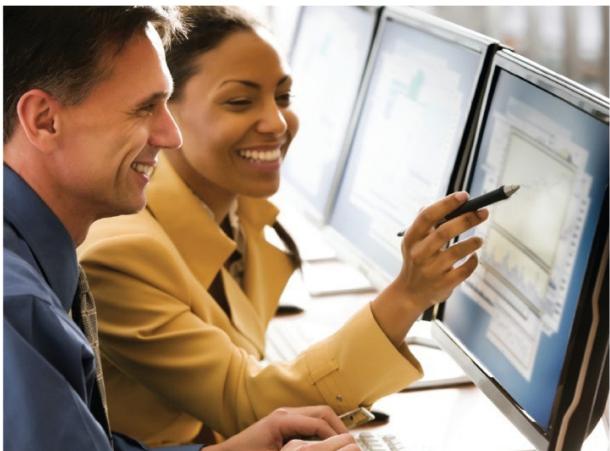


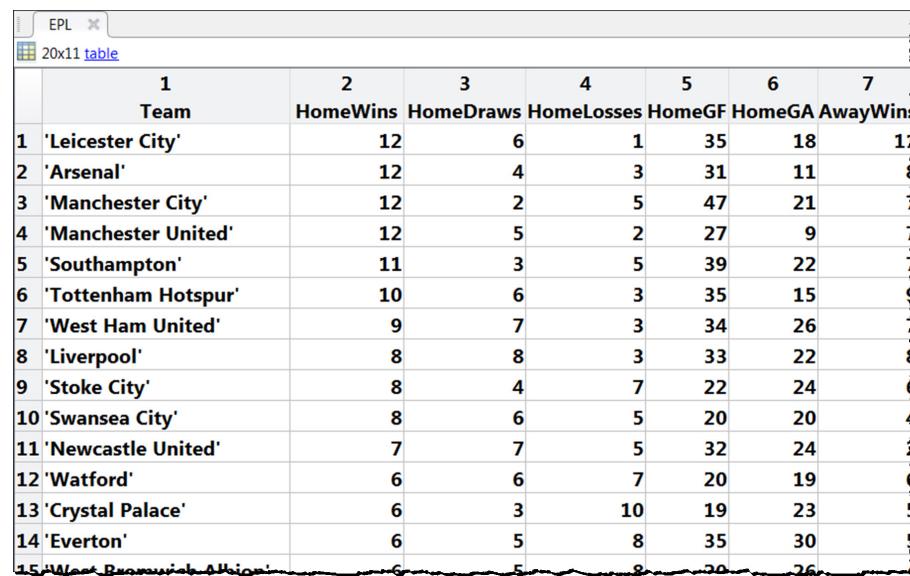
Tables of Data

MATLAB® Fundamentals for Aerospace Applications



Outline

- Storing data in tables
- Working with tables
- Indexing into tables
- Exporting from tables



The screenshot shows a MATLAB workspace window titled 'EPL'. The window displays a table with 15 rows and 8 columns. The columns are labeled 'Team' (row 1), 'HomeWins' (row 2), 'HomeDraws' (row 3), 'HomeLosses' (row 4), 'HomeGF' (row 5), 'HomeGA' (row 6), and 'AwayWins' (row 7). The 'Team' column contains team names, and the other columns contain numerical values representing their performance metrics.

1	2	3	4	5	6	7
Team	HomeWins	HomeDraws	HomeLosses	HomeGF	HomeGA	AwayWins
1 'Leicester City'	12	6	1	35	18	17
2 'Arsenal'	12	4	3	31	11	16
3 'Manchester City'	12	2	5	47	21	15
4 'Manchester United'	12	5	2	27	9	14
5 'Southampton'	11	3	5	39	22	13
6 'Tottenham Hotspur'	10	6	3	35	15	12
7 'West Ham United'	9	7	3	34	26	11
8 'Liverpool'	8	8	3	33	22	10
9 'Stoke City'	8	4	7	22	24	9
10 'Swansea City'	8	6	5	20	20	8
11 'Newcastle United'	7	7	5	32	24	7
12 'Watford'	6	6	7	20	19	6
13 'Crystal Palace'	6	3	10	19	23	5
14 'Everton'	6	5	8	35	30	4
15 'Aston Villa'	6	5	8	20	26	3

