1 Answers

EXERCISE 1.2

1 D
2 D
3 C
4 B
5 Numerical: **a**, **b**, **c**
6 Categorical: **c**, **d**, **e**, **f**, **g**
7 Discrete: **c**
Continuous: **a**, **b**
8 C
9 C
10 Categorical
11 B
12 A
13 Categorical and ordinal
14 Discrete
15 Ordinal
16 D

EXERCISE 1.3

1

Stem	Leaf
1	6 8
2	1 5 8 8 9
3	0 1 3 5 8 9
4	2 8 9

Key: 1|6 = 16

2

Stem	Leaf
0	5
1	1 8 9
2	3 7 9
3	1 2 5 6 7 9
4	1 2 3 5
5	2

Key: 0|5 = $5

The busker's earnings are inconsistent.

3

Stem	Leaf
86	8
87	7
88	0
89	8
90	2 4 8 9
91	
92	0 1 2 6
93	
94	3 9
95	
96	
97	0
98	3 5 9

Key: 86|8 = 86.8%

4

Stem	Leaf
18	5 7 9
19	1 5 6 6 7 9
20	1 3 3 5 9
21	7
22	1

Key: 18|5 = 1.85 cm

5 a

Stem	Leaf
2	0 2 2
2*	5 6 8 8
3	3 3 3
3*	7 7 8 9 9 9

Key: 2|0 = 20 points

b

Stem	Leaf
2	0
2	2 2
2	5
2	6
2	8 8
3	
3	3 3 3
3	
3	7 7
3	8 9 9 9

Key: 2|0 = 20 cm

6 a

Stem	Leaf
4	3 7 7 8 8 9 9 9
5	0 0 0 0 1 2 2 3

Key: 4|3 = 43 cm

b

Stem	Leaf
4	3
4*	7 7 8 8 9 9 9
5	0 0 0 0 1 2 2 3
5*	

Key: 4|3 = 43 cm

c

Stem	Leaf
4	
4	3
4	
4	7 7
4	8 8 9 9 9
5	0 0 0 0 1
5	2 2 3
5	
5	
5	

Key: 4|3 = 43 cm

7 a 1 2 5 8 12 13 13 16
16 17 21 23 24 25 25 26
27 30 32

b 10 11 23 23 30 35 39 41
42 47 55 62

c 101 102 115 118 122 123
123 136 136 137 141 143
144 155 155 156 157

d 50 51 53 53 54 55 55 56
56 57 59

e 1 4 5 8 10 12 16 19 19
21 21 25 29

8

Stem	Leaf
3	7 9
4	2 9 9
5	1 1 2 3 7 8 9
6	1 3 3 8

Key: 3|7 = 37 years

It seems to be an activity for older people.

9 C

10

Stem	Leaf
1*	9
2	
2*	5 8 8 9 9 9
3	0 0 2 2 2 3 3 4
3*	5 5 7 8 9

Key: 2|5 = 25 years

More than half of the parents are 30 or older with a considerable spread of ages, so this statement is not very accurate.

11

Stem	Leaf
1*	9
2	1 2 4
2*	5 6 8 9 9
3	1 1 2 3 4
3*	
4	0 1

Key: 2|1 = 21 hit outs

Bulldogs, Melbourne, St Kilda

12

Stem	Leaf
33	0
34	
35	0 0 1
36	5
37	3
38	0 0
39	0 0 5
40	0 6
41	0 5
42	1 3
43	0 0
44	
45	0

Key: 33|0 = $330

The stem plot shows a fairly even spread of rental prices with no obvious outliers.

13 a

Stem	Leaf
1	5 6 7 7 7 8 9 9 9 9
2	0 0 0 1 1 1 2 3 3 3

Key: 1|5 = 15 mm

b

Stem	Leaf
1	
1*	5 6 7 7 7 8 9 9 9 9
2	0 0 0 1 1 1 2 3 3 3
2*	

Key: 1|5 = 15 mm

c

Stem	Leaf
1	
1	
1	5
1	6 7 7 7
1	8 9 9 9 9
2	0 0 0 1 1 1
2	2 3 3 3
2	
2	
2	

Key: 1|5 = 15 mm

Values are bunched together; they vary little.

