

Calculating the mean from an ungrouped frequency table

Starter activity:

- A) Which average is most appropriate when expressing an average salary?
- B) Which average is most appropriate when showing a football players goals per game?
- C) Which average is most appropriate to express student's favourite flavour of ice cream?



Calculating the mean from an ungrouped frequency table



Izzy

The **mean** is calculated by finding the total and then dividing by the number of **data** points.

Data such as:

3, 5, 5.5, 6, 6.5, 10

has a **mean** of

$$\frac{3 + 5 + 5.5 + 6 + 6.5 + 10}{6} = 6$$

Can the **mean** be calculated for all types of **data**?



Jun

Calculating the mean from an ungrouped frequency table

Or **data** such as:

The **mean** can still be calculated by adding the numbers up and dividing by how many there are... technology may be helpful to do so!



Izzy

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
1	-27.71	47.72	28.21	-24.28	14.70	-30.83	25.65	30.66	22.77	55.78	22.50	51.93	4.84	37.15	-23.31	-32.28	47.86	-9.77	-5.31	4.89	25.23	21.26
2	24.16	-24.53	-28.76	13.09	1.10	-23.64	36.73	37.42	47.03	-19.76	14.50	47.15	-36.85	-37.68	-36.50	7.27	-6.42	-37.26	25.62	-26.53	-4.33	-12.22
3	-32.74	52.04	49.49	-17.81	16.78	49.60	-4.09	-28.51	0.21	-21.57	-24.31	50.52	29.23	9.17	-30.26	-10.94	40.38	-24.59	39.62	25.99	-23.18	23.15
4	20.33	52.72	23.50	-14.99	-27.99	-17.41	2.71	33.00	23.69	5.93	39.32	58.90	-32.23	59.26	-31.85	54.01	42.21	42.55	-21.79	-17.13	22.06	-3.18
5	-37.38	41.06	-27.67	-7.93	-28.58	-32.88	59.75	-13.51	-3.80	7.13	32.66	-1.71	-26.94	53.41	-27.70	-32.07	7.99	-31.58	-36.64	23.69	46.42	16.80
6	-0.03	17.62	-36.63	-7.61	-38.59	24.61	15.97	-28.92	-27.85	23.23	10.11	30.47	-11.72	6.13	41.57	52.87	-32.22	30.03	21.64	-21.29	-5.18	54.37
7	15.08	44.84	8.36	-25.17	-2.36	-22.46	-10.89	29.69	-13.18	-5.55	18.30	-25.76	27.48	45.70	-0.66	-30.15	45.70	2.30	34.33	-29.28	-18.76	59.01
8	-6.76	46.98	40.57	12.54	22.18	12.47	-33.86	11.65	49.89	20.28	22.86	47.54	1.70	9.03	37.96	-23.77	6.76	-21.53	-14.82	51.80	-0.68	-37.64
9	34.57	-30.86	53.23	0.65	29.42	-13.92	-25.95	-31.33	38.03	39.84	22.13	46.97	41.04	-28.77	16.68	37.96	-8.97	10.23	48.01	-18.54	43.38	25.40
10	7.26	50.06	35.35	31.52	59.33	-38.73	-7.48	-34.09	-9.47	-38.46	-14.09	-3.08	-13.23	12.82	-37.72	-37.39	19.69	49.29	11.17	-6.58	-35.63	-18.15
11	5.49	29.20	26.41	-12.38	30.40	36.89	-13.92	56.08	-5.18	16.99	41.27	56.20	-18.49	-33.34	18.98	-22.87	43.79	-34.81	-23.23	-39.92	-11.43	-3.22
12	40.26	-23.74	58.14	42.70	-30.65	-22.04	12.76	27.78	4.63	5.67	16.72	-36.46	-18.71	19.60	-24.94	-21.14	2.96	53.42	-23.83	36.82	31.22	-19.85
13	-38.49	-34.12	24.48	33.91	54.95	11.29	59.88	27.45	15.51	-30.91	17.56	7.45	-36.27	51.32	2.41	59.13	26.31	-4.23	40.11	24.08	10.69	37.57
14	16.31	-10.66	49.63	55.98	-24.02	-32.14	57.54	54.99	21.88	-34.51	48.42	-0.22	-36.92	-4.50	42.83	-6.98	37.29	5.17	-22.43	-33.34	-35.63	24.64
15	35.76	-28.03	33.83	-21.67	7.32	32.80	-6.28	5.63	6.42	25.15	30.39	22.19	28.46	35.52	36.27	-31.02	-15.17	-10.35	30.60	6.31	20.75	53.16
16	-0.42	-19.85	51.39	3.59	-24.50	24.43	-30.54	-18.18	-14.23	7.02	-33.60	49.10	-1.52	34.80	58.85	19.08	-8.83	45.69	-16.95	-35.87	25.36	-15.87
17	46.66	7.56	48.27	15.75	-8.22	-29.16	-5.11	-39.98	46.84	-30.15	5.85	41.63	34.67	-8.83	-6.92	44.02	-3.12	1.56	22.43	30.64	-20.41	-22.96
18	56.94	45.88	-19.22	-27.41	-7.84	-15.76	36.05	46.56	26.79	7.73	33.99	-14.51	6.13	-33.82	46.83	-38.53	-12.02	1.73	6.82	-0.91	22.92	33.69
19	6.26	2.72	9.94	-17.36	42.25	27.65	-24.18	-6.70	25.58	39.65	37.38	35.80	-36.81	50.89	-39.76	-24.57	-21.07	48.87	19.02	0.16	-25.39	55.68
20																						
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23																						
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25																						
26																						
27																						
28																						
29	52.23	-4.64	37.39	24.34	18.32	-13.73	26.32	-11.56	11.46	29.67	-32.21	58.71	-38.51	8.28	-4.85	53.56	-5.42	-9.81	22.75	-31.85	15.33	41.68
30	18.10	34.79	11.17	53.89	-29.18	32.42	-32.40	46.31	33.30	54.89	-24.93	50.21	58.89	-37.22	-13.17	-25.13	21.51	-35.85	33.21	-38.32	1.60	56.40
31	7.29	20.64	-35.06	46.79	-37.05	-39.63	-10.50	-6.29	12.02	45.52	45.55	-20.93	12.64	4.98	23.95	31.20	-0.47	34.49	33.90	40.35	-3.27	13.56
32	26.48	-21.32	-22.61	48.16	39.10	-26.46	-11.58	1.73	22.30	13.90	22.23	-8.42	20.81	16.99	-39.58	4.93	3.72	4.39	-27.24	50.32	52.95	9.10
33	-0.35	-4.26	31.49	13.52	-16.53	4.47	-10.31	24.94	30.64	1.40	53.09	3.35	54.34	-34.37	0.48	-34.71	-37.76	-9.83	46.52	27.80	47.42	-16.58
34	3.36	-19.11	-21.31	17.57	57.82	-21.70	40.66	20.69	43.84	3.00	36.25	45.72	29.78	0.73	5.31	-18.30	-27.12	25.83	42.52	-36.01	0.54	37.00
35	38.01	52.74	-3.50	34.84	49.94	50.32	39.43	2.95	-29.05	-20.14	-25.86	-3.89	38.60	-3.65	38.25	-36.99	-24.55	26.73	22.52	-27.68	24.55	33.17
36	1.17	31.07	27.39	7.80	37.09	54.00	-16.61	23.59	47.85	39.77	37.05	50.88	-37.82	30.94	1.96	-6.72	54.92	-19.13	22.12	-24.24	57.22	1.71
37	-18.12	9.82	35.13	-30.58	-3.48	5.68	-4.12	15.27	22.37	-26.92	-36.40	37.23	44.11	22.59	-5.73	44.70	11.25	38.99	-10.90	24.26	35.85	42.84

