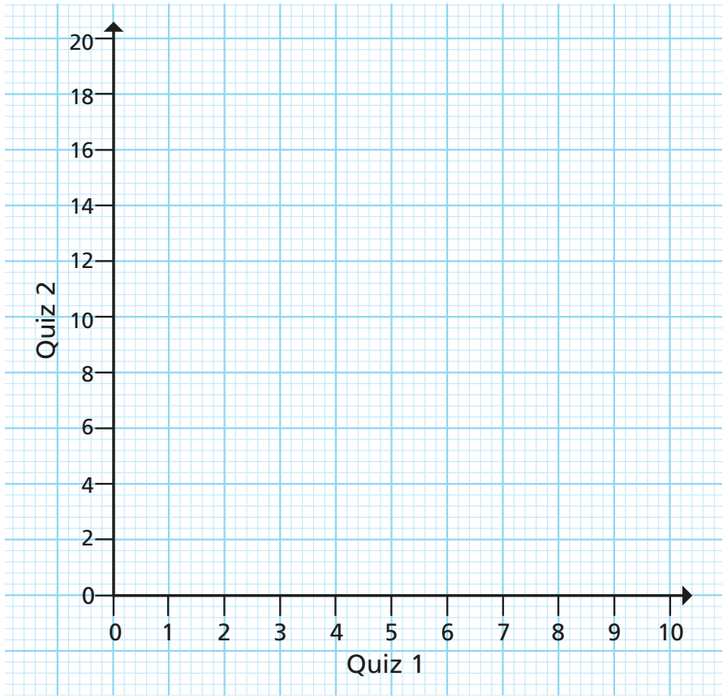
Draw and interpret scatter graphs

1 Five students take part in two different quizzes.

The table shows the results for the five students.

Student	Quiz 1	Quiz 2
Mo	7	13
Dora	3	6
Tommy	5	9
Annie	9	12
Ron	10	18

a) Plot the points to draw a scatter graph for the students' results.

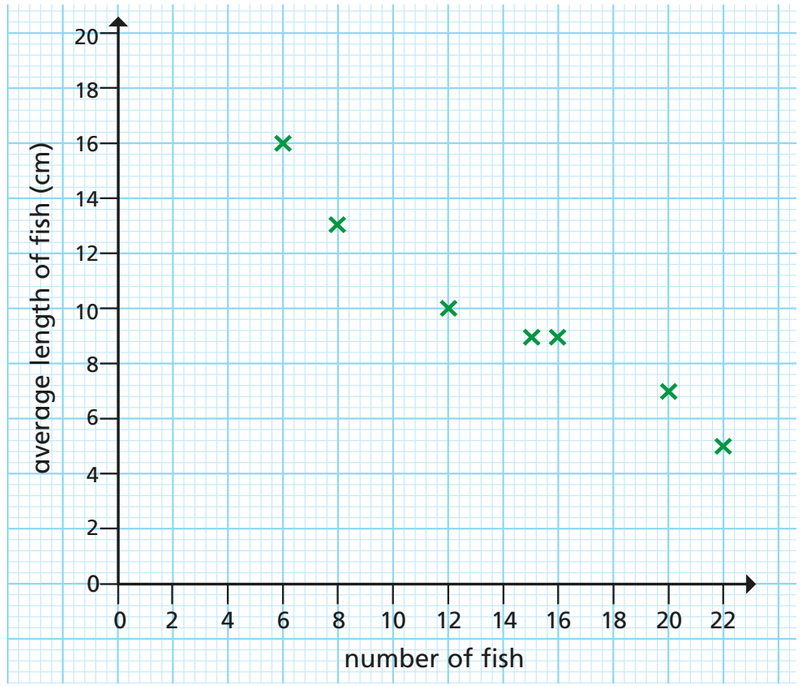


b) What do you notice about the scores on the two quizzes?

c) Discuss with a partner what you can understand from the scatter graph.

2 A zoo records the average number of fish in a tank, and the average length of the fish.

They plot a scatter graph to show their results.



a) Use coordinates from the graph to complete the table.

Number of fish							
Average length of fish (cm)							

b) Complete the sentence.

The _____ fish there are in the tank, the _____ the length of the fish.

c) A different fish tank contains ten fish.

Estimate the average length in centimetres of the fish in this tank.

Circle your answer.

17 cm **25 cm** **11 cm** **4 cm**

Discuss your answer with a partner.

3 Students are comparing how long they charge their phones for in hours, with the percentage of charge shown on their phones.

a) Draw a scatter graph to represent the results for these six students.

Dani (5, 80) Ron (3, 70)

Kim (0, 10) Eddy (7, 100)

Nijah (10, 4) Brett (5, 60)

b) Whose phone do you think is broken? _____

Explain your reasoning.

_____

_____

4 Distance from school against mode of transport to school

Is it possible to represent this on a scatter graph? _____

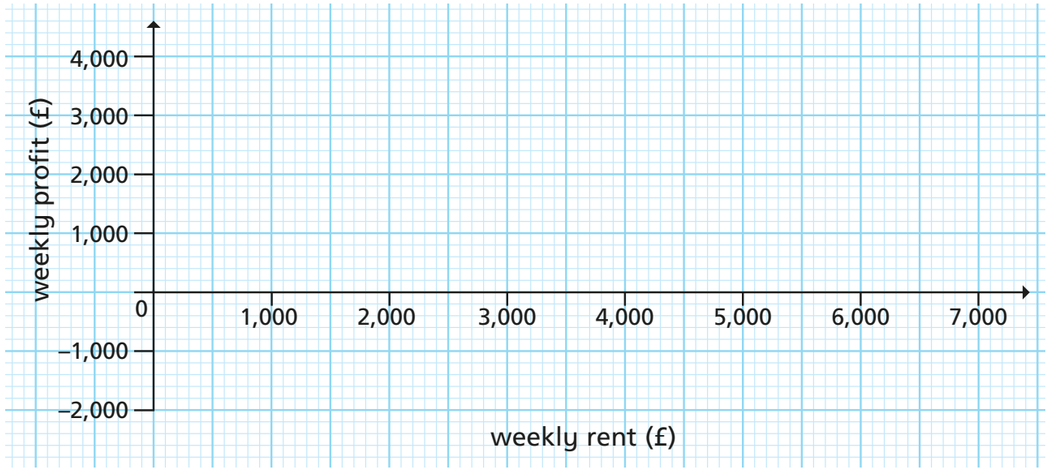
Talk about your reasoning with a partner.

5 The owner of a large company wants a scatter graph showing the weekly rent and profit of their shops.

Here is a table showing the information.

