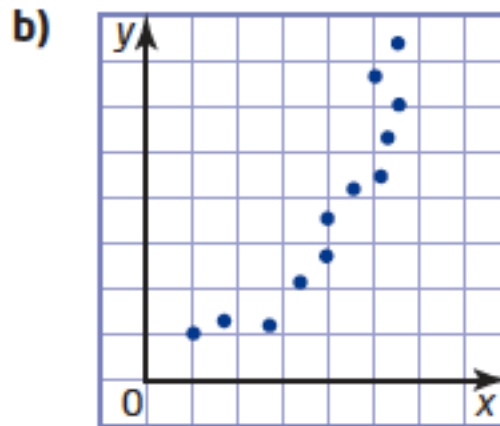
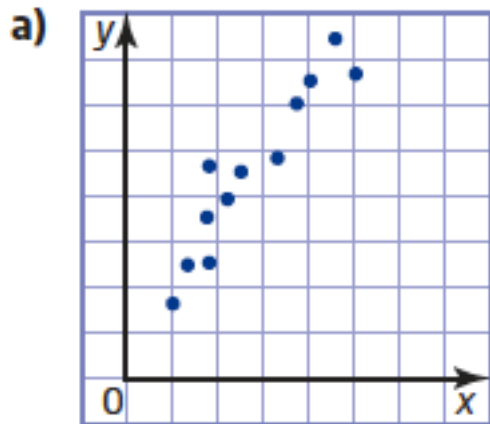


2.5 – Linear and Non-Linear Relations Worksheet

MPM1D

Jensen

1. Does each graph show a linear relationship? Explain.

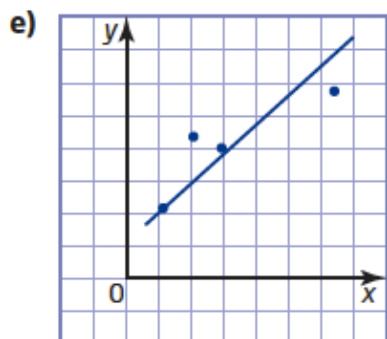
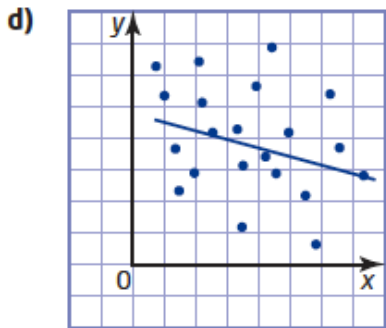
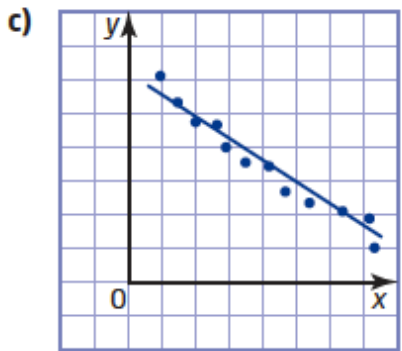
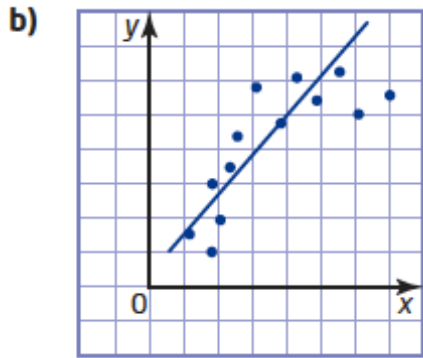
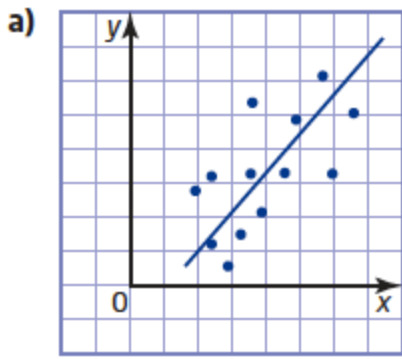


