**24** The table below shows the stopping distances for a car.

| Speed of car (m/s) | Thinking distance (m) | Braking distance (m) | Total stopping distance (m) |
|---|---|---|---|
| 8 | 6 | 6 | 12 |
| 16 | 12 | 24 | 36 |
| 32 | 24 | 96 | 120 |

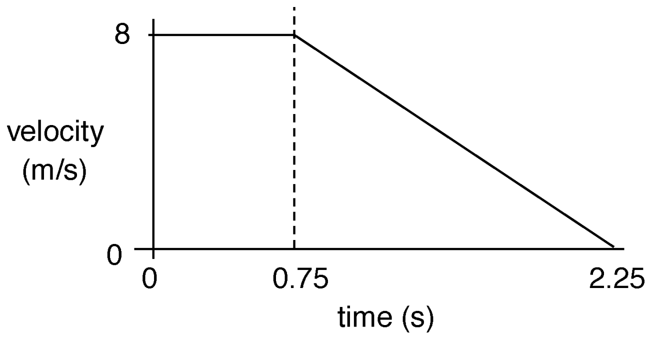
**(a)*** Analyse the data in the table and use it to describe the trends shown.

Suggest reasons for the differences in the patterns in the data. **[6]**

When the speed doubles so does the thinking distance (because $s = \frac{d}{t}$), they are directly proportional to each other. Doubling the speed quadruples the braking distance. For the thinking distance, this is because at twice the speed, twice the distance is covered before pushing on the brakes. For the braking distance, kinetic energy needs to drop to zero, the equation is $KE = \frac{1}{2}mv^2$, it can be seen that doubling the speed (v) will cause the braking distance to multiply by 4.

**(b)** The car takes 6 m to brake when moving at 8 m/s.

Look at the graph of a car travelling at 8 m/s, starting to brake and then stopping.




**(i)** Calculate the acceleration of the car during braking.

Show your working and state the units.

$$a = \frac{v-u}{t} = \frac{0-8}{2.25-0.75} = -\frac{8}{1.5} = -5.33\ m/s^2$$

Answer = -5.33 Unit = $m/s^2$

**[4]**