6a) Suppose that $n!$ ends in k zeroes, i.e. $n! = m \cdot 10^k$. Then $(n+1)! = (n+1) \cdot n!$ $= (n+1) \cdot m \cdot 10^k$, thus ends in (at least) k zeroes.

b). As there will be at least one 2 for every 5 we just need to count the powers of 5 that divides. For a given n, there are $\left\lfloor \frac{n}{5} \right\rfloor$ multiples of 5, $\left\lfloor \frac{n}{25} \right\rfloor$ multiples of 25 (that give an extra 5) and so on. We thus want

$$(*) \quad \left\lfloor \frac{n}{5} \right\rfloor + \left\lfloor \frac{n}{25} \right\rfloor + \left\lfloor \frac{n}{125} \right\rfloor + \left\lfloor \frac{n}{625} \right\rfloor + \left\lfloor \frac{n}{3125} \right\rfloor \geq 2017$$

will see that next term is zero.

to solve, ignore rounding for the moment.

$$n \underbrace{\left(\frac{1}{5} + \frac{1}{25} + \frac{1}{125} + \frac{1}{625} + \frac{1}{3125} \right)}_{} \geq 2017$$

$$= \frac{1 - \left(\frac{1}{5}\right)^5}{1 - \frac{1}{5}} \cdot \frac{1}{5} \quad \text{(geom. series)}$$

$$= \frac{781}{3125}, \qquad 2017 \cdot \frac{3125}{781} = 8070.58$$

Thus at least 8071. Now calculate exactly, rounding down: (x) for $n = 8071$ gives 2014. So at least ~~[illegible]~~ another 5! $n = 8075$ gives 2016

Thus $n = 8080$.

7) Solve $220 - (1.0357)^{30} - B \cdot \frac{1.0357 - 1}{0.0357} = 0$

for $B \Rightarrow B = 12.0668$

Total $30\,B = 362.04$

8) If 7 cars had at most 3 students each it would transport $7 \cdot 3 = 21$ students, not enough.

9) a) Numbers not containing 9: ~~[illegible]~~ 9^{10}

Thus $10^{10} - 9^{10}$ different numbers containing 9

(this is larger)

b) The question is: ~~[illegible]~~ For which n is $9^n / 10^n < 1/2$, i.e. $\left(\frac{9}{10}\right)^n < 1/2$

Thus $n < \log_{9/10}\left(\frac{1}{2}\right)$, i.e. $n < 6.57$

Thus the pattern holds for $n \geq 7$.

10) label the $(n-1)$ points different from 1 in all $(n-1)!$ possible ways.