# Straight lines and their gradients
# Introduction

This activity is designed to get you used to using Geogebra and to introduce some key ideas about straight lines and their equations.

You will be trying to find the relationship between the gradients of some straight lines.

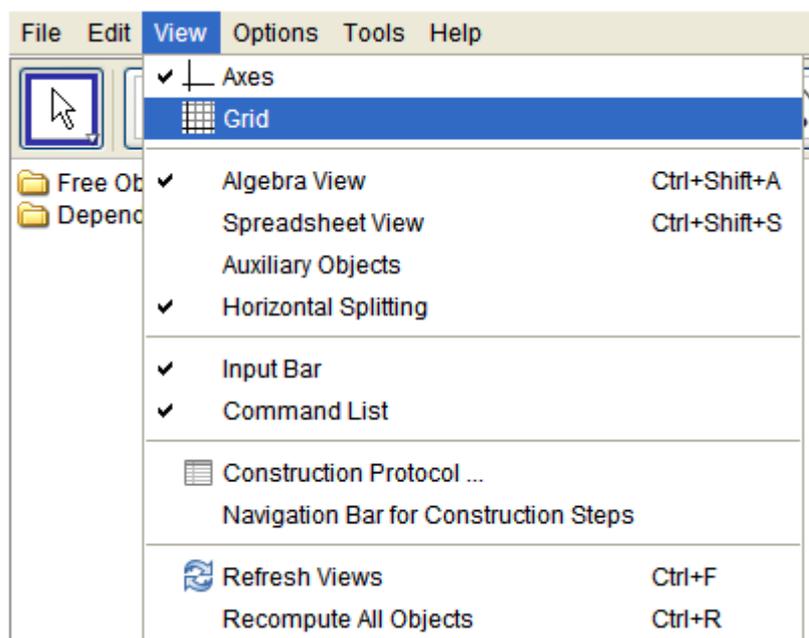You will be expected to write a brief conclusion about what you have found and explain why this is the case.

Go to www.geogebra.org and click the [Download] link.

Now click the [Applet Start] link.

This will open Geogebra in your web browser.

Before you start the activity, you will need to make the drawing grid visible.

Select it from the View dropdown menu:

| File | Edit | **View** | Options | Tools | Help |
|---|---|---|---|---|---|

- ✔ ⊥ Axes
- ▦ **Grid**

| ✔ | Algebra View | Ctrl+Shift+A |
|---|---|---|
| | Spreadsheet View | Ctrl+Shift+S |
| | Auxiliary Objects | |
| ✔ | Horizontal Splitting | |
| ✔ | Input Bar | |
| ✔ | Command List | |
| | Construction Protocol ... | |
| | Navigation Bar for Construction Steps | |
| | Refresh Views | Ctrl+F |
| | Recompute All Objects | Ctrl+R |

You are now ready to start the activity.

Draw the line $y = x + 3$.

Do his by typing the equation into the input box (at the bottom of the screen) like this:

Input: y=x+3
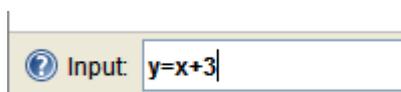
You should know that the gradient of this line is 1 but, just to show you how to use some of the features of Geogebra, you can measure it like this:

Hover the cursor over the small arrow at the bottom of the angle icon and a set of measurement options will appear like this:



Note: You can move the drawing pad by clicking on  and dragging it to where you want.
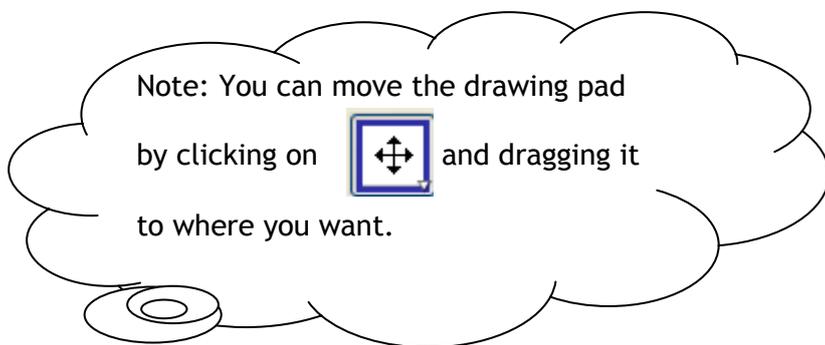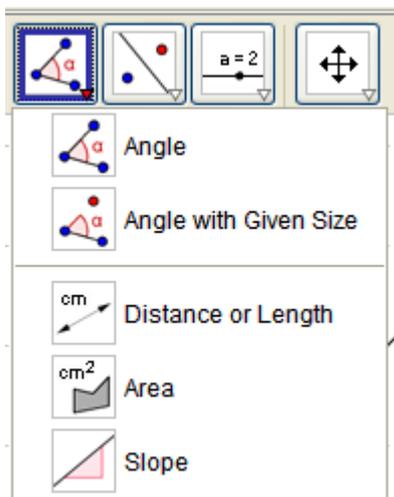
Click on the option marked slope and then click on the line. It should then tell you that the gradient is 1.

