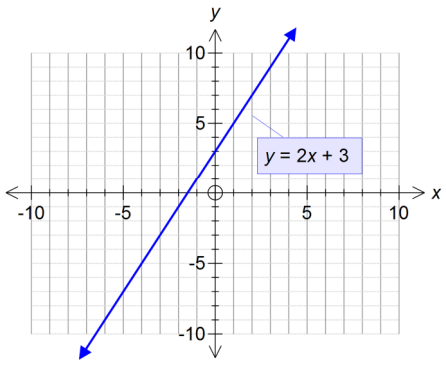
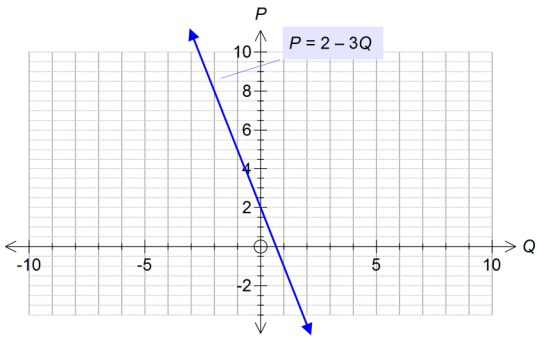
MATHS FOR PRICES & MARKETS

LINEAR GRAPHS

The graph of a linear equation, representing all possible solutions to the equation, is called a straight line or linear graph,

Examples

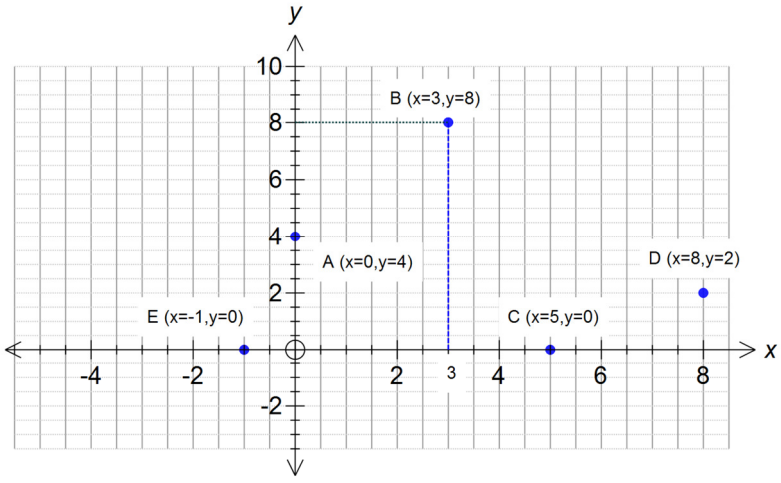




The names of the axes will vary depending on the context. In mathematics they are often x and y.
In physics they may be v (speed) and t (time).
In economics they may be P (price) and Q (quantity)

Points on the plane are referred to by their **horizontal** and **vertical** coordinates. Points to the right of, and up from the origin are positive. Points to the left of, and down from the origin are negative.

Examples



A is the point x=0, y=4
B is the point x=3, y=8
C is the point x=5, y=0
D is the point x=8, y=2
E is the point x=–1, y=0

Graphing a straight line

Only **two** points need to be determined to sketch the graph of a straight line.
The intercepts (where the graph cuts the axes) are usually the easiest.
If the graph passes through the origin (0,0) this is the only intercept and another point must be chosen.

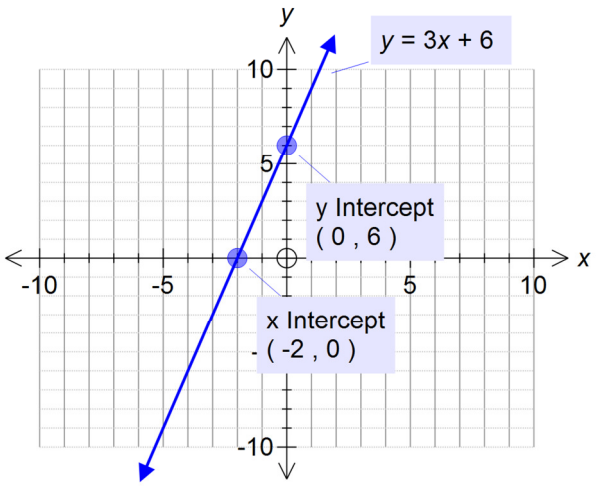
Examples

1. Sketch the graph $y = 3x + 6$.

***y*-intercept** (where the graph cuts the y- axis).
$x = 0$ $\therefore y = 3 \times 0 + 6$
$y = 6$
The ***y*-intercept** is the point $x = 0$, $y = 6$