Or **data** such as: red, blue, red, pink, orange, red



Izzy

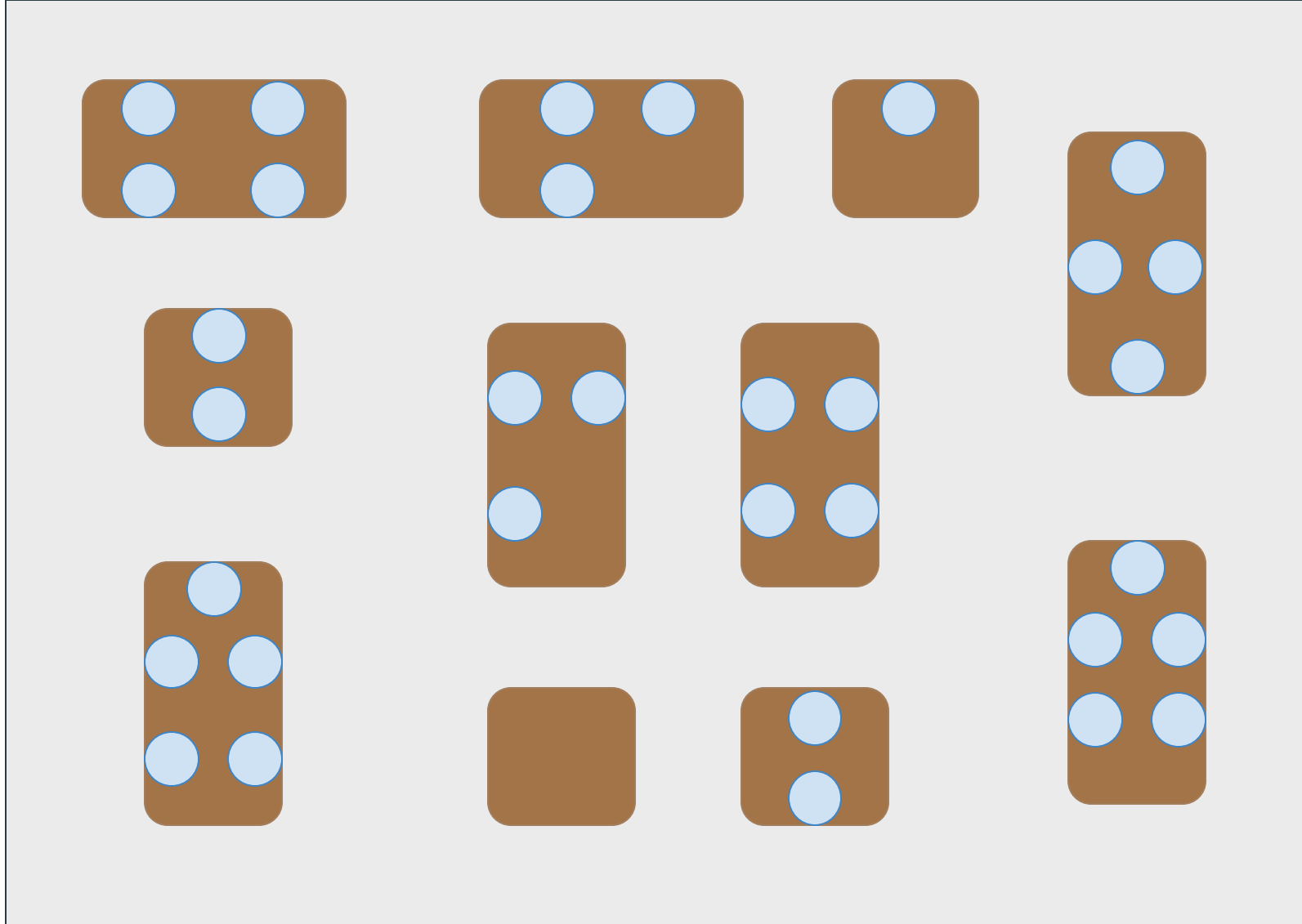
The **mean** is calculated by finding the total... but I can't find a total for these **data**.

Where the **data** points don't have a numerical value it isn't possible to find a total, so you **cannot** have a **mean**.

For which of the following **data** can the **mean** be calculated

- a** 7, 9, 12, -3, -5, 6, 0, 8 ✓
- b** ash, oak, beech, oak, birch, beech
- c** 6.2, 4.5, 6.7, 3.4, 5.5, 3 ✓

Calculating the mean from an ungrouped frequency table



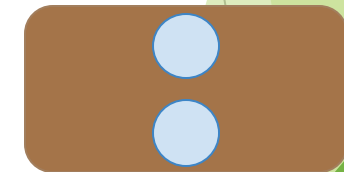
Here is a plan view of a restaurant's tables.



This is a table.

