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.