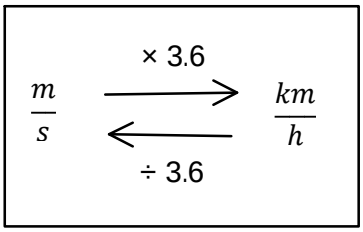
M10 - 1.1 - $\frac{km}{h} \longleftrightarrow \frac{m}{s}$



$v = 45\frac{km}{hr} \times \frac{1000m}{1\ km} \times \frac{1hr}{60min} \times \frac{1min}{60s} = 12.5\ \frac{m}{s}$

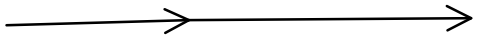
$\times \frac{1000}{3600} = \times \frac{1}{3.6} = \div 3.6$

$v = 12.5\frac{m}{s} \times \frac{1km}{1000m} \times \frac{60s}{1min} \times \frac{60\ min}{1\ hr} = 45\frac{km}{hr}$

$\times \frac{3600}{1000} = \times 3.6$

M10 - 1.2 - Average Speed/Velocity Notes

$2hrs$ @30$\frac{km}{h}$ + $3hrs$ @ 40$\frac{km}{h}$



$v = \frac{d}{t}$
$d = vt$
$d = 30 \times 2$
$d = 60$

$v = \frac{d}{t}$
$d = vt$
$d = 40 \times 3$
$d = 120$

$v_{av} = \frac{total\ distance}{total\ time}$
$v_{av} = \frac{180}{5}$
$v_{av} = 36\frac{km}{h}$

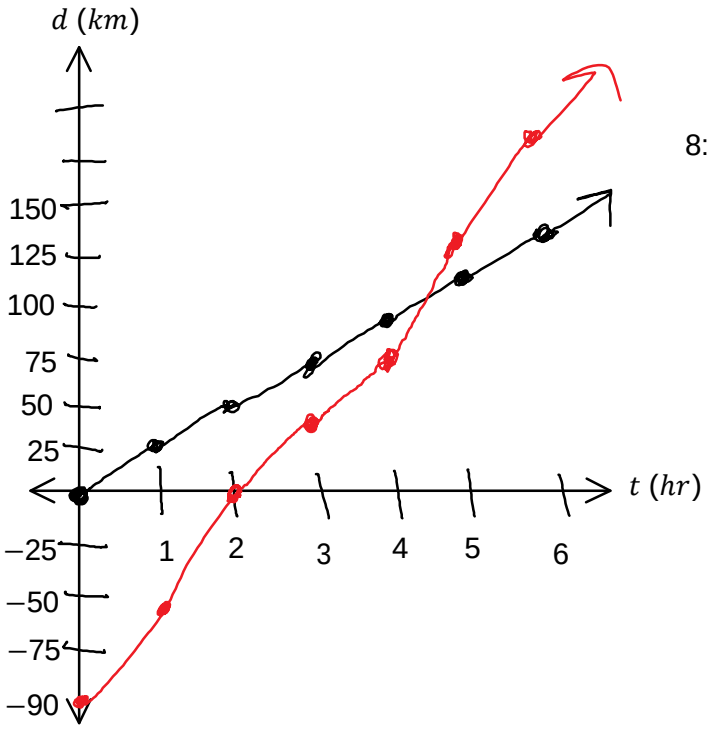
$total\ distance = 60 + 120 = 180km$

$total\ time = 2 + 3 = 5hrs$

$y = mx + b$

M10 - 1.3 - Trains catch up time Notes

Train A leaves the station at 8:00*am at* 25$\frac{km}{hr}$. *Train B leaves the station at* 10:00*am at* 45$\frac{km}{hr}$.
How long before Train A catches up to train B, find the time of day and distance from station. Make a TOV, draw a graph, find the equations of both trains.



