

Graphing from Points

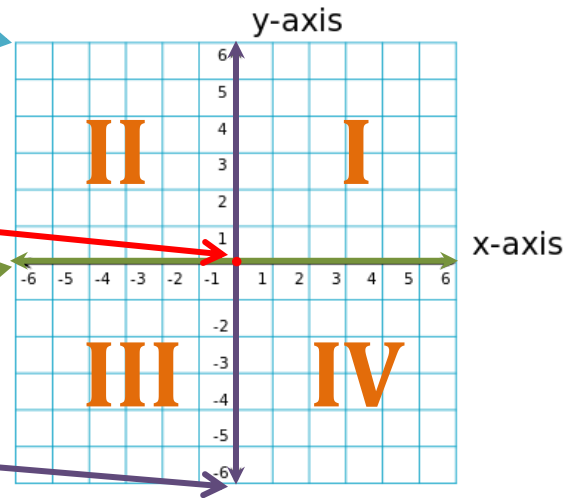
1. The co-ordinate grid is called the **Cartesian plane**.

2. Axes divide the plane into **4 quadrants** (I, II, III, and IV).

3. The point where axes intersect is the **origin**.

4. The horizontal axis is the **x-axis**.

5. The vertical axis is the **y-axis**.



6. An ordered pair of numbers that identify any point is written in the form **(x,y)**.

x – always written first and is the **x-coordinate**

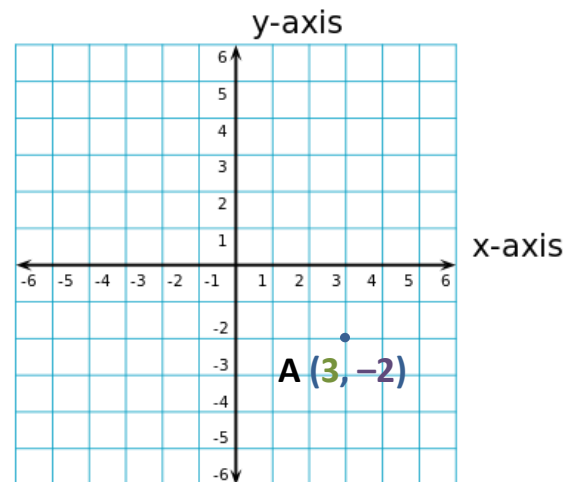
y – always written second and is the **y-coordinate**

7. Coordinates of the **origin** are **(0, 0)**.

8. A **dot** is used to represent a point on a graph.

9. A **capital letter** is used to name the points. Ex: **A (3, -2)**

10. Cartesian plane includes: \pm numbers, \pm fractions & \pm decimals



Example 1

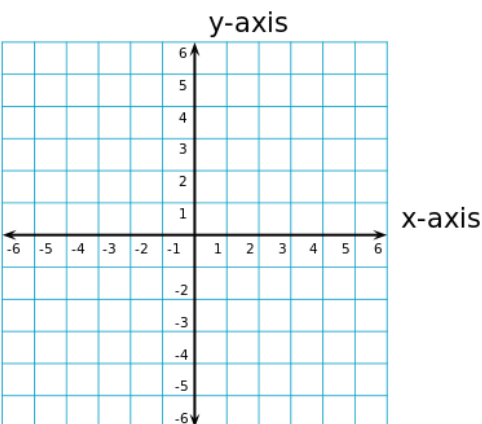
Graph the following points

A (2, 5)

C (-2, 3)

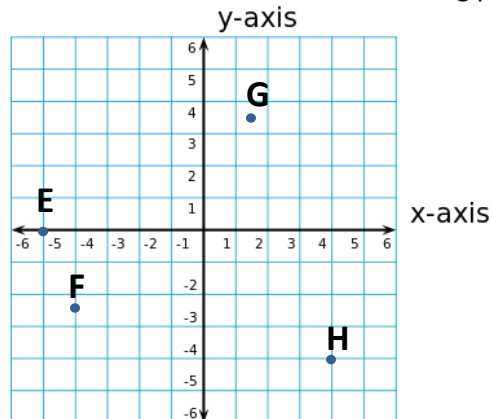
B (0, -1)

D (-5, -4)



Example 2

Give the coordinates for the following points



E (,)

G (,)

F (,)

H (,)

GET THE POINT

Graph the points in each group and connect each point with the next point using straight line segments. Do NOT connect the last point in one group with the first point in the next group. For the next-to-last group, you are asked to shade in the area formed by the points in that group. Use pencil so you can erase if necessary. It's gra-fun!



(0, 6.5)

(6, 6.5)

(7, 5.5)

(6, 4)

(9.5, 9)

(13.5, 6)

(12.5, 2.5)

(9.5, 2.5)

(9.5, 9)

LIFT PENCIL



(-6, 6.5)

(-3, 8.5)

(0, 6.5)

(-1.5, 5.5)

(-2.5, 4)

LIFT PENCIL



(1.5, 3.5)

(2.5, 3)

(3, 2.5)

LIFT PENCIL

(-3, -15.5)

(-7, -15.5)

(-10, -12.5)

(-13.5, -5)

(-10.5, -5)

(-9.5, -2)

(-6, 1)

(-4.5, 1)

LIFT PENCIL



(0, 3.5)

(-1, 3)

(-1.5, 2.5)

LIFT PENCIL



(15, 2.5)

(12, 1)

(10.5, 2.5)

(8, 0)

LIFT PENCIL



(12, 1)

(12, -8)

(4.5, -17)

(-1.5, -17)

(2, -20.5)

(-3, -15.5)

(3, -15.5)

(10.5, -8)

(10.5, 0.5)

(9.5, 1.5)

LIFT PENCIL



(-4.5, 4)

(-6, 2.5)

(-6, 6.5)

(-2.5, 4)

(-4.5, 1)

(6, 1)

LIFT PENCIL



(-2, -1.5)

(-5, -1.5)

(-5.5, -1)

(-5.5, 0)

(-5, 0.5)

(-2, 0.5)

(-1.5, 0)

(-1.5, -1)

(-2, -1.5)

SHADE IN THE AREA FORMED WITH THE POINTS ABOVE.