2. Does each set of points have a linear relationship? Justify your answer.

a) $(-6, -4), (-5, -2), (-4, 0), (-3, 2), (-2, 4), (-1, 6), (0, 8), (1, 10), (2, 12), (3, 14)$

b) $(0, 0), (1, 1), (2, 4), (3, 9), (4, 16), (5, 25), (6, 36)$

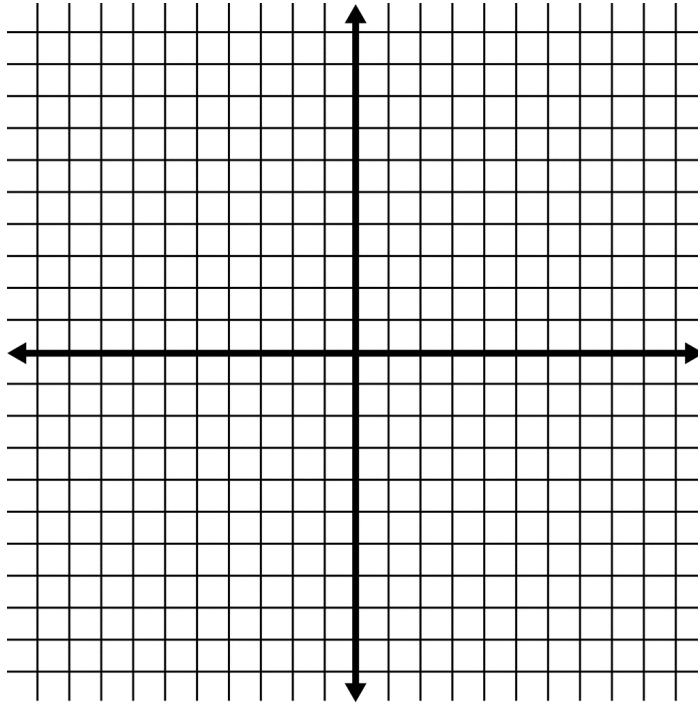
3. State whether each of these lines of best fit is a good model for the data. Justify your answers.



4. Plot each set of points on a grid. If your plot shows a linear relationship, draw a line of best fit. If the relation appears non-linear, sketch a curve of best fit.

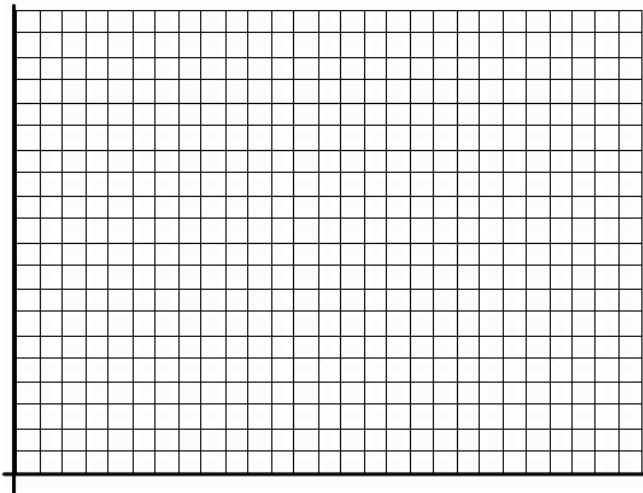
a)

