AB/BC 2

t (hours)	0	2	5	7	8
$E(t)$ (hundreds of entries)	0	4	13	21	23

(a) $E(6) \approx \dfrac{E(7)-E(5)}{7-5} = \dfrac{21-13}{2} = \boxed{4 \dfrac{hundred\ entries}{hour}}$

(b) $\dfrac{1}{8}\int_0^8 E(t)\,dt \approx \dfrac{1}{8}\left[\dfrac{1}{2}(2)(0+4)+\dfrac{1}{2}(3)(4+13)+\dfrac{1}{2}(2)(13+21)+\dfrac{1}{2}(1)(21+23)\right] =$

$\boxed{10.6875}$ or 10.688

This approximates the average number of entries (in hundreds) in the box from noon until 8pm.

(c) Entries processed: $P(t) = t^3 - 30t^2 + 298t - 976 \ \dfrac{hundreds\ of\ entries}{hour}$ for $8 \le t \le 12$

Number of entries not yet processed at midnight is the number of entries at 8pm minus the number processed from 8pm until midnight:

$E(8) - \int_8^{12} P(t)\,dt = 23 - 16 = \boxed{7\ hundred\ entries}$

(d) The entries were processed most quickly at the absolute maximum of $P(t)$ on $8 \le t \le 12$ which will occur at $t = 8$, or $t = 12$, or at some critical point of P on the interval.

$P'(t) = 3t^2 - 60t + 298 = 0 \ \Rightarrow \ t = 9.184$ and 10.817

$P(8) = 0,\ P(9.184) = 5.089,\ P(10.817) = 2.911,\ P(12) = 8$

Hence, the entries were processed most quickly at $\boxed{t = 12 \text{ or midnight}}$