Question 1

$ABCD$ is a trapezium. M is the midpoint of BC.
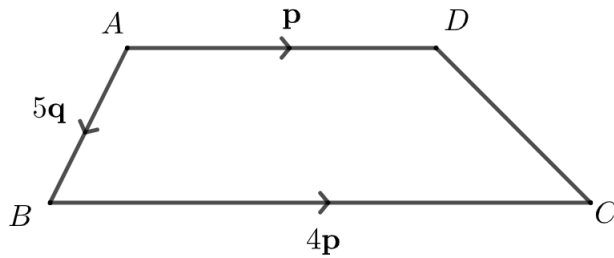

Diagram not drawn
accurately

X is the point such that DMX is a straight line and $DM : MX$ is $k : 1$.

Given that $\overrightarrow{BX} = \dfrac{9}{4}\mathbf{p} + \dfrac{5}{4}\mathbf{q}$, find the value of k.

Question 2

$\mathrm{h}(x) = 6\,x + 1$

k is the number such that $\mathrm{h}(k) = -7k$

Find the value of k.

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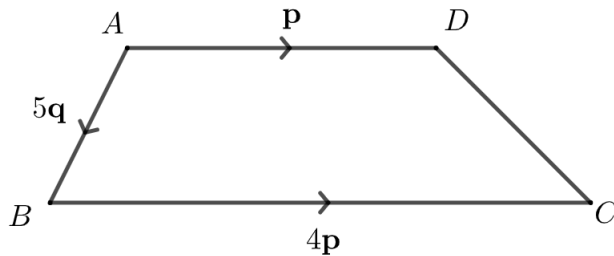$ABCD$ is a trapezium. M is the midpoint of BC.

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X is the point such that DMX is a straight line and $DM : MX$ is $k : 1$.

Given that $\overrightarrow{BX} = \dfrac{9}{4}\mathbf{p} + \dfrac{5}{4}\mathbf{q}$, find the value of k.

$\overrightarrow{DM} = -\mathbf{p} + 5\mathbf{q} + 2\mathbf{p} = \mathbf{p} + 5\mathbf{q}$

$\overrightarrow{MX} = \dfrac{1}{k}\left(\mathbf{p} + 5\mathbf{q}\right)$ using the given ratio.

$\overrightarrow{BX} = \overrightarrow{BM} + \overrightarrow{MX} = 2\mathbf{p} + \dfrac{1}{k}\left(\mathbf{p} + 5\mathbf{q}\right)$

Equating this with the given information about $\overrightarrow{BX}$, we see $k = 4$

Question 2

$\mathrm{h}(x) = 6\,x + 1$

k is the number such that $\mathrm{h}(k) = -7k$

Find the value of k.

We need to solve:

$6k + 1 = -7k$

$\Rightarrow \; 13k = -1$

$\Rightarrow k = -\dfrac{1}{13}$