***x*-intercept** (where the graph crosses the x- axis).
$y = 0$ $\therefore 0 = 3x + 6$
$x = -2$
The ***x*-intercept** is the point $x = -2$, $y = 0$

Plot the points and connect the two points with a straight line.



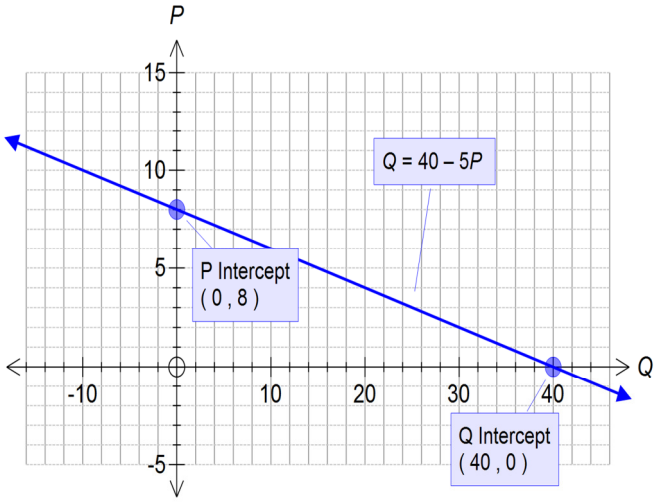
See exercise 1.

2. Sketch the graph $Q = 40 - 5P$.

Q-intercept (where the graph cuts the Q- axis).
$P = 0$ $\therefore Q = 40 - 5 \times 0$
$Q = 40$
The **Q-intercept.** P = 0, Q = 40

P-intercept (where the graph crosses the P- axis).
$Q = 0$. $\therefore 0 = 40 - 5P$.
P= 8
The **P-intercept.** Q = 0, P = 8

Plot the points and connect the two points with a straight line.

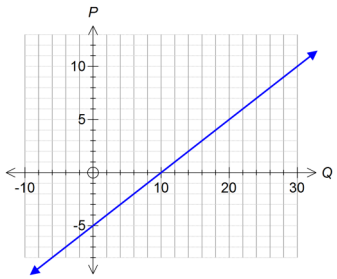


Gradient of a straight line

Positive, negative and zero gradients

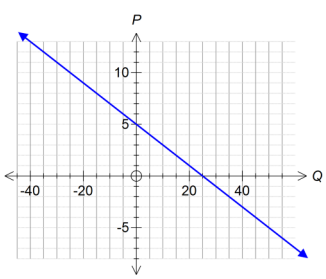
Positive gradient.

As one quantity increases the other increases.



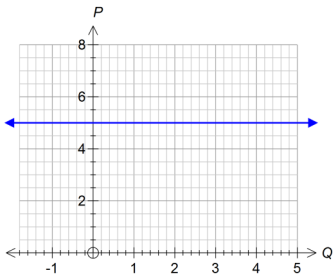
Negative gradient

As one quantity increases the other decreases.



Zero gradient

The gradient of a horizontal Is zero.



Parallel lines have the same gradient.

See exercise 2

Exercises

Exercise 1

Sketch the graphs of the following equations. Use the indicated variable as the horizontal axis.