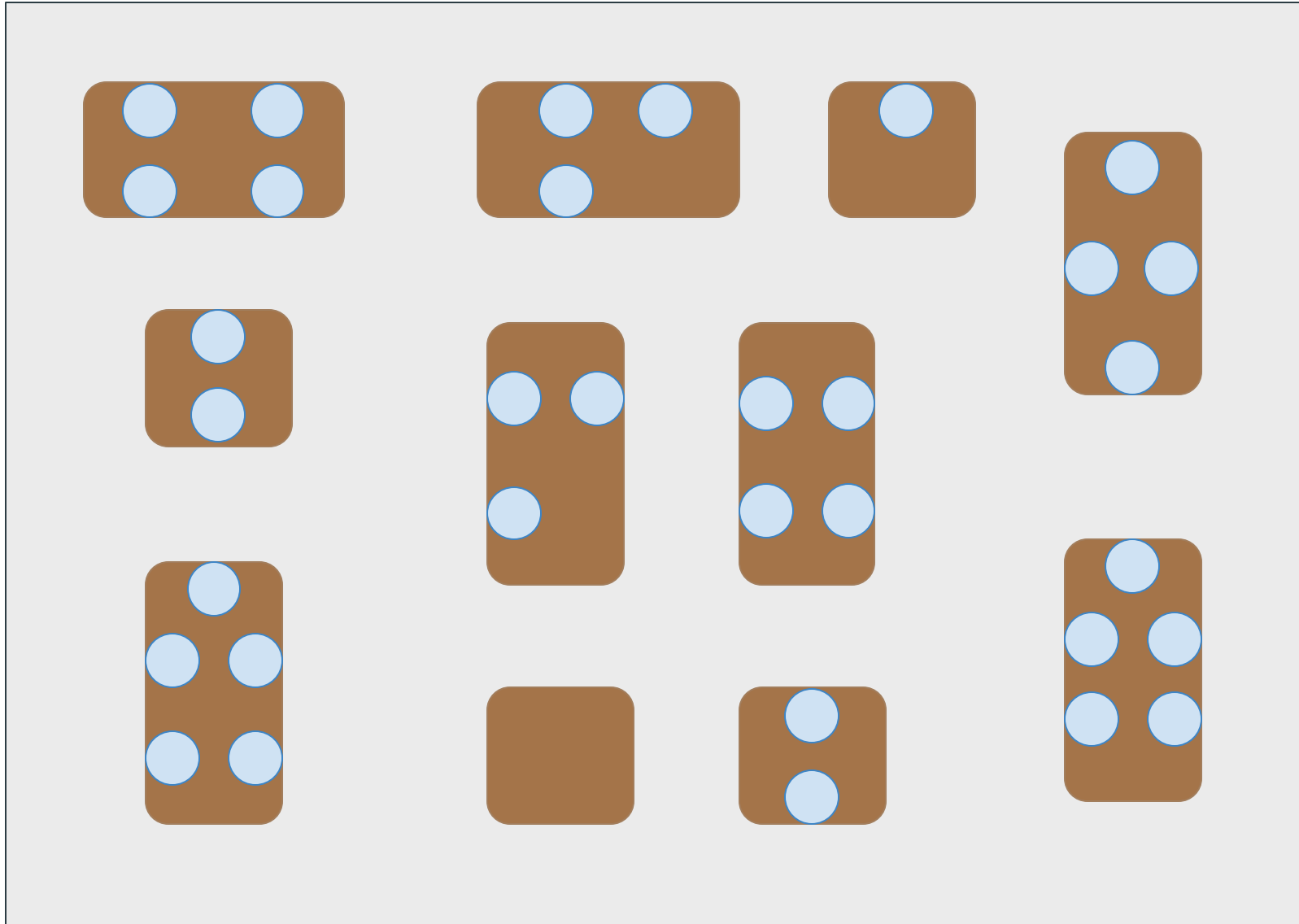


This shows where a person is seated.



This means two people are at the table.

Calculating the mean from an ungrouped frequency table



How many tables are there at this restaurant?

11 tables

How many people are dining at the restaurant?

33 people

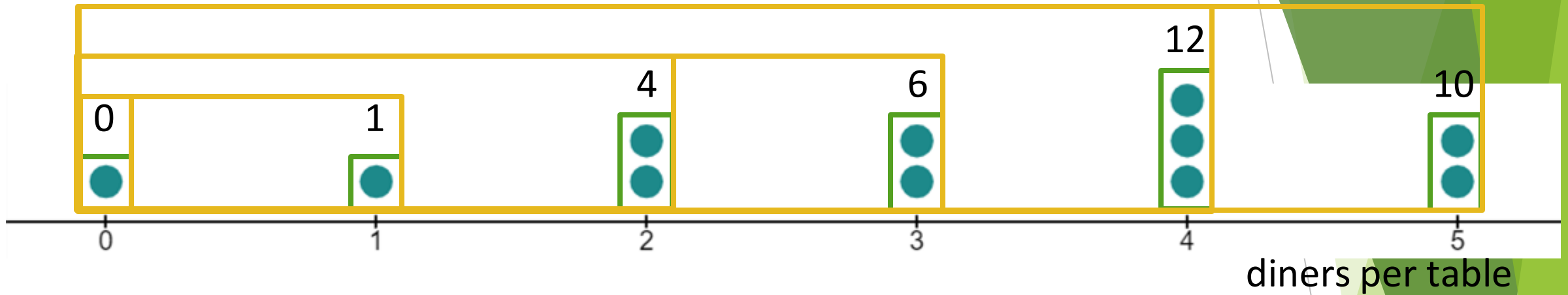
Calculating the mean from an ungrouped frequency table

This dot plot shows the tables by number of diners.



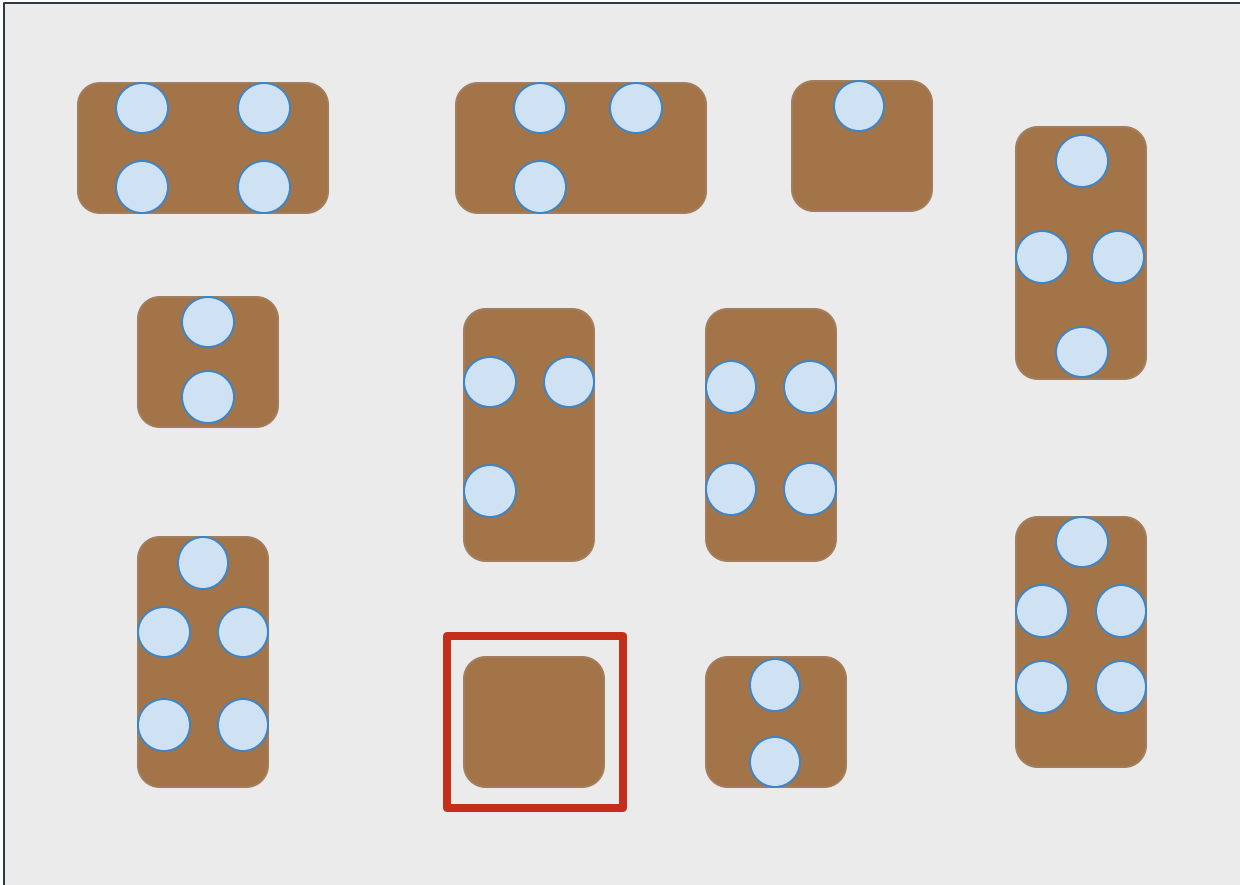
The 11 dots show that there are 11 tables in the restaurant.

