## Kinematics

## Animal examples

1. Little turtle went to school for the first time, its speed is 2 m in a minute, but forgot his lunchbox. After 5 minutes his mother went after him with speed 4 m in a minute. How fast mom catches up with her son.

Solution

| Turtle son |  | Turtle mother |  |
| :--- | :--- | :--- | :--- |
| Time (minutes) | Position (m) | Time (minutes) | Position (m) |
| 1 | 2 | 1 |  |
| 2 | 4 | 2 |  |
| 3 | 6 | 3 |  |
| 4 | 8 | 4 |  |
| 5 | 10 | 5 | 4 m |
| 6 | 12 | 6 | 8 m |
| 7 | 14 | 7 | 12 m |
| 8 | 16 | 8 minutes |  |
| 9 | 18 | 9 minutes | 16 m |
| 10 | 20 | 10 minutes | 20 m |
| n | n .2 | $(\mathrm{n}-5)$ minutes | $(\mathrm{n}-5) 4 \mathrm{~m}$ |

$n .2 m=(n-5) 4 m$
$\mathrm{n}=10$ minutes
Mother caught her son with his lunchbox after 10 minutes.
Use table and figurines from Children's board game Man, don't be angry

| 20 <br> $m$ |  |  |  |  |  |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 18 <br> $m$ |  |  |  |  |  |  |  |  |  |  |
| 16 <br> $m$ |  |  |  |  |  |  |  |  |  |  |
| 14 <br> $m$ |  |  |  |  |  |  |  |  |  |  |


| $\begin{aligned} & 12 \\ & \mathrm{~m} \end{aligned}$ |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\begin{aligned} & 10 \\ & \mathrm{~m} \end{aligned}$ |  |  |  |  |  |  |  |  |  |  |
| 8m |  |  |  |  |  |  |  |  |  |  |
| 6m |  |  |  |  |  |  |  |  |  |  |
| 4 m |  |  |  |  |  |  |  |  |  |  |
| 2 m |  |  |  |  |  |  |  |  |  |  |
|  | $1 \text { minut }$ e | $\begin{aligned} & 2 \\ & \text { minute } \\ & \mathrm{s} \\ & \hline \end{aligned}$ | $\begin{aligned} & 3 \\ & \text { minute } \\ & \mathrm{s} \\ & \hline \end{aligned}$ | $\begin{aligned} & 4 \\ & \text { minute } \end{aligned}$ $\mathrm{s}$ | $\begin{aligned} & 5 \\ & \text { minute } \end{aligned}$ $\mathrm{s}$ | $\begin{aligned} & 6 \\ & \text { minute } \end{aligned}$ $\mathrm{s}$ | $\begin{aligned} & 7 \\ & \text { minute } \end{aligned}$ $\mathrm{s}$ | $\begin{aligned} & 8 \\ & \text { minute } \end{aligned}$ $\mathrm{s}$ | $\begin{aligned} & 9 \\ & \text { minute } \end{aligned}$ $\mathrm{s}$ | 10 minute s |

2.Cat and dog were good friends and wanted to play together. They lived 4700m apart. Dog ran faster 250 m per minute and cat 200 m per minute. Cat ran out 10 minutes sooner than dog. Where will they meet?

## Solution

| Cat |  | Dog |  |  |
| :--- | :--- | :--- | :--- | :--- |
| Time (minutes) | Position (m) | Time (minutes) | Position (m) | Distance <br> done by cat <br> and dog <br> together (m) |
| 0 | 0 | 0 | 0 | 0 |
| 1 | 200 | 1 | 0 | 200 |
| 3 | 600 | 3 | 0 | 600 |
| 5 | 1000 | 5 | 0 | 1000 |
| 8 | 1600 | 8 | 0 | 1600 |
| 10 | 2000 | 10 | 0 | 2000 |
| 11 | 2200 | 11 | 250 | 2450 |
| 12 | 2400 | 12 | 500 | 2900 |
| 13 | 2600 | 13 | 750 | 3350 |
| 14 | 2800 | 14 | 1000 | 3800 |
| 15 | 3000 | 15 | 1250 | 4250 |
| 16 | 3200 | 16 | 1500 | 4700 |
| n minutes |  | $(\mathrm{n}-10)$ minutes |  |  |
|  |  |  |  |  |

$$
250(n-1)+250 n=4700
$$

$$
n=16 \text { minutes }
$$

## Word game:

Variable with unit $\mathrm{m} . \mathrm{s}^{-1}$, the rate at which an object changes its location (speed).
Variable measures with watch (time).
Graphical expression of relation between 2 variables (graph).
Point in space or a point on a plane or just a point on a line (position).
Physical quantity equal to the length of the shortest path between the final and the initial points (displacement).

