

# Exercises: Straight Lines and Quadratics

## Exercises

1. The cost of hiring a car for a day is £90 plus £1.50 per mile travelled.
  - (a) If £ $y$  is the cost of hiring a car for a day and  $x$  is the number of miles travelled, write down the relationship between  $x$  and  $y$ .
  - (b) Draw the line represented by this equation, identifying the gradient and intercept.
  - (c) If the car is driven 350 miles in a day, what is the cost of hire?
  - (d) How far could one travel for £150?

2. To convert between temperatures in Fahrenheit and Centigrade, the following formulae are used:

$$F = \frac{9}{5}C + 32,$$
$$C = \frac{5}{9}(F - 32)$$

where  $F$  and  $C$  are the temperatures in Fahrenheit and Centigrade, respectively.

- (a) Find the Fahrenheit equivalent of 30 degrees Centigrade and the Centigrade equivalent of 12 degrees Fahrenheit.
  - (b) What temperature is the same in Fahrenheit and Centigrade?
3. Solve the following simultaneous equations:
  - (a)  $2x - 3y = 0$ ,  $4x + 5y = 22$ ,
  - (b)  $3x + y = 15$ ,  $2x - 3y = -1$ ,
  - (c)  $x + y = 4$ ,  $6x - 2y = 2$ .
4. Find the equations of the lines going through the points:
  - (a) (1, 1) and (5, 10),
  - (b) (2, 12) and (6, 6).

Calculate their point of intersection (crossing point).

5. Where possible, solve the following quadratic equations:

(a)  $2x^2 + 7x - 4 = 0$ ,

(b)  $x^2 - 10x + 8 = 0$ ,

(c)  $x^2 + 3x + 5 = 0$ .

In each case sketch the relevant quadratic curve, indicating where it crosses the  $x$  and  $y$  axes and state the coordinates of the lowest (minimum) point on the curve.

## Solutions

1. The cost of hiring a car for a day is £90 plus £1.50 per mile travelled.

(a) If £ $y$  is the cost of hiring a car for a day and  $x$  is the number of miles travelled, write down the relationship between  $x$  and  $y$ .  $y = 1.5x + 90$

(b) Draw the line represented by this equation, identifying the gradient and intercept.

(c) If the car is driven 350 miles in a day, what is the cost of hire? £615

(d) How far could one travel for £150? 40 miles

2. To convert between temperatures in Fahrenheit and Centigrade, the following formulae are used:

$$F = \frac{9}{5}C + 32,$$

$$C = \frac{5}{9}(F - 32)$$

where  $F$  and  $C$  are the temperatures in Fahrenheit and Centigrade, respectively.

(a) Find the Fahrenheit equivalent of 30 degrees Centigrade and the Centigrade equivalent of 12 degrees Fahrenheit.  $30C = 86F$ ,  $12F = -11.1C$

(b) What temperature is the same in Fahrenheit and Centigrade? Set  $F = C$ , e.g.,

$$C = \frac{9}{5}C + 32.$$

Then solve for  $C$  to get  $C = F = -40$ .

3. Solve the following simultaneous equations:

(a)  $2x - 3y = 0$ ,  $4x + 5y = 22$ :  $x = 3$ ,  $y = 2$ ,

(b)  $3x + y = 15$ ,  $2x - 3y = -1$ :  $x = 3$ ,  $y = 4$ ,

(c)  $x + y = 4$ ,  $6x - 2y = 2$ :  $x = \frac{5}{4} = 1.25$ ,  $y = \frac{11}{4} = 2.75$ .

4. Find the equations of the lines going through the points:

(a)  $(1, 1)$  and  $(5, 10)$ :  $y = \frac{9}{4}x - \frac{5}{4} = 2.25x - 1.25$ ,

(b)  $(2, 12)$  and  $(6, 6)$ :  $y = -1.5x + 15$ .

Calculate their point of intersection (crossing point).

5. Where possible, solve the following quadratic equations:

(a)  $2x^2 + 7x - 4 = 0$ :  $x = -4$ ,  $x = \frac{1}{2}$ ,

(b)  $x^2 - 10x + 8 = 0$ :  $x = 9.12$ ,  $x = 0.88$  (2 d.p.),

(c)  $x^2 + 3x + 5 = 0$ : No solutions.

In each case sketch the relevant quadratic curve, indicating where it crosses the  $x$  and  $y$  axes and state the coordinates of the lowest (minimum) point on the curve.