Course Example:

Premier League Football

Team	Home Wins	Home Draws	Home Losses	Home GF	Home GA	Away Wins	Away Draws	Away Losses	Away GF	Away GA
Arsenal	12	4	3	31	11	8	7	4	34	25
Aston Villa	2	5	12	14	35	1	3	15	13	41
Bournemouth	5	5	9	23	34	6	4	9	22	33
Chelsea	5	9	5	32	30	7	5	7	27	23
Crystal Palace	6	3	10	19	23	5	6	8	20	28
Everton	6	5	8	35	30	5	9	5	24	25
Leicester City	12	6	1	35	18	11	6	2	33	18
Liverpool	8	8	3	33	22	8	4	7	30	28
Manchester City	12	2	5	47	21	7	7	5	24	20
Manchester United	12	5	2	27	9	7	4	8	22	26
Newcastle United	7	7	5	32	24	2	3	14	12	41
Norwich City	6	5	8	26	30	3	2	14	13	37
Southampton	11	3	5	39	22	7	6	6	20	19
Stoke City	8	4	7	22	24	6	5	8	19	31
Sunderland	6	6	7	23	20	3	6	10	25	
Swansea City	8	6	5	20	20	4	5	10	22	
Tottenham Hotspur	10	6	3	35	15	9	7	3	34	
Watford	6	6	7	20	19	6	3	10	20	
West Bromwich Albion	6	5	8	20	26	4	8	7	14	
West Ham United	9	7	3	34	26	7	7	5	31	



What Is a Table?

Each column is a
named variable

Team	Home Wins	Home Draws	Home Losses	Home GF	Home GA	Away Wins	Away Draws	Away Losses	Away GF	Away GA
Arsenal	12	4	3	31	11	8	7	4	34	25
Aston Villa	2	5	12	14	35	1	3	15	13	41
Bournemouth	5	5	9	23	34	6	4	9	22	33
Chelsea	5	9	5	32	30	7	5	7	27	23
Crystal Palace	6	3	10	19	23	5	6	8	20	28
Everton	6	5	8	35	30	5	9	5	24	25
Leicester City	12	6	1	35	18	11	6	2	33	18
Liverpool	8	8	3	33	22	8	4	7	30	28
Manchester City	12	2	5	47	21	7	7	5	24	20
Manchester United	12	5	2	27	9	7	4	8	22	26
Newcastle United	7	7	5	32	24	2	3	14	12	41
Norwich City	6	5	8	26	30	3	2	14	13	37
Southampton	11	3	5	39	22	7	6	6	20	19
Stoke City	8	4	7	22	24	6	5	8	19	31
Sunderland	6	6	7	23	20	3	6	10	25	42
Swansea City	8	6	5	20	20	4	5	10	22	32
Tottenham Hotspur	10	6	3	35	15	9	7	3	34	20
Watford	6	6	7	20	19	6	3	10	20	31
West Bromwich Albion	6	5	8	20	26	4	8	7	14	22
West Ham United	9	7	3	34	26	7	7	5	31	25

Each row is a
set of observations

Storing Data as a Table

The screenshot shows the MATLAB workspace window titled 'Workspace'. Inside, there is a table variable named 'EPL' with a size of 20x11. The table is displayed as a grid of data. The first few rows of the table are:

