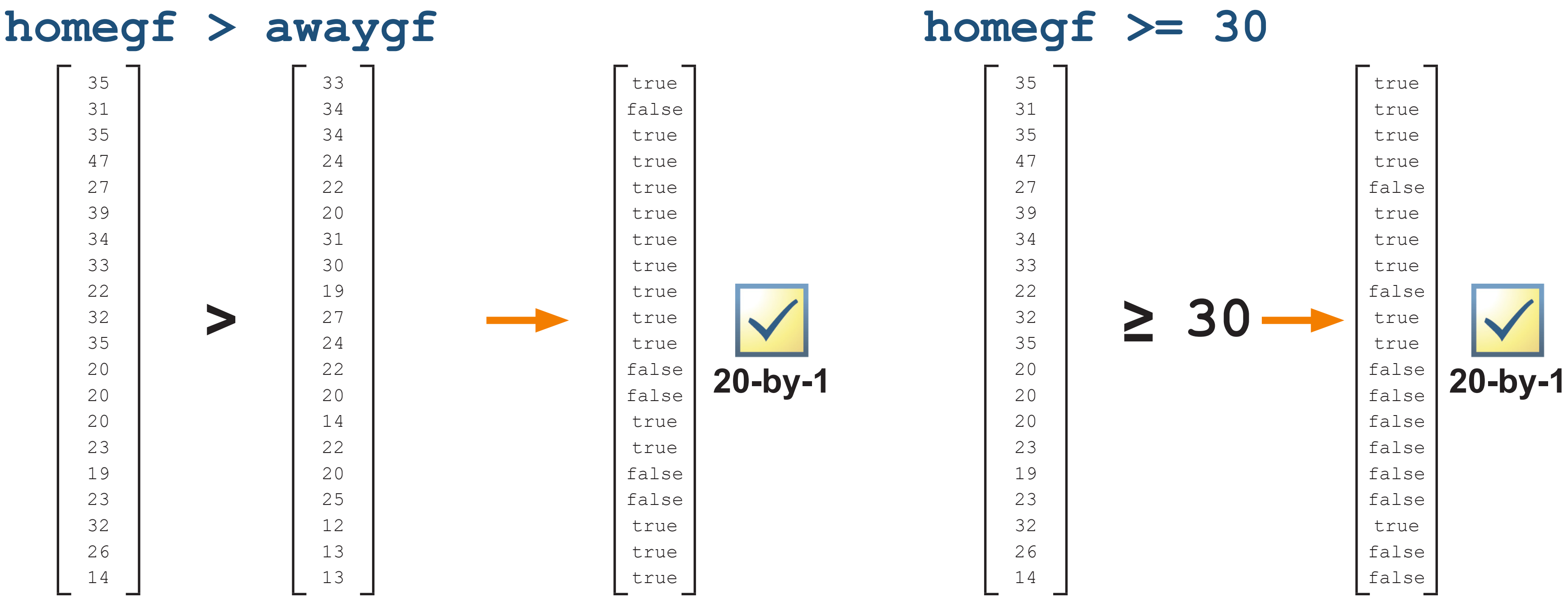


```
x = 3 == pi
```

Assignment

Logical operation (Result is `false`)

1-by-1



```
homegf > awaygf
```

$$\begin{bmatrix} 35\\31\\35\\47\\27\\39\\34\\33\\22\\32\\35\\20\\20\\20\\23\\19\\23\\32\\26\\14 \end{bmatrix} > \begin{bmatrix} 33\\34\\34\\24\\22\\20\\31\\30\\19\\27\\24\\22\\20\\14\\22\\20\\25\\12\\13\\13 \end{bmatrix} \rightarrow \begin{bmatrix} \text{true}\\\text{false}\\\text{true}\\\text{true}\\\text{true}\\\text{true}\\\text{true}\\\text{true}\\\text{true}\\\text{true}\\\text{true}\\\text{false}\\\text{false}\\\text{true}\\\text{true}\\\text{false}\\\text{false}\\\text{true}\\\text{true}\\\text{true} \end{bmatrix}$$