Location	Weekly rent (£)	Weekly profit (£)
Harrogate	7,000	500
Knaresborough	2,000	3,000
Wetherby	3,500	2,000
Skipton	5,000	–1,000
Keighley	4,800	1,000

a) Plot the points on the graph.



b) What is the relationship between the weekly rent paid and the weekly profit?

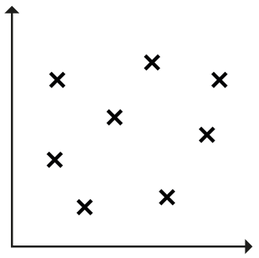
_____

_____

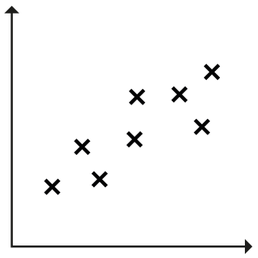
Understand and describe linear correlation

1 Match each scatter graph to a description.

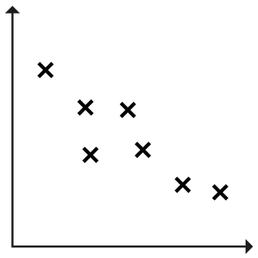
A



B



C

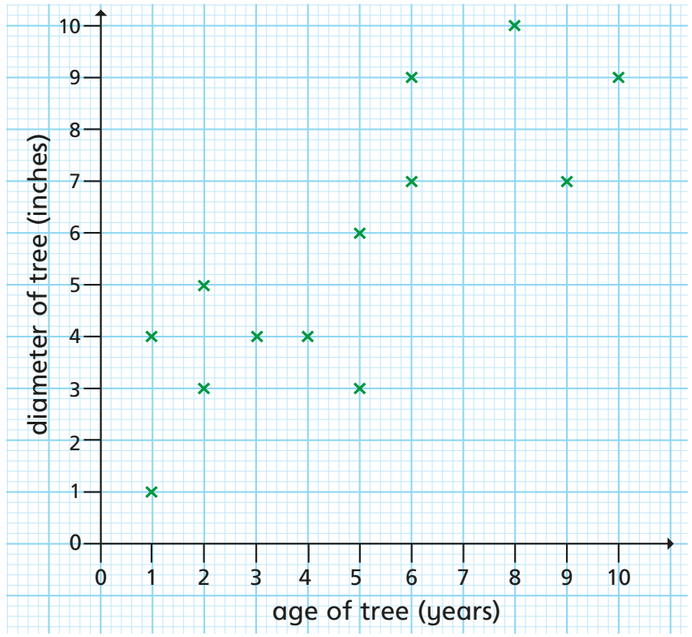


Length of child's foot and their height _____

Length of foot and house number _____

Outside temperature and number of snowmen made _____

2 Here is a scatter graph for the age of a tree and the diameter of its trunk.



Complete the sentence.

As the age of the tree _____, the diameter of the trunk _____

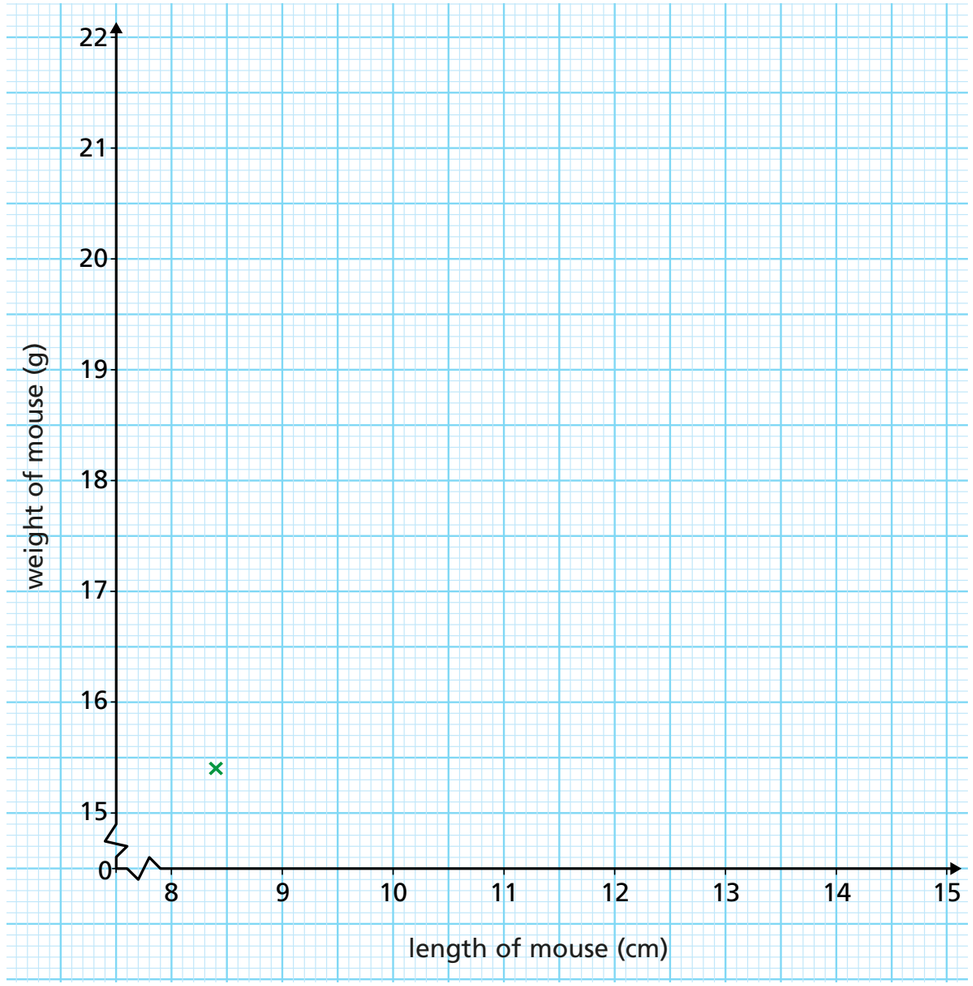
This shows _____ correlation.

3 The table shows the lengths and weights of ten pet mice.

Length (cm)	8.4	8.7	9.5	9.6	10.4	11	11.3	12.2	12.5	13.6
Weight (g)	15.4	15.9	18.4	17.9	18.8	19.5	20	20.1	20.8	21.3

a) Plot the information on the graph.

The first point has been plotted for you.



