Correlation 1.

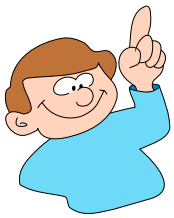
A. Copy each of the following sentences. For each one state whether you would expect any connection between the two variables.

1). The attendance at a football match and the position in the league of the football club.
2). The air temperature and the number of ice-creams sold.
3). Your last maths test score and the distance you can jump.
4). The number of people in a family and the amount of water used in their house.
5). The number of cars on the road and the number of hamsters kept as pets.
6). The amount of rainfall and the depth of mud on the school field.
7). The height of school children and their ages.
8). The number of chips served in the school dining hall and the age of the teachers.
9). The distance a pupil lives from school and the time it takes to travel to school.
10). The length of a person's nose and the speed they can run.

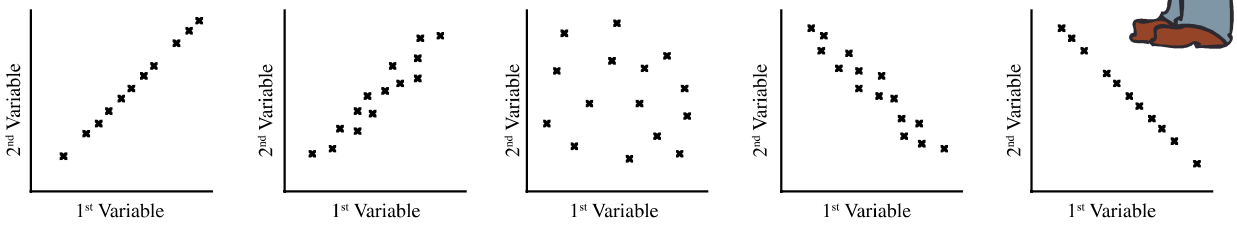
If one variable increases as the other variable <u>increases</u> then this is called **positive** or **direct** correlation.
If one variable increases as the other variable <u>decreases</u> then this is called **negative** or **indirect** correlation.

B. Copy each of the following sentences. For each one state whether you would expect positive or negative correlation between the two variables.

1). The heat loss through the roof and the thickness of insulation in the loft.
2). The speed of traffic and the number of accidents.
3). The number of bees and the number of flowers.
4). The temperature in the U.K. and the temperature in Australia on the same day.
5). The age of a car and its value.
6). The number of work places and the number of unemployed people.
7). The height and weight of a person.
8). The amount of cola drunk from a glass and the amount of cola left in the glass.
9). The amount of alcohol drunk and reaction time.
10). Fitness and the amount of exercise that person does.



One way to show correlation is to use a **scatter graph**.
The ones below show different amounts of correlation.

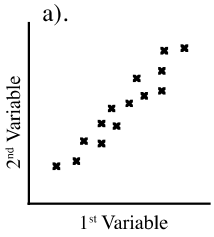


Perfect positive correlation | Good positive correlation | No Correlation | Good negative correlation | Perfect negative correlation

When we use a scatter graph we should use at least 30 pairs of data to make the statistics valid. To keep this section simple we have not used so many. When you do your experiments later you must bear this in mind.

C.

a).



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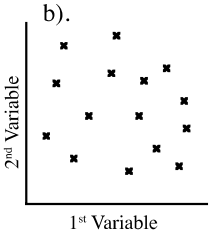
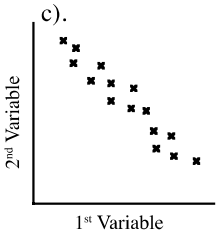


c).

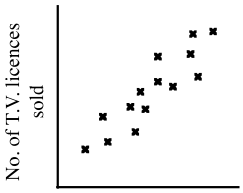


Copy each of the following sentences. Next to the sentence draw the scatter graph from the above that best describes the results.