x	1	2	7	4	9	3	6	2
y	-2	0	12	5	20	3	11	1

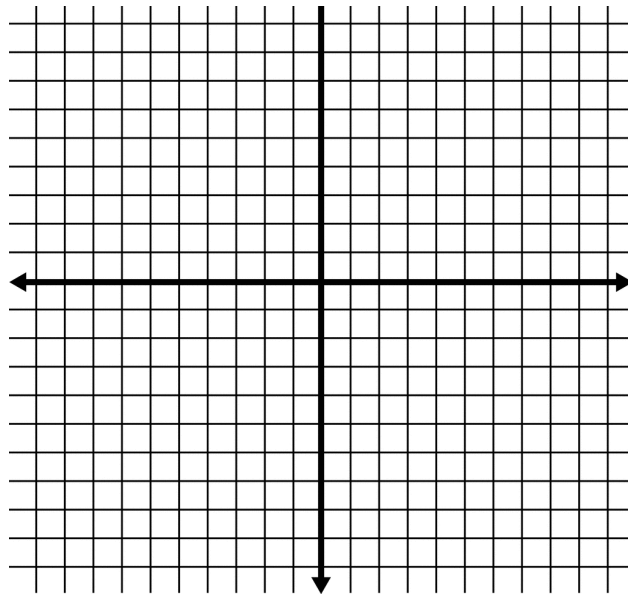


b)

Time (s)	40	32	55	18	66	43	37
Score	7	9.5	6	10	4	6	7.5



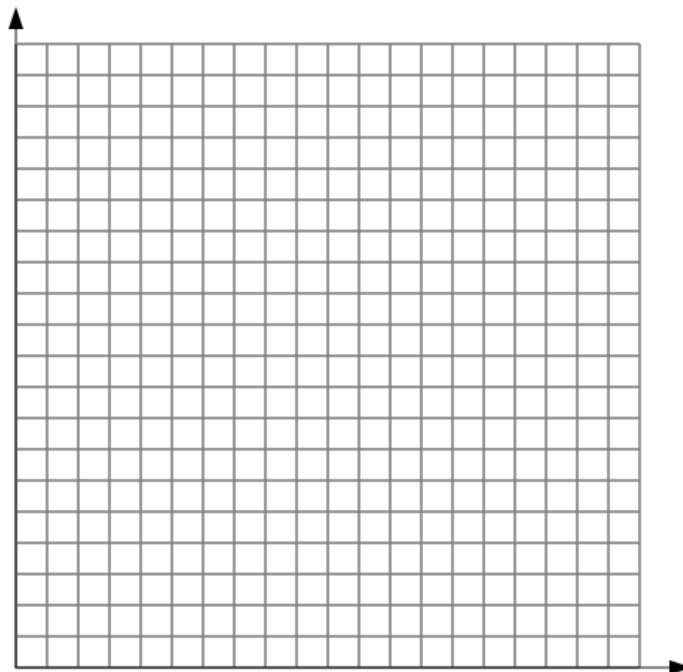
- c) $(-5, 3), (6, 1), (2, 2), (-3, 0), (-1, 2), (9, 10), (8, 4), (0, 1), (7, 5), (-4, 1)$



5. A weather balloon recorded the air temperature at various altitudes.

Altitude (m)	500	800	1000	1500	1700	2100
Temperature ($^{\circ}\text{C}$)	16.2	14.5	13.1	11.2	9.8	8.1

- a) Make a scatter plot of the data.

