Lines of best fit

Common core icons

This icon indicates a slide where the Standards for Mathematical Practice are being developed. Details of these are given in the Notes field.

MODELING

Slides containing examples of mathematical modeling are marked with this stamp.

This icon indicates an opportunity for discussion or group work.

The **Standards for Mathematical Practice** outlined in the Common Core State Standards for Mathematics describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

They are:

1) **Make sense of problems and persevere in solving them.**

2) **Reason abstractly and quantitatively.**

3) **Construct viable arguments and critique the reasoning of others.**

4) **Model with mathematics.**

5) **Use appropriate tools strategically.**

6) **Attend to precision.**

7) **Look for and make use of structure.**

8) **Look for and express regularity in repeated reasoning.**

This icon indicates that the slide contains activities created in Flash. These activities are not editable.
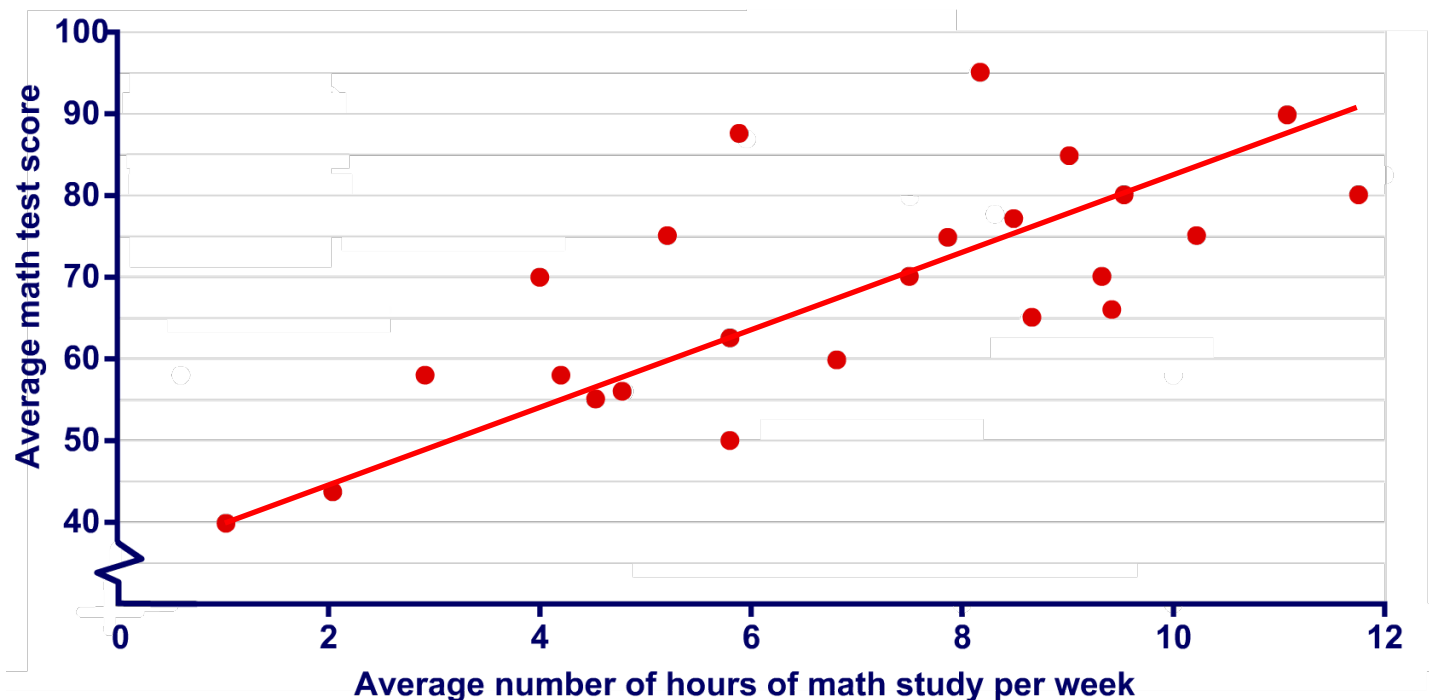
This icon indicates teacher's notes in the Notes field.

