The Equation of a Straight Line

Information
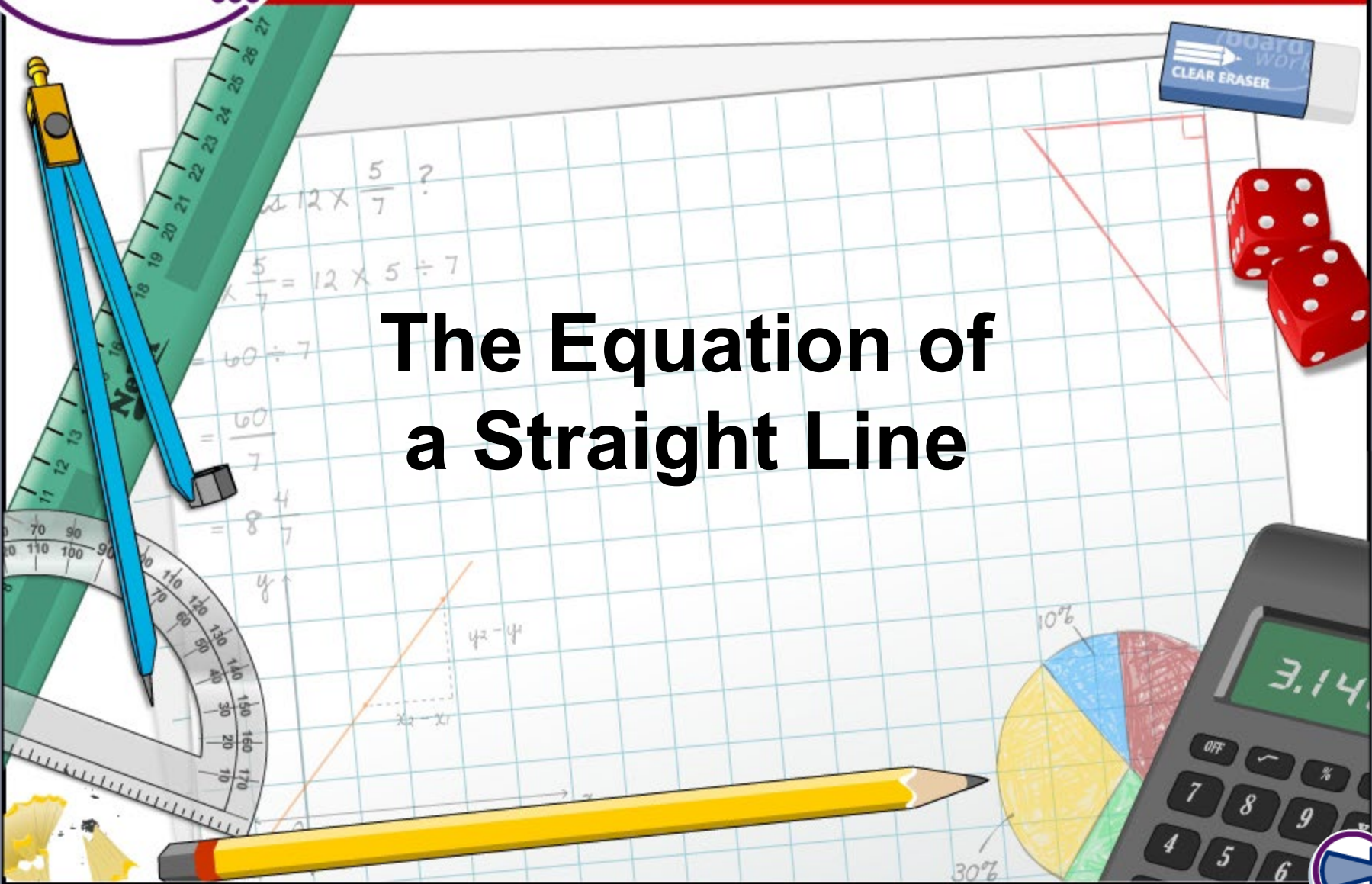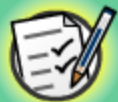
Common core icons