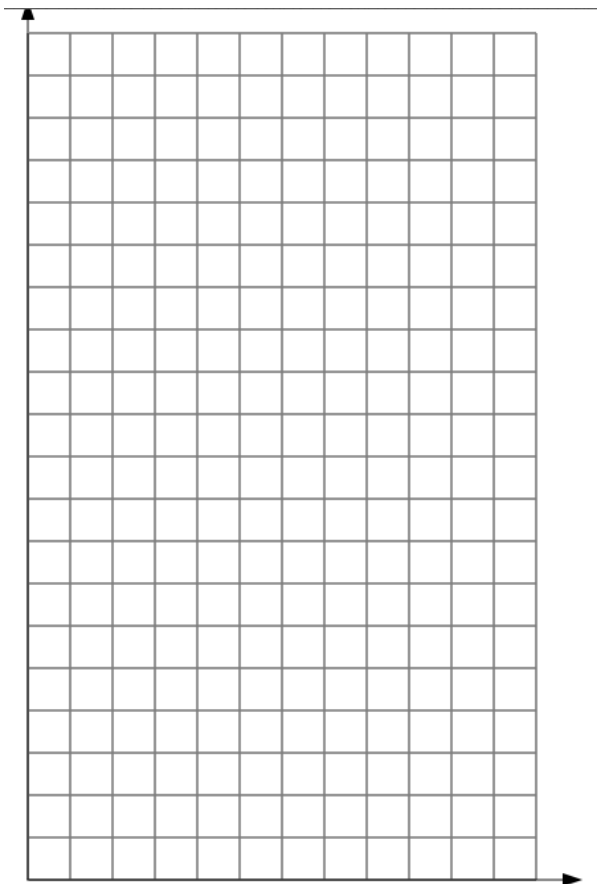


b) Describe the relation and draw a line or curve of best fit.

c) Use your line or curve of best fit to estimate the temperature at an altitude of 600 m. Is this interpolation or extrapolation?

d) Estimate the temperature at 2500 m. Is this interpolation or extrapolation?

6. a) This table lists the speed of a skydiver during the first 4 seconds of free fall. Plot the data on a grid with time from 0 seconds to 12 seconds on the horizontal axis and speed from 0 m/s to 100 m/s on the vertical axis.



Time (s)	0	1	2	3	4
Speed (m/s)	0	6	12	18	23

b) Extrapolate to estimate the skydiver's speed after 12 seconds of free fall.

c) This table gives the skydiver's speed for the next 8 seconds of free fall. Add these data to the graph you made in part a).

Time (s)	5	6	7	8	9	10	11	12
Speed (m/s)	28	33	37	40	42	43	43	43

d) Describe the trend in the enlarged set of data. What causes this trend?

e) Explain why extrapolations can be inaccurate.

7. (Consider each set of data. How can you tell whether the relation between the variables in each pair is linear without graphing the data?)

a)