Calculating the mean from an ungrouped frequency table



$$\text{Total} = 0 + 1 + 4 + 6 + 12 + 10 = 33$$

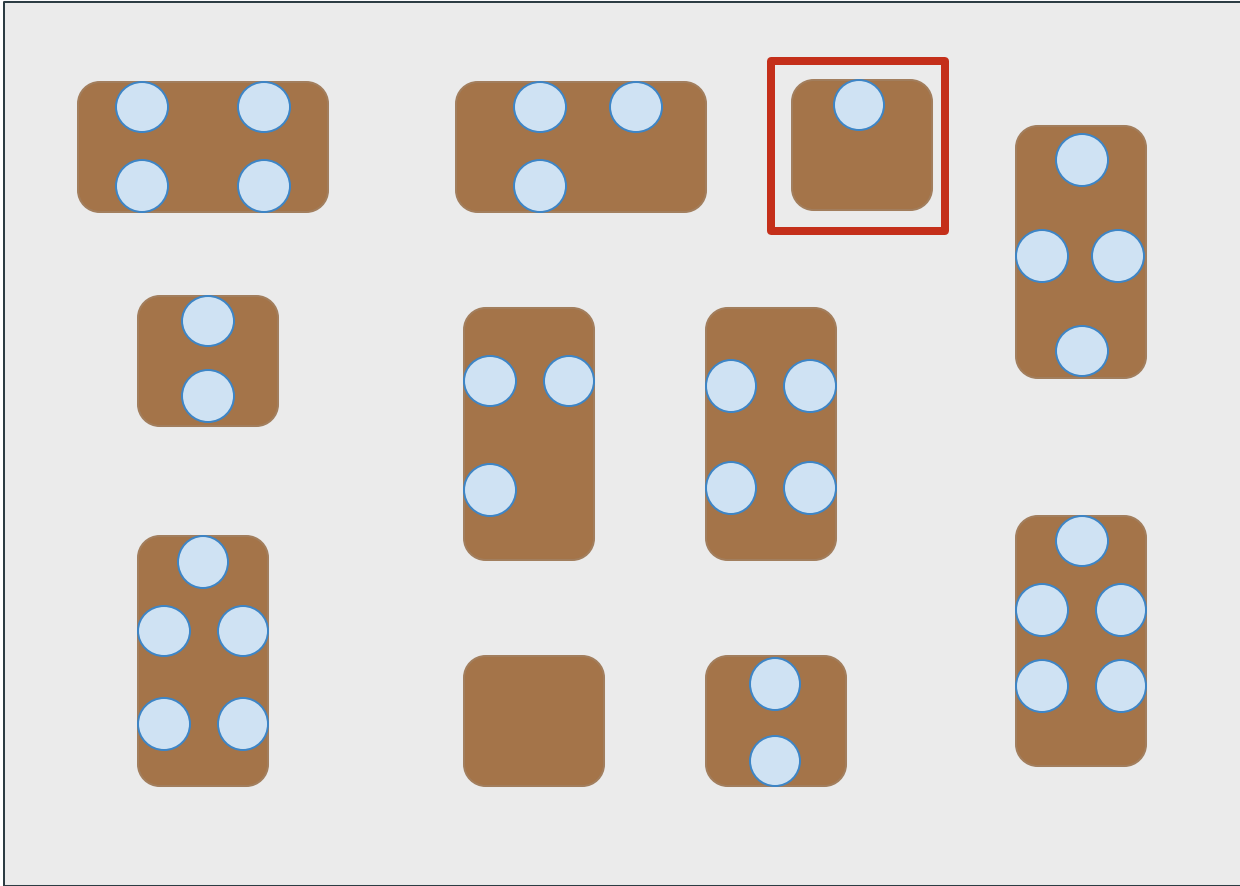
The same information can be shown as a **frequency** table too.



Group size	Frequency
0	1

How many empty tables are there?

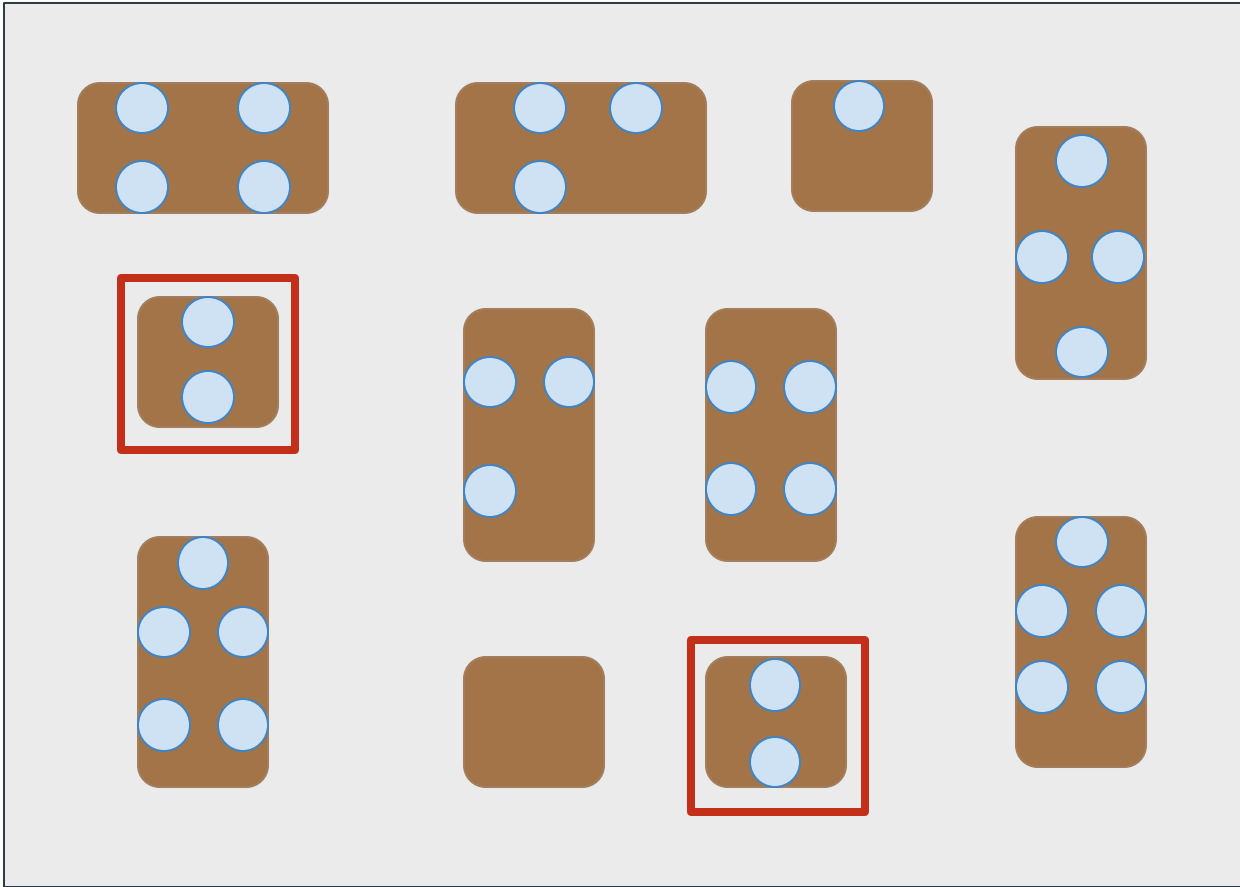
Calculating the mean from an ungrouped frequency table