14

Stem	Leaf
7	2 8
8	3 3 5 7 8 8
9	0 1 2 2 3 4 8 9
10	0 2 4
11	2

Key: 7|2 = 72 shots

15

Stem	Leaf
6	
6*	8 9
7	1 1 2 2 3 3 3 3 4 4
7*	5 5 5 6 6 7
8	
8*	6

Key: 7|1 = 71 net score

The handicapper has done a good job as most of the net scores are around the same scores; that is, in the 70s.

16 a

Stem	Leaf
6	0 3 9
7	0 1 3 5 6 7 8
8	0 1 3 4 7 8 9 9
9	1 3 7 8

Key: 6|0 = 60%

b

Stem	Leaf
6	0 3
6*	9
7	0 1 3
7*	5 6 7 8
8	0 1 3 4
8*	7 8 9 9
9	1 3
9*	7 8

Key: 6|0 = 60%

17 a

Computer 1	Stem	Computer 2
5	34	0 2 6 8
8 2	35	2 3 5 5 7 8
6 3	36	1 2
6	37	
1 0	38	
2 1	39	
5	40	
0	41	

Key: 34|0 = 340 minutes

b Computer 1 lasts longer but is not as consistent. Computer 2 is more consistent but doesn't last as long.

18 a

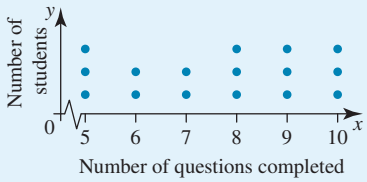
Year 8	Stem	Year 10
9 8	14	
7 5 5 5 3 1 0	15	2 4 6 8 9
8 6 5 4 3 2 1 0	16	0 4 5 7 7 9
5 2 1	17	2 3 4 6 7 8 8
	18	2 5

Key: 14|8 = 148 cm

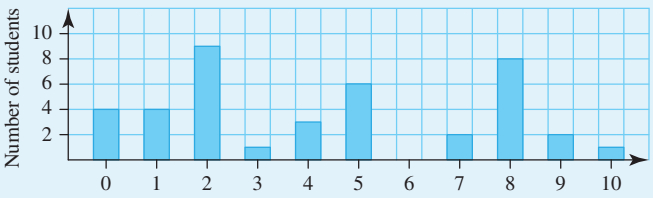
b As you would expect the Year 10 students are generally taller than the Year 8 students; however, there is a large overlap in the heights.