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.**

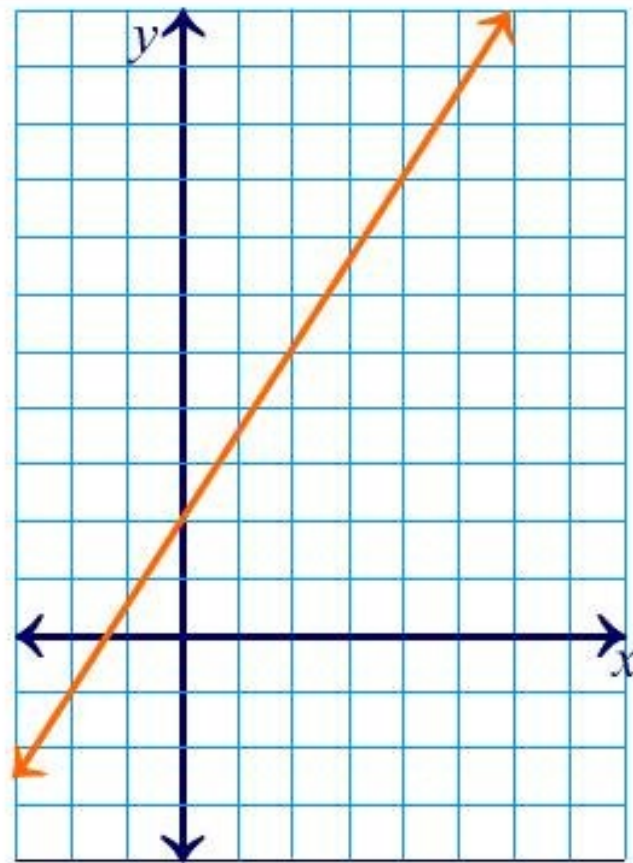This icon indicates that the slide contains activities created in Flash. These activities are not editable.

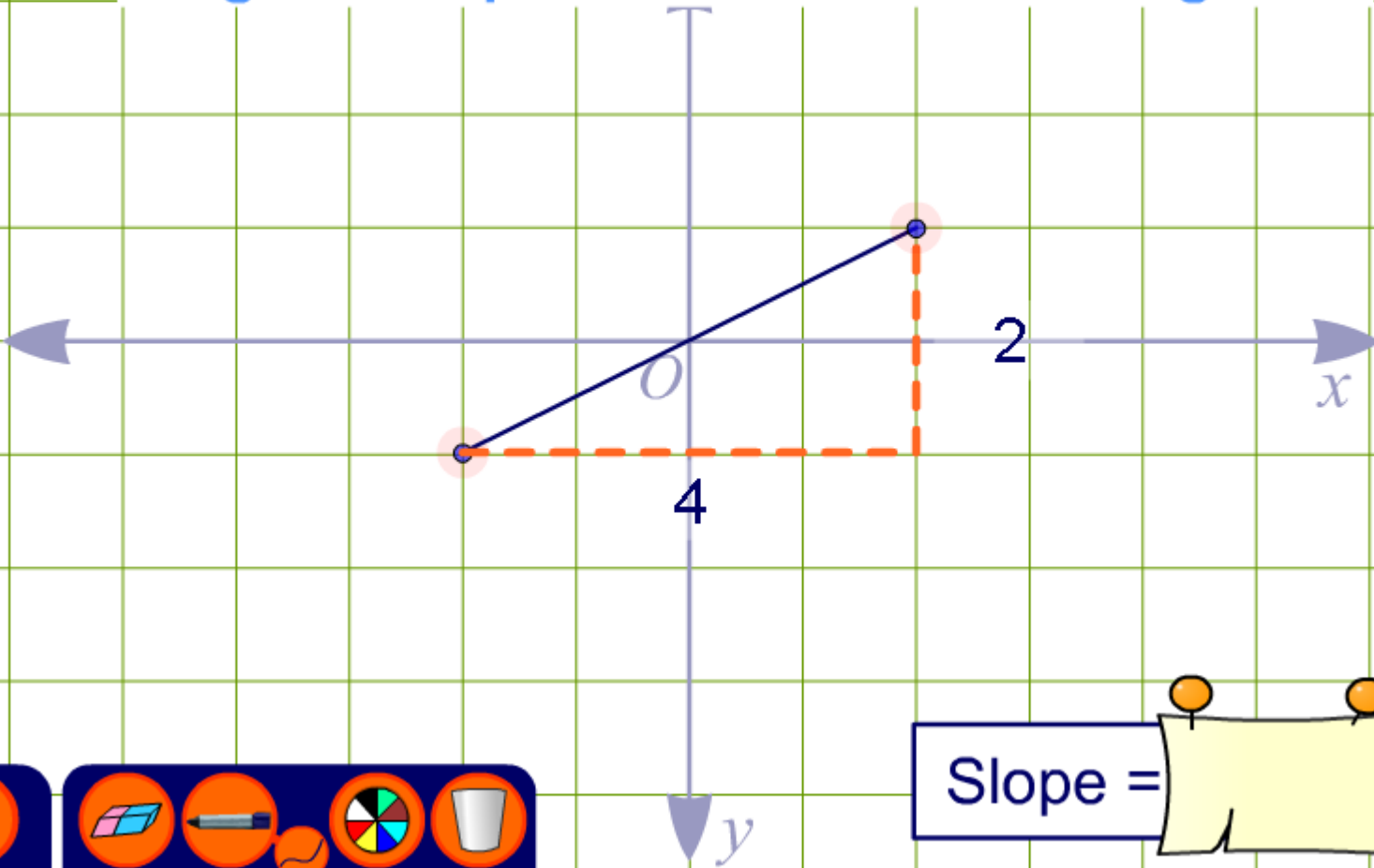This icon indicates teacher's notes in the Notes field.