This scatter plot shows the relationship between average hours of math study per week and average math test score.

What can we add to this graph to help us to more easily see the general trend of the data?
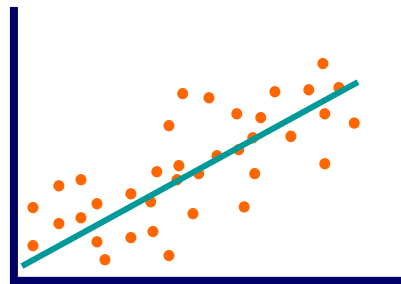
Lines of best fit

A **line of best fit** (or a **trend line**) is drawn on a scatter plot to show the linear trend in a set of data.
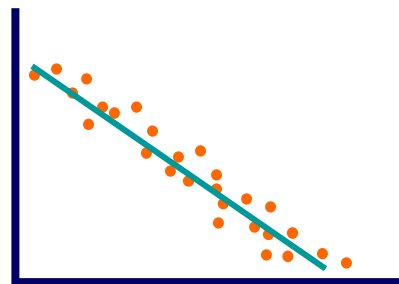
It is drawn so that there are roughly an equal number of points above and below the line.
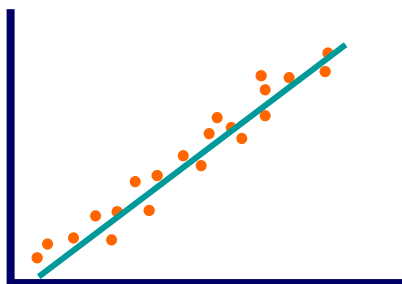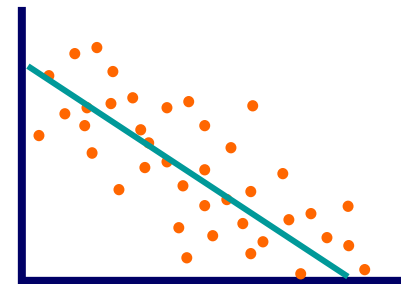
strong positive correlation

weak positive correlation

strong negative correlation

weak negative correlation

The stronger the correlation, the closer the points are to the line.

Lines of best fit

When drawing a line of best fit, remember:

- The line does not have to pass through the origin.

- For a more accurate line of best fit, find the mean of each variable. This forms a coordinate pair, which can be plotted. The line of best fit should pass through this **mean point**.

- The equation of the line of best fit can be found using the **slope** and y**-intercept**.

- The line of best fit can be used to estimate one variable using another, within the range of data used.
  This is called **interpolation**.

Finding the mean point

This table shows heights and weights of some grade 10 boys.

height (cm)	150	154	159	162	164	167	169	171	173	175	179	181
weight (lbs)	102	110	115	106	119	115	121	120	124	120	130	125