20-by-1

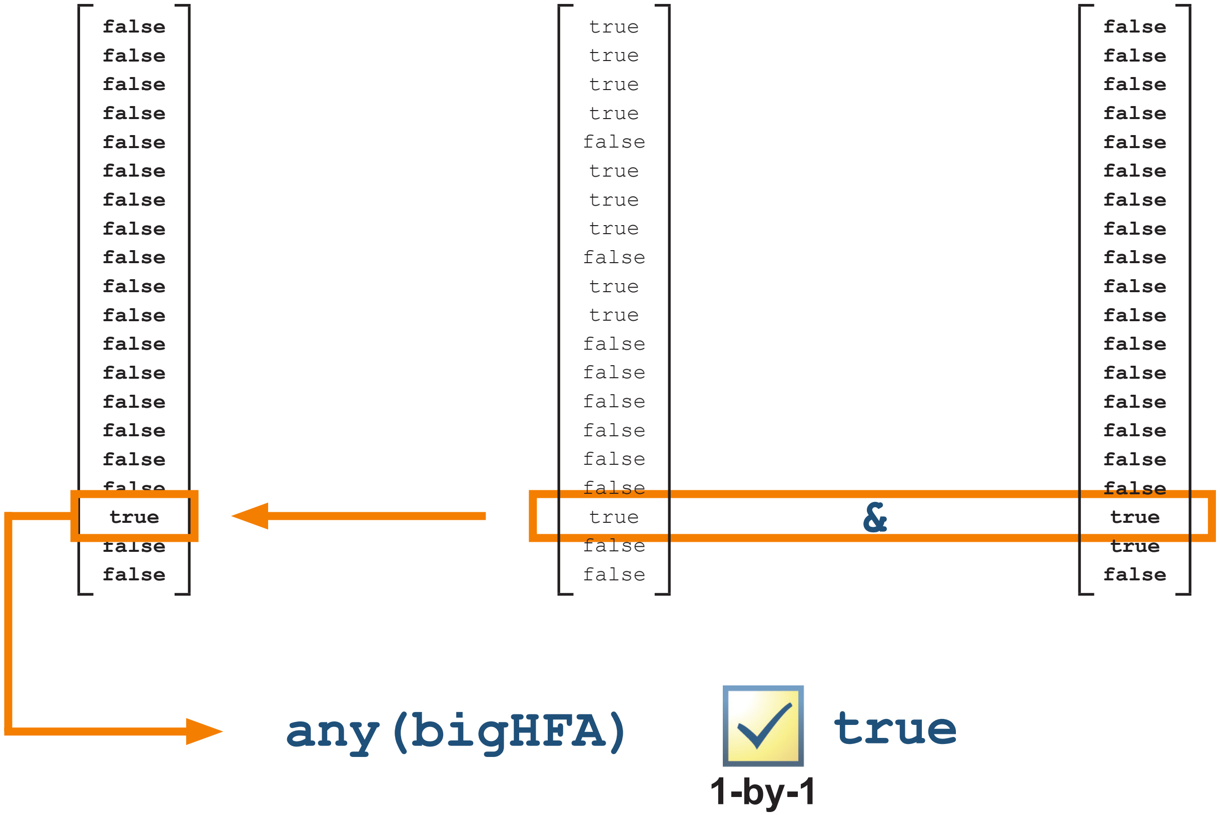
```
homegf >= 30
```

$$\begin{bmatrix} 35\\31\\35\\47\\27\\39\\34\\33\\22\\32\\35\\20\\20\\20\\23\\19\\23\\32\\26\\14 \end{bmatrix} \geq 30 \rightarrow \begin{bmatrix} \text{true}\\\text{true}\\\text{true}\\\text{true}\\\text{false}\\\text{true}\\\text{true}\\\text{true}\\\text{false}\\\text{true}\\\text{true}\\\text{false}\\\text{false}\\\text{false}\\\text{false}\\\text{false}\\\text{false}\\\text{true}\\\text{false}\\\text{false} \end{bmatrix}$$