The **slope** of a line is a measure of how steep the line is. If we are given two points (x_1, y_1) and (x_2, y_2) on a line, we can calculate the slope of the line.
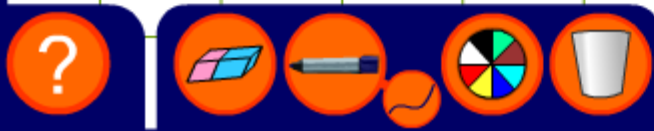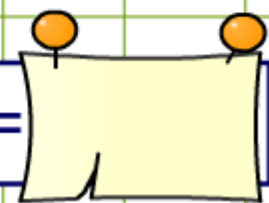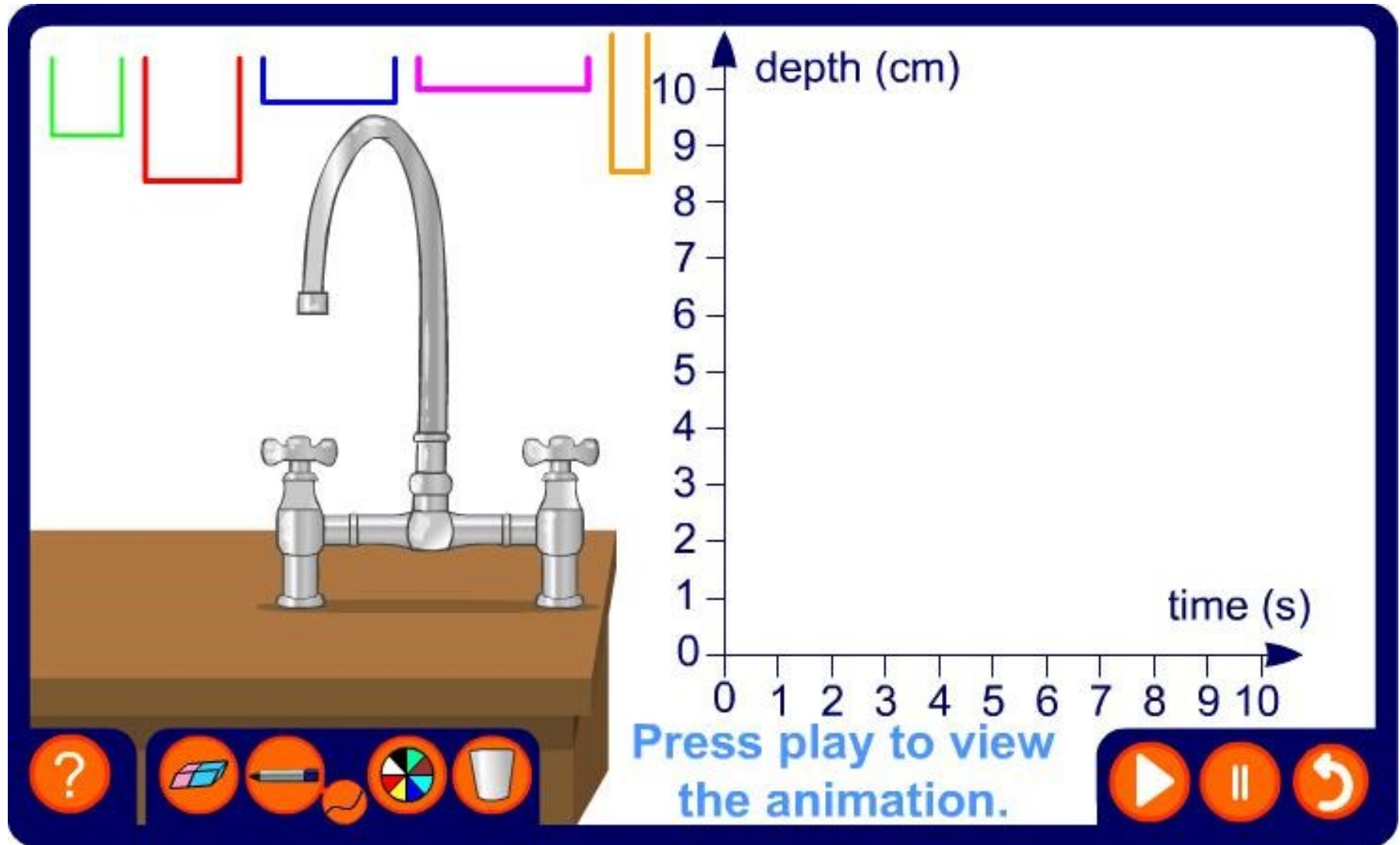
Drag the endpoints to alter the line segment.

