Motion Project

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0.1 The minute hand on a clock of with a length hand of $3cm$:

1. 60 seconds
2. 60 seconds
3. 60 seconds
4. 60 seconds
5. 60 seconds

The distance the tip of the minute hand travels can be calculated with $d = r\theta$ where $\theta = \pi/30$ and $r = 3\,cm$, therefore $d = \pi/10\,cm$. The speed of the tip of the minute hand can be calculated with $s = d/t$ where $t = 60\,sec$ and $d = \pi/30\,cm$, so therefore $s = \pi/1800\,cm/sec$, or less than $.001\,cm/sec$.

0.2 The second hand on the same clock is $4cm$:

1. 1 second
2. 1 second
3. 1 second
4. 1 second
5. 1 second

The distance the tip of the second hand travels can be calculated with $d = r\theta$ where $\theta = \pi/30$ and $r = 4\,cm$, therefore $d = 2\pi/15\,cm$. The speed of the tip of the second hand can be calculated with $s = d/t$ where $t = 1\,sec$ and $d = 2\pi/15\,cm$, therefore $s = 2\pi/15\,cm/sec$, or approximately $.42\,cm/sec$.

0.3 Treaded vehicle moving away from sensor for five seconds:

Calculated with logger pro.

1. 91 centimetres
2. 88 centimetres
3. 92 centimetres
4. 89 centimetres
5. 89 centimetres

The average speed of the vehicle can be calculated with

$$s = \frac{\frac{d_1+d_2+\cdots+d_5}{5}}{5\,sec}$$

where $d_1 \ldots d_5 = \{91\,cm,\ 88\,cm,\ 92\,cm,\ 89\,cm,\ 89\,cm\}$. Therefore, $s = 18\,cm/sec$.

0.4 Pencil rolling down a 50cm plane at 10°

Timed with a stopwatch.

1. 2.62 seconds
2. 2.35 seconds
3. 2.35 seconds
4. 2.37 seconds
5. 2.52 seconds

The average speed of the pencil can be calculated with

$$s = \frac{50\ cm}{\frac{t_1+t_2+\cdots+t_5}{5}}$$

where $t_1 \ldots t_5 = \{2.62\ sec,\ 2.35\ sec,\ 2.35\ sec,\ 2.37\ sec,\ 2.52\ sec\}$. Therefore, $s = 20\ cm/sec$.

0.5 Softball thrown 600cm

Timed with a stopwatch.

1. .38 seconds
2. .37 seconds
3. .34 seconds
4. .41 seconds
5. .40 seconds

The average speed of the softball can be calculated with

$$s = \frac{600\ cm}{\frac{t_1+t_2+\cdots+t_5}{5}}$$

where $t_1 \ldots t_5 = \{.38\ sec,\ .37\ sec,\ .34\ sec,\ .41\ sec,\ .40\ sec\}$. Therefore, $s = 1600\ cm/sec$.

0.6 Frisbee thrown 500cm

Timed with a stopwatch.

1. .48 seconds
2. .47 seconds
3. .52 seconds
4. .44 seconds

5. .47 seconds

The average speed of the frisbee can be calculated with

$$s = \frac{500\,cm}{\frac{t_1+t_2+\cdots+t_5}{5}}$$

where $t_1 \ldots t_5 = \{.48\,sec,\ .37\,sec,\ .52\,sec,\ .44\,sec,\ .47\,sec\}$. Therefore, $s = 1050\,cm/sec$.