20-by-1

Combining Logical Conditions

```
bigHFA = (homegf >= 30) & (homegf > 2*awaygf)
```



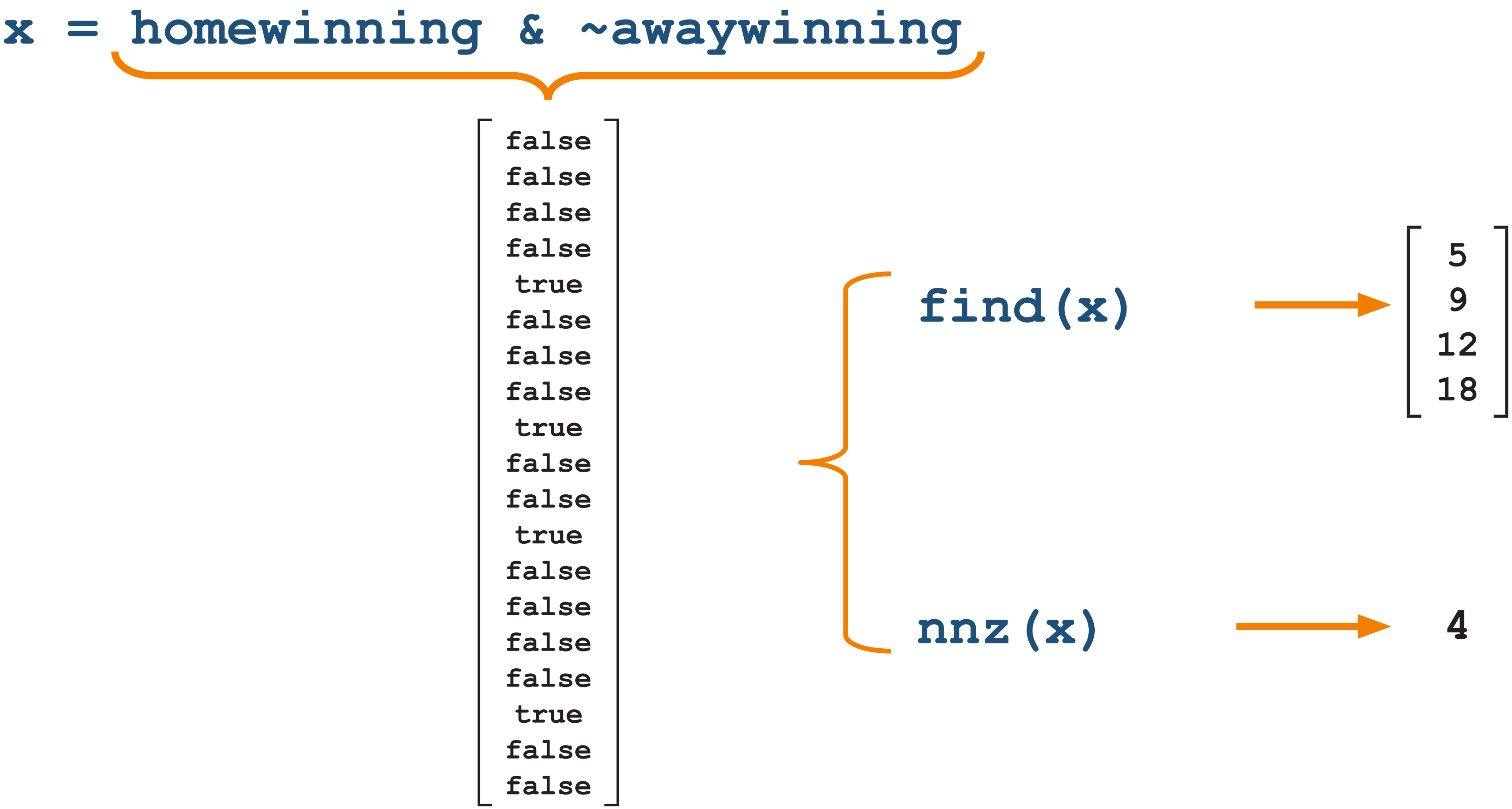
```
false      true       false
false      true       false
false      true       false
false      true       false
false      false      false
false      true       false
false      true       false
false      true       false
false      false      false
false      true       false
false      true       false
false      false      false
false      false      false
false      false      false
false      false      false
false      false      false
false      false      false
true       true   &   true
false      false      true
false      false      false
```

```
any(bigHFA)
```

