**2C Parabolas & Chords**

1. A point $P(8, -8)$ lies on the parabola C with equation $y^{2}=8x$. The point $S$ is the focus of the parabola. The line l passes through S and P.
2. Find the coordinates of $S$.
3. Find an equation for $l$, giving your answers in the form $ax+by+c=0$, where $a$, $b$, $c$ are integers.
4. The line $l$ meets the parabola $C$ again at the point $Q$. The point $M$ is the mid-point of $PQ$. Find the coordinates of $Q$.
5. Find the coordinates of $M$.
6. Draw a sketch showing parabola $C$, the line $l$
and the points $P$, $Q$, $S$ and $M$.
7. The parabola $C$ has general point $\left(at^{2},2at\right)$. The line $x=k$ intersects $C$ at the points $P$ and $Q$. Find, in terms of $a$ and $k$, the length of the chord $PQ$.