(-12.5, -5)

(-11.5, -3.5)

(-10.5, -5)

(2, -5)

(1, -3.5)

(0, -5)

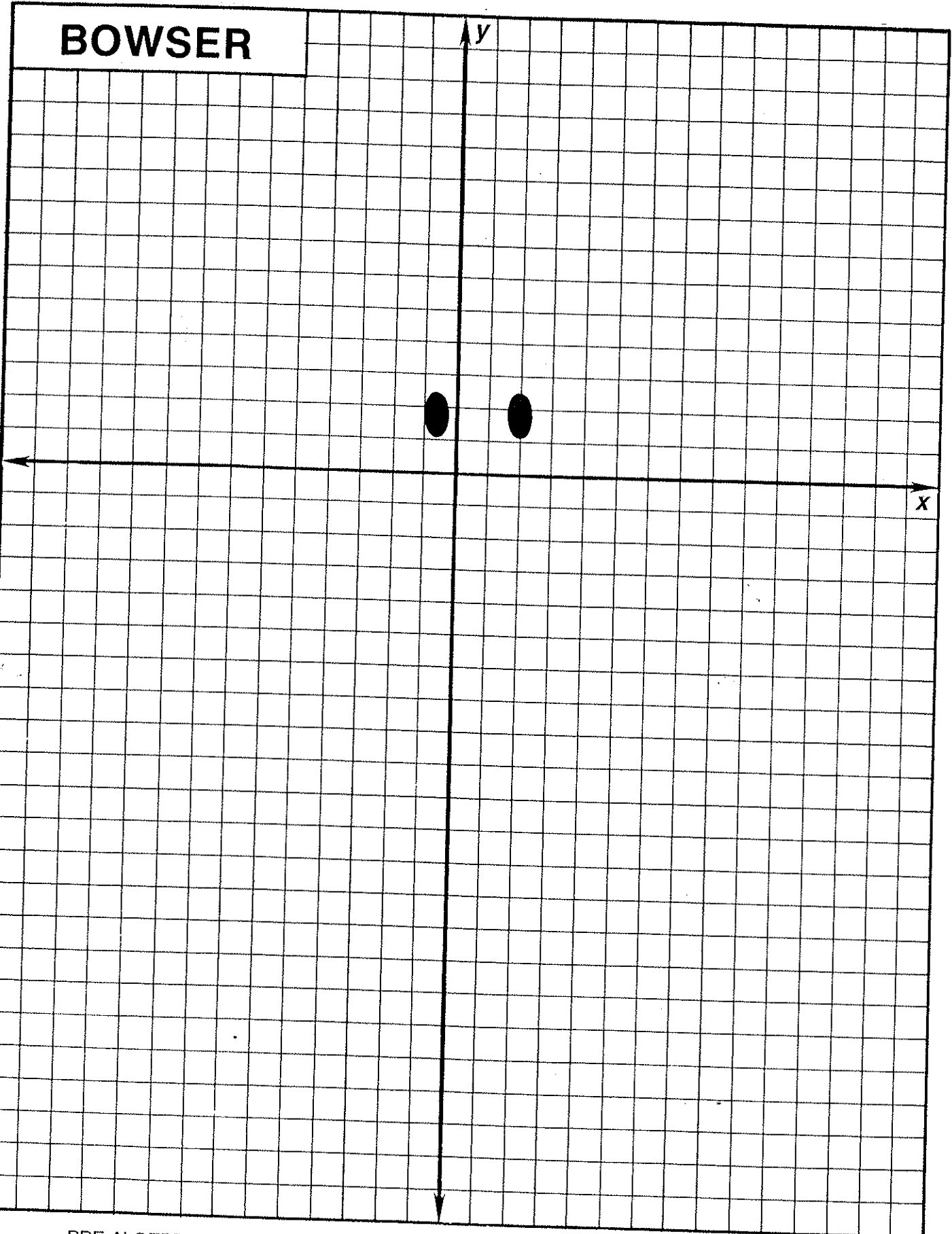
(3.5, -5)

(6.5, -2)

(6.5, -3.5)