Height and weight of twelve grade 10 boys
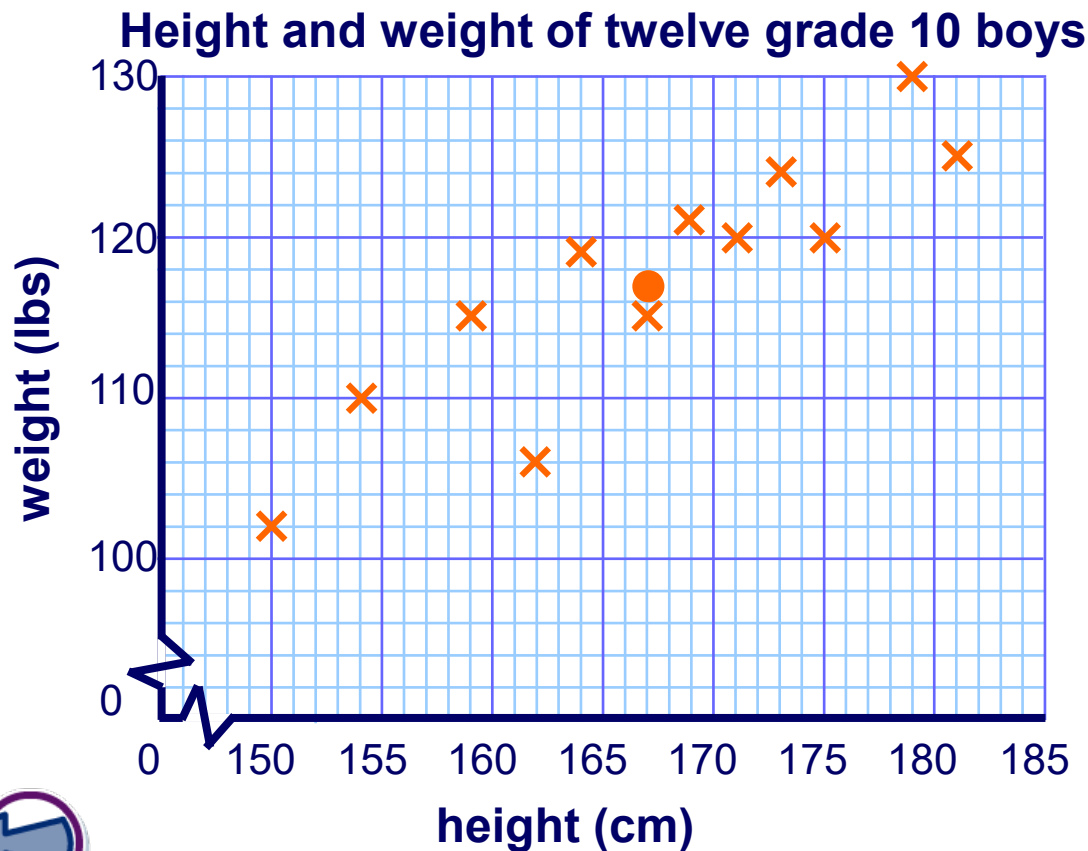
Find the mean height and mean weight:

mean height (cm)	mean weight (lbs)
167	117

Plot the mean point:
(167, 117)

Height and weight of twelve grade 10 boys
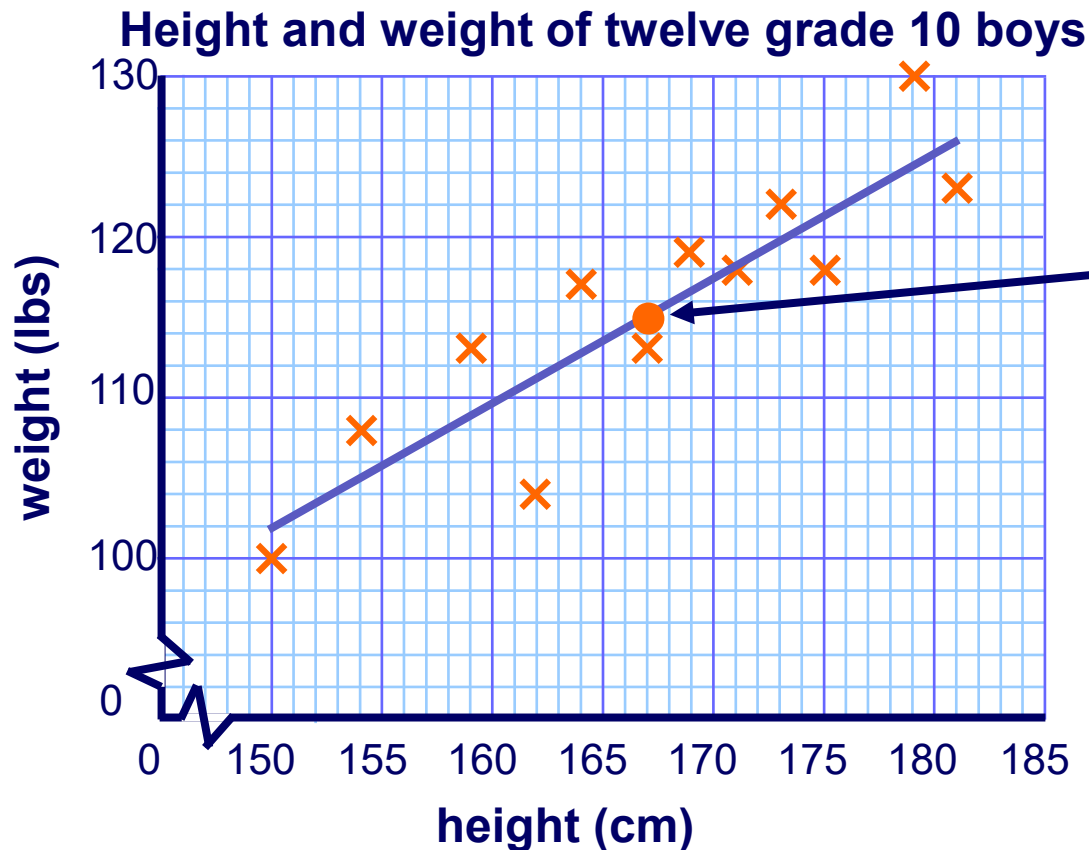
mean point:
height 167 cm,
weight 117 lbs