(a) $y = 2x - 3$ (x) (b) $Q = 12 - 3P$ (Q) (c) $Q = -5 + 10P$ (Q) (d) $y = 5$ (x)

(e) $Q = 10P$ (Q) Hint: (two points needed)

Exercise 2

1. For the graphs in exercise 1. State whether the gradient is positive, negative or zero.

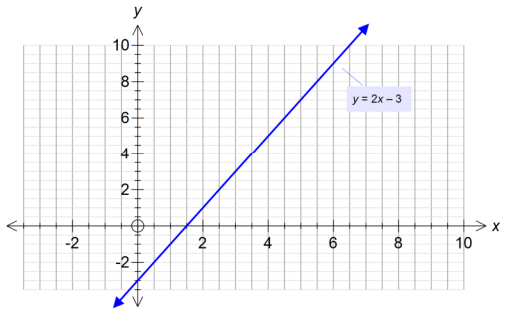
2. Consider the line $Q = 4 - 3P$
   (a) If P increases would you expect Q to increase, decrease or remain the same?
   (b) If Q decreases would you expect P to increase, decrease or remain the same?
   (c) If P decreases would you expect Q to increase, decrease or remain the same?

3. Consider the line $y = 5x+2$
   (a) If x increases would you expect y to increase, decrease or remain the same?
   (b) If y increases would you expect x to increase, decrease or remain the same?
   (c) If y decreases would you expect x to increase, decrease or remain the same?

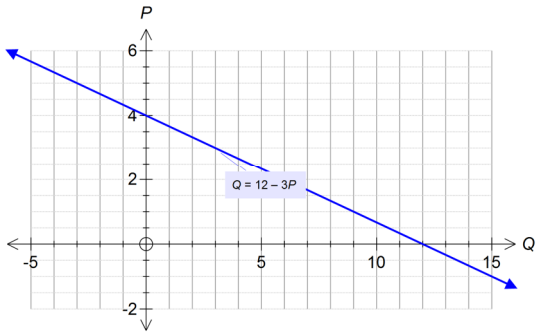
4. Consider the line $P = 6$
   (a) If Q increases would you expect P to increase, decrease or remain the same?

Answers

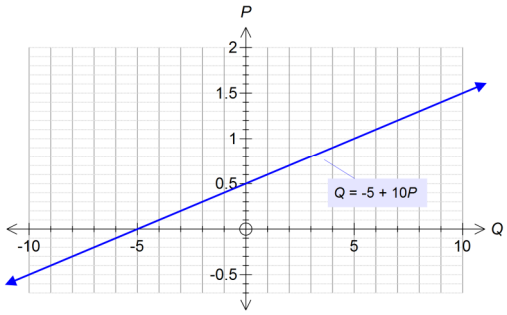
Exercise 1(a)



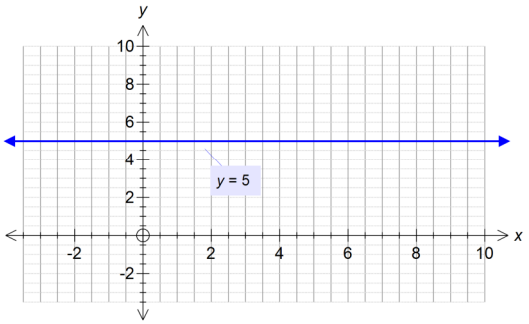
(b)



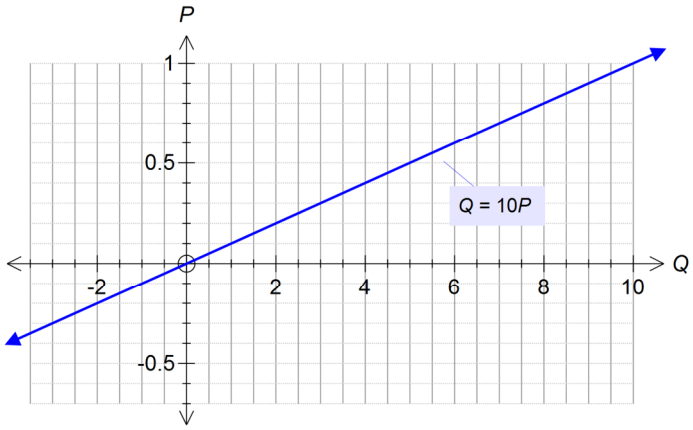
(c)



(d)



(e)



Exercise 2

1. (a) positive (b) negative (c) positive (d) zero (e) positive
2. (a) decrease (b) increase (c) increase
3. (a) increase (b) increase (c) decrease
4. Remain the same.