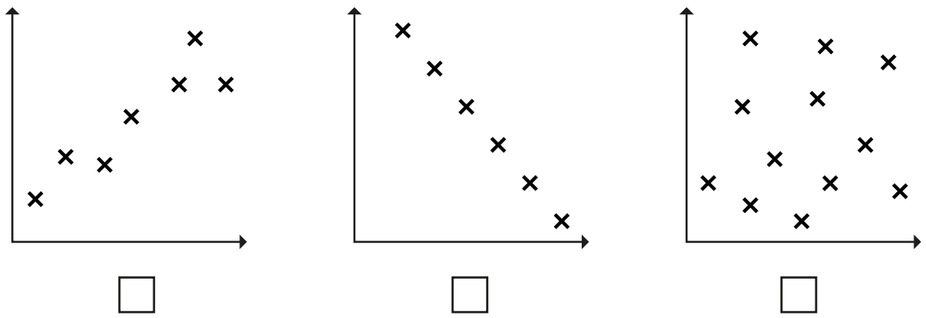
a) Describe the type of correlation shown. _____

b) What does this tell you about the relationship between the length and weight of a mouse?

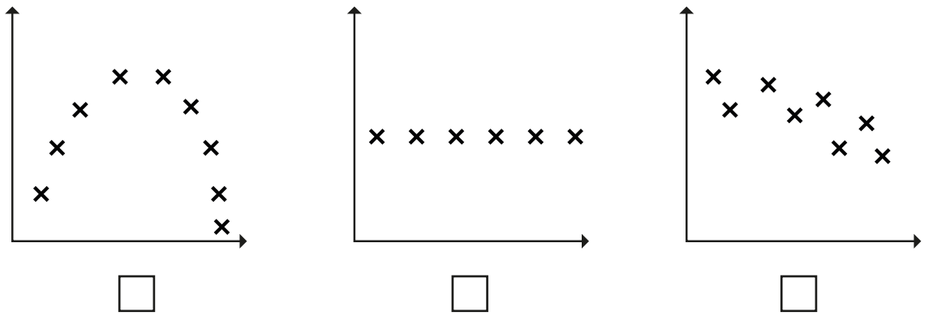
_____

_____

4 **a)** Tick the graph that shows positive correlation.

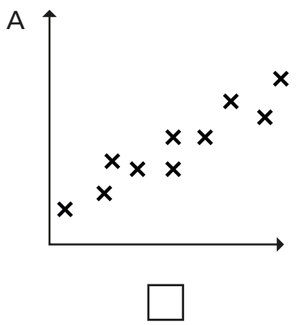


b) Tick the graph that shows negative correlation.



c) Which graph shows the strongest positive correlation?

A



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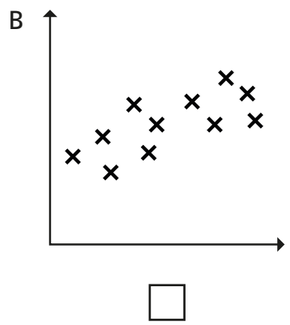


Explain your reasoning.

_____

_____

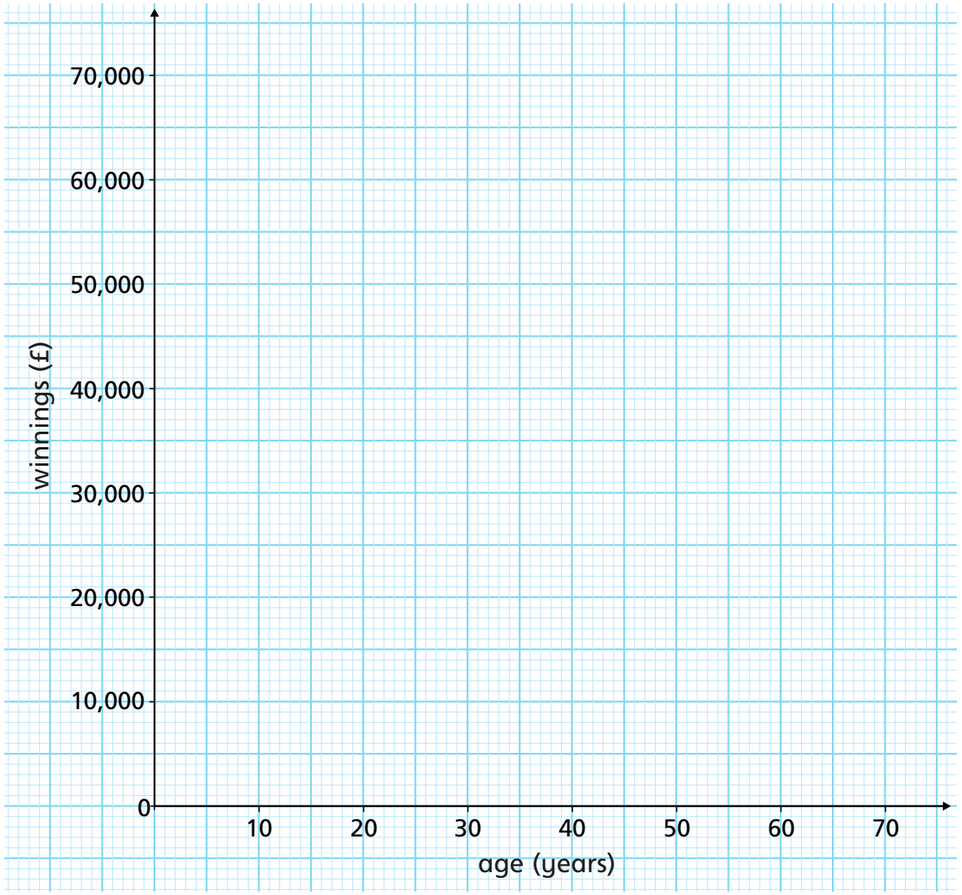
5 On a TV quiz, contestants can win an amount of money between £1,000 and £75,000

The table shows the ages of 12 contestants and their winnings.

Age (years)	26	30	18	64	44	31
Winnings (£)	5,000	17,000	75,000	1,800	2,000	32,000

Age (years)	48	20	35	42	50	21
Winnings (£)	16,000	2,000	36,000	19,000	1,900	41,000

a) Draw a scatter graph to represent this information.



b) Describe the type of correlation shown. _____

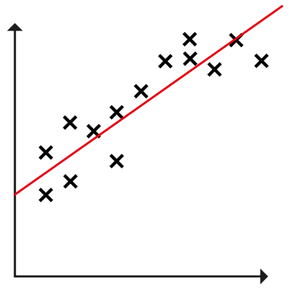
c) Can you use your scatter graph to estimate the age of a contestant who won £50,000? Discuss with a partner.

Draw and use line of best fit

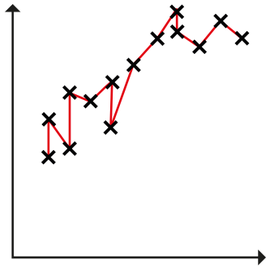
1 Do the scatter graphs show the best line of fit?