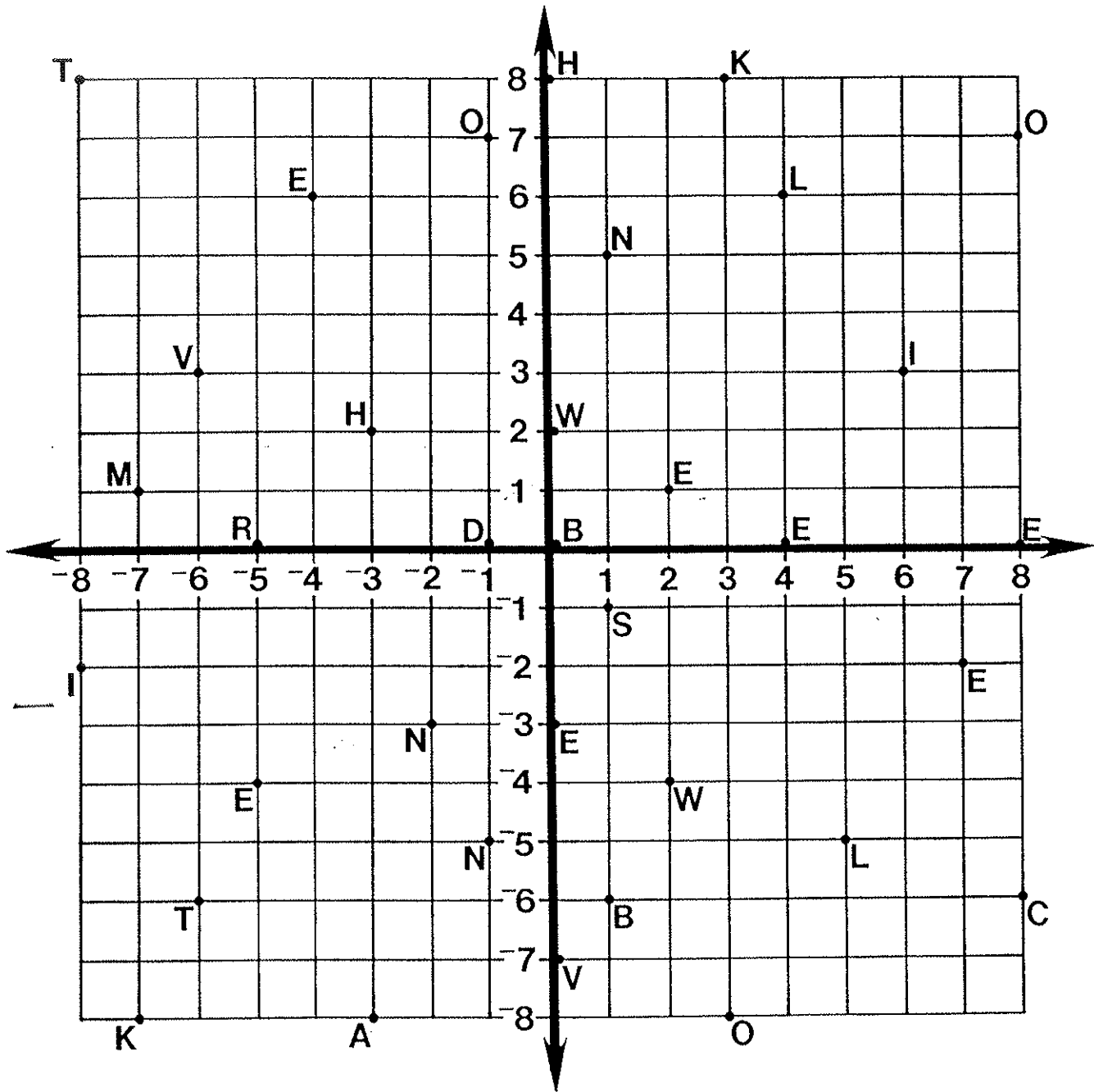
STOP

BOWSER



What Did One Ear Say To The Other?

Each pair of numbers at the bottom of the page stands for a point on the coordinates below. Above each pair of numbers, write the letter that appears at that point.



- (6,3) (1,5) (-4,6) (-6,3) (4,0) (-5,0) (-7,-8) (-1,-5) (7,-2) (2,-4) (0,2) (0,-3)
- (0,0) (8,7) (-6,-6) (-3,2) (5,-5) (-8,-2) (0,-7) (-5,-4) (-1,0) (3,-8) (-2,-3)
- (-8,8) (0,8) (8,0) (1,-1) (-3,-8) (-7,1) (2,1) (1,-6) (4,6) (-1,7) (8,-6) (3,8)

Relationships

- When two quantities are related in some way, they form a **relationship**.
- Values that **can change** in a relationship are called **variables**.
- The variable that **does not depend** on the other is the **independent variable**.
- The variable that **depends on** the other variable is the **dependent variable**.
- In a table of values, the **independent** variable is placed in the **left-hand column** and the **dependent** variable in the **right-hand column**.
- In a graph, the **independent** variable is placed on the **horizontal axis (x-axis)** and the **dependent** variable on the **vertical axis (y-axis)**.
- When the graph of the relationship is a **straight line**, the relationship is called **linear**.

PRACTICE 3: Dependent and Independent Variables

Identify the independent variable and the dependent variable in each situation.

1. The hours spent studying for a test and the test mark
2. The hours spent working, and the weekly earnings
3. The cost of a rental car, and the distance driven
4. The outdoor temperature, and the quantity of fuel needed to heat a house
5. People's ages and their heights
6. The height of a hot air balloon, and time
7. Amount of sleep, and how alert you feel
8. Amount of time that passes, and the amount of water left in a bucket with a hole in the bottom
9. Number of minutes spent talking on the phone, and the cost of your phone bill
10. Time spent driving, and distance travelled
11. Amount of flour used and size of cake baked
12. Volume of water in your swimming pool and the time spent filling it
13. Amount of snowfall and time spent shovelling
14. Temperature of stove, and the time it takes for a pot of water to boil

Scatter Plots

A **scatter plot** is a graph that shows the relationship between **two sets of numeric data**

The **points** in a scatter plot often **show** a general **pattern**, or **trend**.