☑ true

1-by-1

Finding and Counting



```
x = homewinning & ~awaywinning
```

```
false
false
false
false
 true
false
false
false
 true
false
false
 true
false
false
false
false
 true
false
false
```

```
find(x)
```

```
 5
 9
12
18
```

```
nnz(x)
```

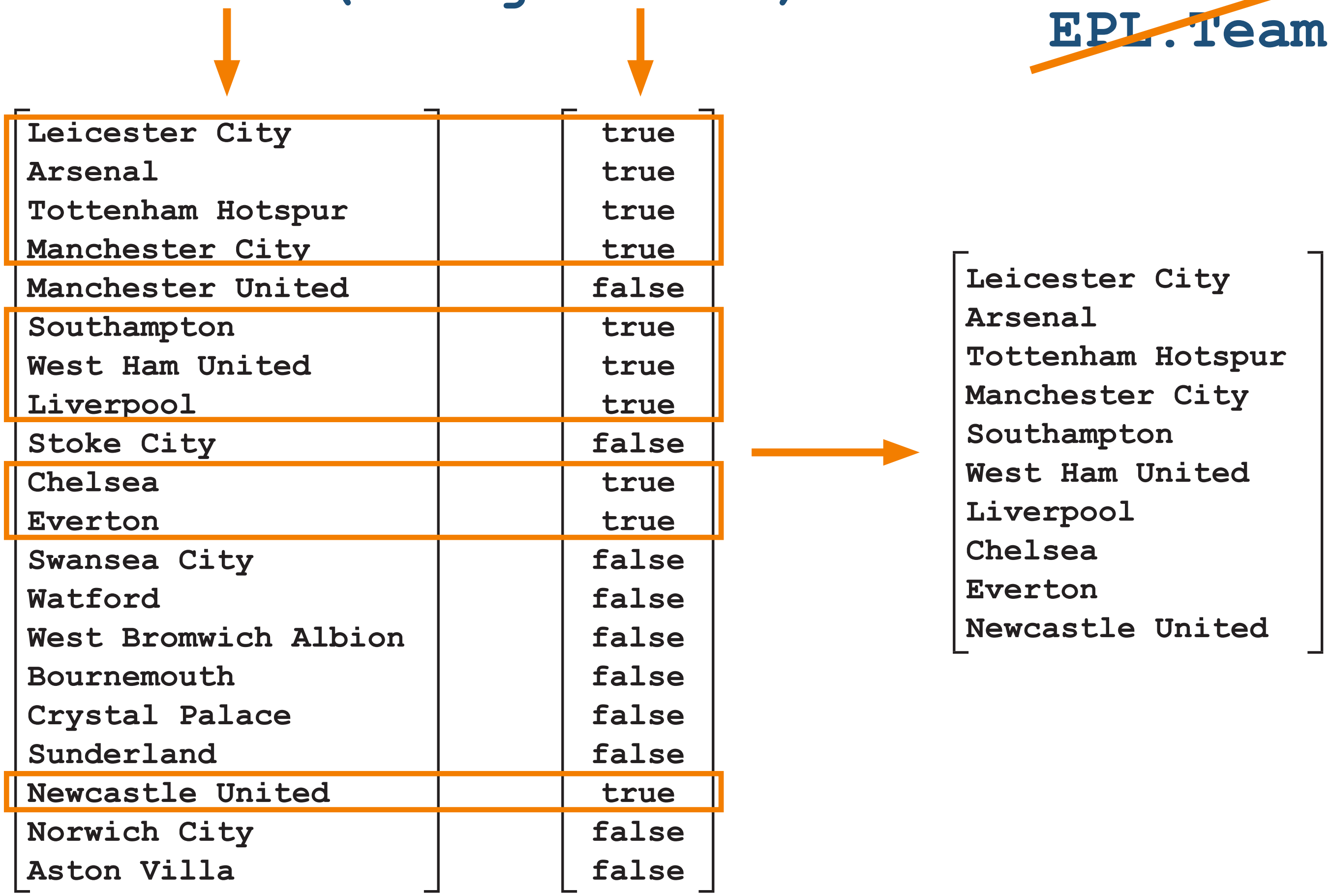
```
4
```

Logical Indexing

```
EPL.Team(homegf >= 30)
```

~~idx = find(...)~~

~~EPL.Team(idx)~~



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Arsenal                   true
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Manchester United        false
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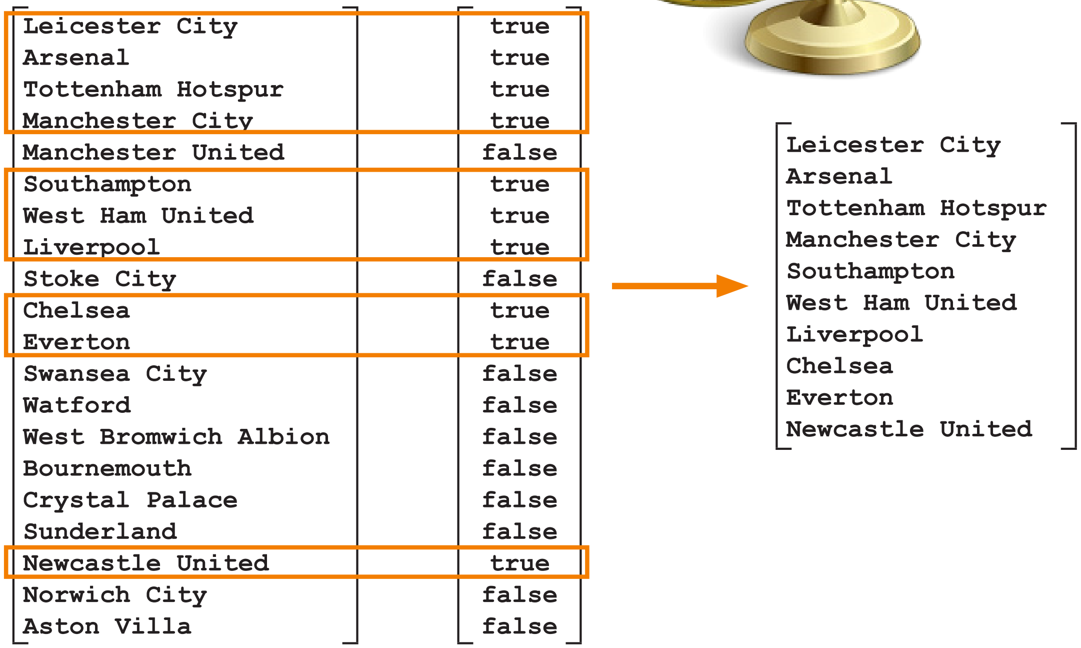
Summary

- Logical operations and variables
- Finding and counting
- Logical indexing



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Test Your Knowledge

1. If `x` and `y` are both 20-by-1 (numeric) vectors and half of the elements of `y` are greater than 0.5, the command

```
y>0.5
```

will return:

A. A 10-by-1 numeric vector of `y` values

B. A 20-by-1 logical vector

C. A 20-by-1 numeric vector of `y` values

D. An error message

Test Your Knowledge

2. If `x` and `y` are both 20-by-1 (numeric) vectors and half of the elements of `y` are greater than 0.5, the command

   ```
   x(y>0.5)
   ```

   will return:

   A. A 10-by-1 numeric vector of `x` values

   B. A 10-by-1 numeric vector of `y` values

   C. A 20-by-1 logical vector

   D. A 20-by-1 numeric vector of `x` values

   E. An error message