Team	HomeWins	HomeDraws	HomeLosses	HomeGF	HomeGA	AwayWins	AwayDraws	AwayLosses	AwayGF	AwayGA
'Arsenal'	12	4	3	31	11	8	7	4	34	25
'Aston Villa'	2	5	12	14	35	1	3	15	13	41
'Bournemouth'	5	5	9	23	34	6	4	9	22	33
'Chelsea'	5	9	5	32	30	7	5	7	27	23
'Crystal Palace'	6	3	10	19	23	5	6	8	20	28
'Everton'	6								24	25
'Leicester City'	12								33	18
'Liverpool'	8								30	28
'Manchester City'	12								24	20
'Manchester United'	12								22	26
'Newcastle United'	7								12	41
'Norwich City'	6								13	37
'Southampton'	11								20	19
'Stoke City'	8	4	7	22	24	6	5	8	19	31
'Sunderland'	6	6	7	23	20	3	6	10	25	42
'Swansea City'	8	6	5	20	20	4	5	10	22	32
'Tottenham Hotspur'	10	6	3	35	15	9	7	3	34	20
'Watford'	6	6	7	20	19	6	3	10	20	31
'West Bromwich Albion'	6	5	8	20	26	4	8	7	14	22
'West Ham United'	9	7	3	34	26	7	7	5	31	25

Variable
names

A table

containing 11 variables

each with 20 observations

Operating on Tables

```
byHomeWins = sortrows(EPL, 'HomeWins', 'descend');
```

EPL x
20x11 table

1	Team	2	3	4	5	6	7	8	9	10	11	12
		HomeWins	HomeDraws	HomeLosses	HomeGF	HomeGA	AwayWins	AwayDraws	AwayLosses	AwayGF	AwayGA	
1	'Arsenal'	12	4	3	31	11	8	7	4	34	25	
2	'Aston Villa'	2	5	12	14	35	1	3	15	13	41	
3	'Bournemouth'	5	5	9	23	34	6	4	9	22	33	
4	'Chelsea'	5	9	5	32	30	7	5	7	27	23	
5	'Crystal Palace'	6	2	10	19	23	5	6	8	20	28	
6	'Everton'	6	5	8	35	30	5	9	5	24	25	
7	'Leicester City'	12	6	1	35	18	1	0	2	35	18	
8	'Liverpool'	8	8	3	33	22	8	4	7	30	28	
9	'Manchester City'	12	2	5	47	21	7	7	5	24	20	
10	'Manchester United'	12	5	2	27	9	7	4	8	22	26	
11	'Newcastle United'	7	7	5	32	24	2	3	14	12	41	
12	'Norwich City'	6	5	8	26	30	3	2	14	13	37	
13	'Southampton'	11	3	5	39	22	7	3	6	20	19	
14	'Stoke City'	8	4	7	22	24	6	5	8	19	31	
15	'Sunderland'	6	6	7	23	20	3	6	10	25	42	
16	'Swansea City'	8	6	5	20	20	4	5	10	22	32	
17	'Tottenham Hotspur'	10	6	3	35	15	9	7	3	34	18	
18	'Watford'	6	6	7	20	19	6	3	10	20	31	
19	'West Bromwich Alb...	6	5	8	20	26	4	8	7	14	22	
20	'West Ham United'	9	7	3	34	26	7	7	5	20	19	
21												

20-by-11

Observations
stay together

2

		HomeWins	HomeDraws	HomeLosses	HomeGF	HomeGA	AwayWins	AwayDraws	AwayLosses	AwayGF	AwayGA	
1	'Arsenal'	12	4	3	31	11	8	7	4	34	25	
2	'Aston Villa'	2	5	12	14	35	1	3	15	13	41	
3	'Bournemouth'	5	5	9	23	34	6	4	9	22	33	
4	'Chelsea'	5	9	5	32	30	7	5	7	27	23	
5	'Crystal Palace'	6	2	10	19	23	5	6	8	20	28	
6	'Everton'	6	5	8	35	30	5	9	5	24	25	
7	'Leicester City'	12	6	1	35	18	1	0	2	35	18	
8	'Liverpool'	8	8	3	33	22	8	4	7	30	28	
9	'Manchester City'	12	2	5	47	21	7	7	5	24	20	
10	'Manchester United'	12	5	2	27	9	7	4	8	22	26	
11	'Newcastle United'	7	7	5	32	24	2	3	14	12	41	
12	'Norwich City'	6	5	8	26	30	3	2	14	13	37	
13	'Southampton'	11	3	5	39	22	7	6	8	22	26	
14	'Stoke City'	8	4	7	22	24	6	5	8	19	31	
15	'Tottenham Hotspur'	10	6	3	35	15	9	7	5	34	20	
16	'Watford'	6	6	7	20	19	6	3	10	20	31	
17	'West Bromwich Alb...	6	5	8	20	26	4	8	7	14	22	
18	'West Ham United'	9	7	3	34	26	7	7	5	20	19	
19												
20	'Aston Villa'	2	5	12	14	35	1	3	15	13	41	
21												



