Question 1

$ABCD$ is a trapezium.

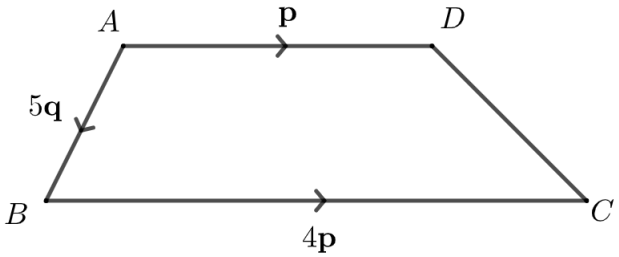

Diagram not drawn accurately

X is the point such that DCX is a straight line and $DC : CX$ is $1 : k$.

Given that $\overrightarrow{BX} = \frac{17}{2}\mathbf{p} + \frac{15}{2}\mathbf{q}$, find the value of k.

Question 2

$\mathrm{g}(x) = -2\,x - 1$

Solve $\mathrm{g}^{-1}(x) = -4\,x - 5$

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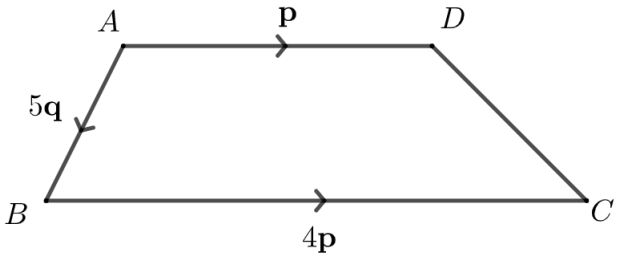

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X is the point such that DCX is a straight line and $DC : CX$ is $1 : k$.

Given that $\overrightarrow{BX} = \frac{17}{2}\mathbf{p} + \frac{15}{2}\mathbf{q}$, find the value of k.

$\overrightarrow{DC} = -\mathbf{p} + 5\mathbf{q} + 4\mathbf{p} = 3\mathbf{p} + 5\mathbf{q}$

$\overrightarrow{CX} = k(3\mathbf{p} + 5\mathbf{q})$ using the given ratio.

$\overrightarrow{BX} = \overrightarrow{BC} + \overrightarrow{CX} = 4\mathbf{p} + k(3\mathbf{p} + 5\mathbf{q})$

Equating this with the given information about $\overrightarrow{BX}$, we see $k = \frac{3}{2}$

Question 2

$\mathrm{g}(x) = -2\,x - 1$

Solve $\mathrm{g}^{-1}(x) = -4\,x - 5$

$\mathrm{g}^{-1}(x) = \frac{x+1}{-2}$

So we need to solve:

$\frac{x+1}{-2} = -4\,x - 5$

$\Rightarrow\ x + 1 = 8\,x + 10$

$\Rightarrow\ -7\,x = 9$

$\Rightarrow\ x = -\frac{9}{7}$