Group size	Frequency
0	1
1	1

How many tables have only one diner?

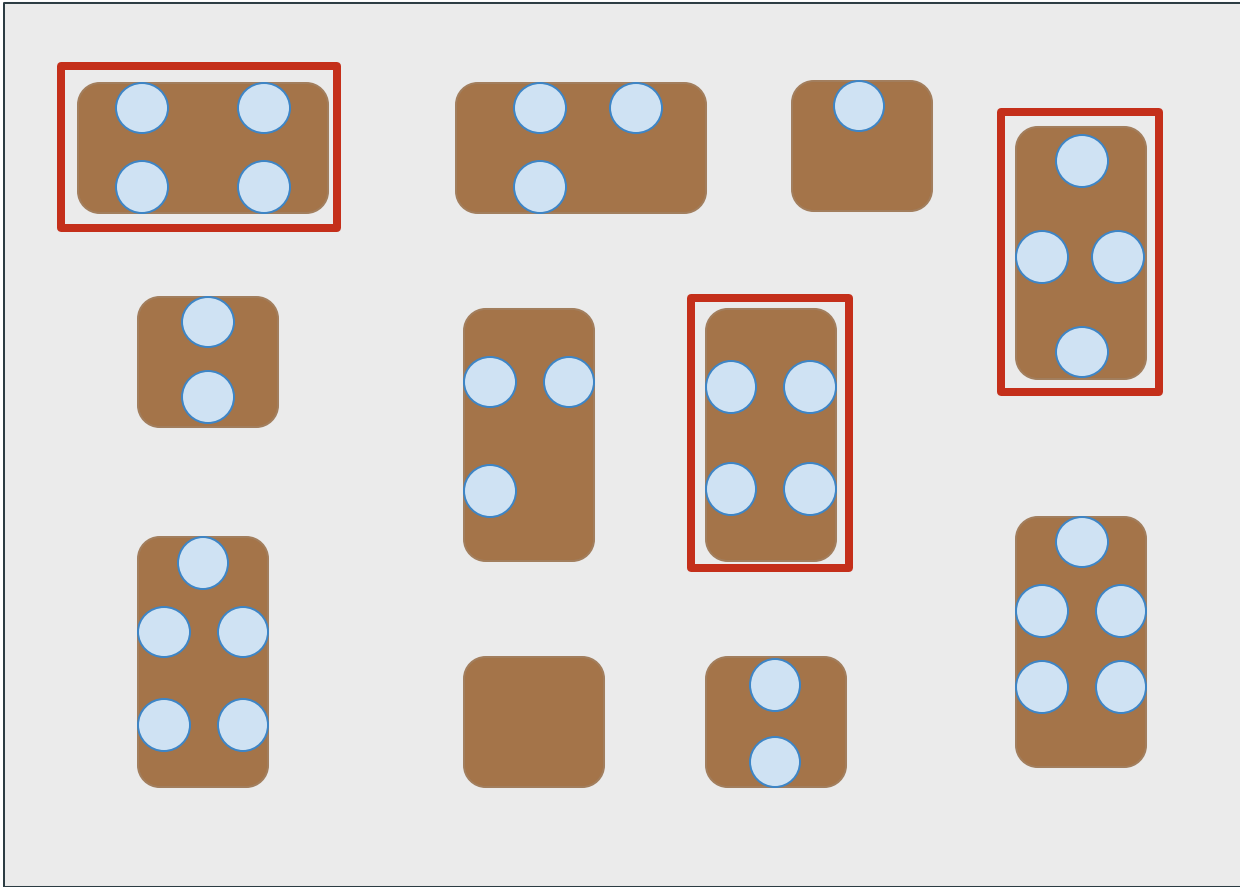
Calculating the mean from an ungrouped frequency table



Group size	Frequency
0	1
1	1
2	2

How many groups of 2 are there?