2

O

x

4

y

Slope =

depth (cm)

10
9
8
7
6
5
4
3
2
1
0

time (s)

0 1 2 3 4 5 6 7 8 9 10

Press play to view the animation.

The general equation of a straight line can be written as:

$$y = mx + b$$
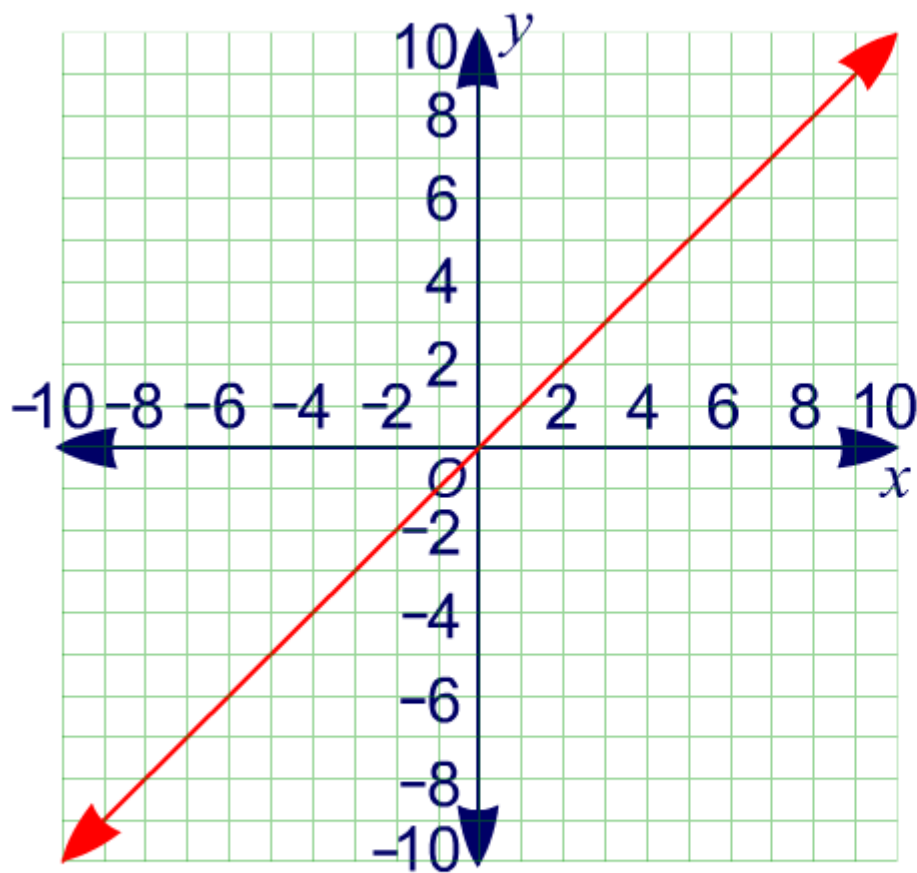
The value of m tells us the **slope** of the line.