20-by-11

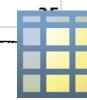
Extracting Portions of a Table

```
Top10Wins = EPL(1:10,[1,2,7]);
```



10-by-3

1	2	3	4	5	6	7	8	9	10	11
Team	HomeWins	HomeDraws	HomeLosses	HomeGF	HomeGA	AwayWins	AwayDraws	AwayLosses	AwayGF	AwayGA
'Leicester City'	12	6	1	35	13	11	6	2	33	18
'Arsenal'	12	4	3	31	1	8	7	4	34	25
'Manchester City'	12	2	5	47	2	7	7	5	24	20
'Manchester United'	12	5	2	27	2	7	4	8	22	26
'Southampton'	11	3	5	39	2	6	6	6	20	19
'Tottenham Hotspur'	10	6	3	35	1	9	7	3	34	20
'West Ham United'	9	7	2	24	2	7	7	5	31	25
'Liverpool'	8	8	3	33	2	8	4	7	30	28
'Stoke City'	8	4	7	22	2	6	5	8	19	31
'Swansea City'	8	6	5	20	2	4	5	10	22	32
'Newcastle United'	7	7	5	32	24	2	3	14	12	41
'Watford'	6	6	7	20	19	6	3	10	20	31
'Crystal Palace'	6	3	10	19	23	5	6	8	20	28
'Everton'	6	5	8	35	30	5	9	5	24	25
'West Bromwich Albion'	6	5	8	20	26	4	8	7	14	22
'Norwich City'	6	5	8	26	30	3	2	14	13	37
'Sunderland'	6	6	7	23	20	3	6	10	25	42
'Chelsea'	5	9	5	32	30	7	5	7	27	23
'Bournemouth'	5	5	9	23	34	6	4	9	22	33
'Aston Villa'	2	5	12	14	25	1	3	15	13	41



20-by-11

Extracting Data from a Table

```
homeWins = EPL.HomeWins;
```



20-by-11

The screenshot shows a MATLAB workspace window titled "EPL" containing a 20x11 table named "EPL". The table has columns labeled 1 through 11. Column 1 is "Team" and columns 2 through 11 are numerical statistics. An orange box highlights the "HomeWins" column (column 2). A blue box highlights a 3x3 submatrix in the "HomeWins" column, specifically rows 5 to 7 and columns 5 to 7. To the left of the table, an orange arrow points upwards from the "HomeWins" column header to the text "20-by-1", indicating the column vector's dimensions. Below the table, an orange arrow points downwards from the highlighted submatrix to the text "topHomeScoring = EPL{1:10,5:6};", indicating the extraction command.

1	2	3	4	5	6	7	8	9	10	11
Team	HomeWins	HomeDraws	HomeLosses	HomeGF	HomeGA	AwayWins	AwayDraws	AwayLosses	AwayGF	AwayGA
1 'Leicester City'	12	6	1	35	18	11	6	2	33	18
2 'Arsenal'	12	4	3	31	11	8	7	4	34	25
3 'Manchester City'	12	2	5	47	21	7	7	5	24	20
4 'Manchester United'	12	5	2	27	9	7	4	8	22	26
5 'Southampton'	11	3	5	30	12	7	6	6	20	19
6 'Tottenham Hotspur'	10	6	3	34	26	9	7	3	34	20
7 'West Ham United'	9	7	3	22	24	7	7	5	31	25
8 'Liverpool'	8	8	3	33	22	8	4	7	30	28
9 'Stoke City'	8	4	5	20	20	6	5	8	19	31
10 'Swansea City'	8	6	5	20	20	4	5	10	22	32
11 'Newcastle United'	7	7	5	32	24	2	3	14	12	41
12 'Watford'	6	6	7	20	19	6	3	10	20	31
13 'Crystal Palace'	6	3	10	19	23	5	6	8	20	28
14 'Everton'	6	5	8	35	30	5	9	5	24	25
15 'West Bromwich Albion'	6	5	8	20	26	4	8	7	14	22
16 'Norwich City'	6	5	8	26	30	3	2	14	13	37
17 'Sunderland'	6	6	7	23	20	3	6	10	25	42
18 'Chelsea'	5	9	5	32	30	7	5	7	27	23
19 'Bournemouth'	5	5	9	23	34	6	4	9	22	33
20 'Aston Villa'	2	5	12	14	35	1	3	15	13	41

```
topHomeScoring = EPL{1:10,5:6};
```



