

4.3 Equations of straight lines: different forms of equations

- 1** The new sustainable agent in the school looks into how the current equipment can be into more ecologically friendly options.

Currently the lighting system is made of 400 neon tubes and 60 Watts bulbs. The electricity bill is on average \$900 a month and all the bulbs which are a dollar each are replaced every year.

If everything was to be changed into a new LED system, the electricity bill would be on average \$480 a month. The installation plus the cost of the LED bulbs and tubes would add up to \$4000 but last on average 5 years.

a State

- i** the maintenance cost of the current system.
- ii** the initial cost of setting up the LED systems.

b Write

- i** an equation to show the cumulative cost of the current lighting system per months
- ii** an equation to show the cumulative cost of the current lighting system per months

c Draw those two equations on the same axes where x is in months and $0 \leq x \leq 12$.

d Identify

- i** when both systems cost the same
- ii** when the electricity bill is lower when using the LED system

- 2** Using LED also creates a social benefit as it means using less electricity and thus creating fewer CO₂ emissions. "On average, electricity sources emit 1.222 lbs CO₂ per kWh" according to the CarbonFund. The original system uses on average 8 000 kWh a month, whereas the LED systems would use 4224 kWh.

a Draw on the same set of axes where y corresponds to the quantity of CO₂ in lbs and x the number of months $0 \leq x \leq 12$.

- i** the CO₂ emission for old lighting system
- ii** the CO₂ emission for the LED lighting system
- iii** the reduction of the CO₂ emission if the school was to change system

b Determine

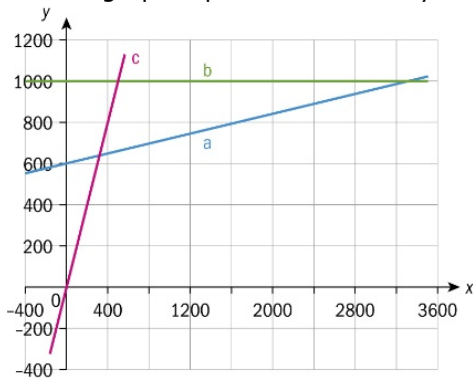
- i** how many pounds of the CO₂ you would emit if you were to use the old system for 6 months
- ii** how many pounds of the CO₂ you would emit if you were to use the LED system for 6 months
- iii** when the LED system would emit as much CO₂ as the old system in 6 months
- iv** when switching to the new system would save as much CO₂ as the old system in 6 months

According to NC state university a tree can absorb as much as 48 lbs of carbon dioxide per year.

c Use your graph to find how many trees needs to be planted to absorb the CO₂ emission the yearly CO₂ emission of

- i** the old lighting system
- ii** the LED lighting system

3 This graph represent the money earned by three people per item sold.



- a** Find the equation of each graph
- b** Determine which graph corresponds to the following cases
- i** a salary e.g. a fixed amount is paid per month
 - ii** a piece work contract e.g. a fixed amount of money is paid for each piece sold
 - iii** a commission contract with a low wage
- c** State how much
- i** the fixed salary is
 - ii** is paid per item sold in the piece work contract
 - iii** the low wage and the commission
- d** Explain why there can be a horizontal line but no vertical line.
- 4** Create the illusion of a curved shape using the equation of straight lines.
- a** Find the equation of the line
- i** going through (6,0) and (0,6)
 - ii** with gradient 1 and the same x intercept as the line drawn i.
 - iii** going through (7,1) and (0,6)
 - iv** with gradient $\frac{1}{7}$ going through (3,3)
 - v** going through (-2,-5) and (12,6)
 - vi** with gradient $\frac{-3}{7}$ going through (15,-1)
 - vii** going through (-7,1) and (7,11)
- b** on a set of axis such that $0 \leq x \leq 8$ and $0 \leq y \leq 12$, draw the above equation and the following one.
- i** $x + 7y = 30$
 - ii** $7y - 3x = 2$

Answers

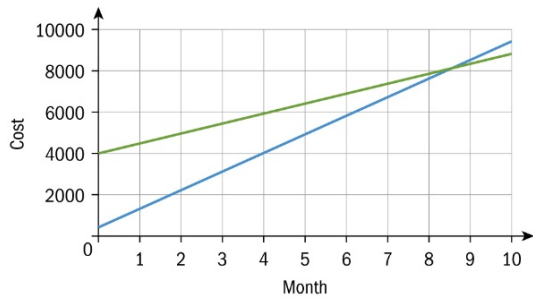
1 a i \$400

ii \$4000

b i $y = 900x + 400$

ii $y = 4000 + 480x$

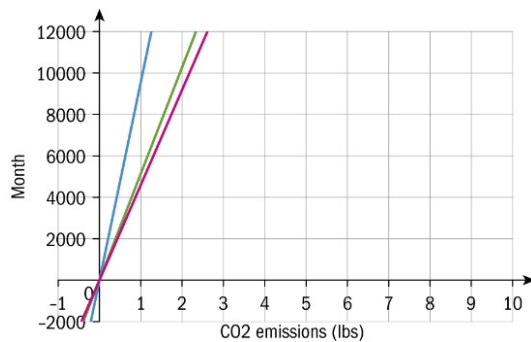
c



d i Mid-August

ii the electricity bill is lower from the first month as LED cost only \$480 a month in electricity

2 a i. ii. iii



b i 586556

ii 27 685

iii In the 11th months

iv 12.7 months

c i 2444 trees

ii 1153 trees

3 a a: $y = 600 + \frac{12}{100}x$

b: $y = 1000$

c: $y = 2x$

b i b

ii c

iii a

c i 1000 euros

ii 2 euros per piece

iii a fixed wage of 600 euros and 0.12euro per piece

d A horizontal line means that an employee receive a fixed amount of money whatever the number of items sold, whereas a vertical line would mean that for a set a number of item sold an employee could receive any salary, which doesn't make sense.

4 a i $y = -x + 6$

ii $y = x - 6$

iii $y = -\frac{5}{7}x + 6$

iv $y = \frac{1}{7}x + 2\frac{4}{7}$ or $y = \frac{1}{7}x + \frac{18}{7}$

v $y = \frac{5}{7}x - \frac{18}{7}$

vi $y = \frac{-3}{7}x + \frac{38}{7}$

vii $y = \frac{5}{7}x - 6$

b