Train A

8:00*am*

t	*d*
0	*0*
1	*25*
2	*50*
3	*75*
4	*100*
5	*125*
6	*150*

Train B

10:00 *am*

t	*d*
0	*0*
1	*0*
2	*0*
3	*45*
4	*90*
5	*135*
6	*180*

$d = mt + b$

$d = 25t$

$d = mt + b$

$45 = 45(3) + b$
$b = -90$

$d = 45t - 90$

$d = d$
$25t = 45t - 90$
$90t = 20t$

$t = 4.5$

$d = 25t$
$d = 25(4.5)$

$d = 112.5\ km$

$0.5hr \times \frac{60min}{1hr} = 30min$

Train B will catch up to Train A in 3*hrs* 30 min *at* 11:30*am a distance of* 112.5 *km.*

$y = mx + b$
$d = vt$
$d = 45(t - 2)$
$d = 45t - 90$

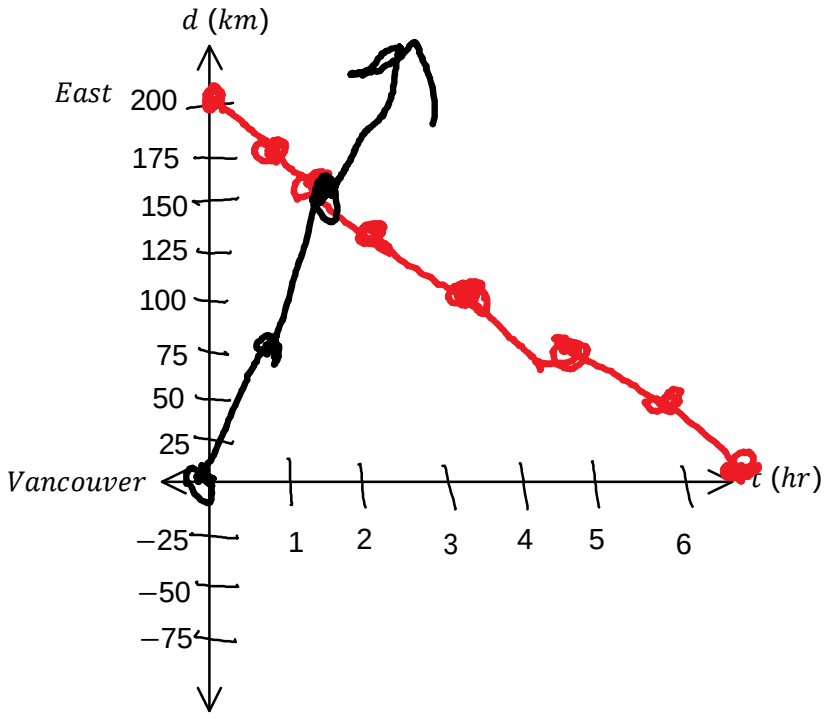
M10 - 1.3 - Trains meet time Notes

$y = mx + b$

Train A leaves the Abbotsford station at 8:00*am heading West at* 25 $\frac{km}{hr}$.

Train B leaves the Vancouver station at 8:00*am heading East at* 75 $\frac{km}{hr}$.

If Vancouver and Abbostsford are 200 *km apart, what time do the trains meet and where?*



	Train A		*Train B*	
8:00*am*	*t*	*d*	*t*	*d*
	0	*200*	*0*	*0*
	1	*175*	*1*	*75*
	2	*150*	*2*	*150*
	3	*125*	*3*	*225*
	4	*100*	*4*	*300*

$d = mt + b$

$d = -25t + 200$

$d = mt + b$

$d = 75t$

$$d = d$$
$$-25t + 200 = 75t$$
$$200 = 100t$$

$t = 2$

$d = 75t$

$d = 75(2)$

$d = 150\ km$

Train A and Train B will meet at 10:00 *am* 150 *km from Vancouver, Or* 50 *km from Abbotsford.*