From the pattern or trend, **you can describe a relationship**, if one exists.

Scatter plots can sometimes have an **outlier**, which is a point separated from the main body of data on a graph. It **differs significantly** from the rest of the data.

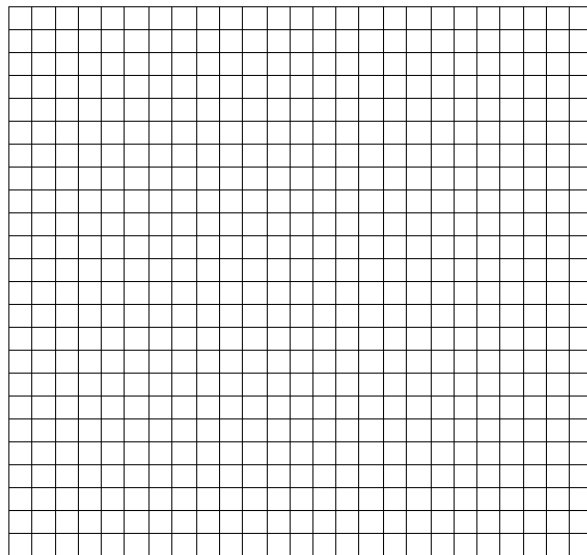
To create a scatter plot:

1. Collect the data and organize it in a **table** or as **ordered pairs**
2. Present the data points on a **graph** with labelled axes.
3. **Use** the scatter plot to:
 - **Analyze** the data by looking for a **pattern**
 - **Describe** the pattern if one exists.

PRACTICE 4: Scatter Plots

FACT: Crickets make their chirping sounds by rapidly sliding one wing over the other. The faster they move their wings, the higher the chirping sound that is produced. Scientists have noticed that crickets move their wings faster in warm temperatures than in cold temperatures. Therefore, by listening to the pitch of the chirp of crickets, it is possible to tell the temperature of the air. The table below gives the recorded pitch (vibrations per second) of a cricket chirping recorded at 15 different temperatures.

Temperature (°C)	Chirps per second
32	20
22	16
34	20
29	18
27	17
24	16
21	15
28	17
21	15
28	16
27	15
28	17
27	16
29	17
25	14



- a) Draw a scatter plot to examine the relationship between chirps per second and temperature.
- b) In complete sentences, describe any trends in the data
- c) Could you tell someone what the temperature was, without using the thermometer?

Lines of Best Fit

A **line of best fit** is a **straight line** that best **describes** the **trend**, direction, distribution, or pattern of points in a scatter plot.

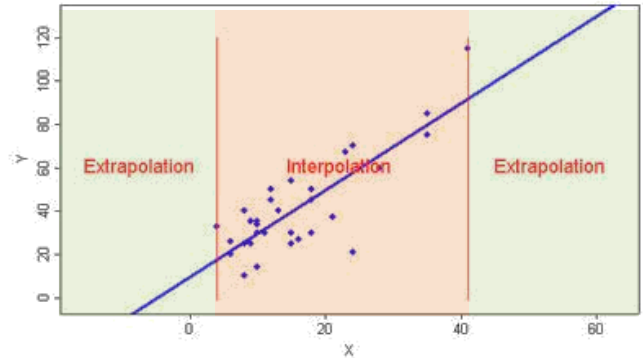
It **passes through as many points as possible**, with the remaining points grouped equally above and below the line.

The line of best fit **does not have to pass through (0,0)**

The line of best fit **can help you make predictions** for values not actually plotted

When you are predicting a value anywhere **within** the smallest and largest values that you recorded, this is called **interpolating**.

When you are predicting a values anywhere **outside** the range of values (smaller than your smallest number or larger than your largest number), you are **extrapolating**.

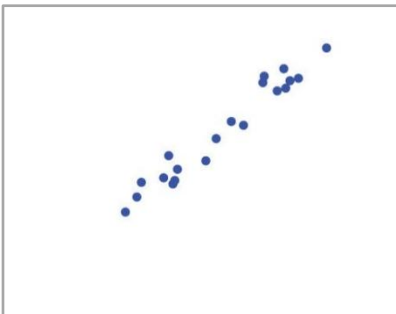


A **curve of best fit** is used if the data is **non-linear**, and it is a **smooth curve** that passes through as many points as possible.

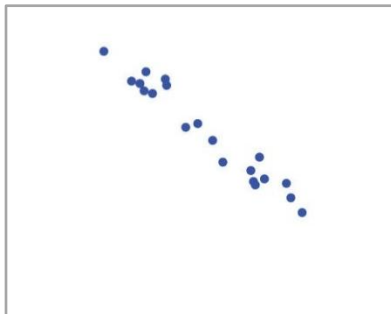
Strength and Direction of Correlations

When describing a relationship in words, you need to talk about both the **strength** of the correlation and the **direction** of the correlation.

