Question 1

q is inversely proportional to p

p is directly proportional to the square of w

Given that $q = 9$ and $w = 1$ when $p = 7$
find a formula for q in terms of w.

Question 2

$\mathrm{f}(x) = 12\,x + 5$ and $\mathrm{g}(x) = px + q$

$\mathrm{g}(3) = -6$ and $\mathrm{f}^{-1}(-115) = \mathrm{g}(4)$

Find the value of p and the value of q.

Question 1

q is inversely proportional to p

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Given that $q = 9$ and $w = 1$ when $p = 7$
find a formula for q in terms of w.

We can say $q = \dfrac{k}{p}$ and $p = cw^2$ where k and c are constants.

Substituting in $q = 9$, $w = 1$ and $p = 7$, we find $k = 63$
and $c = 7$

So $q = \dfrac{63}{p}$ and $p = 7w^2$

Substituting the second formula into the first, we see $q = \dfrac{9}{w^2}$

Note that this formula could also be found *without* calculating k
and c individually. Can you see how?

Question 2

$f(x) = 12\,x + 5$ and $g(x) = px + q$

$g(3) = -6$ and $f^{-1}(-115) = g(4)$

Find the value of p and the value of q.

$f^{-1}(x) = \dfrac{x - 5}{12}$, so $f^{-1}(-115) = -10$

$g(3) = -6 \Rightarrow 3p + q = -6$

$f^{-1}(-115) = g(4) \Rightarrow -10 = 4p + q$

Solving simultaneously:

$p = -4$, $q = 6$