Discuss how the line of best fit should be drawn.

The line of best fit should pass through the mean point and the points should be distributed evenly either side of the line.
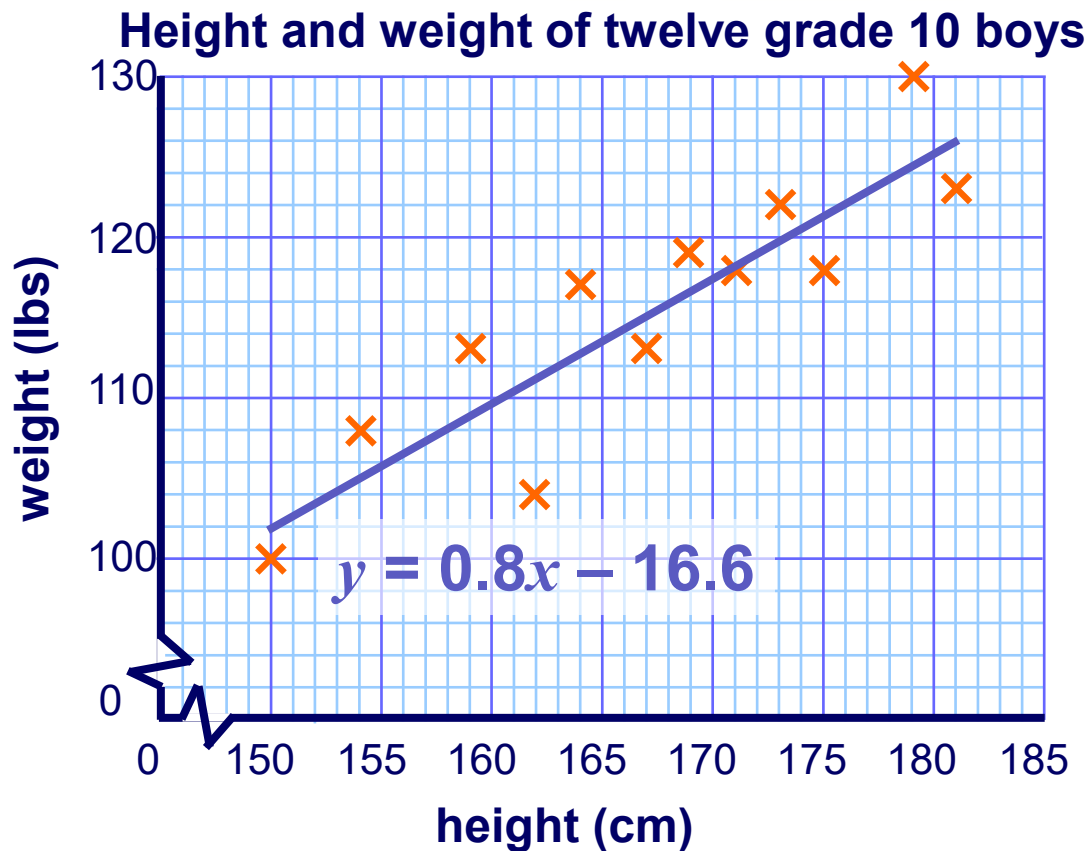
Once we've drawn the line of best fit on a graph, we can then find its equation.