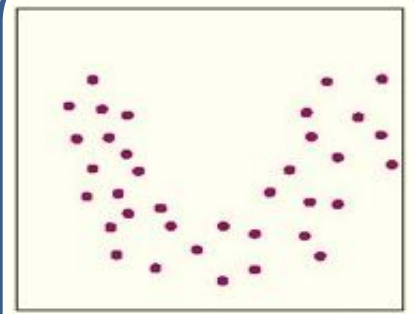
Direction: Positive Linear Correlation



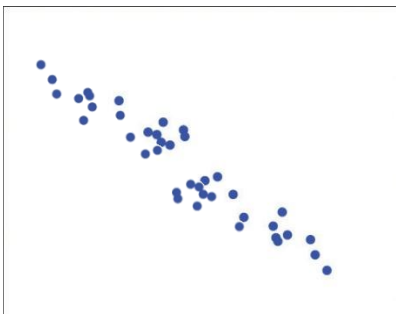
Negative Linear Correlation



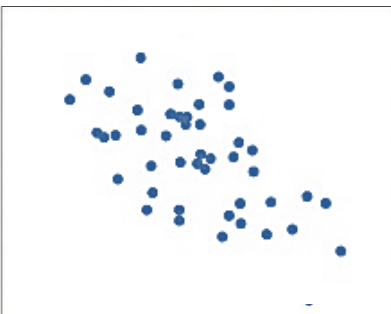
Non-Linear



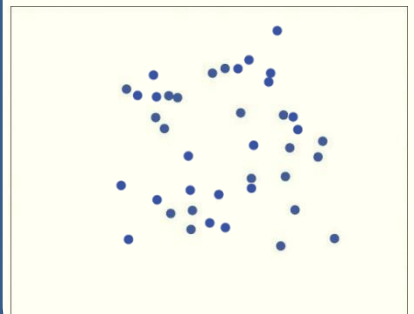
Strength: Strong Linear Correlation



Weak Linear Correlation

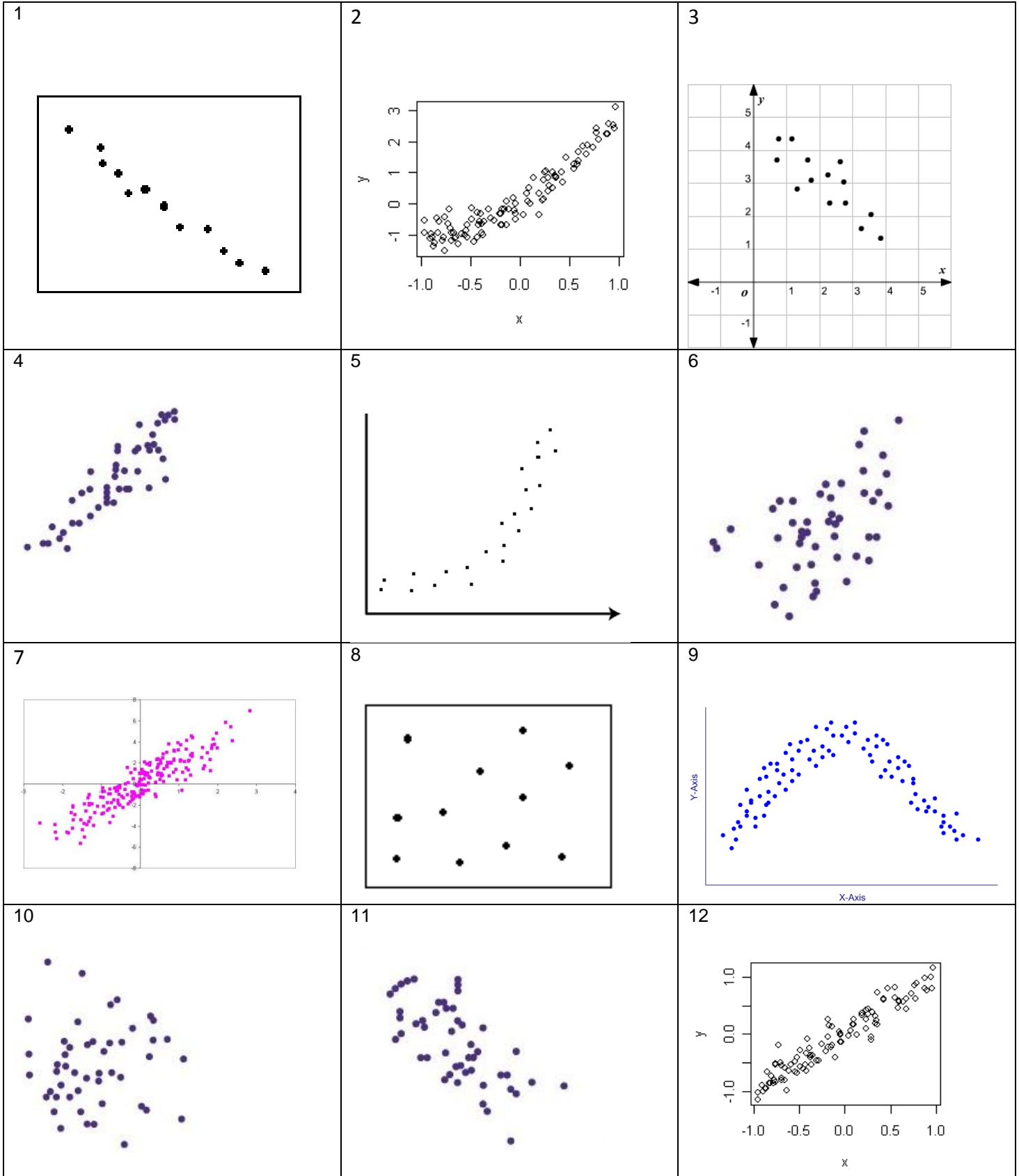


No Correlation

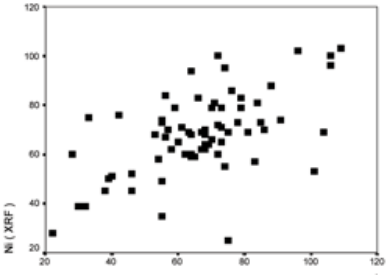


PRACTICE 5: Lines of Best Fit and Correlations

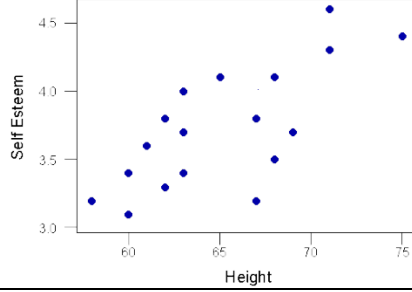
For each of the following, draw a line (or curve) of best fit, and describe the correlation (describe the strength and direction if it is linear, write "non-linear" if it is not linear, and "no correlation" if there is no correlation).



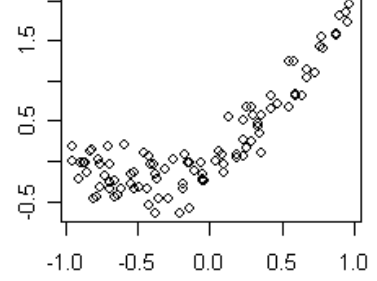
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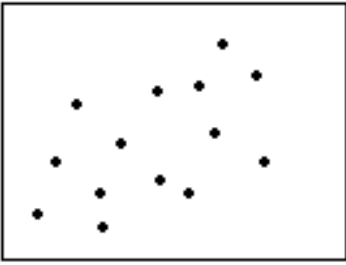