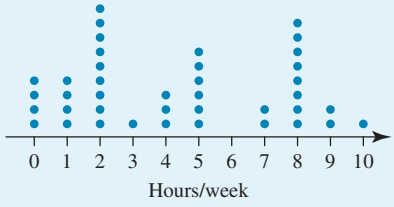
EXERCISE 1.4

1

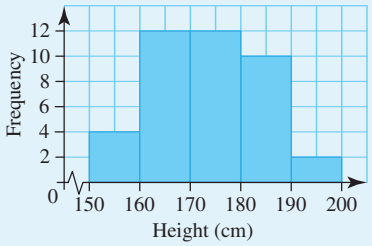


2



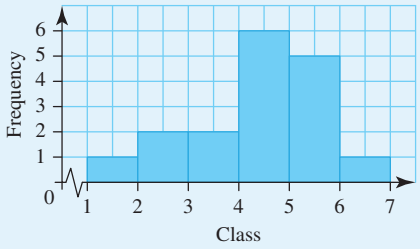


3



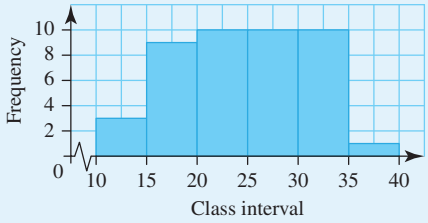
4 a

Class	Frequency
1–	1
2–	2
3–	2
4–	6
5–	5
6–	1



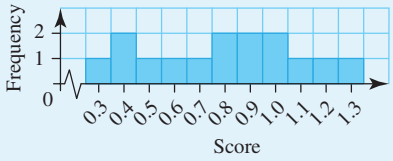
b

Class interval	Frequency
10–	3
15–	9
20–	10
25–	10
30–	10
35–	1

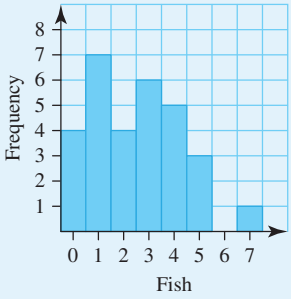


c

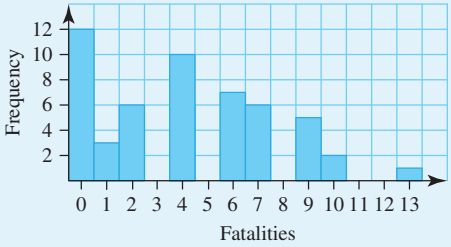
Score	Frequency
0.3	1
0.4	2
0.5	1
0.6	1
0.7	1
0.8	2
0.9	2
1.0	2
1.1	1
1.2	1
1.3	1



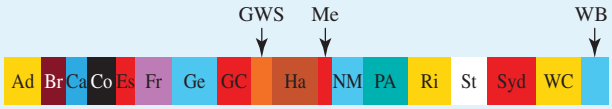
5



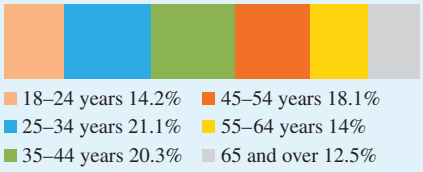
6



7

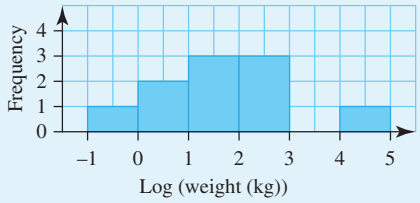


8 Participation in activities



The statement seems untrue as there are similar participation rates for all ages. However, the data don't indicate types of activities.

9



10 D

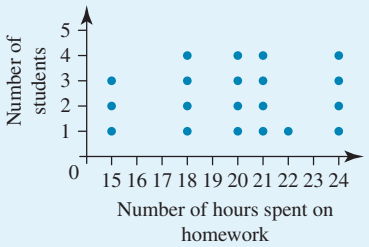
11 16

12 5 times

13 Check your histograms against those shown in the answer to question **4**.

14 D

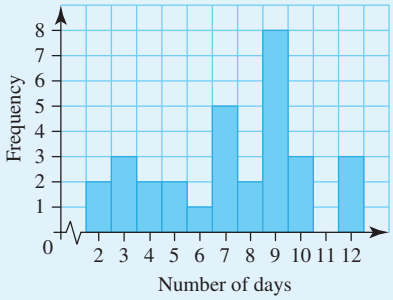
15



16

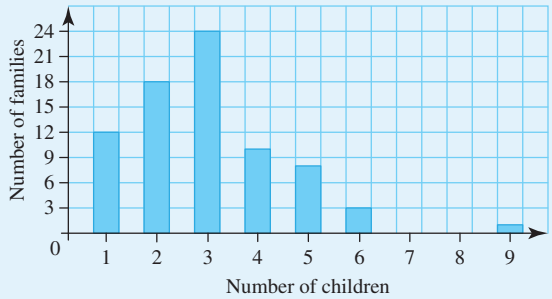
Number of days	Tally	Frequency
2	II	2
3	III	3
4	II	2
5	II	2
6	I	1
7	𝍸	5
8	II	2
9	𝍸 III	8
10	III	3
11		0
12	II	2
		30

17



18 Check your histogram against that shown in the answer to question **17**.

19



20 **a** B **b** A **c** D

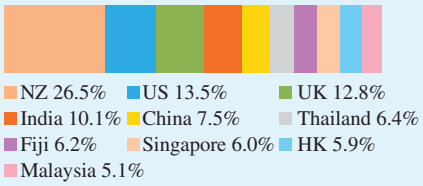
21 A

22 B

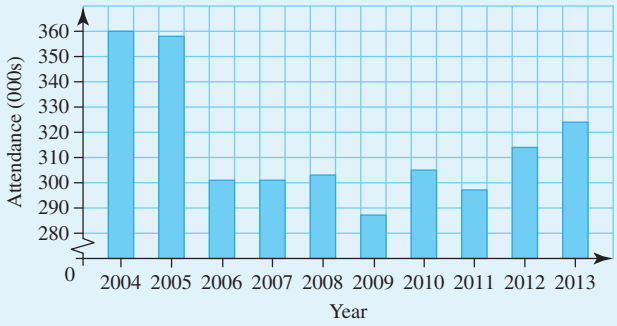
23 a

NZ	26.5%
US	13.5%
UK	12.8%
India	10.1%
China	7.5%
Thailand	6.4%
Fiji	6.2%
Singapore	6.0%
HK	5.9%
Malaysia	5.1%

b



24 a



b Check your bar chart against that shown in the answer to part **a**.