Explain your reasoning.

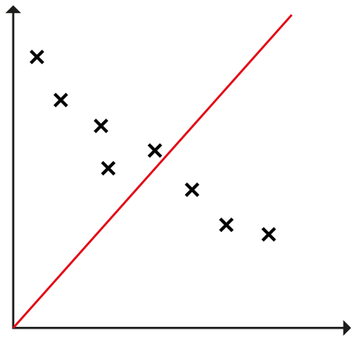
a)



b)



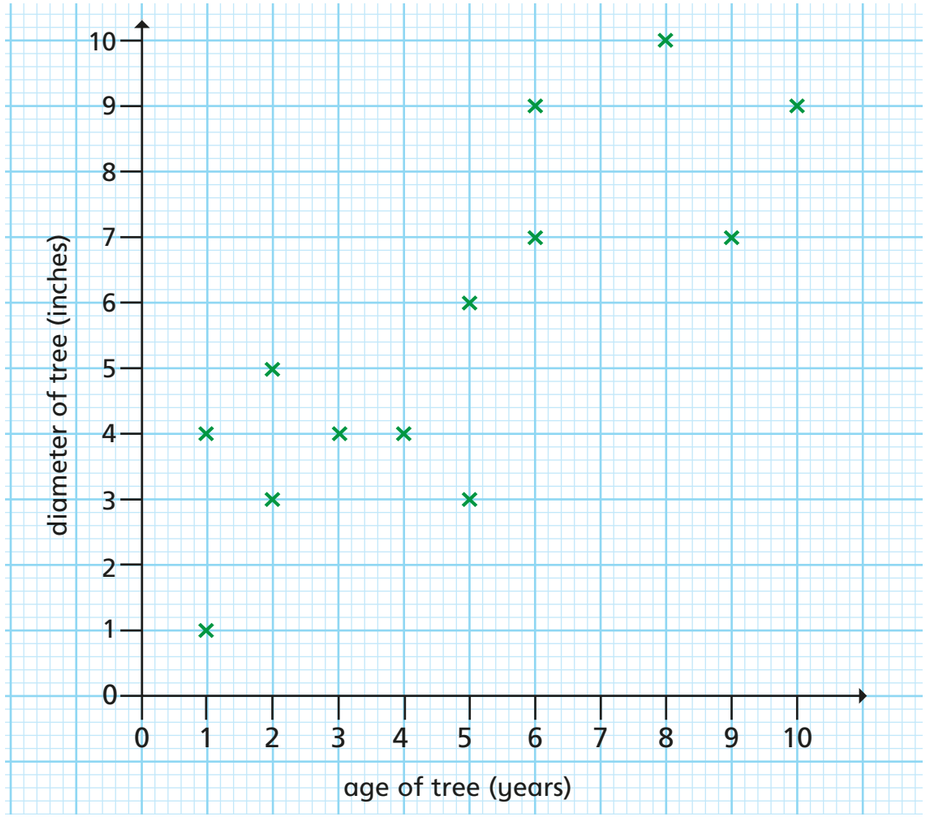
2 Eva draws a line of best fit on the scatter graph.



What mistake has Eva made?

Draw a line of best fit on the scatter graph.

3 Here is the scatter graph for the age of a tree and the diameter of its trunk.



a) Use your ruler to draw the line of best fit.

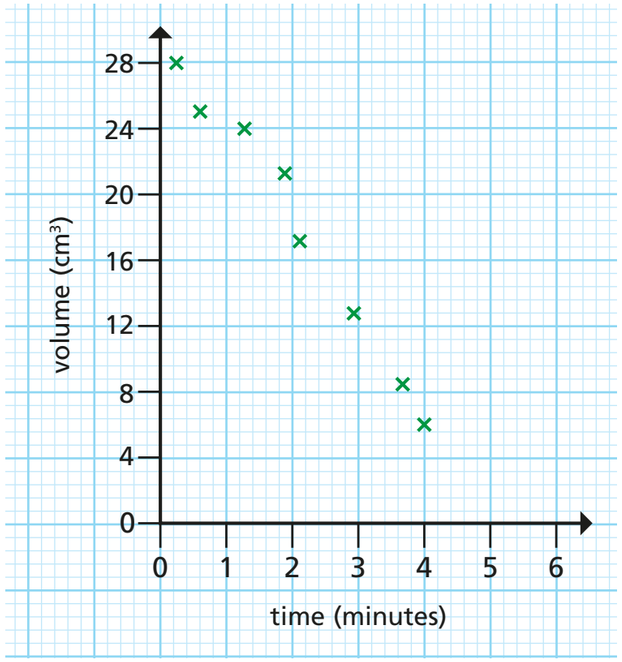
b) Does your line have a positive or negative gradient? _____

c) Do you think your line needs to go through the origin?

Discuss with a partner.

d) Use your line of best fit to predict the diameter of a tree that is 7 years old. ☐

4 Whitney has drawn a scatter diagram showing the volume of an ice cube over time.



a) Draw the line of best fit.

b) Use your line of best fit to predict when the ice cube will have completely melted. ☐ minutes

5 Are the statements always true, sometimes true or never true?

Give an example to support your answer.

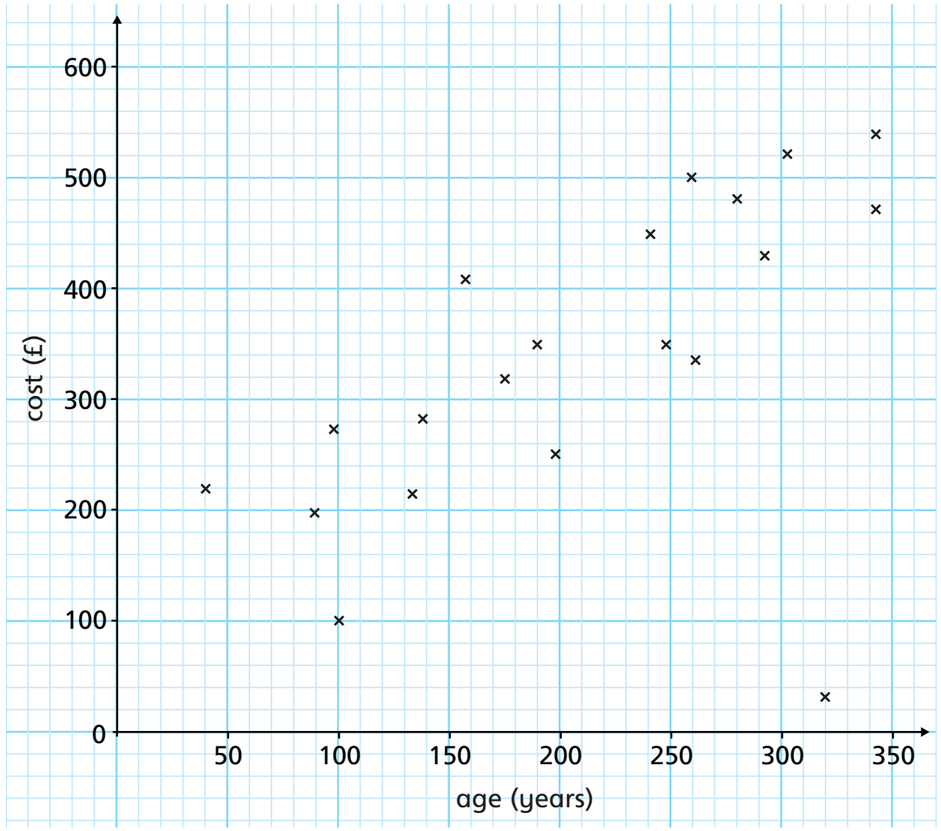
a) A line of best fit goes through the origin.