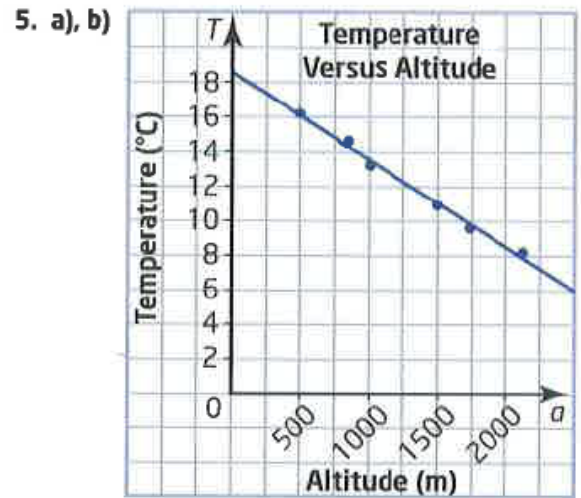
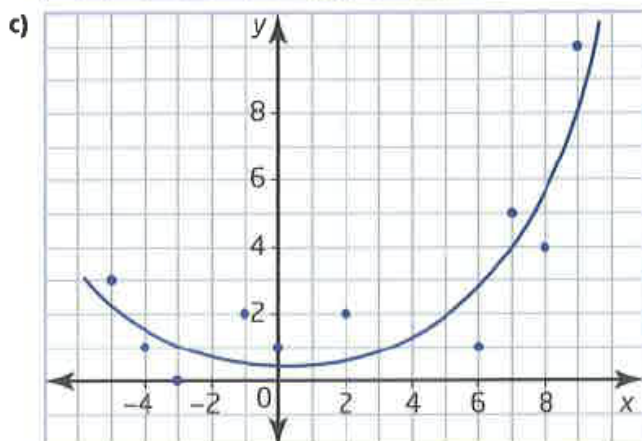
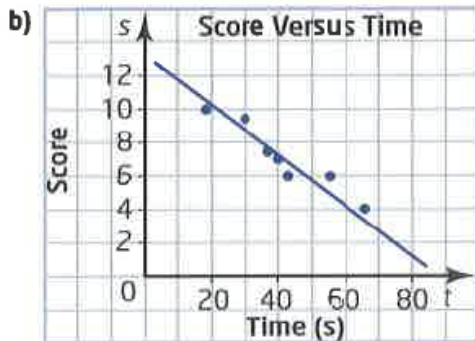
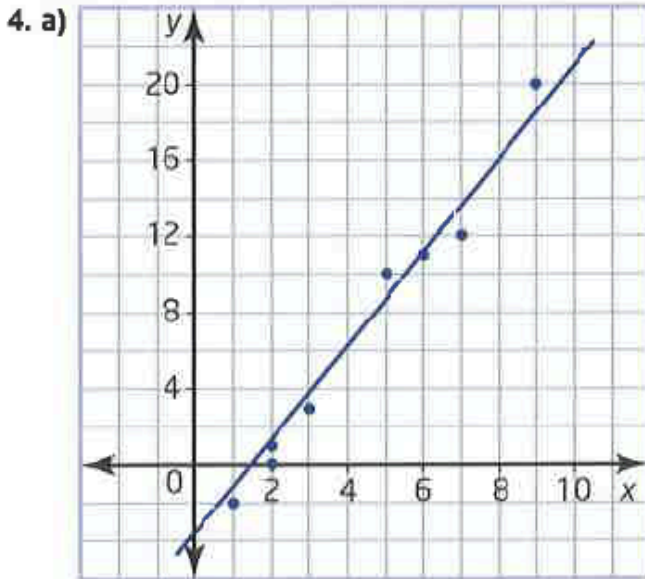
<i>t</i>	-2	-1	0	1	2	3	4	5
<i>d</i>	-9	-4	1	6	11	16	21	26

b)

<i>t</i>	-3	-2	-1	0	1	2
<i>h</i>	5	0	-3	-4	-3	0

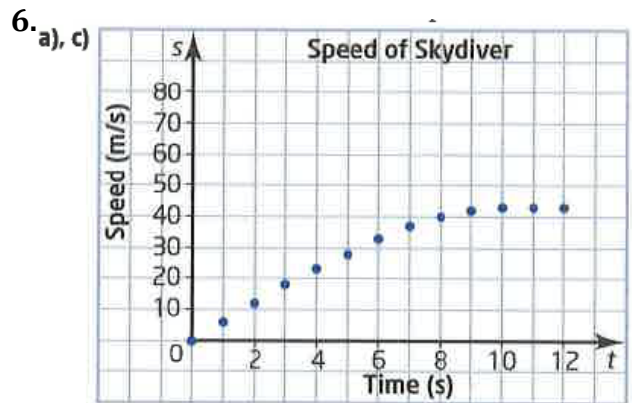
Answers:

- 1. a) Yes; the points lie close to a straight line.
b) No; the points lie close to a curve.
- 2. a) Linear; the points lie on a straight line.
b) Non-linear; the points lie on a curve.
- 3. a) Yes; points are reasonably close to a straight line.
b) No; the points follow a curve.
c) Yes; the points lie close to a straight line.
d) No; there is no apparent pattern.
e) No; there are not enough points to find a good line of best fit.



The temperature decreases linearly as the altitude increases.

- c) 15.5°C d) 6.0°C



- b) about 70 m/s
- d) Air resistance increases with speed, so the speed increases only until the air resistance offsets the acceleration due to gravity.
- e) The relationship between the variables may change beyond the range of the data.

11. a) Linear; each time t increases by 1, d increases by 5.

b) Non-linear; h does not change by a constant amount each time t increases by 1.