EXERCISE 1.5

1 Positively skewed

2 Negatively skewed

3 a Symmetric
b Negatively skewed
c Positively skewed
d Symmetric
e Symmetric
f Positively skewed

4 a Symmetric, no outliers
b Symmetric, no outliers
c Symmetric, no outliers
d Negatively skewed, no outliers
e Negatively skewed, no outliers
f Positively skewed, no outliers

5 E
6 C

7 Negatively skewed

8 Positively skewed. This tells us that most of the flight attendants in this group spend a similar number of nights (between 2 and 5) interstate per month. A few stay away more than this and a very few stay away a lot more.

9 a Symmetric

b This tells us that there are few low-weight dogs and few heavy dogs but most dogs have a weight in the range of 10 to 19 kg.

10 a Symmetric

b Most students receive about $8 (give or take $2).

11 a Positively skewed

b **i** 15 **ii** 85%

12 a Positively skewed

b Since most of the data is linked to the lower stems, this suggests that some students do little exercise, but those students who exercise, do quite a bit each week. This could represent the students in teams or in training squads.

13 a Club A: negatively skewed

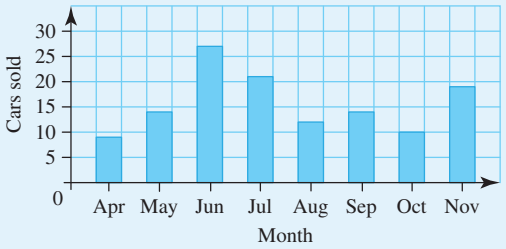
Club B: positively skewed

b Since Club A has more members of its bowling team at the higher stems as compared to Club B; you could say Club A has the older team as compared to Club B.

c **i** Club A: 11 members over 70 years of age

ii Club B: 4 members over 70 years of age.

14 a



b Positively skewed

c June, July and November represent the months with the highest number of sales.

d This is when the end of financial year sales occur.

EXERCISE 1.6

1 Median = 33
2 Median = 36.5 goals
3 IQR = 14
4 IQR = 8
5 IQR = 6.5
6 IQR = 3.3

7

	Median	Range	Mode
a	37	56	38, 49
b	5	17	5
c	11	18	8, 11
d	42.5	18	43
e	628	72	613, 628, 632

8

	Median	Range
a	6	7
b	17	9
c	6	6
d	10	13
e	18.5	14
f	4	7
g	19	17
h	4.5	9
i	23	21

9 a 10

b 8

c The IQRs (middle 50%) are similar for the two restaurants, but they don't give any indication about the number of cars in each data set.

10 An example is 2 3 6 8 9. There are many others.

11 a The lowest score occurs several times. An example is 2 2 2 3 5 6.

b There are several data points that have the median value. An example is 3 5 5 5 5 5 7.

12 C

13

	Median	Interquartile range	Range	Mode
a	21	18	45	15, 23, 32
b	27.5	8	20	29
c	3.7	3	5.9	3.7

14

	Median	Interquartile range	Range	Mode
a	42	21	91	46
b	32	7	30	34

The data in set **a** have a greater spread than in set **b**, although the medians are similar. The spread of the middle 50% (IQR) of data for set **a** is bigger than for set **b** but the difference is not as great as the spread for all the data (range).

15 a Range = 72, Median = 37.5, Mode = 46, IQR = 22

b Range = 47
Median = 422
Mode = 411
IQR = 20

16 Median = 7, Mode = 7

17 $Q_1 = 42.2$, $Q_3 = 48.15$, IQR = 5.95, Median = 45.1

18 a Median = 93, $Q_1 = 91.5$, $Q_3 = 97$, IQR = 5.5, Range = 30, Mode = 93

b The average handicap of the golfer's should be around 21.