b) A line of best fit goes through every point.

c) You can draw a line of best fit on a scatter graph.

Discuss your answers with a partner.

6 The scatter graph shows the cost in pounds of some rare books.



a) Circle the outlier on the graph.

b) Give a possible reason for the outlier.

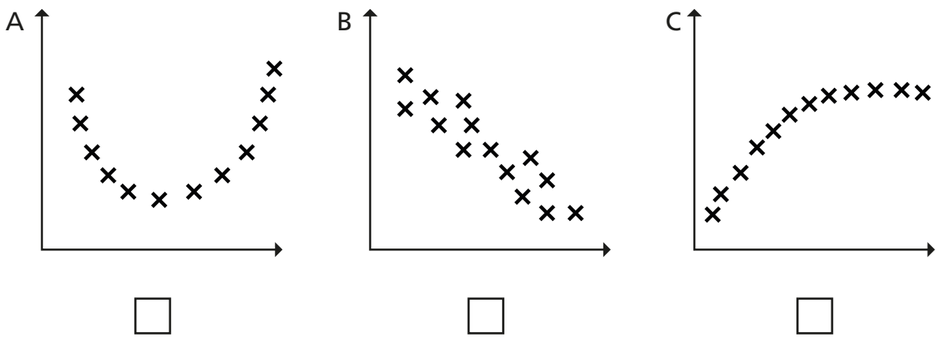
Identify non-linear relationships

1 Are the sequences linear or non-linear?

	linear	non-linear
a) 30, 50, 70, 90, 110	☐	☐
b) 30, 60, 120, 240, 480	☐	☐
c) 30, 18, 6, –6, –18	☐	☐
d) 30, 60, 90, 120, 150	☐	☐

2 Here are three scatter graphs.

a) Tick the graphs that do not show linear correlation.



☐ ☐ ☐

b) Match the graphs to the statements.

The points seem to follow a negative trend. ____

The points seem to follow a negative trend to start with but then a positive trend. ____

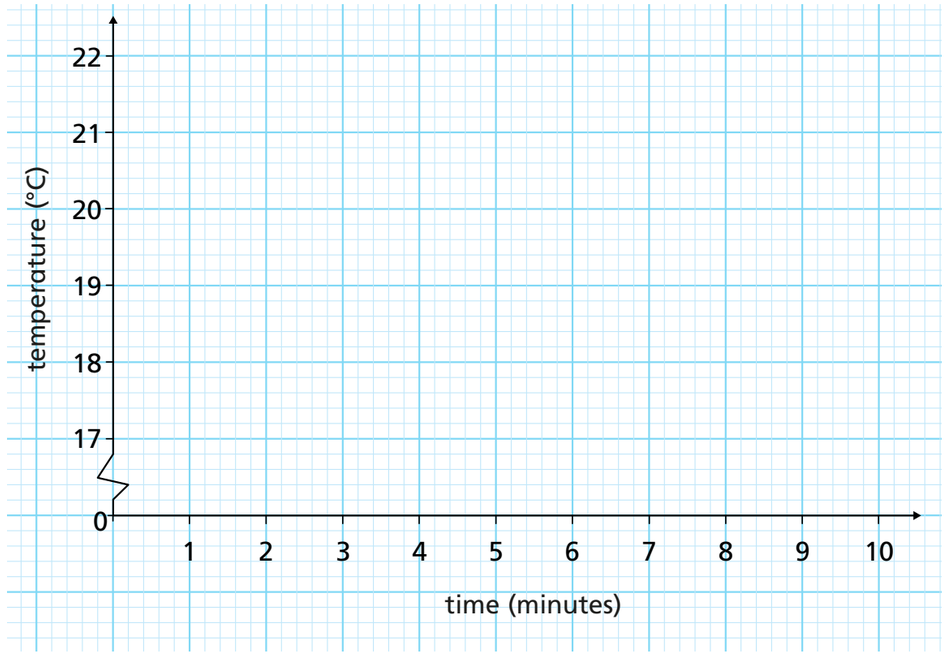
The points start to form a horizontal arrangement later on. ____

3 A cup of tea is cooling.

Mo measures its temperature each minute and records it in the table.

Time (minutes)	Temperature (°C)
1	21.8
2	21.0
3	19.5
4	18.8
5	18.4
6	18.2
7	18.1
8	18.0
9	18.0
10	18.0

a) Plot the information on the graph.