Or

$Velocity_{Relative} = v_a + v_b$

$v_r = 25 + 75$

$v_r = 100\ \frac{km}{hr}$

$v = \frac{d}{t}$

$t = \frac{d}{v}$

$t = \frac{200}{100}$

$t = 2\ hrs$

Meet in 2 *hrs*

$v_a = \frac{d_a}{t}$

$d_a = v_a t$

$d_a = 25(2)$

$d_a = 50\ km$

$v_b = \frac{d_b}{t}$

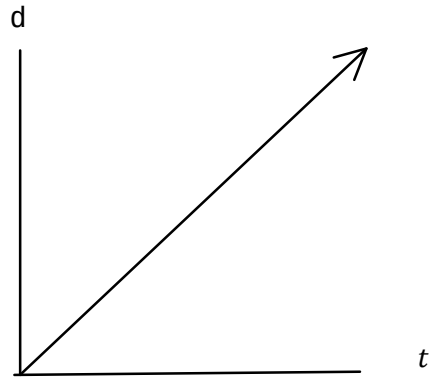
$d_b = v_b t$

$d_b = 75(2)$

$d_b = 150\ km$

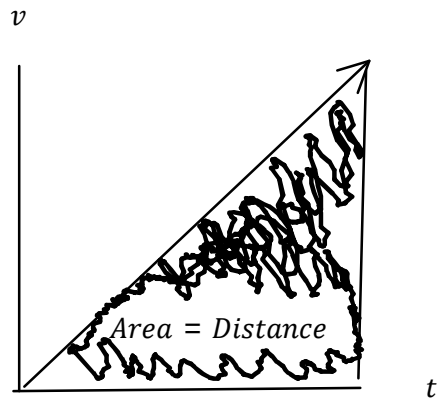
M10 - 1.4 - d, v, a vs t graphs Review

Distance vs Time



$slope = velocity$ $v = \frac{d}{t}$ $m = \frac{rise\ distance}{run\ time}$

Acceleration vs Time



$slope = acceleration$ $a = \frac{v}{t}$ $m = \frac{rise\ velocity}{run\ time}$

$$v = \frac{d}{t}$$
$$vt = d$$

$$l \times w = a$$

$Displacement = Area$

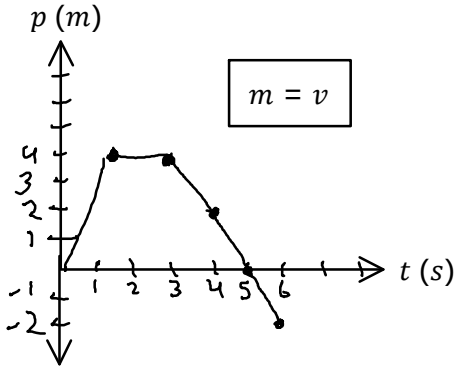
M10 - 1.4 - $p\ vs.\ t\ graph\ v = \frac{d}{t}$ WS

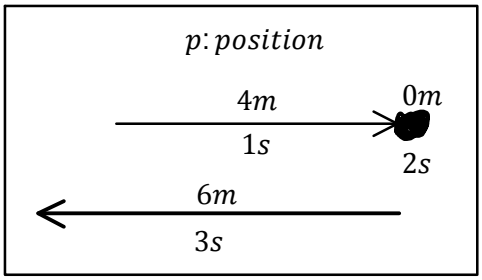
$slope = m = \frac{y_2 - y_1}{x_2 - x_1}$ $\quad v = \frac{\Delta d}{\Delta t} = \frac{d_f - d_i}{(t_f - t_i)}$

Run 4 meters in 1 second. Wait 2 seconds. Jog backwards 6 meters in 3 seconds.