EXERCISE 1.7

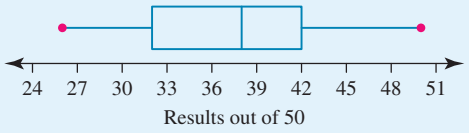
1 Range = 39
Median = 25
IQR = 19

2 Range = 3
Median = 7.5
IQR = 1.4

3 They could represent the same data.

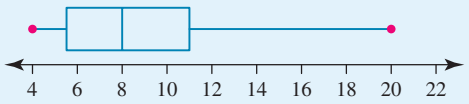
4 They could represent the same data.

5



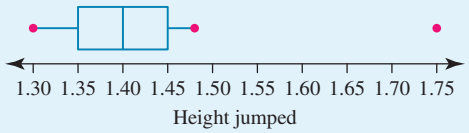
Negatively skewed; 50% of results are between 32 and 42.

6



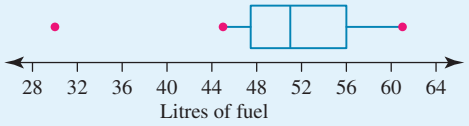
Fairly symmetrical.

7 a



b The data is symmetrical and 1.75 is an outlier.

8



30.3 is an outlier.

9

	Range	Interquartile range	Median
a	12	6	8
b	7	2	5
c	350	100	250
d	100	30	65
e	20	10	25

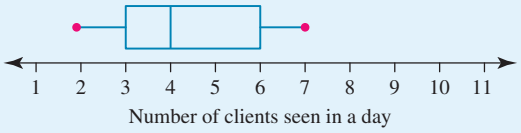
10 a iii **b** iv **c** i **d** ii

11 The boxplots should show the following:

	Minimum value	Q_1	Median	Q_3	Maximum value
a	3	6	8.5	14	18
b	3	5	7	9	12
c	4.3	4.6	5	5.4	5.6
d	11	15.5	18	20	22
e	0.4	0.7	0.9	1.1	1.3

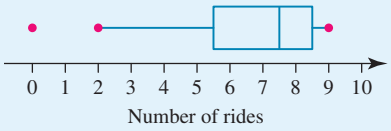
12 D

13



14 See boxplot at foot of the page*

15 a



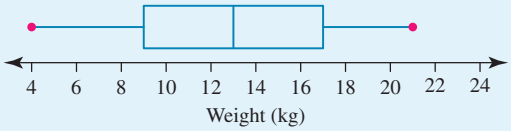
The data are negatively skewed with an outlier on the lower end. The reason for the outlier may be that the person wasn't at the show for long or possibly didn't like the rides.

16 a Two similar properties: both sets of data have the same minimum value and similar IQR value.

b Boys IQR = 16
Girls IQR = 16.5

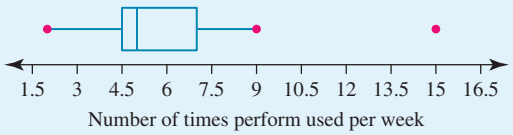
c The reason for an outlier in the boys' data may be that the student did not understand how to do the test, or he stopped during the test rather than working continuously.

17 Median = 13, $Q_1 = 9$, $Q_3 = 17$, $\text{Min}_x = 4$, $\text{Max}_x = 21$

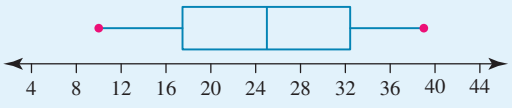


18 Median = 5
$Q_1 = 4.5$
$Q_3 = 7$
$\text{Min}_x = 2$, $\text{Max}_x = 15$
IQR = 2.5

15 is an outlier



19 a Median = 25
$Q_1 = 17.5$
$Q_3 = 32$
$\text{Min}_x = 11$, $\text{Max}_x = 39$
IQR = 14.5

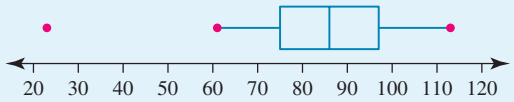


b No outliers

c Check your boxplot against that shown in the answer to part **a**.

20 Median = 86
$Q_1 = 75$
$Q_3 = 97$
$\text{Min}_x = 23$, $\text{Max}_x = 113$
IQR = 22

23 is an outlier



EXERCISE 1.8

1 23.46

2 8.26

3 10.54

4 26.80

5 a 7.2 **b** 7.125 **c** 4.9875
d 16.7 **e** 0.8818

6 a 1.0783 No, because of the outlier.

b 17 Yes

c 30.875 Yes

d 15.57 No, because of the outlier.