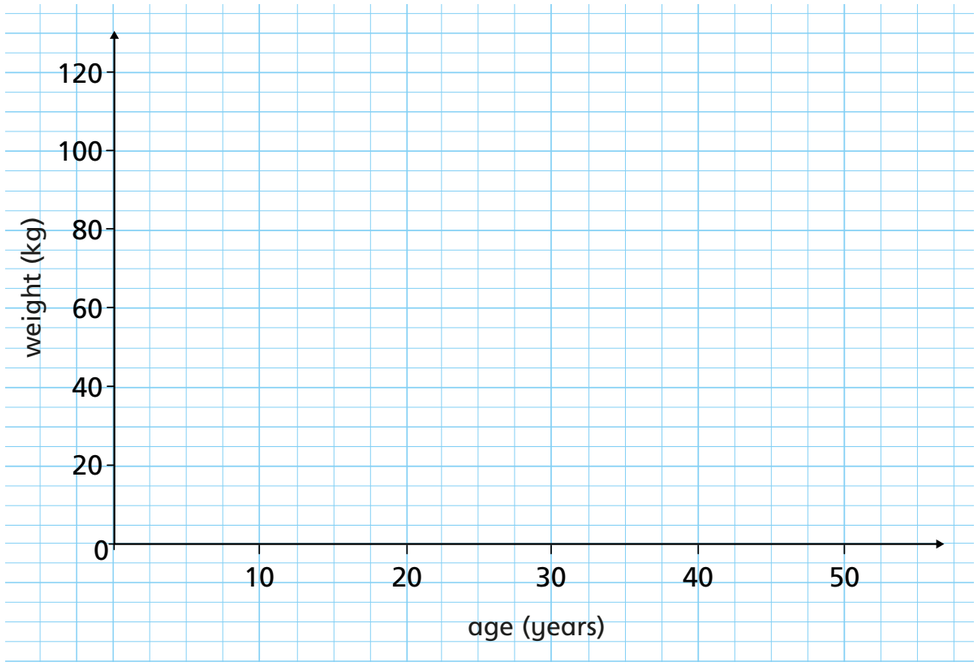


b) Discuss with a partner whether the relationship is linear or non-linear.

4 The table shows the average weights of a group of people at different ages.

Age (years)	Weight (kg)
5	18
10	34
15	57
20	69
25	72
30	75
35	76
40	77
45	79
50	79

a) Plot the data on the graph.



b) Is the graph linear or non-linear? _____

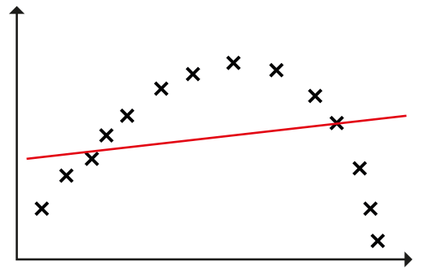
Explain your reasoning.

_____

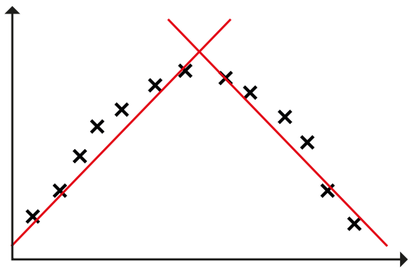
_____

5 Amir and Dexter are drawing a line of best fit for some data.

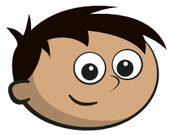
Amir



Dexter



Here is their thinking.



My line of best fit has roughly the same number of points above and below.

Amir

I can just draw two lines of best fit.

Dexter

Who do you agree with? Circle your answer.

Amir **Dexter** **neither**

Explain your answer.

_____

_____

Identify different types of data

1 Complete the following sentences.

a) The number of children on a bus is discrete data because _____

_____

_____

b) The heights of the children on the bus is continuous data because _____

_____

_____

c) The nationalities of the children on the bus is qualitative data because

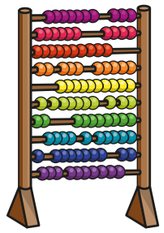
_____

_____

2 Match the statements to the type of data.

number of hours of sleep		
hand span		continuous
favourite sport		qualitative
number of pets		discrete
weight of school bag		

3 Which of these can be used to measure continuous data?



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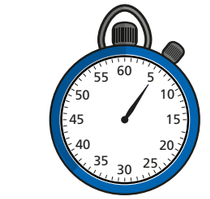

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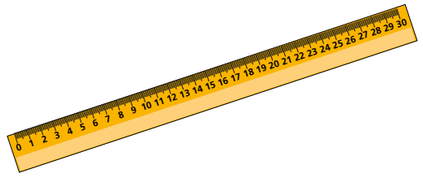

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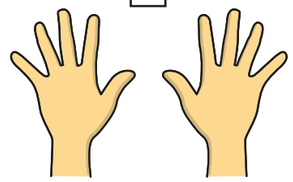


☐

4 Put the types of data into the correct columns.

rainfall for the month	number of books read by students
height of children	time it takes to complete a puzzle
age in years of people in your class	how much a sunflower grows in a week

Discrete data	Continuous data

5 **a)** Tick the types of data that each graph or chart can be used to represent.

	Qualitative	Discrete	Continuous
Bar chart			
Pie chart			
Pictogram			
Scatter graph			
Line graph			

b) Draw an example of a chart showing discrete data.

c) Draw an example of a chart showing continuous data.

6 Are the statements always true, sometimes true or never true?

Give reasons for your answers.

a) Discrete data uses integers.

b) Continuous data can be rounded.

c) Qualitative data is words.

d) You can find the average of qualitative data.

7 Aisha is collecting information about students in her class.

She wants to include qualitative, discrete and continuous data.

Give some suggestions for each type of data.

Qualitative

Hair colour

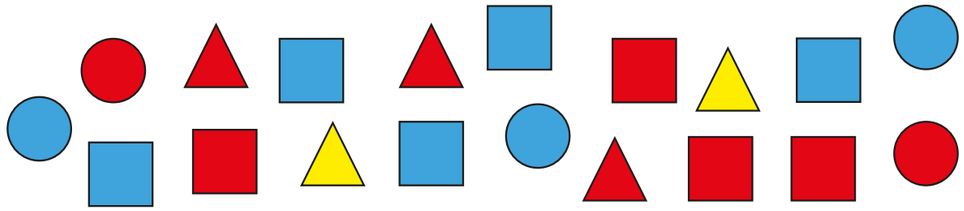
Discrete

Continuous

Compare answers with a partner.

Read and interpret ungrouped frequency tables

1 Huan is sorting shapes.



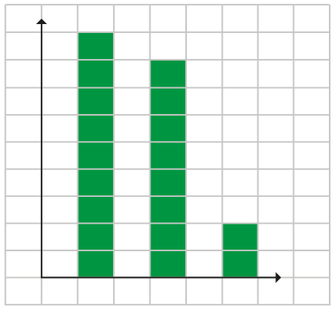
He has made two tables to record the shapes.

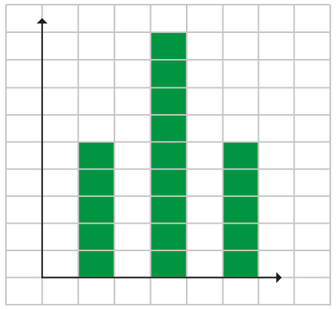
a) Complete the tables.

Colour	Frequency
red	9
blue	
yellow	2

Shape	Frequency
triangle	
square	
circle	

b) Use your tables to complete and label the axes on the graphs.





c) Esther looks at Huan's graphs and says that the most popular shape is a red square.

