

a)

$x$  is directly proportional to  $y$ .

$y$  is directly proportional to  $z$ .

When  $x = 10$ ,  $y = 60$ .

When  $y = 8$ ,  $z = 1.6$ .

Find a formula for  $z$  in terms of  $x$ .

Write the relationship between  $x$  and  $y$  as a formula using a multiplier,  $k$

$$y \propto x$$
$$y = kx$$

Substitute values of  $x$  and  $y$

$$60 = k \times 10$$
$$k = \frac{60}{10} = 6$$

Substitute the value of  $k$  in to the formula

$$y = 6x$$

Write the relationship between  $y$  and  $z$  as a formula using a multiplier,  $k$

$$z \propto y$$
$$z = ky$$

Substitute values of  $y$  and  $z$

$$1.6 = k \times 8$$
$$k = \frac{1.6}{8} = 0.2 = \frac{1}{5}$$

Substitute the value of  $k$  in to the formula

$$z = \frac{1}{5}y = \frac{y}{5}$$

Using the formula for  $y$  in terms of  $x$ , substitute  $y$  in to the formula for  $z$  in terms of  $y$

$$y = 6x$$
$$z = \frac{y}{5}$$

$$z = \frac{6x}{5}$$

b)

$a$  is directly proportional to  $b$ .

$b$  is directly proportional to  $c$ .

When  $a = 5$ ,  $b = 20$ .

When  $b = 6$ ,  $c = 2$ .

Find a formula for  $c$  in terms of  $a$ .

Write the relationship between  $a$  and  $b$  as a formula using a multiplier,  $k$

$$b \propto a$$
$$b = ka$$

Substitute values of  $a$  and  $b$

$$20 = k \times 5$$
$$k = \frac{20}{5} = 4$$

Substitute the value of  $k$  in to the formula

$$b = 4a$$

Write the relationship between  $b$  and  $c$  as a formula using a multiplier,  $k$

$$c \propto b$$
$$c = kb$$

Substitute values of  $b$  and  $c$

$$2 = k \times 6$$
$$k = \frac{2}{6} = \frac{1}{3}$$

Substitute the value of  $k$  in to the formula

$$c = \frac{1}{3}b = \frac{b}{3}$$

Using the formula for  $b$  in terms of  $a$ , substitute  $b$  in to the formula for  $c$  in terms of  $b$

c)

$m$  is directly proportional to  $n$ .

$n$  is directly proportional to  $p$ .

When  $m = 2$ ,  $n = 80$ .

When  $n = 10$ ,  $p = 1.25$ .

Find a formula for  $p$  in terms of  $m$ .

Write the relationship between  $m$  and  $n$  as a formula using a multiplier,  $k$

$$n \propto m$$
$$n = km$$

Substitute values of  $m$  and  $n$

$$80 = k \times 2$$
$$k = \frac{80}{2} = 40$$

Substitute the value of  $k$  in to the formula

$$n = 40m$$

Write the relationship between  $n$  and  $p$  as a formula using a multiplier,  $k$

Substitute values of  $n$  and  $p$

Substitute the value of  $k$  in to the formula

Using the formula for  $n$  in terms of  $m$ , substitute  $n$  in to the formula for  $p$  in terms of  $n$

d)

$r$  is directly proportional to  $s$ .

$s$  is directly proportional to  $t$ .

When  $r = 4$ ,  $s = 40$ .

When  $s = 30$ ,  $t = 7.5$ .

Find a formula for  $t$  in terms of  $r$ .