7 12

8 D

9 A

10 a Median **b** Mean **c** Median **d** Median

11 a 36.09 **b** 16.63 **c** 168.25 **d** 18.55

12 a 24.4

b Median = 22

The distribution is positively skewed — confirmed by the table and the boxplot.

13 214.5 papers

14 Approximately 41 fish

15 63.14 kg

16 a Approximately 53 cups

b The median is 54.5, approximately 55 cups.

c The data is negatively skewed.

EXERCISE 1.9

1 3.54 cents

2 14.27%

3 9.489

4 7.306

5 a 1.21

b 2.36

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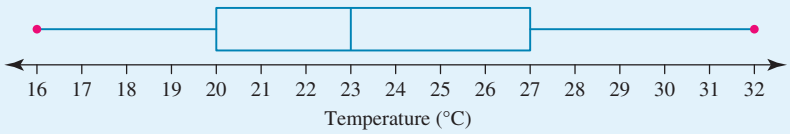
*14



c 6.01
d 2.45
e 0.06

6 0.48%
7 0.06 m
8 0.51 seconds
9 15.49
10 C
11 2.96 km/h
12 6.067 pens
13 2.39 °C
14 $\bar{x} = 75.7, s = 5.6$
15 3.786 players
16 2.331

EXERCISE 1.10

1 Answers will vary.
2 Answers will vary.
3 B
4 Answers will vary.
5 Answers will vary.
6 Population is larger, since a sample is taken from the population.
7 C
8 E
9 Yes, because the distribution is reasonably symmetric with no outliers
10 B
11 C
12 Answers will vary.
13 Answers will vary.
14 Answers will vary.

EXERCISE 1.11

1 a 68% of group's concentration span falls between 35 secs and 63 secs
b 95% of group's concentration span falls between 21 secs and 77 secs
c 99.7% of group's concentration span falls between 7 secs and 91 secs

2 a 68% of the group to lie between 43.3 mm and 46.7 mm
b 95% of the group to lie between 41.6 mm and 48.4 mm
c 99.7% of the group to lie between 39.9 mm and 50.1 mm

3 a 2.50% **b** 50% **c** 16% **d** 81.5%

4 a 84% **b** 2.5% **c** 84% **d** 97.35%

5 420 bags

6 a 336 containers **b** 10 containers
c 380 containers.

7 2.33
8 3

9 a Specialist: $\mu = 67, \sigma = 9$
English: $\mu = 58, \sigma = 14$
$z_s = 1.78, z_e = 2.14$
b English has the higher result as it has the higher z-score.

10 a English 1.25, Maths 1.33
b Maths mark is better as it has a higher z-score.

11 a Yes **b** Yes **c** No
d No **e** No **f** Yes

12 a 8 and 12 **b** 6 and 14 **c** 4 and 16

13 a 3.7 and 6.3 **b** 2.4 and 7.6 **c** 1.1 and 8.9

14 a 1.3 mm and 2.5 mm
b 0.7 mm and 3.1 mm
c 0.1 mm and 3.7 mm

15 a 5 and 9 **b** 3 and 11 **c** 1 and 13

16 C

17 a 0.15% **b** 2.5% **c** 84%
d 83.85% **e** 81.5%

18 a **i** 1360 **ii** 1950 **iii** 317
b 100

19 a −0.48 **b** 1.44 **c** 0.08
d −2.24 **e** 2.8

20 B

21 Second test, Barbara's z-score was −0.33 compared to −0.5 in the first test.

22 a Barn: $\mu = 4.4 \quad \sigma = 0.3$
FR: $\mu = 4.1 \quad \sigma = 0.2$
b 1.18
c 84%
d

	Cage	Barn	Free range
Min_x	4.7	3.9	3.8
Q_1	5	4.1	4
med	5.15	4.35	4.1
Q_3	5.5	4.6	4.2
Max_x	5.8	4.9	4.4

i Cage: 5.15
Barn: 4.35
Free: 4.1
ii It could be concluded that the more space a chicken has, the fewer eggs it lays because the median is greatest for cage eggs.