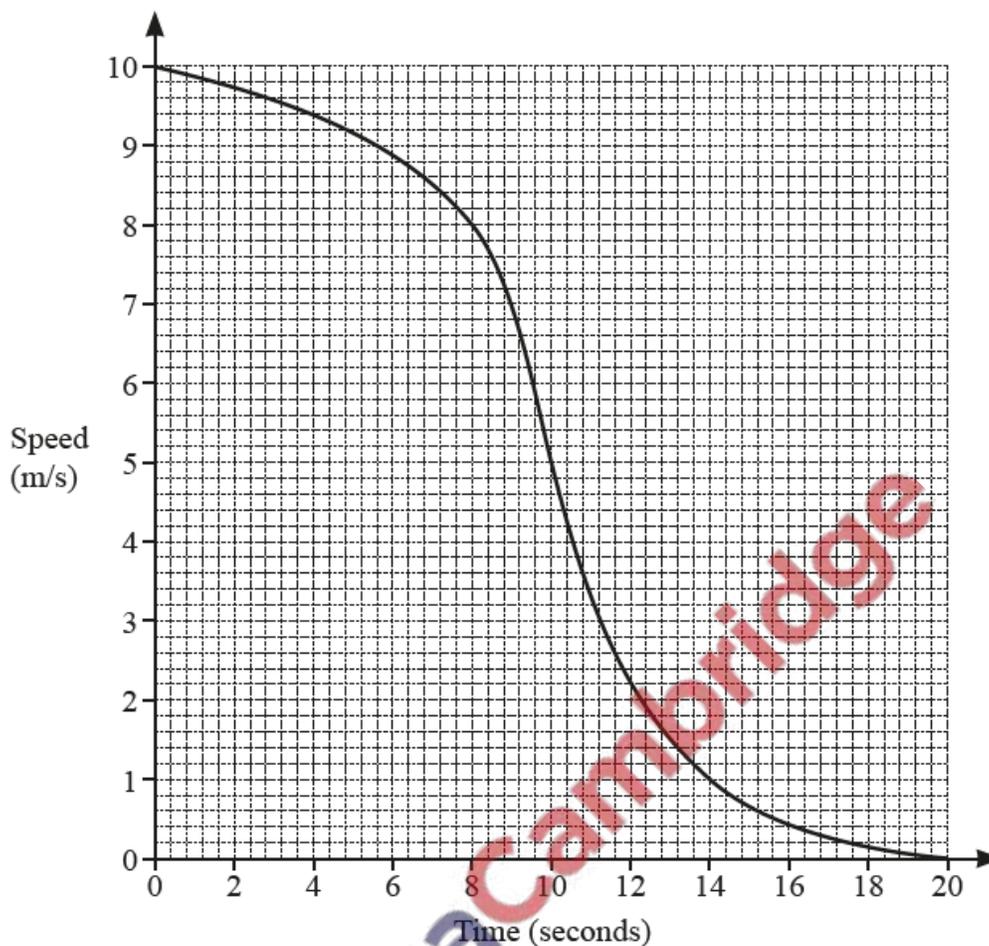**1.** Nov/2022/Paper_23/No.15

The graph shows the speed of a car as it slows down from a speed of 10 m/s until it stops at 20 seconds.

(a) Find the speed of the car at 14 seconds.

.... m/s   [1]

(b) Find the average rate of change of the speed between 8 seconds and 10 seconds.

.... m/s^2 [2]

(c) By drawing a suitable tangent to the curve, find the rate of change of the speed at 8 seconds.

.... m/s^2 [2]

$$f(x) = 5x - 3, \ x > 1$$

$$g(x) = \frac{10}{x-2}, \ x \neq 2$$

(a) Find $g(f(x))$.

Give your answer in its simplest form.

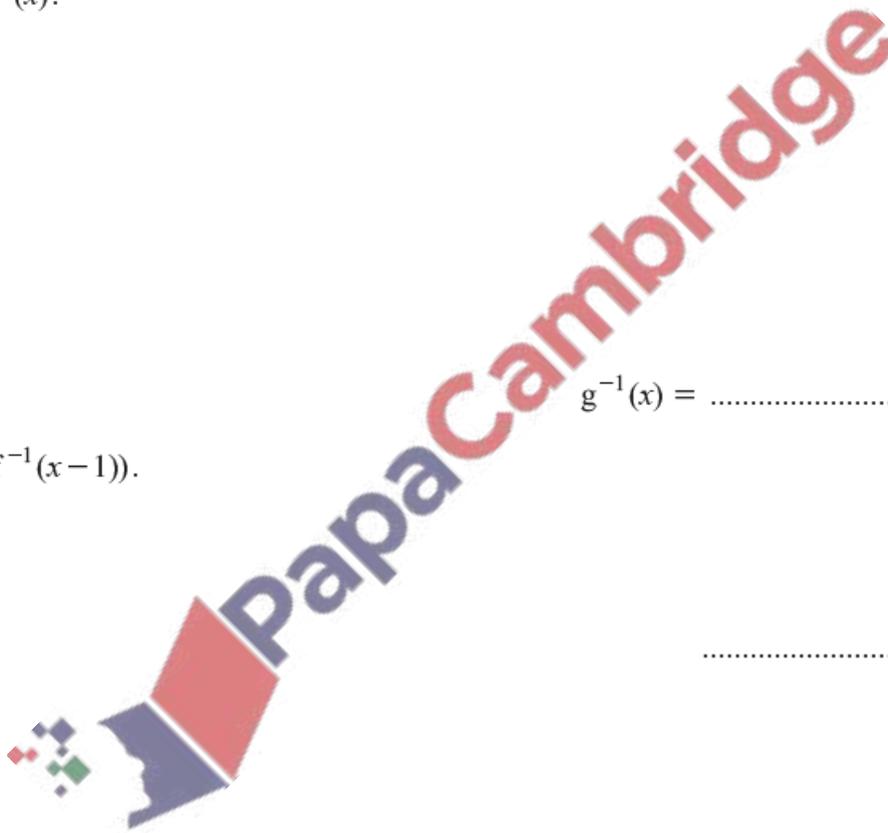... [2]