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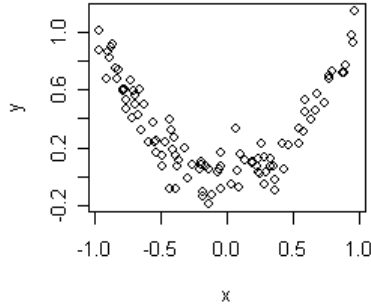
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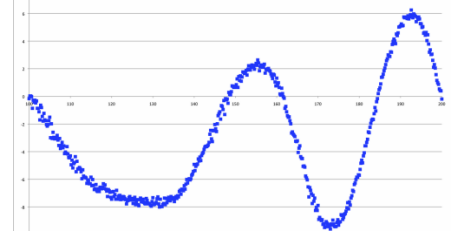
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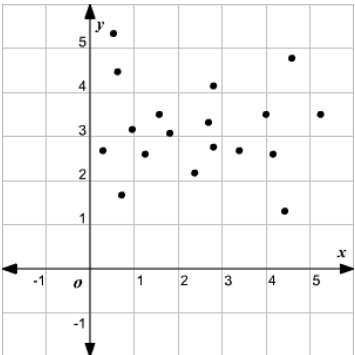
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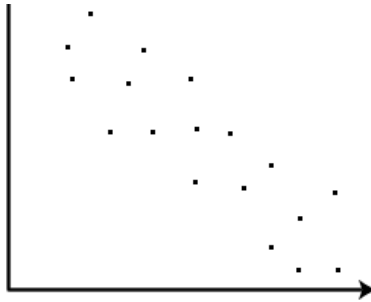
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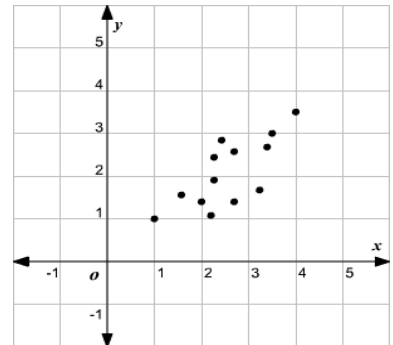
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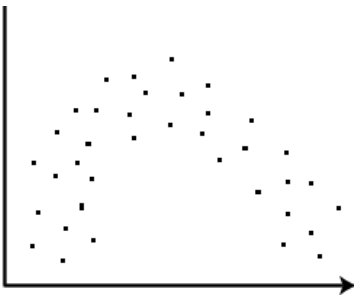
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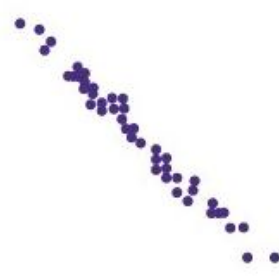
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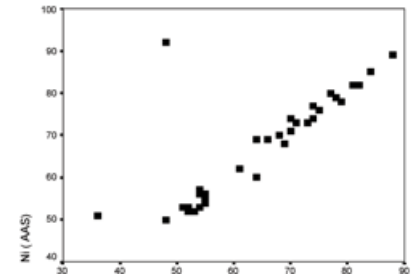
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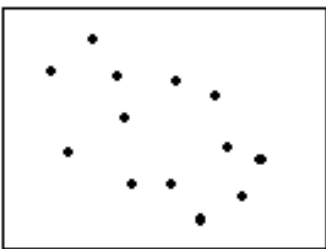
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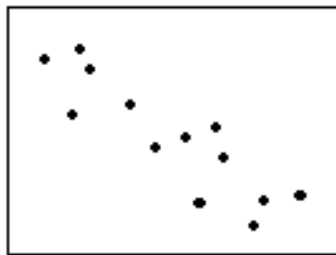
24



