Correlation

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- **Correlation**:
    1. How two variables move together.
    2. For example height & weight

1. Positive correlations mean that two variables fluctuate together (a positive change in one is a positive change to another)
2. negative correlations mean that two variable change opposite one another (a positive change in one is a negative change in another)

Positive Correlation

- **Example Answer 1:**
- The more hours you work, the higher your paycheck will be.
- **Example Answer 2:**
- As a child grows, so too does their shoe size.

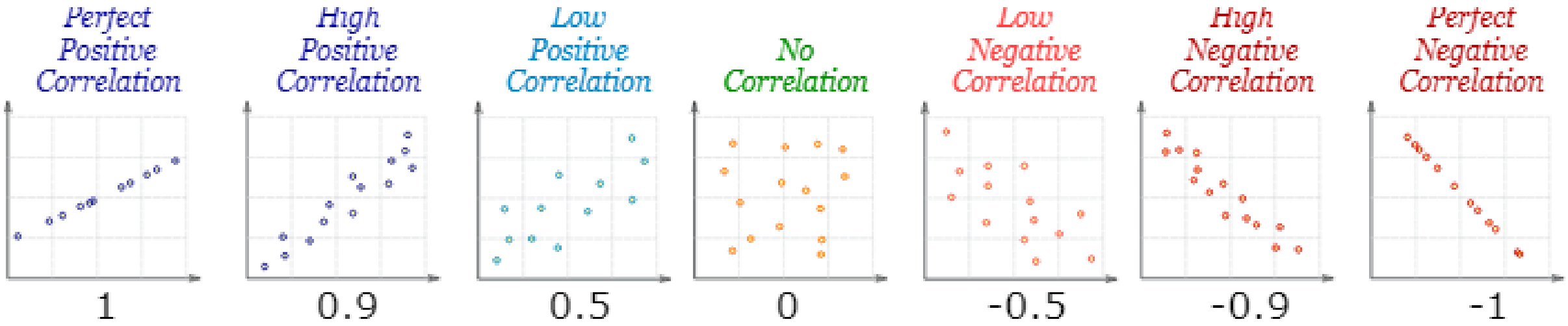
Negative Correlation

- **Example Answer 1:**
- The slower you drive, the longer your trip will take.
- **Example Answer 2:**
- The more you exercise, the less you'll weigh.

No correlation

- **Example Answer 1:**
- The amount of tea someone drinks vs. how British they are.
- **Example Answer 2:**
- The price of chocolate vs. the price of cereal.

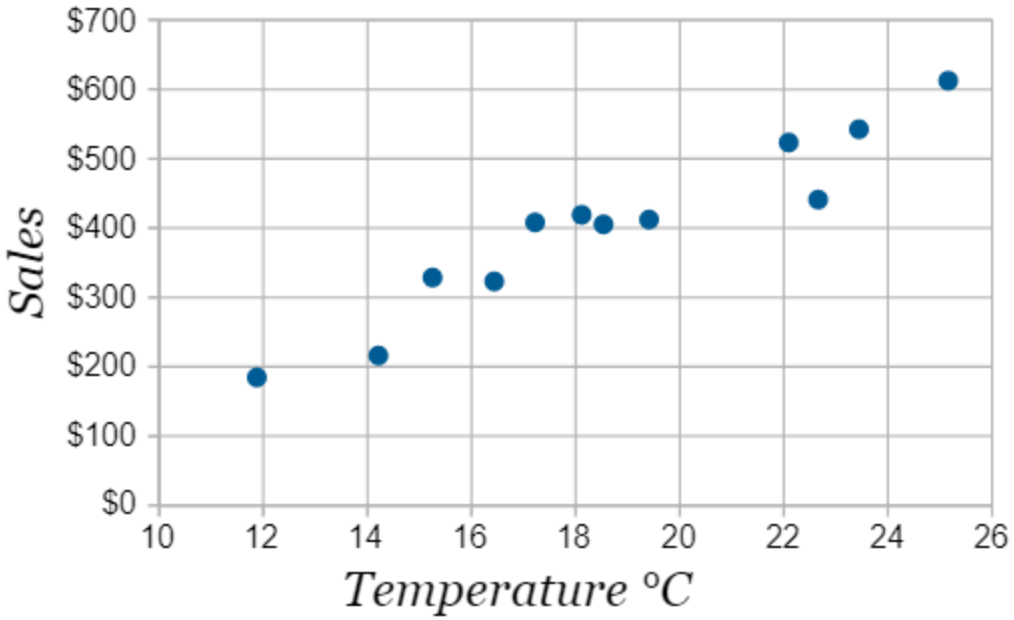
Strength


Perfect Positive Correlation
1
High Positive Correlation
0.9
Low Positive Correlation
0.5
No Correlation
0
Low Negative Correlation
-0.5
High Negative Correlation
-0.9
Perfect Negative Correlation
-1

The local ice cream shop keeps track of how much ice cream they sell versus the temperature on that day. Here are their figures for the last 12 days:

Ice Cream Sales vs Temperature	
Temperature °C	Ice Cream Sales
14.2°	$215
16.4°	$325
11.9°	$185
15.2°	$332
18.5°	$406
22.1°	$522
19.4°	$412
25.1°	$614
23.4°	$544
18.1°	$421
22.6°	$445
17.2°	$408

How Ice cream Sales is related to temperature



$$r_{xy} = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2 \sum_{i=1}^{n}(y_i - \bar{y})^2}}$$

How to Calculate correlation coefficient

2 *Subtract Mean*

3 *Calculate ab, a^2 and b^2*

Temp °C	Sales	"a"	"b"	a×b	a^2	b^2
14.2	$215	-4.5	-$187	842	20.3	34,969
16.4	$325	-2.3	-$77	177	5.3	5,929
11.9	$185	-6.8	-$217	1,476	46.2	47,089
15.2	$332	-3.5	-$70	245	12.3	4,900
18.5	$406	-0.2	$4	-1	0.0	16
22.1	$522	3.4	$120	408	11.6	14,400
19.4	$412	0.7	$10	7	0.5	100
25.1	$614	6.4	$212	1,357	41.0	44,944
23.4	$544	4.7	$142	667	22.1	20,164
18.1	$421	-0.6	$19	-11	0.4	361
22.6	$445	3.9	$43	168	15.2	1,849
17.2	$408	-1.5	$6	-9	2.3	36
18.7	**$402**			**5,325**	**177.0**	**174,757**

1 *Calculate Means*

4 *Sum Up*

5 $\frac{5{,}325}{\sqrt{177.0 \times 174{,}757}} = 0.9575$