Is Esther correct? _____

Explain your answer.

_____

_____

2 Filip and Annie go on a jungle walk

Here is a table of the animals Filip sees.

Animals	Frequency
snakes	6
monkeys	12
elephants	2
crocodiles	1
parrots	6

a) Which animal did Filip see the most? _____

b) How many different types of animals did he see? _____

c) How many animals did he see altogether? _____

d) Which animals did he see with the same frequency?

_____

e) Filip wanted to see a tiger, but did not see one.

How could he add this to his table?

_____

_____

f) Annie saw twice as many monkeys as Filip.

Do you think she saw twice as many snakes? _____

Explain your answer.

3 Here is a list of shoe sizes in a class.

3, 3, 3, 3, 3, 4, 4, 4, 4, 4, 4, 4,
5, 5, 5, 5, 5, 6, 6

Record the sizes in the blank frequency table.

You need to write headings in the table.

4 The table shows numbers of passengers in cars recorded one morning outside a school.

Number of passengers	Number of cars
1	3
2	4
3	1
4	5
5	2

a) Ron is working out the total number of passengers.

He gets 15. What mistake has he made?

b) Scott and Alex are working out the total number of passengers.

Scott's method	Alex's method
1 + 1 + 1 +	1 × 3 +
2 + 2 + 2 + 2 +	2 × 4 +
3 +	3 × 1 +
4 + 4 + 4 + 4 + 4 +	4 × 5 +
5 + 5	5 × 2
= 44	= 44

What is the same and what is different between Scott and Alex's methods?

Which method do you prefer?

5 Students counted how many pencils they have in their pencil case.

They recorded the information in a table.

Number of pencils	Frequency	Total frequency
0	2	
1	15	
2	3	
3	5	
4	0	
5	2	

a) Complete the sentences.

The most number of pencils someone has is ☐

No one has ☐ pencils.

Most people have ☐ pencil.

b) Find the total number of pencils the students have.

☐

6 The table shows the numbers of pets some students have. Some information is missing from the table.

Number of pets	Number of students
0	5
1	14
2	8
3	
4	4

The students have 61 pets in total.

How many students have 3 pets?

☐

Read and interpret grouped frequency tables

1 20 players take part in a basketball competition.

They have to score as many hoops as they can in one minute.

The results are shown in the table.

11	15	32	26	18	12	5	26	35	8
22	28	31	20	17	10	20	18	24	41

a) Tom tries to put the data into an ungrouped frequency table.

Number of hoops scored	Tally	Frequency
0		0
1		0
2		0
3		0
4		0
5	|	1

Give two reasons it might not be good to use ungrouped data.

b) Annie decides to use a grouped table.

She makes the following table.

Number of hoops scored	Tally	Frequency
0 to 9		
10 to 19		
20 to 29		
30 to 39		
40 to 49		

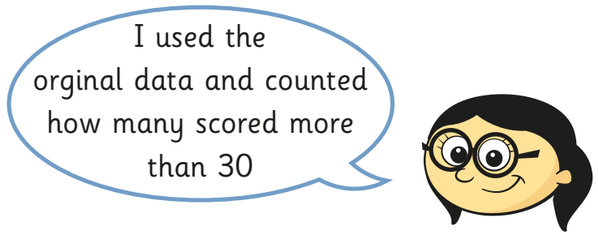
What does 10 to 19 mean?

c) Complete the table to represent the data.

d) How many players scored between 20 and 29 hoops?

Explain how you worked this out.

e) Annie is trying to work out how many players scored more than 30 hoops.



Explain a quicker way Annie could have worked out her answer.

2 The table shows the number of laps completed by people who attended a go-kart circuit last Saturday.

Number of laps	Number of people
0–19	17
20–39	48
40–59	21
60–79	6
80–100	3

a) How many people completed between 20 and 39 laps?

b) How many people attended the go-kart circuit last Saturday?

c) How many people completed fewer than 60 laps?

d) Why can't you tell exactly how many people completed fewer than 25 laps?

3 Mr Patel goes shopping.

He buys 78 items.

The table shows information about some of the prices.

Cost of item	Number of items
£0–£1	11
£1.01–£2.00	26
£2.01–£4.00	32
£4.01–£6.00	
£6.00+	4

a) What does £6.00+ mean?

b) How many items cost between £4.01 and £6.00?

4 Carrots come in 15 kg bags.

Ron counts the number of carrots in 65 bags.

- 18 bags contain fewer than 20 carrots.
- 36 bags contain fewer than 40 carrots.
- 58 bags contain fewer than 60 carrots.
- The greatest number of carrots in a bag is 83

Complete the table.

Number of carrots in a bag	0 to 19	20 to 39	40 to 59	60+
Number of bags				

Represent grouped discrete data

1 Here are two tables of data from a survey of some houses in a street.

a) Which is a grouped frequency table? Tick your answer.

House number	Number of houses
0 to 9	3
10 to 19	8
20 to 29	8
30 to 39	9

☐

Number of people in house	Number of houses
1	4
2	12
3	9
4	3

☐

b) How many houses have been surveyed so far?

☐

c) House number 30 is not included in the table.

When this house is surveyed there are 3 people living in it.

Show how the tables will change.

House number	Number of houses
0 to 9	
10 to 19	
20 to 29	
30 to 39	

Number of people in house	Number of houses
1	
2	
3	
4	

2 Here are some lists of numerical data.

State whether a grouped or ungrouped table would be most appropriate and explain your answer.

a) 1, 1, 1, 2, 3, 3, 3, 4, 5, 6, 6, 6, 6, 6

b) 1, 1, 1, 2, 3, 5, 7, 7, 11, 15, 18, 18, 18, 22, 22, 25, 30, 31

c) 2.4, 2.6, 2.7, 2.7, 2.9, 3.2, 4.0, 4.1, 4.5, 5.2

Discuss your answers with a partner.

3 The amounts spent on 20 online purchases are shown.

The amounts have been rounded to the nearest £1

£90 £63 £19 £112 £64 £30 £52 £60 £103 £28

£85 £72 £66 £99 £115 £58 £73 £115 £72 £55

Put the data into this grouped frequency table.

Amount spent	Tally	Frequency
£0–£20		
£21–£40		
£41–£60		
£61–£80		
£81–£100		
£101–£120		

4 Here are the scores for an international singing competition.

Country	Total
Albania	90
Australia	284
Azerbaijan	302
Cyprus	109
Czech Republic	157
Denmark	120
Estonia	76
France	105
Greece	74
Iceland	232
Italy	472

Country	Total
Malta	107
Netherlands	498
North Macedonia	305
Norway	331
Russia	370
San Marino	77
Serbia	89
Slovenia	105
Sweden	334
Switzerland	364

a) Put the same data into both of these tables.