1). The speed of a car and its braking distance.
2). The amount of television watched in an evening by a pupil and the amount of homework done.
3). The distance travelled with new tyres and the depth of the tyre tread remaining.
4). A pupil's shoe size and their average score in maths tests.
5). The size of a car engine and the fuel consumption of the car.
6). The age of a school pupil and the time they go to bed.
7). A pupil's score in a biology test and how fast they can run.
8). A long jumper's speed on the runway and the distance they can jump.
9). The value of a computer and the age of the computer.
10). The value of an antique and the age of the antique.
11). Cinema attendance and the number of empty spaces in the cinema car park.
12). The level of the world's sea water and the area of land above sea level.
13). The height above sea level and the air temperature.
14). Hot soup sales and the air temperature.
15). The number of days absent from school and the number of GCSE's achieve.

D. Draw each scatter graph. Next to each one write what it describes.

1).



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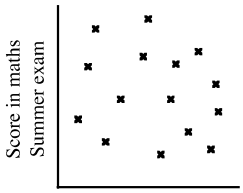
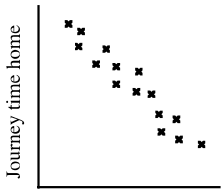
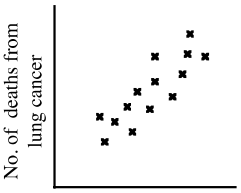


3).



4).



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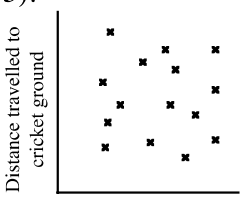

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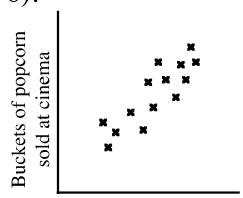

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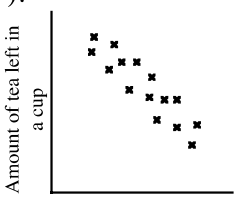

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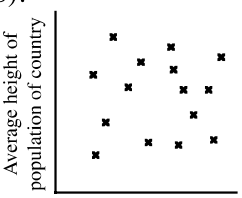

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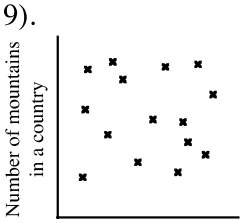

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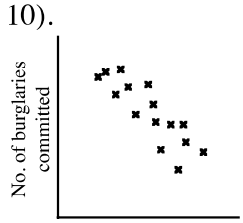

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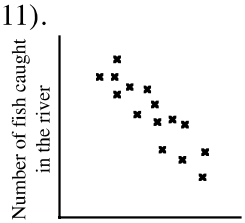

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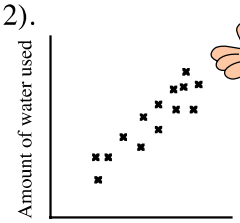
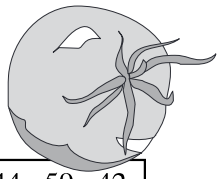


Correlation 2.

A. 1). The height (cm) of young tomato plants were measured and the number of leaves on each plant counted. This information is below.

Height (cm)	6	28	19	22	10	16	14	23	9	26	18	24	21	12	20	17	14
No. of leaves	1	16	8	4	2	7	5	11	3	15	10	13	12	5	11	9	6

a). Plot this information on a scatter graph.
b). Comment on the correlation of this graph.
c). If a plant has 10 leaves, use your graph to estimate the height you would expect it to be.
d). If a plant was 12 cm tall, use your graph to estimate the number of leaves you would expect it to have.
e). There is one plant that does not appear to fit in, which one is it ?



2). A class sits two maths papers out of 80. Here are the results.

Paper 1	76	30	21	39	60	30	49	38	64	69	51	34	55	26	44	59	42
Paper 2	80	48	25	41	59	23	56	28	70	71	51	31	57	22	44	65	38

a). Plot this information on a scatter graph.
b). Comment on the correlation of this graph.
c). One pupil missed Paper 2, but scored 62 on Paper 1. Use your graph to estimate the mark you would expect this pupil to get on Paper 2.
d). Another pupil missed Paper 1, but scored 29 on Paper 2. Use your graph to estimate the mark you would expect this pupil to get on Paper 1.
e). One pupil didn't feel well for paper 1. Look at your scatter graph and say which one it is ?