Now type the equation $y = -x + 1$ into the input bar. Measure its gradient.

You are now going to measure the angle between the two lines. The measurement utility is currently set to slope so you will need to set it back to angle measurement like this:
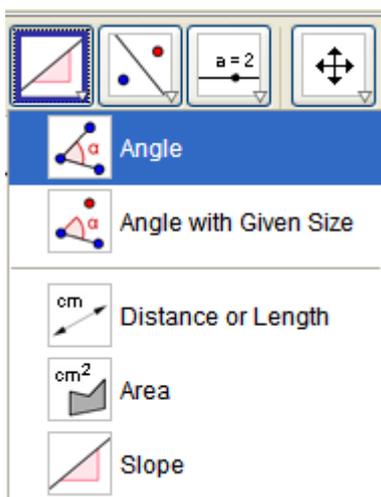


Now click on both lines (one at a time) and the angle will be measured automatically.

You can now work through the activity.

Fill in the answer sheet.

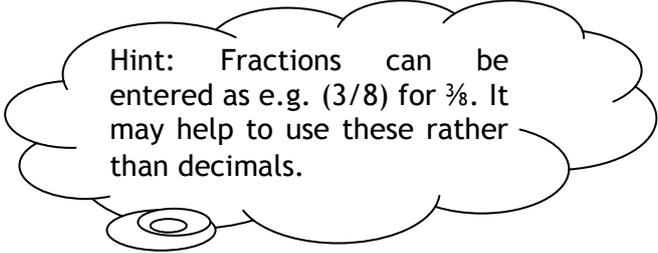# Straight lines and their gradients
## Activity

1.  Draw the graph of $y = 2x + 3$.

Find (by experimenting if need be) a line that is perpendicular (at 90°) to this.

Do the same for the following lines. Each time, try to do the same for each of the following lines.

Use the angle measuring tool to check that you have the correct perpendicular line.

2.  $y = \frac{1}{3}x - 2$
3.  $y = 5x - 1$
4.  $y = -\frac{1}{4}x + 1$
5.  $y = -\frac{4}{3}x + 4$

> Hint: Fractions can be entered as e.g. (3/8) for ⅜. It may help to use these rather than decimals.

Note down anything that occurs to you about each line and its perpendicular.

You should by now have some idea of what you are trying to discover about straight lines and their gradients.

Write a brief conclusion stating what you have discovered.

Explain why this works.
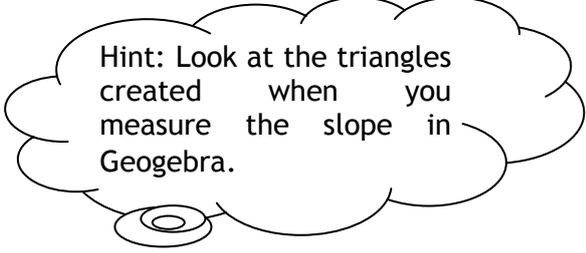
> Hint: Look at the triangles created when you measure the slope in Geogebra.

How would you find a line perpendicular to $5y - 3x = 7$?

**Quick check:** Are these lines perpendicular?

Look at each pair of straight line equations.

Decide which are pairs of perpendicular lines and use Geogebra to find out if you are correct.

1.  $y = 2x - 5$ and $y = \frac{1}{2}x + 2$
2.  $y = \frac{1}{3}x + 2$ and $y = -3x + 5$
3.  $y = 5x$ and $y = -\frac{1}{5}x + 3$
4.  $5x + y = 3$ and $5y = 2x - 1$
5.  $2x + 3y = 2$ and $2y = 3x + 6$