The value of b tells us where the line crosses the y-axis. This is called the y-**intercept**, and it has the coordinate $(0, b)$.

For example, the line $y = $ **3**$x + $ **4** has a slope of **3** and crosses the y-axis at the point $(0, $ **4**$)$.

What is the equation of a line that passes through the origin?

Investigating straight lines

$$y = \quad x$$

Slide to change m

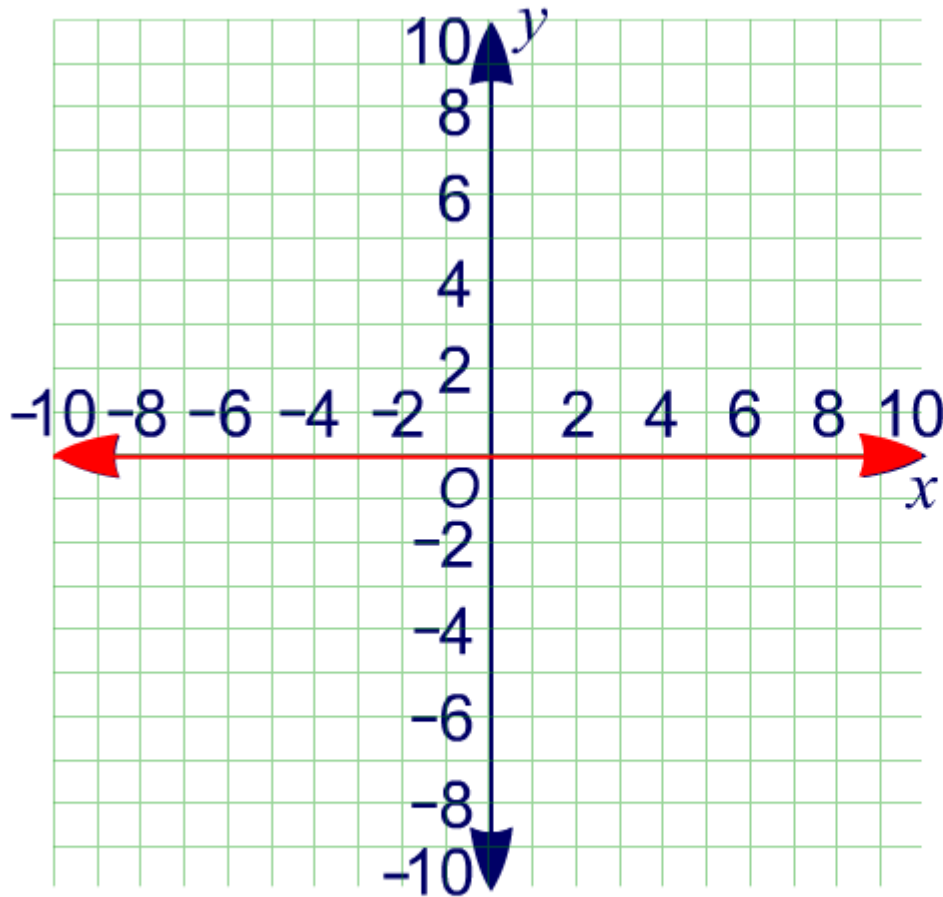Slide to change b

Drag the green arrows to alter the graph.

Drag and rotate the lines to change *m* and b.

$y =$

one line

Equation	Slope	y-intercept
$y = 3x + 4$		
$y = \dfrac{x}{2} - 5$		
$y = -3x + 2$		
	1	(0, 0)
	−2	(0, −7)

(0, 2)

A line with the equation $y = mx + 5$ passes through the point (3, 11). What is the value of m?

To solve this problem we can substitute $x = 3$ and $y = 11$ into the equation $y = mx + 5$.