10-by-2

Modifying Tables

EPL.Points = points;

EPL x
20x12 table

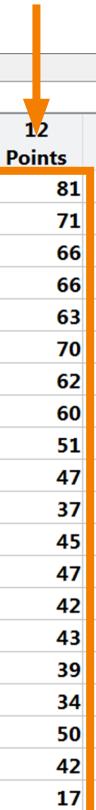
1	2	3	4	5	6	7	8	9	10	11	12	13
	Team	HomeWins	HomeDraws	HomeLosses	HomeGF	HomeGA	AwayWins	AwayDraws	AwayLosses	AwayGF	AwayGA	Points
1	'Leicester City'	12	6	1	35	18	11	6	2	33	18	81
2	'Arsenal'	12	4	3	31	11	8	7	4	34	25	71
3	'Manchester City'	12	2	5	47	21	7	7	5	24	20	66
4	'Manchester United'	12	5	2	27	9	7	4	8	22	26	66
5	'Southampton'	11	3	5	39	22	7	6	6	20	19	63
6	'Tottenham Hotspur'	10	6	3	35	15	9	7	3	34	20	70
7	'West Ham United'	9	7	3	34	26	7	7	5	31	25	62
8	'Liverpool'	8	8	3	33	22	8	4	7	30	28	60
9	'Stoke City'	8	4	7	22	24	6	5	8	19	31	51
10	'Swansea City'	8	6	5	20	20	4	5	10	22	32	47
11	'Newcastle United'	7	7	5	32	24	2	3	14	12	41	37
12	'Watford'	6	6	7	20	19	6	3	10	20	31	45
13	'Everton'	6	5	8	35	30	5	9	5	24	25	47
14	'Crystal Palace'	6	3	10	19	23	5	6	8	20	28	42
15	'West Bromwich Albion'	6	5	8	20	26	4	8	7	14	22	43
16	'Sunderland'	6	6	7	23	20	3	6	10	25	42	39
17	'Norwich City'	6	5	8	26	30	3	2	14	13	37	34
18	'Chelsea'	5	9	5	32	30	7	5	7	27	23	50
19	'Bournemouth'	5	5	9	23	34	6	4	9	22	33	42
20	'Aston Villa'	2	5	12	14	35	1	3	15	13	41	17



20-by-11



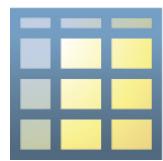
20-by-12



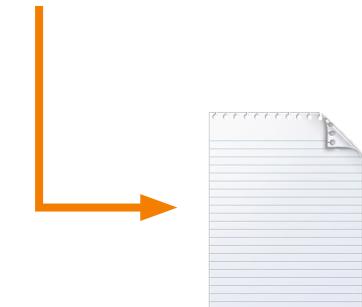
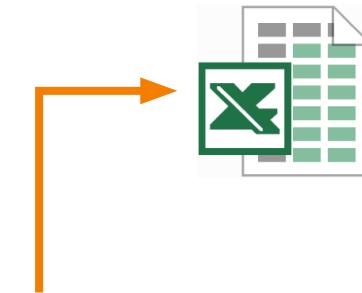
20-by-1