3). Bill recorded the maximum speed he reaches and the journey time to work every day.

Journey Time	39	3	16	30	11	34	19	26	6	13	20	23	27	34	9	31	37
Max. speed	5	48	34	17	42	34	26	22	44	37	29	25	19	13	40	15	9

a). Plot this information on a scatter graph.
b). Comment on the correlation of this graph.
c). If Bill's journey takes 25 minutes, find a good estimate of his maximum speed.
d). If Bill's maximum speed is 35 Km/h, give an estimate for the length of his journey time.
e). One day Bill was diverted and had to go a longer way home.
Which plot on your graph was this ?

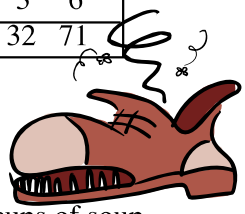
4). Jenny is testing the braking distance of a new car. These are her readings.

Speed (m.p.h.)	36	20	29	40	41	52	43	54	60	30	50	59	55	43	33
Stopping Distance (m)	35	13	21	43	82	79	54	76	91	26	59	87	80	50	25

a). Plot this information on a scatter graph.
b). Comment on the correlation of this graph.
c). If the car is travelling at 35 m.p.h., give a good estimate of Jenny's stopping distance.
d). If Jenny's stopping distance is 85m, give a good estimate of the speed of the car.
e). On one of the tests Jenny heard the signal to brake late.
Which of the plots on the graph shows this ?

5). In Year 8 the shoe size and an English test (out of 80) was recorded for 17 pupils.

Shoe size	2	6	$2\frac{1}{2}$	4	$5\frac{1}{2}$	8	$1\frac{1}{2}$	3	$4\frac{1}{2}$	$6\frac{1}{2}$	4	7	2	3	4	3	6
English score	21	11	49	78	45	33	64	74	29	60	63	25	43	14	47	32	71



a). Plot this information on a scatter graph.
b). Comment on the correlation of this graph.

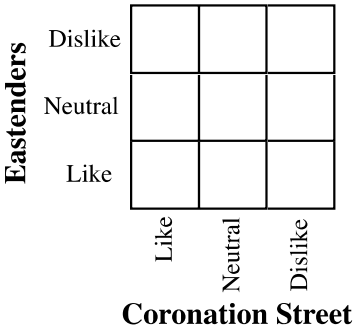
6). The school canteen recorded the temperature outside (˚F) and the number of cups of soup sold. Here are a selection of the results from over the year.

Temperature (˚F)	71	53	30	67	57	78	35	32	63	41	42	59	51	65	64	46	50	46	65
Cups of soup sold	17	40	88	19	44	3	76	80	24	72	61	35	49	29	73	65	59	51	36

a). Plot this information on a scatter graph.
b). Comment on the correlation of this graph.
c). If the temperature outside is 60˚F, estimate how many cups of soup the canteen will sell.
d). If the canteen sells 30 cups of soup, estimate the outside temperature.
e). One day is National Soup Day were everyone was encourage to buy soup.
Which of the plots on the graph represents this day ?

B. Here are some experiments and surveys you can do yourself. Do not expect you results to show as good correlation as the previous questions. This would be quite rare!

1). a). Copy the table and record your classes preferences in the appropriate boxes.
Comment on any correlation you see.
Do you need to ask a larger group of people ?
b). Pick two television programmes of your own and repeat this survey.
c). Now have 5 choices along each side of the grid:
Like a lot, like, neutral, dislike, dislike a lot.
Pick two more programmes and investigate for any correlation.



2). Pick one of the ideas below and find the required information. You may have a database in school of these records, if not you will have to measure your class.
Plot scatter graphs and comment if you find any correlation.
a). Height and head circumference.
b). Height and arm stretch (finger tip to finger tip).
c). Foot size and handspan.
d). Each pupil's scores in their last two maths tests.

3). Dressmakers used to have a saying, " Once around the waist is twice around the neck, once around the neck is twice around the wrist ".
Take appropriate measurements from your class. Plot a scatter graph for each statement.
Comment on any correlation you find.

4). The Egyptians believed, " One of the foot is the same length of the forearm".
Investigate.