Calculating the mean from an ungrouped frequency table

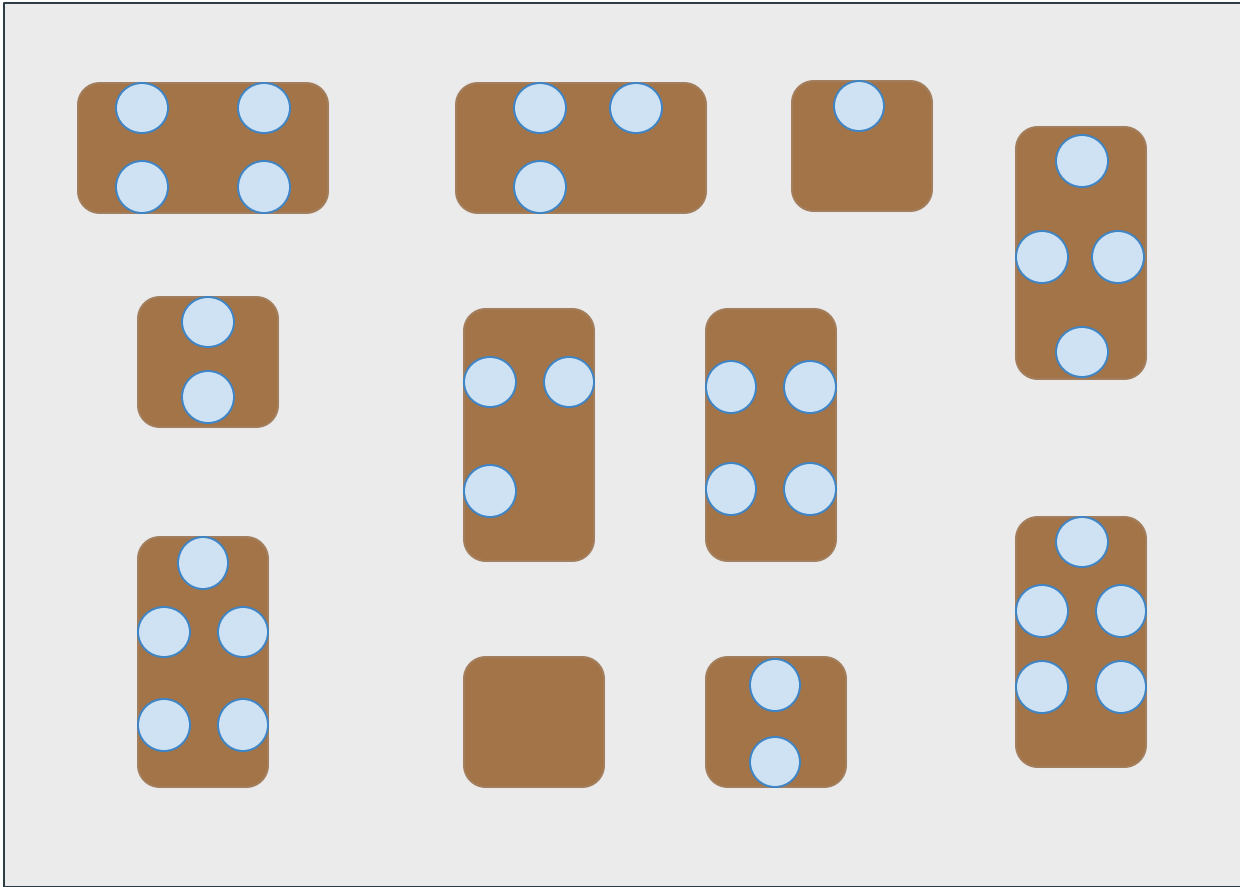


Group size	Frequency
0	1
1	1
2	2
3	2
4	3
5	2

What does the 3 in the **frequency** represent?

It represents the 3 tables with 4 diners.

Calculating the mean from an ungrouped frequency table

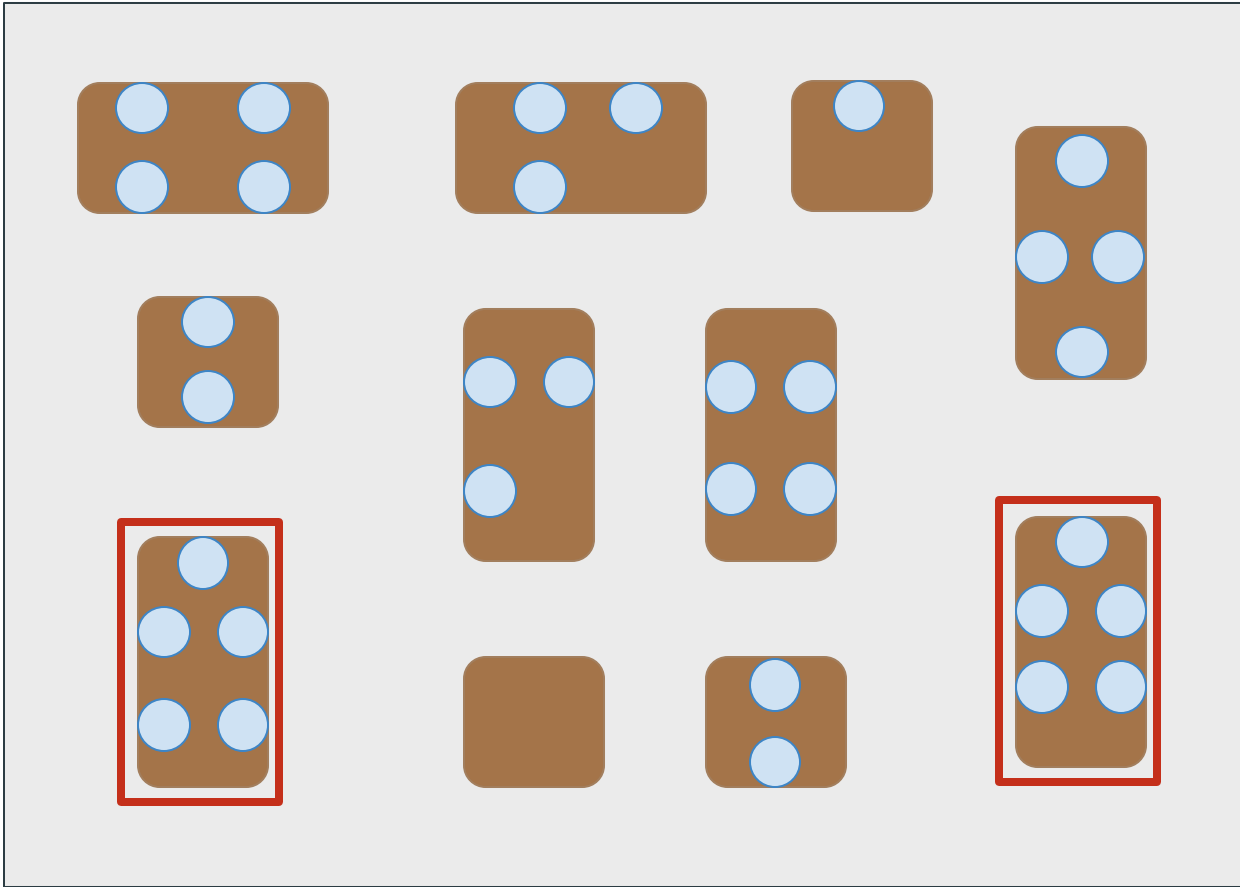


Group size	Frequency
0	1
1	1
2	2
3	2
4	3
5	2

We know there are 11 tables in the restaurant but how can you tell from the **frequency** table?