Exporting Tables

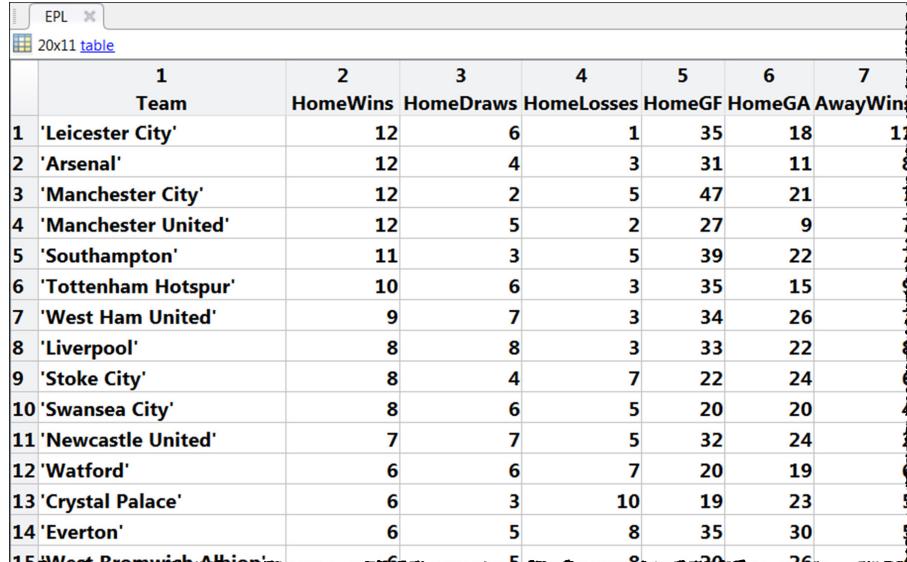


```
writetable(standings, 'EPLstandings.xlsx',  
          'EPLstandings.txt')
```



Summary

- Storing data in tables
- Working with tables
- Indexing into tables
- Exporting from tables



The screenshot shows a MATLAB workspace window titled 'EPL'. Inside, there is a table variable named 'EPL' with dimensions 20x11. The table contains data for 20 football teams, with columns for Team, HomeWins, HomeDraws, HomeLosses, HomeGF, HomeGA, and AwayWins. The data is as follows:

	Team	HomeWins	HomeDraws	HomeLosses	HomeGF	HomeGA	AwayWins	AwayDraws	AwayLosses	Total
1	'Leicester City'	12	6	1	35	18	17	8	11	53
2	'Arsenal'	12	4	3	31	11	18	6	10	53
3	'Manchester City'	12	2	5	47	21	17	6	11	53
4	'Manchester United'	12	5	2	27	9	17	6	11	53
5	'Southampton'	11	3	5	39	22	16	6	11	52
6	'Tottenham Hotspur'	10	6	3	35	15	15	6	11	52
7	'West Ham United'	9	7	3	34	26	14	6	11	51
8	'Liverpool'	8	8	3	33	22	14	6	11	51
9	'Stoke City'	8	4	7	22	24	14	6	11	51
10	'Swansea City'	8	6	5	20	20	14	6	11	51
11	'Newcastle United'	7	7	5	32	24	13	6	11	50
12	'Watford'	6	6	7	20	19	13	6	11	50
13	'Crystal Palace'	6	3	10	19	23	13	6	11	50
14	'Everton'	6	5	8	35	30	13	6	11	50
15	'Aston Villa'	6	5	8	20	26	13	6	11	50

Test Your Knowledge

1. If `x` is a 20-by-5 table with variables “A”, “B”, “C”, “D”, and “E”, which are all numeric vectors, the command

```
y = x.C
```

will return:

- A. A 20-by-1 numeric vector
- B. A 20-by-1 table
- C. A 20-by-5 numeric array
- D. A 1-by-1 table
- E. An error message

Test Your Knowledge

2. If `x` is a 20-by-5 table with variables “A”, “B”, “C”, “D”, and “E”, which are all numeric vectors, the command

```
y = x(:, 'C')
```

will return:

- A. A 20-by-1 numeric vector
- B. A 20-by-1 table
- C. A 20-by-5 numeric array
- D. A 1-by-1 table
- E. An error message