Example 16 Self Tutor

The acceleration of a falling raindrop is given by $a = g - 1.96v$ m s^{-2} where $g = 9.8$ m s^{-2} is the gravitational constant and v is the speed of the raindrop.

Find: **a** the acceleration of the raindrop before it starts falling

b the acceleration of the raindrop when its speed reaches 3 m s^{-1}

c the speed of the raindrop for which it does not accelerate.

a $a = g - 1.96v$ where $g = 9.8$ and $v = 0$

$\therefore a = 9.8 - 1.96 \times 0$

$\therefore a = 9.8$ m s^{-2}

b $a = g - 1.96v$ where $g = 9.8$ and $v = 3$

$\therefore a = 9.8 - 1.96 \times 3$

$\therefore a = 3.92$ m s^{-2}

c $a = g - 1.96v$ where $a = 0$ and $g = 9.8$

$\therefore 0 = 9.8 - 1.96v$

$\therefore 1.96v = 9.8$

$\therefore v = \dfrac{9.8}{1.96} = 5$ m s^{-1}

Example 17 Self Tutor

Make y the subject of $3x - 7y = 22$.

$3x - 7y = 22$

$\therefore 3x - 7y - 3x = 22 - 3x$ {subtracting $3x$ from both sides}

$\therefore -7y = 22 - 3x$

$\therefore 7y = 3x - 22$ {multiplying both sides by -1}

$\therefore \dfrac{7y}{7} = \dfrac{3x - 22}{7}$ {dividing both sides by 7}

$\therefore y = \dfrac{3x - 22}{7}$

Example 19 Self Tutor

The circumference of a circle is given by $C = 2\pi r$, where r is the circle's radius. Rearrange this formula to make r the subject, and hence find the radius when the circumference is:

a 10 cm **b** 20 cm **c** 50 cm.

$2\pi r = C$

$\therefore\ r = \dfrac{C}{2\pi}$ {dividing both sides by 2π}

a When $C = 10$, $r = \dfrac{10}{2\pi} \approx 1.59$

$\therefore$ the radius is about 1.59 cm.

b When $C = 20$, $r = \dfrac{20}{2\pi} \approx 3.18$

$\therefore$ the radius is about 3.18 cm.

c When $C = 50$, $r = \dfrac{50}{2\pi} \approx 7.96$

$\therefore$ the radius is about 7.96 cm.