then ~~on~~ $\frac{1}{3}$, so $y = x/3 + 1/3$.
Consider AP. We have two points through which AP passes, for both of which $x=0$. Hence this is the equation of AP.
Since ~~x~~ X lies on AP and BQ, which has equation $y = x/3 + 1/3$, we can substitute $x=0$ into the equation for BQ to find the y coordinate of X. Hence the coordinates of X are $(0, 1/3)$.

3/3

$$\frac{BX}{XQ} = \frac{|X-B|}{|Q-X|} = \frac{|(0,\frac{1}{3})-(-1,0)|}{|(\frac{1}{2},\frac{1}{2})-(0,\frac{1}{3})|} = \frac{|(1,\frac{1}{3})|}{|(\frac{1}{2},-\frac{1}{3})|} = \frac{\sqrt{1^2+(\frac{1}{3})^2}}{\sqrt{(\frac{1}{2})^2+(\frac{1}{6})^2}} = 2$$

$$\frac{AX}{XP} = \frac{|X-A|}{|P-X|} = \frac{|(0,\frac{1}{3})-(0,1)|}{|(0,0)-(0,\frac{1}{3})|} = \frac{|(0,-\frac{2}{3})|}{|(0,-\frac{1}{3})|} = 2$$

OK but see Unit 1, p35 for a quicker method of getting the ratios

b) By the Fundamental Theorem of Affine Geometry, given any arbitrary triangle A'B'C', there is an affine transformation that sends A' to A, B' to B and C' to C respectively. Affine transformations preserve ratios of lengths along straight lines, and since in the triangle ABC, $\frac{BX}{XQ} = \frac{AX}{XP} = 2$, so the same ratios will apply in the triangle A'B'C'. The same applies for the inverse transformation that maps ABC to A'B'C'. Hence if $\frac{BX}{XQ} = 2$, $\frac{BX}{BQ} = \frac{2}{3}$, and if $\frac{AX}{XP} = 2$, $\frac{AX}{AP} = \frac{2}{3}$ and $\frac{B'X'}{B'Q'} = \frac{2}{3}$ and $\frac{A'X'}{A'P'} = \frac{2}{3}$

Verify that X ~~also bisects CR~~ divides CR in also 2:1 for given triangle.

c) Affine transformations have the form
$T(x) = Ax + b$

3/5