Press **start** to see how.

start

Using the line of best fit

Height and weight of twelve grade 10 boys

$y = 0.8x - 16.6$

weight (lbs)

height (cm)

Use the line of best fit to estimate the weight of a 163 cm tall grade 10 boy.

$y = 0.8x - 16.6$

$= 0.8(163) - 16.6$

$= 130.4 - 16.6$

$= \textbf{113.8 lbs}$

Could we use this graph to predict the height of a grade 10 boy weighing 176 lbs?

Extrapolation

Using lines of best fit to predict values **outside** the range of data is called **extrapolation**.

Extrapolation should be used with caution; only predict values when you expect the trend of the data to continue.
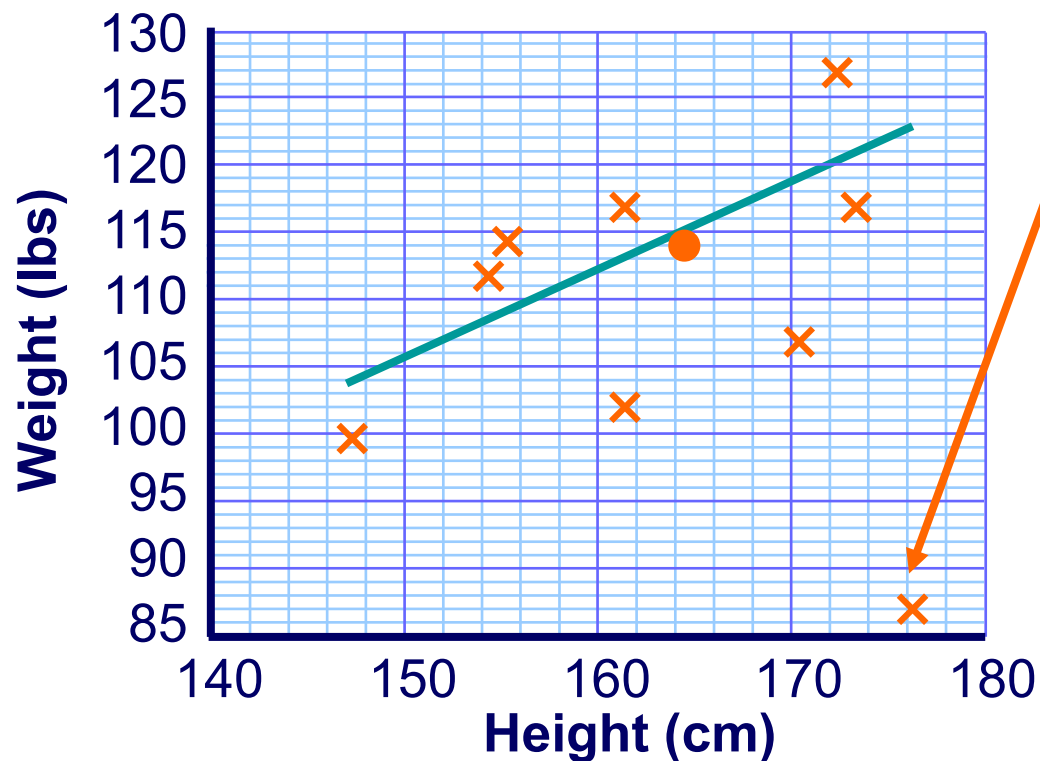
We found that the grade 10 boys tended to weigh more the taller they were. However, think about the limits of the variables.

Using our line of best fit, a 176 lb boy would be around 241 cm tall. That's over 7 ft 10 in!

In this case, it is unrealistic to assume that the trend will continue much further.

This scatter plot shows the height and weight of a sample of grade 10 girls.

One point on the scatter plot does not fit in with the rest.

How will this affect the line of best fit? How do you think we should deal with it?

This point is an **outlier**. When drawing a line of best fit on the scatter plot, this outlier should be ignored.