Question 1

w is inversely proportional to h

h is directly proportional to the square root of r

Given that $w = 5$ and $r = 9$ when $h = 12$
find a formula for w in terms of r.

Question 2

$f(x) = -10\,x - 5$ and $g(x) = px + q$

$g(-7) = 22$ and $f^{-1}(15) = g(1)$

Find the value of p and the value of q.

Question 1

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Given that $w = 5$ and $r = 9$ when $h = 12$
find a formula for w in terms of r.

We can say $w = \dfrac{k}{h}$ and $h = c\sqrt{r}$ where k and c are constants.

Substituting in $w = 5$, $r = 9$ and $h = 12$, we find $k = 60$
and $c = 4$

So $w = \dfrac{60}{h}$ and $h = 4\sqrt{r}$

Substituting the second formula into the first, we see $w = \dfrac{15}{\sqrt{r}}$

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

Question 2

$f(x) = -10\,x - 5$ and $g(x) = px + q$

$g(-7) = 22$ and $f^{-1}(15) = g(1)$

Find the value of p and the value of q.

$f^{-1}(x) = \dfrac{x + 5}{-10}$, so $f^{-1}(15) = -2$

$g(-7) = 22 \;\Rightarrow\; -7p + q = 22$

$f^{-1}(15) = g(1) \Rightarrow -2 = p + q$

Solving simultaneously:

$p = -3$, $q = 1$