Path taken to move from one position to another (distance).
Change of speed in time interval (acceleration)

| $\mathbf{B}$ | $\mathbf{R}$ | $\mathbf{A}$ | $\mathbf{F}$ | $\mathbf{G}$ | $\mathbf{O}$ | $\mathbf{U}$ | $\mathbf{I}$ | $\mathbf{P}$ | $\mathbf{E}$ | $\mathbf{S}$ | $\mathbf{T}$ | $\mathbf{P}$ |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| $\mathbf{R}$ | $\mathbf{I}$ | $\mathbf{V}$ | $\mathbf{A}$ | $\mathbf{L}$ | $\mathbf{R}$ | $\mathbf{Y}$ | $\mathbf{S}$ | $\mathbf{T}$ | $\mathbf{O}$ | $\mathbf{P}$ | $\mathbf{S}$ | $\mathbf{O}$ |
| $\mathbf{A}$ | $\mathbf{V}$ | $\mathbf{A}$ | $\mathbf{L}$ | $\mathbf{A}$ | $\mathbf{N}$ | $\mathbf{C}$ | $\mathbf{H}$ | $\mathbf{E}$ | $\mathbf{B}$ | $\mathbf{U}$ | $\mathbf{T}$ | $\mathbf{S}$ |
| $\mathbf{V}$ | $\mathbf{I}$ | $\mathbf{T}$ | $\mathbf{A}$ | $\mathbf{L}$ | $\mathbf{I}$ | $\mathbf{T}$ | $\mathbf{Y}$ | $\mathbf{H}$ | $\mathbf{E}$ | $\mathbf{R}$ | $\mathbf{O}$ | $\mathbf{I}$ |
| $\mathbf{A}$ | $\mathbf{C}$ | $\mathbf{C}$ | $\mathbf{E}$ | $\mathbf{L}$ | $\mathbf{E}$ | $\mathbf{R}$ | $\mathbf{A}$ | $\mathbf{T}$ | $\mathbf{I}$ | $\mathbf{O}$ | $\mathbf{N}$ | $\mathbf{T}$ |
| $\mathbf{T}$ | $\mathbf{D}$ | $\mathbf{I}$ | $\mathbf{S}$ | $\mathbf{T}$ | $\mathbf{A}$ | $\mathbf{N}$ | $\mathbf{C}$ | $\mathbf{E}$ | $\mathbf{K}$ | $\mathbf{L}$ | $\mathbf{O}$ | $\mathbf{I}$ |
| $\mathbf{I}$ | $\mathbf{I}$ | $\mathbf{S}$ | $\mathbf{Y}$ | $\mathbf{M}$ | $\mathbf{I}$ | $\mathbf{S}$ | $\mathbf{T}$ | $\mathbf{A}$ | $\mathbf{G}$ | $\mathbf{E}$ | $\mathbf{B}$ | $\mathbf{O}$ |
| $\mathbf{N}$ | $\mathbf{G}$ | $\mathbf{P}$ | $\mathbf{M}$ | $\mathbf{T}$ | $\mathbf{I}$ | $\mathbf{M}$ | $\mathbf{E}$ | $\mathbf{M}$ | $\mathbf{R}$ | $\mathbf{S}$ | $\mathbf{L}$ | $\mathbf{N}$ |
| $\mathbf{Y}$ | $\mathbf{N}$ | $\mathbf{E}$ | $\mathbf{P}$ | $\mathbf{R}$ | $\mathbf{I}$ | $\mathbf{V}$ | $\mathbf{T}$ | $\mathbf{A}$ | $\mathbf{A}$ | $\mathbf{R}$ | $\mathbf{G}$ | $\mathbf{U}$ |
| $\mathbf{A}$ | $\mathbf{I}$ | $\mathbf{E}$ | $\mathbf{A}$ | $\mathbf{K}$ | $\mathbf{L}$ | $\mathbf{E}$ | $\mathbf{O}$ | $\mathbf{N}$ | $\mathbf{P}$ | $\mathbf{O}$ | $\mathbf{U}$ | $\mathbf{R}$ |
| $\mathbf{N}$ | $\mathbf{T}$ | $\mathbf{D}$ | $\mathbf{I}$ | $\mathbf{G}$ | $\mathbf{N}$ | $\mathbf{I}$ | $\mathbf{T}$ | $\mathbf{I}$ | $\mathbf{H}$ | $\mathbf{O}$ | $\mathbf{N}$ | $\mathbf{T}$ |
| $\mathbf{D}$ | $\mathbf{I}$ | $\mathbf{S}$ | $\mathbf{P}$ | $\mathbf{L}$ | $\mathbf{A}$ | $\mathbf{C}$ | $\mathbf{E}$ | $\mathbf{M}$ | $\mathbf{E}$ | $\mathbf{N}$ | $\mathbf{T}$ | $\mathbf{O}$ |

Solution

|  |  |  |  |  |  |  |  |  |  |  |  | P |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
|  |  |  |  |  |  |  |  |  |  |  |  | O |
|  |  |  |  |  |  |  |  |  |  |  |  | S |
|  |  |  |  |  |  |  |  |  |  |  |  | I |
| A | C | C | E | L | E | R | A | T | I | O | N | T |
|  | D | I | S | T | A | N | C | E |  |  |  | I |
|  |  | S |  |  |  |  |  |  | G |  |  | O |
|  |  | P |  | T | I | M | E |  | R |  |  | N |
|  |  | E |  |  |  |  |  |  | A |  |  |  |
|  |  | E |  |  |  |  |  |  | P |  |  |  |
|  |  | D |  |  |  |  |  |  | H |  |  |  |
| D | I | S | P | L | A | C | E | M | E | N | T |  |