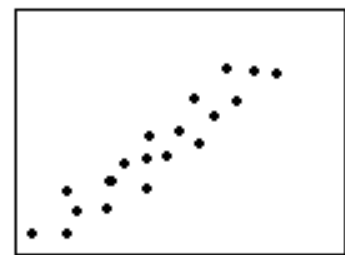
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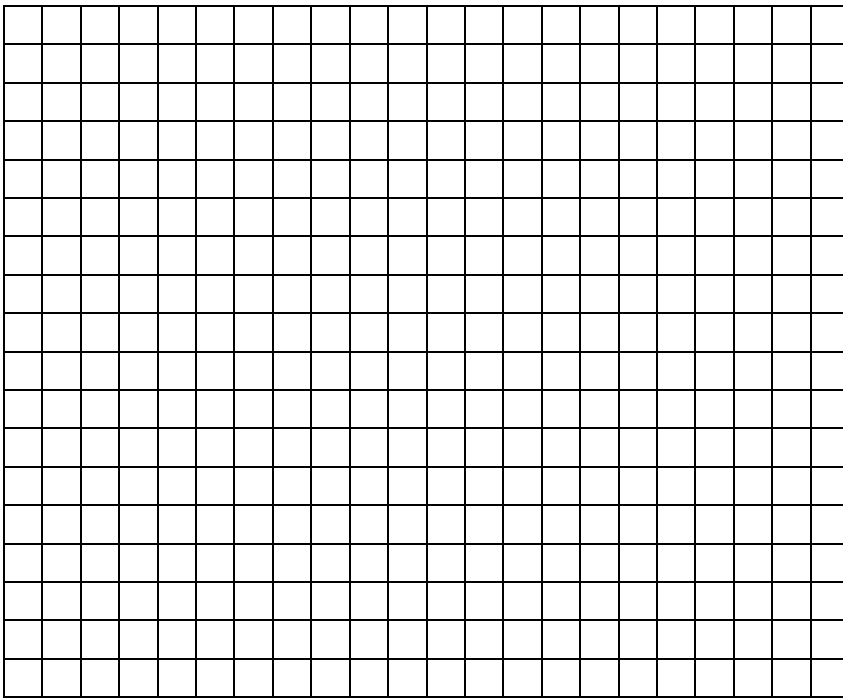
PRACTICE 6: Creating Scatter Plots

1. A skateboarder starts from various points along a steep ramp and practises coasting to the bottom. This table lists the skateboarder's initial height above the bottom of the ramp and his speed at the bottom of the ramp.

Initial Height (m)	2.0	2.7	3.4	3.8	4.0	4.5	4.7	5.0
Speed (m/s)	4.4	5.2	5.8	6.1	4.5	6.5	6.6	6.9

- a) Identify the **independent** variable and the **dependent** variable. Explain your reasoning.

- b) Make a scatter plot of the data.



- c) Describe the **relationship** between the variables.

- d) Identify any **outliers**. An "outlier" is a measurement that differs significantly from the rest of the data. It is a point separated from the main body of data on a graph. What might cause an outlier in the data?

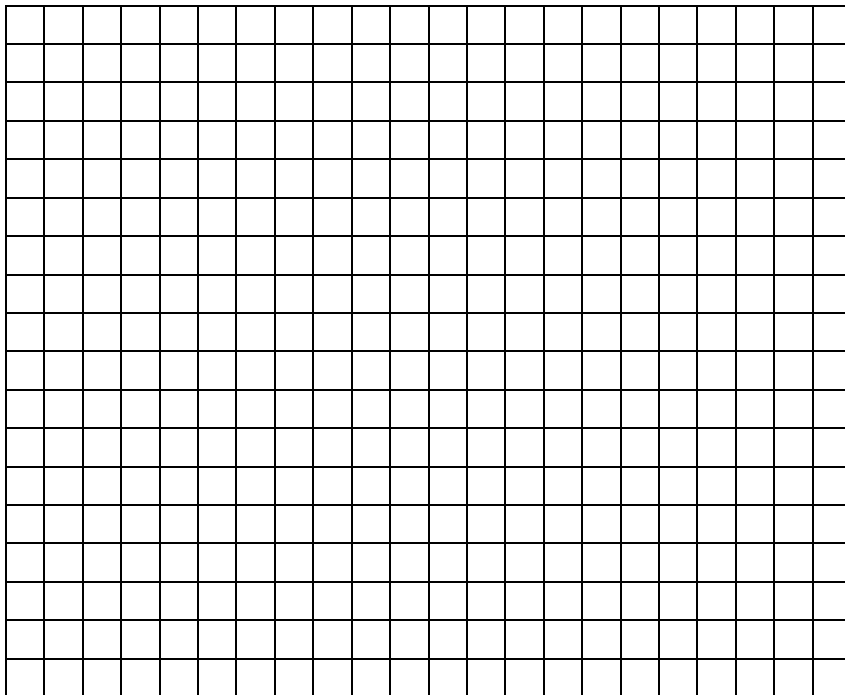
2. The chart shows the number of hours studying for a math exam and the mark each student received, for 12 randomly selected students.

