Solution 21.25

We can set up a table that contains the values comprising the integrand

t, hr	*t*, d	rate (cars/4 min)	rate (cars/d)
7:30	0.312500	18	6480
7:45	0.322917	24	8640
8:00	0.333333	26	9360
8:15	0.343750	20	7200
8:45	0.364583	18	6480
9:15	0.385417	9	3240

t, hr	*t*, d	rate (cars/4 min)	rate (cars/d)
7:30	0.312500	18	6480
7:45	0.322917	24	8640
8:00	0.333333	14	5040
8:15	0.343750	24	8640
8:45	0.364583	21	7560
9:15	0.385417	9	3240

We can integrate this data using a combination of Simpson's 3/8 and 1/3 rules. This yields the number of cars that go through the intersection between 7:30 and 9:15 (1.75 hrs),

$$I = (0.34375 - 0.3125)\frac{6480 + 3(8640 + 5040) + 8640}{8} + (0.385417 - 0.34375)\frac{8640 + 4(7560) + 3240}{6} = 219.375 + 292.5 = 511.875 \text{ cars}$$

The number of cars going through the intersection per minute can be computed as

$$\frac{511.875 \text{ cars}}{1.75 \text{ hr}}\frac{\text{hr}}{60 \text{ min}} = 4.875\frac{\text{cars}}{\text{min}}$$