(b) Find $g^{-1}(x)$.

$g^{-1}(x) = $ .... [3]

(c) Find $f(f^{-1}(x-1))$.

.... [1]

(c) The line $y = 16$ is drawn on the grid.
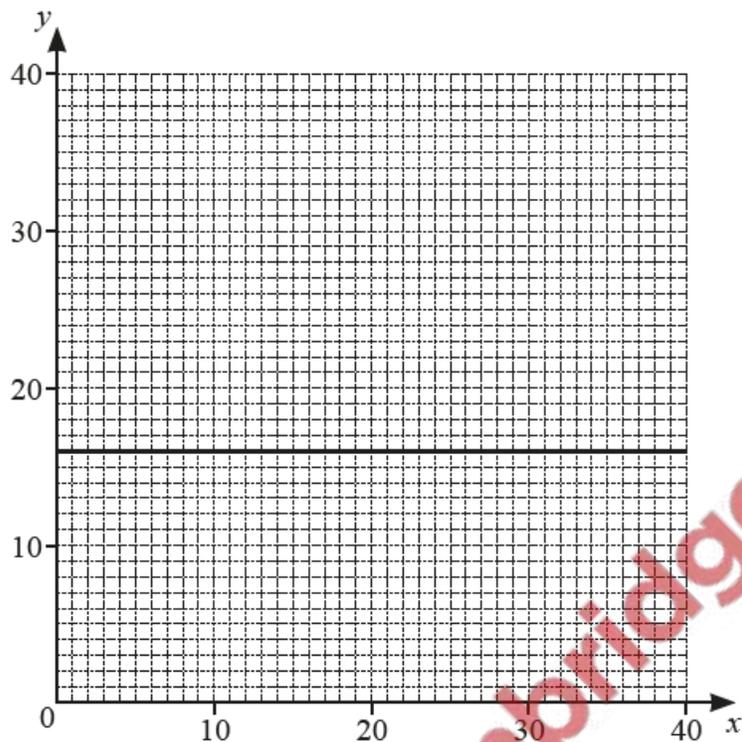
The region R satisfies the following inequalities.
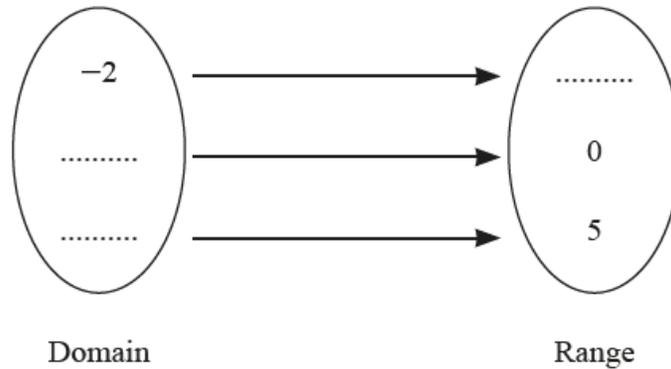
$$y \geqslant 16 \qquad x > 2 \qquad 2x + 3y \geqslant 72 \qquad y \leqslant 32 - x$$

(i) By drawing three more lines and shading the region **not required**, find and label region R.

[6]

(ii) Find the integer coordinates (x, y) of the point in the region R that give the maximum value of $2x + y$.

(...................... , ...) [2]

(a) $f(x) = 7 - 5x$

Complete the mapping diagram.

Domain, Range

-2 → ....

.... → 0

.... → 5

[3]

(b) $T(x) = 50 + 30x$

A plumber charges $T(x)$ dollars for x hours of work.

(i) Find the charge for 4 hours of work.

$ .... [1]

(ii) Find the number of hours of work when the charge is $305.

.... hours [2]

(iii) $C(x) = 20 + 50x$

Another plumber charges $C(x)$ dollars for x hours of work.

Find the number of hours of work when the charges of the two plumbers are the same.

.... hours [2]

(c) $j(x) = a\sin bx$

The amplitude of $j(x)$ is 5 and the period of $j(x)$ is $60°$.

Find the value of a and the value of b.

$a =$ ....

$b =$ .... [2]

(d) (i) $\sin x° = 0.2$, for $0 \leqslant x \leqslant 360$

Find the values of x.

.... [2]

(ii) Complete the statement.

$\sin x = \cos ($...$)$ [1]

(e) $g(x) = 5^x - 2x$

Find the value of x when $g^{-1}(x) = 3$.

$x =$ .... [2]

(f) Describe fully the **single** transformation that maps the graph of $y = h(x)$ onto the graph of $y = 3h(x)$.

....

.... [3]