Total **frequency** =
11

Calculating the mean from an ungrouped frequency table

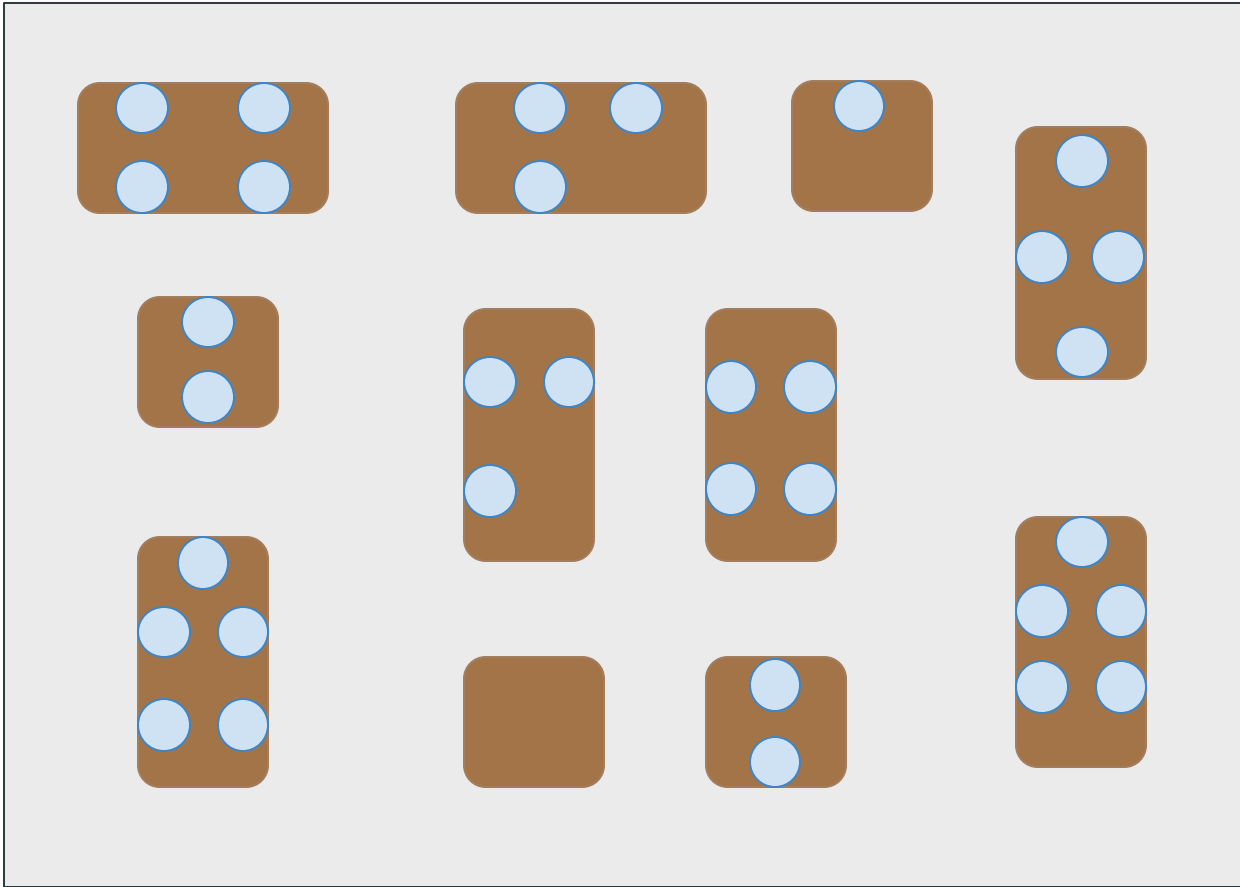


Group size	Frequency
0	1
1	1
2	2
3	2
4	3
5	2

How many people are sat in groups of 5?

10 as 2 tables of 5

Calculating the mean from an ungrouped frequency table



Group size	Frequency
0	1
1	1
2	2
3	2
4	3
5	2

We also know there are 33 diners in the restaurant but how can you tell from the **frequency** table?

Calculating the mean from an ungrouped frequency table

Group size	Frequency
0	1
1	1
2	2
3	2
4	3
5	2

This represents 3 tables, each with 4 diners.

That contributes to 12 to the total diners in the restaurant.

This represents 2 tables, each with 5 diners, that contributes to 10 to the total diners in the restaurant.

Calculating the mean from an ungrouped frequency table

Group size		Frequency		Number of diners
0	×	1	=	0
1	×	1	=	1
2	×	2	=	4
3	×	2	=	6
4	×	3	=	12
5	×	2	=	10

Total number of
diners = 33

The restaurant tables were set up on another day.

How many people were eating
in groups of 4?

12 people as there
were 3 tables of 4

Group size	Frequency
0	0
1	1
2	4
3	2
4	3
5	1

Calculating the mean from an ungrouped frequency table



Check

The restaurant tables were set up on another day.

How many people
were eating at the
restaurant in total?