Number of Hours	4	5	2	0	3	6	2	3	1	5	2	2
Mark	85	87	68	43	66	91	61	70	50	84	64	58

a) Create a scatter plot to display this data. To create a scatter plot of the data, you need to follow the following steps:

- decide which variable is the independent variable
- decide on a scale for each axis, then label the axes
- plot the points and give your graph a title.

b) Create a line of best fit.



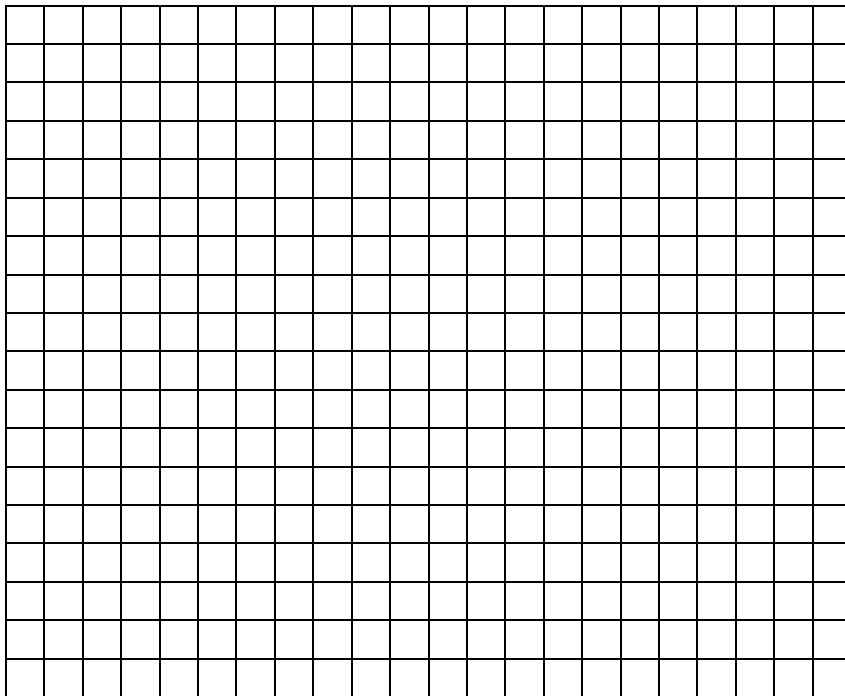
c) Using your line of best fit, predict the exam mark for a student that studied for 7 hours. Is this an interpolation or an extrapolation? Explain.

d) Describe the correlation.

3. The following table shows the relationship between number of hours different students spend watching TV, and what their overall grade average is in school.

Grade	TV in hours per week
77	14
60	10
50	20
95	7
55	25
85	9
97	15
80	13
93	4
88	21

- a) Create a scatter plot to display this data.

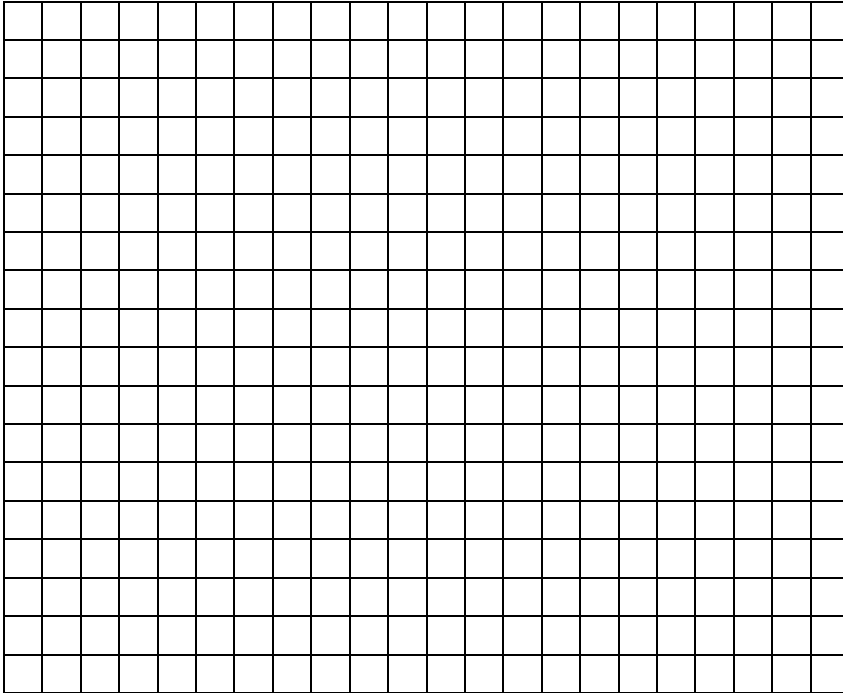


- b) Create a line of best fit.
- c) Describe the correlation.
- d) If someone watched 0 hours of television, what would you predict their grade average to be? Is this a reasonable prediction? Explain.

4. This table shows the sales of bottled water at a refreshment booth at the Canada's Wonderland for different days during a heat wave one summer.

Time (minutes)	23	25	28	29	24	28	27	30	32	35	35	37	36	37
Height (metres)	32	50	112	147	193	223	312	376	286	250	357	364	321	335

- a) Draw a scatter plot and a line of best fit.



- b) Describe the correlation.

- c) Answer the following questions:

- ◆ Predict how many bottles of water will be sold on a day when the temperature reaches:

i) 25° _____

ii) 42° _____