Graph using a Table of Values. Draw a 1 dimensional picture. Find distance, displacement, speed and velocity from 0-1 seconds, 1-3 seconds, 3-6 seconds, 0-3 seconds, 0-6 seconds and 1-6 seconds.

t	p
0	0
1	4
3	4
6	−2





0 − 1 seconds

$d = 4$ $\quad \vec{d} = 4$

$v = \frac{d}{t}$ $\quad \vec{v} = \frac{\vec{d}}{t}$

$v = \frac{4}{1}$ $\quad \vec{v} = \frac{4}{1}$

$v = 4\frac{m}{s}$ $\quad \vec{v} = 4\frac{m}{s}$

1 − 3 seconds

$d = 0$ $\quad \vec{d} = 0$

$v = \frac{d}{t}$ $\quad \vec{v} = \frac{\vec{d}}{t}$

$v = \frac{0}{2}$ $\quad \vec{v} = \frac{0}{2}$ $\quad t = 3 - 1$

$v = 0\frac{m}{s}$ $\quad \vec{v} = 0\frac{m}{s}$ $\quad t = 2$

3 − 6 seconds

$d = 6$ $\quad \vec{d} = -6$

$v = \frac{d}{t}$ $\quad \vec{v} = \frac{\vec{d}}{t}$

$v = \frac{6}{3}$ $\quad \vec{v} = \frac{-6}{3}$ $\quad t = 6 - 3$

$v = 4\frac{m}{s}$ $\quad \vec{v} = -2\frac{m}{s}$ $\quad t = 3$

0 − 3 seconds (3,4) (0,0)

$d = 4 + 0$ $\quad \vec{d} = 4 + 0$

$v = \frac{d}{t}$ $\quad \vec{v} = \frac{\Delta d}{\Delta t}$

$v = \frac{4}{3}$ $\quad \vec{v} = \frac{d_f - d_i}{t_2 - t_1}$

$v = 1.34\frac{m}{s}$ $\quad \vec{v} = \frac{4 - 0}{3 - 0}$

$\vec{v} = \frac{4}{3}$

$\vec{v} = 1.34\frac{m}{s}$

0 − 6 seconds (6, −2) (0,0)

$d = 4 + 0 + 6$ $\quad \vec{d} = -2 - 0$

$v = \frac{d}{t}$ $\quad \vec{v} = \frac{\Delta d}{\Delta t}$

$v = \frac{10}{6}$ $\quad \vec{v} = \frac{d_f - d_i}{t_2 - t_1}$

$v = 1.67\frac{m}{s}$ $\quad \vec{v} = \frac{-2 - 0}{6 - 0}$

$\vec{v} = \frac{-2}{6}$

$\vec{v} = -0.34\frac{m}{s}$

1 − 6 seconds (6, −2) (1,4)

$d = 0 + 6$ $\quad \vec{d} = -2 - 4$

$v = \frac{d}{t}$ $\quad \vec{v} = \frac{\Delta d}{\Delta t}$

$v = \frac{6}{5}$ $\quad \vec{v} = \frac{d_f - d_i}{t_2 - t_1}$

$v = 1.2\frac{m}{s}$ $\quad \vec{v} = \frac{-2 - 4}{6 - 1}$

$\vec{v} = \frac{-6}{5}$

$\vec{v} = -1.2\frac{m}{s}$

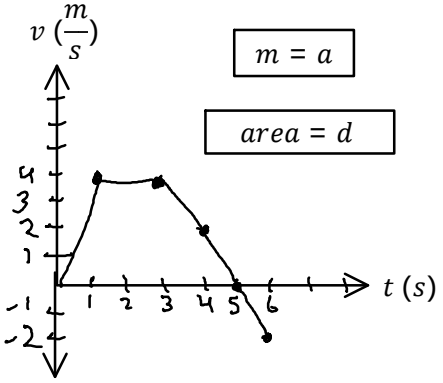
M10 - 1.4 - $v\ vs.\ t\ graph\ a = \frac{v}{t}, d = area$ Notes

$$slope = m = \frac{y_2 - y_1}{x_2 - x_1}$$

Accelerate to $4\frac{m}{s}$ from rest in one second. Drive for 2 seconds. Slow down to a stop in 2 seconds. Accelerate backwards for 1 second to $-2\ \frac{m}{s}$.