32 diners in total

Group size	Frequency
0	0
1	1
2	4
3	2
4	3
5	1

Calculating the mean from an ungrouped frequency table

Group size	Frequency	Number of diners
0	1	0
1	1	1
2	2	4
3	2	6
4	3	12
5	2	10

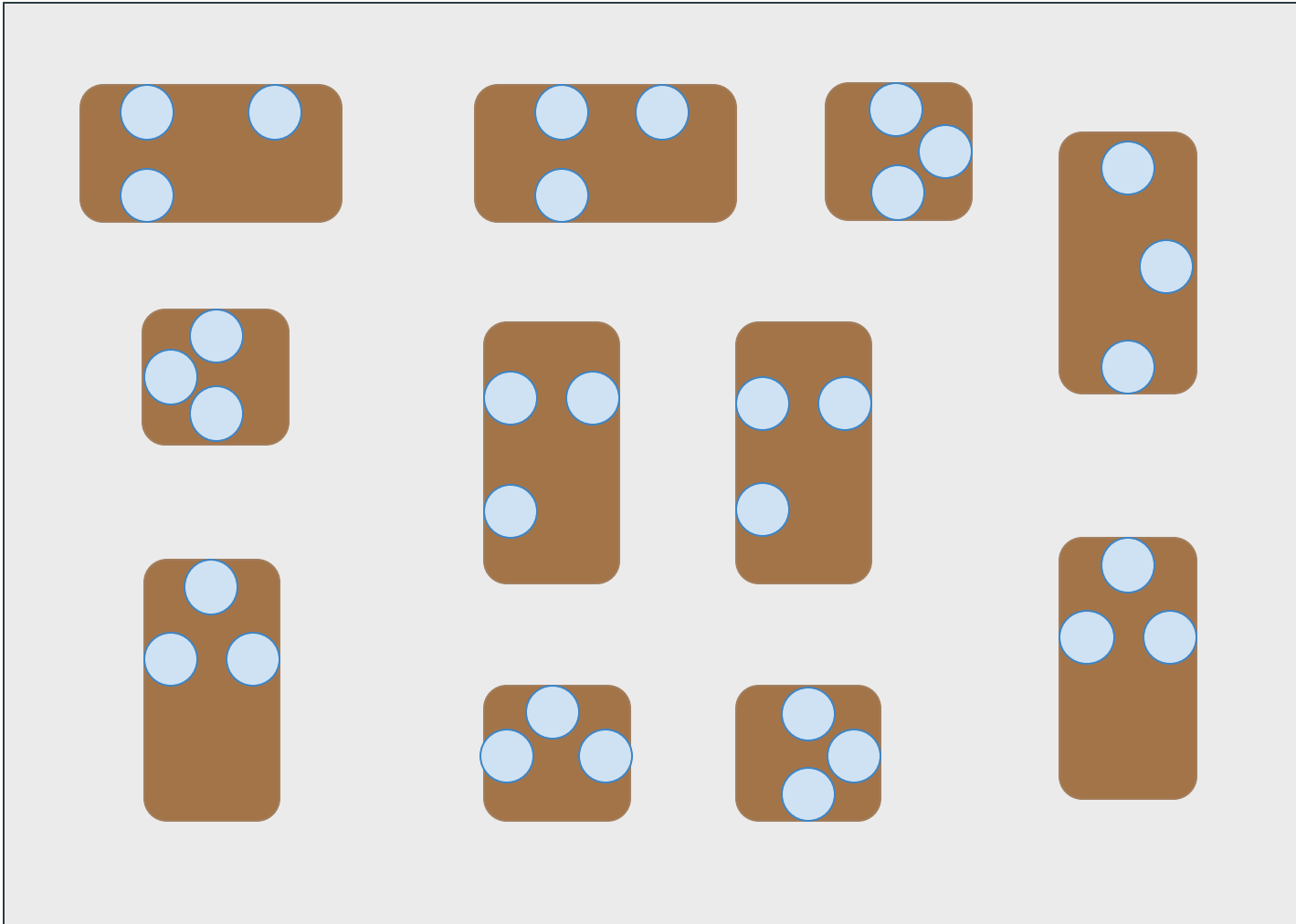
Total number
of tables = 11

Total number of
diners = 33

What is the **mean** number of diners per table at the restaurant?

$$\frac{\text{Total number of diners} = 33}{\text{Total number of tables} = 11} = 3 \text{ diners per table}$$

Calculating the mean from an ungrouped frequency table



What is the **mean** number of diners per table at the restaurant?

$$\frac{\text{Total number of diners} = 33}{\text{Total number of tables} = 11} = 3 \text{ diners per table}$$

The **mean** tells us the number of diners at each table if they were evenly distributed.

Calculating the mean from an ungrouped frequency table

This **frequency** table shows the number of goals scored in each match by all the teams in a club over one football season.

Goals scored	Frequency
0	19
1	34
2	21
3	15
4	11

By adding up the **frequency** column, what are you working out?

The number of games played by all teams in that season.

$$100 = 19 + 34 + 21 + 15 + 11$$

Calculating the mean from an ungrouped frequency table

This **frequency** table shows the number of goals scored in each match by a football club over one season.

Goals scored	Frequency
0	19
1	34
2	21
3	15
4	11

If I add up the goals scored column, this tells me that over the course of the season, the club scored a total of 10 goals.



Is Alex right?

No, the **frequency** table shows that there are 34 occasions where 1 goal is scored, so that would be at least 34 goals scored in total. Adding the first column is meaningless.

Calculating the mean from an ungrouped frequency table

This **frequency** table shows the number of goals scored in each match by a football club over one season.

Goals scored	Frequency	
0	19	0
1	34	34
2	21	42
3	15	45
4	11	44

There were 21 games where 2 goals were scored.

This means there were 42 goals scored in those 21 games.

Calculating the mean from an ungrouped frequency table

This **frequency** table shows the number of goals scored in each match by a football club over one season.

Goals scored	Frequency	
0	19	0
1	34	34
2	21	42
3	15	45
4	11	44

165 goals were scored in total.

Calculating the mean from an ungrouped frequency table

This **frequency** table shows the number of goals scored in each match by a football club over one season.

Goals scored	Frequency	
0	19	0
1	34	34
2	21	42
3	15	45
4	11	44

100 matches
played

165 goals scored in
total

What was the **mean** number of goals scored per match by the club?

$$\frac{165}{100} = 1.65$$

goals per match

1.



Robbie played twenty football matches for his school team.
The number of goals scored in each game are shown in the table.

Goals	Number of matches	
0	3	
1	5	
2	9	
3	1	
4	2	

(a) Work out the total number of goals scored by Robbie.

.....
(2)

(b) Calculate the mean number of goals scored per game.

2. The table shows the number of sweets in 20 bags.



Number of sweets	Frequency
23	1
24	4
25	9
26	3
27	3

Calculate the mean.

Independent Practice:



Explanation

Question 1: Work out the mean for each of these frequency tables.
You may not use a calculator

(a)

Age	Frequency
5	2
6	2
7	5
8	1

(b)

Number of phones	Frequency
0	1
1	3
2	2
3	0
4	4
5	0

(c)

Number of pets	Frequency
0	13
1	28
2	50
3	9

(d)

Money Withdrawn	Frequency
£10	16
£20	19
£30	4
£40	3
£50	6
£60	2

(e)

Number of bedrooms	Frequency
1	34
2	275
3	512
4	179

(f)

Level	Frequency
3	1
4	9
5	7
6	2
7	1

Independent Practice:



Explanation

Question 2: Work out the mean for each of these frequency tables.
You may use a calculator

(a)

Age	Frequency
16	28
17	7
18	3
19	2

(b)

Grade	Frequency
3	16
4	27
5	45
6	49
7	50
8	13

(c)

Siblings	Frequency
0	71
1	25
2	14

(d)

Pocket Money	Frequency
£1	5
£2	34
£3	86
£4	19
£5	3
£6	3

(e)

Star rating	Frequency
0	9
1	12
2	17
3	19
4	21
5	8

(f)

Times visited	Frequency
0	131
1	873
2	599
3	205

Independent Practice: Answers



Explanation

Question 1: Work out the mean for each of these frequency tables.
You may not use a calculator

(a)

Age	Frequency
5	2
6	2
7	5
8	1

6.5

(b)

2.3

Number of phones	Frequency
0	1
1	3
2	2
3	0
4	4
5	0

(c)

1.55

Number of pets	Frequency
0	13
1	28
2	50
3	9

(d)

Money Withdrawn	Frequency
£10	16
£20	19
£30	4
£40	3
£50	6
£60	2

£24

(e)

Number of bedrooms	Frequency
1	34
2	275
3	512
4	179

2.836

(f)

Level	Frequency
3	1
4	9
5	7
6	2
7	1

4.65

Independent Practice: Answers



Explanation

Question 2: Work out the mean for each of these frequency tables.
You may use a calculator

(a) 16.475

Age	Frequency
16	28
17	7
18	3
19	2

(b) 5.645

Grade	Frequency
3	16
4	27
5	45
6	49
7	50
8	13

(c) 0.4818

Siblings	Frequency
0	71
1	25
2	14

(d) $£2.933..$

Pocket Money	Frequency
£1	5
£2	34
£3	86
£4	19
£5	3
£6	3

(e) 2.64

Star rating	Frequency
0	9
1	12
2	17
3	19
4	21
5	8

(f) 1.49

Times visited	Frequency
0	131
1	873
2	599
3	205