

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.