This gives us:	$11 = 3m + 5$
Subtracting 5:	$6 = 3m$
Dividing by 3:	$2 = m$
	$m = 2$

The equation of the line is therefore $y = 2x + 5$.

Rearranging equations

The equation of a straight line is $2y + x = 4$. Find the slope and the y-intercept of the line.

We can rearrange the equation by transforming both sides in the same way: $2y + x = 4$

Subtracting x: $2y = -x + 4$

Dividing by 2: $y = \dfrac{-x + 4}{2}$
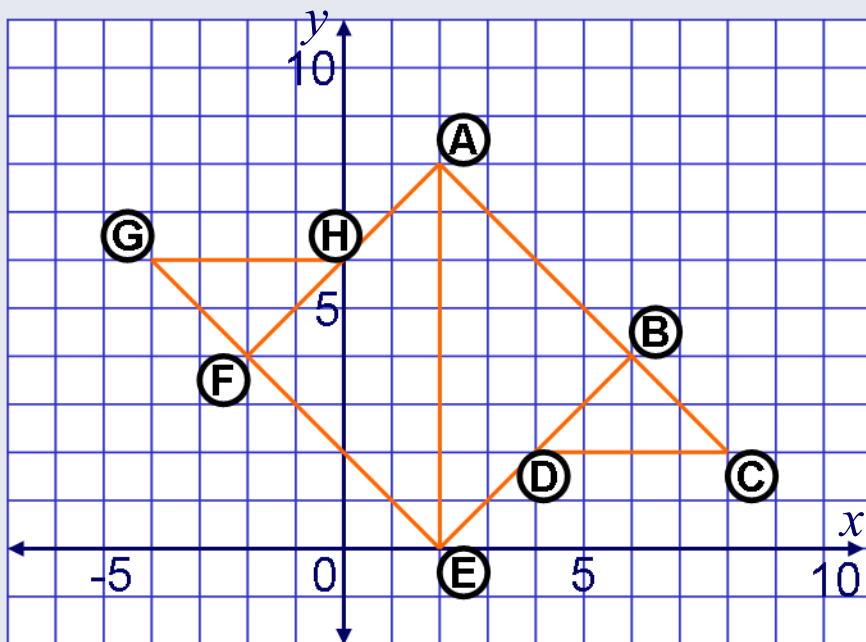
$$y = -\frac{1}{2}x + 2$$

Once the equation is in the form $y = mx + b$, we can find the slope and the y-intercept.

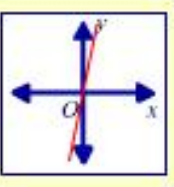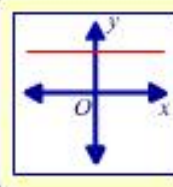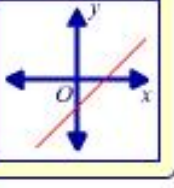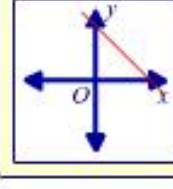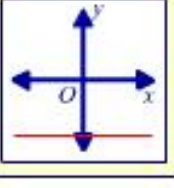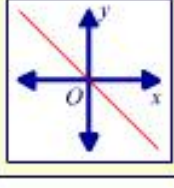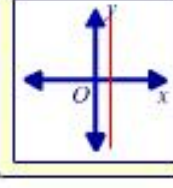The slope is $-\dfrac{1}{2}$, and the y-intercept is 2.
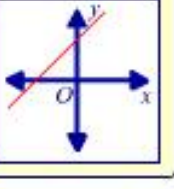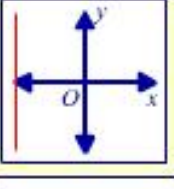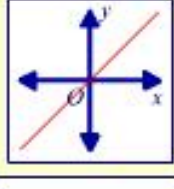
Look at this diagram:

What is the equation of the line segment with endpoints:

a) A and F? $y = x + 6$

b) B and E? $y = x - 2$

c) E and G? $y = -x + 2$

d) A and C? $y = -x + 10$

Matching pairs

$y=-4$	$y=x$		$y=5x$	
$y=-x+4$		$y=x-2$	$x=-5$	$x=1$
$y=x+4$				
$y=-x$	$y=3$			

face-up