Graph using a Table of Values. Find acceleration, distance, displacement from 0-1 seconds, 1-3 seconds, 3-6 seconds, 0-6 seconds.

t	v
0	0
1	4
3	4
6	−2



$m = a$

$area = d$

$$a = \frac{\Delta v}{\Delta t} = \frac{v_f - v_i}{(t_f - t_i)}$$

$0 - 1\ seconds$

$a = \frac{\Delta v}{\Delta t}$
$a = \frac{v_f - v_i}{t_f - t_i}$
$a = \frac{4 - 0}{1 - 0}$
$a = \frac{4}{1}$
$a = 4\frac{m}{s^2}$

$1 - 3\ seconds$

$a = \frac{\Delta v}{\Delta t}$
$a = \frac{v_f - v_i}{t_f - t_i}$
$a = \frac{4 - 4}{3 - 1}$
$a = \frac{0}{2}$
$a = 0\frac{m}{s^2}$

$3 - 6\ seconds$

$a = \frac{\Delta v}{\Delta t}$
$a = \frac{v_f - v_i}{t_f - t_i}$
$a = \frac{-2 - 4}{6 - 3}$
$a = \frac{-6}{3}$
$a = -2\frac{m}{s^2}$

$0 - 6\ seconds$

$a = \frac{\Delta v}{\Delta t}$
$a = \frac{v_f - v_i}{t_f - t_i}$
$a = \frac{-2 - 0}{6 - 0}$
$a = \frac{-2}{6}$
$a = -0.34\ \frac{m}{s^2}$

Displacement

$d = area$
$d = \frac{bh}{2}$
$d = \frac{(1)(4)}{2}$
$d = 2\,m$

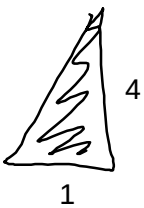
$d = area$
$d = l \times w$
$d = \frac{(2)(4)}{2}$
$d = 4\,m$

$d = area$
$d = \frac{bh}{2} + \left(-\frac{bh}{2}\right)$
$d = \frac{(2)(4)}{2} + (-\frac{(1)(2)}{2})$
$d = 4 - 1$
$d = 3m$

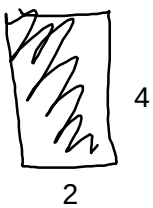
$d = 2 + 4 + 4 - 1$
$d = 9\,m$

Distance

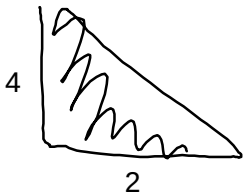
$d = 2\,m$



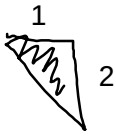
$d = 4\,m$



$d = 4 + 1$
$d = 5$



$d = 2 + 4 + 4 + 1$
$d = 11$



This Area is negative, driving backwards

M10 - 1.5 - $v = \frac{d}{t}$, "$v_f = v_i + at$"

$v = \frac{\Delta d}{\Delta t}$ $\quad v = \frac{\Delta d}{\Delta t} = \frac{d_f - d_i}{(t_f - t_i)}$ $\quad v = \frac{d}{t}$

What is the speed of a car who drove 225 meters in 9 seconds?

$v = \frac{d}{t}$

$v = \frac{225m}{9s}$

$v = 25\frac{m}{s}$

$speed: (v)$

$distance: (d)$

$time: (t)$

What is the velocity of a car who drove 225 meters in 9 seconds?

$\vec{v} = \frac{\vec{d}}{t}$

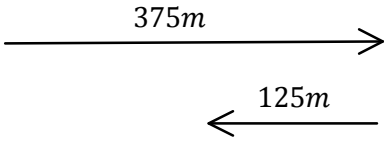
$\vec{v} = \frac{225m}{9s}$

$\vec{v} = 25\frac{m}{s}$

$velocity: \vec{v}$

$displacement: \vec{d}$

If you walk 375 meters East and then 125 meters West in 25 seconds. What is your distance travelled? What is your displacement? What is your Speed? What is your Velocity?