Table 1

Score	Tally	Frequency
0–100		
101–200		
201–300		
301–400		
401–500		

Table 2

Score	Tally	Frequency
50–200		
201–400		
401–500		

b) Which table in part a) is more useful? _____

Explain your answer.

_____

_____

c) Write one advantage of the grouped data and one disadvantage.

_____

_____

_____

5 The number of cats spotted in the garden is recorded every day for a year.

Number of cats	Frequency
0–2	182
3–5	43
6–10	70
10+	29

a) Has the whole year been recorded? How do you know?

_____

b) Explain why you cannot use the table to work out the number of days 3 cats were spotted.

_____

_____

c) Explain how the maximum number of cats seen cannot be read from the table.

_____

_____

6 The table shows the number of cakes sold in a bakery every day in March.

Complete the table using the information provided.

Number of cakes sold	0 to 5	6 to 10	11 to 15	16 to 20	21 to 25
Number of days					7

- On 6 days there were beween 6 and 10 cakes sold.
- On 10 days there were over 15 cakes sold.
- 5 or fewer cakes were sold on 3 more days than between 6 and 10 cakes.

Represent continuous data grouped into equal classes

1 Tick the statement that matches the following inequality.

$10 < t \leq 20$

t lies between 10 and 20	
t lies between 10 and 20, including 20	
t lies between 10 and 20, including 10	
t lies between 10 and 20, including 10 and 20	

2 Tommy is recording the times it takes people to complete a race.

He wants to put the data into a table.

This is the table he makes to record the results.

Time taken	Frequency
0 to 1 minute	
2 minutes to 3 minutes	
3 minutes to 4 minutes	
4 minutes to 5 minutes	

a) Suggest two times that would be difficult to put into this table.

b) What advice might you give Tommy on how to change his table?

3 Here are the heights of 20 plants recorded to 1 decimal place.

15.6 cm	25.4 cm	13.9 cm	12.8 cm	31.1 cm
8.6 cm	21.6 cm	20.8 cm	30.0 cm	22.0 cm
47.1 cm	43.5 cm	27.6 cm	9.5 cm	28.0 cm
20.0 cm	47.9 cm	32.5 cm	4.3 cm	17.0 cm

a) Complete the table.

Height, h (cm)	Tally	Frequency
$0 < h \leq 10$		
$10 < h \leq 20$		
$20 < h \leq 30$		
$30 < h \leq 40$		
$40 < h \leq 50$		

b) Use the table to work out how many plants were taller than 20 cm.

c) Why do you think intervals of width 10 were chosen and not intervals of width 3?

d) Which interval has the highest frequency?

4 The table shows the time of the first goal in 100 football matches.

Time of first goal, t (minutes)	Number of matches
$0 < t \leq 15$	3
$15 < t \leq 30$	15
$30 < t \leq 45$	27
$45 < t \leq 60$	32
$60 < t \leq 75$	14
$75 < t \leq 90$	9

a) In how many matches was the first goal scored between 15 and 30 minutes, including 30 minutes?

b) The first goal in one of these matches was scored after exactly 75 minutes.

Which interval does this goal appear in? _____

c) In how many matches was the first goal scored in less than or equal to 45 minutes?

d) Is it possible to work out in how many matches the first goal was scored in the 30th minute? _____

Explain your answer.

_____

_____

e) Is this statement true or false?

20% of the first goals are scored in the last third of a football match.

_____

5 The table shows the amount of time taken to complete a walk.

Time taken, t (hours)	Frequency
$2 < t \leq 4$	15
$4 < t \leq 6$	26
$6 < t \leq 8$	38
$8 < t \leq 10$	40

a) What percentage of people took more than 6 hours?

b) Estimate how many people took between 5 and 8 hours.

My estimate is ____ people.

Explain your reasoning.

_____

_____

c) The longest time anyone took was 9 hours and 18 minutes.

Estimate the range of the data.

_____

Represent data in two-way tables

1 20 students were asked whether they had a pet.

The results are shown in the table.

Name	Year	Yes/No
Maria	Y7	Yes
Nancy	Y7	Yes
Amy	Y7	Yes
Aisha	Y8	No
Dominique	Y7	No
Lucy	Y8	Yes
Hannah	Y8	No
Zoe	Y7	Yes
Millie	Y8	No
Nima	Y8	No

Name	Year	Yes/No
Tim	Y7	Yes
Graeme	Y7	Yes
Jeff	Y8	No
Harry	Y7	No
Hassan	Y8	No
Marcus	Y7	No
Theo	Y7	No
William	Y7	Yes
Fred	Y7	No
Mika	Y8	Yes

a) Use tallies to complete the two-way table.

	Owns a pet	Does not own a pet	Total
Year 7			
Year 8			
Total			

b) Now complete the table of frequencies.

	Owns a pet	Does not own a pet	Total
Year 7			
Year 8			
Total			

2 The masses of 25 melons and pumpkins are shown.

Melons

11.6 kg 8.8 kg 9.5 kg 10.5 kg 7.8 kg 9.2 kg 12.8 kg

7.2 kg 10.9 kg 11.0 kg 9.9 kg 10.2 kg 10.0 kg 6.8 kg

Pumpkins

16.4 kg 18.2 kg 10.5 kg 9.5 kg 12.8 kg 14.2 kg 15.0 kg

17.2 kg 11.5 kg 11 kg 10.7 kg

a) Complete the two-way table.

	10 kg or lighter than 10 kg	Heavier than 10 kg	Total
Melon			
Pumpkin			
Total			

b) Write two things that you can see from the two-way table.

c) How can you tell from the table how many pumpkins were weighed in total?

3 The table shows information about 200 people who were in a gym at a particular time.

	60 years old or younger	Over 60 years old	Total
Males	22	45	
Females	19		
Total			

a) Complete the table.

b) How many males over 60 years were in the gym?

c) How many males in total were in the gym?

d) How many females were in the gym?

e) How many females over 60 years were in the gym?

f) What time of the day do you think this data was collected?

Give reasons for your answer.

_____

4 The two-way table shows the number of children in a school who have school lunch.

Complete the two-way table.

	Year 4	Year 5	Year 6	Total
School lunch	12			58
No school lunch		8		
Total	30	32		90

5 40 people take part in a show.

The show is made up of singers, dancers and actors.

Here is some information.

- There are 22 males in the show.
- 15 of the males are dancers.
- There are 8 female singers.
- Of the 7 actors, 2 are male.

a) Draw a two-way table to show this information.

b) How many dancers are in the show?