$d = 375 + 125$

$d = 500m$

$v = \frac{d}{t}$

$v = \frac{500}{25}$

$v = 20\frac{m}{s}$

$\vec{d} = 375 - 125$

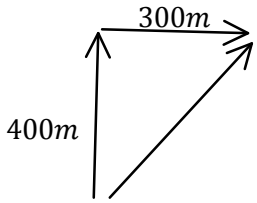
$\vec{d} = 250m$

$\vec{v} = \frac{\vec{d}}{t}$

$\vec{v} = \frac{250}{25}$

$\vec{v} = 10\frac{m}{s}$

If you walk 300 meters North and then 400 meters East in 25 seconds. What is your distance travelled? What is your displacement? What is your Speed? What is your Velocity?



$a^2 + b^2 = c^2$

$400^2 + 300^2 = c^2$

$250000 = c^2$

$c = 500$

$\vec{d} = 500\,m$

$d = 400 + 300$

$d = 700m$

$v = \frac{d}{t}$

$v = \frac{700}{25}$

$v = 28\frac{m}{s}$

$\vec{d} = 500m$

$\vec{v} = \frac{\vec{d}}{t}$

$\vec{v} = \frac{500}{25}$

$v = 20\frac{m}{s}$

M10 - 1.5 - $v = \frac{d}{t}$, "$v_f = v_i + at$" *Notes*

How long to drive 125 *km travelling* $25\frac{km}{h}$?

$$v = \frac{d}{t}$$
$$25 = \frac{125}{t}$$
$$t \times 25 = \frac{125}{t} \times t$$
$$25t = 125$$
$$\frac{25t}{25} = \frac{125}{25}$$
$$t = 5\ hr$$

$$v = \frac{d}{t}$$
$$t = \frac{d}{v}$$
$$t = \frac{125}{25}$$
$$t = 5\ hr$$

How far will you drive at $25\frac{m}{s}$ *for* 15 *seconds*?

$$v = \frac{d}{t}$$
$$25 = \frac{d}{15}$$
$$15 \times 25 = \frac{d}{15} \times 15$$
$$d = 375m$$

$$v = \frac{d}{t}$$
$$d = vt$$
$$d = 25 \times 15$$
$$d = 375\ m$$

M10 - 1.6 - $a = \frac{v}{t}$ Notes

$a = \frac{\Delta v}{\Delta t}$ $a = \frac{\Delta v}{\Delta t} = \frac{v_f - v_i}{(t_f - t_i)}$ $a = \frac{v}{t}$

What is the acceleration on a car that gets to $39\frac{m}{s}$ *in* 3 *seconds from rest.*

REST

$$a = \frac{v}{t}$$
$$a = \frac{39}{3}$$
$$a = 13\frac{m}{s^2}$$

How long does it take a speed boat to reach $36\frac{m}{s}$ *accelerating at* $9\frac{m}{s^2}$?

$$a = \frac{v}{t}$$
$$9 = \frac{36}{t}$$
$$t \times 9 = \frac{36}{t} \times t$$
$$9t = 36$$
$$\frac{9t}{9} = \frac{36}{9}$$
$$t = 4$$

$$a = \frac{v}{t}$$
$$t = \frac{v}{a}$$
$$t = \frac{36}{9}$$
$$t = 4s$$

How fast will a fish get if it accelerates at $5\frac{m}{s}$ *for* 13 *seconds*?

$$a = \frac{v}{t}$$
$$5 = \frac{v}{13}$$
$$13 \times 5 = \frac{v}{13} \times 13$$
$$v = 65\frac{m}{s}$$

$$a = \frac{v}{t}$$
$$v = at$$
$$v = 5 \times 13$$
$$v = 65\frac{m}{s}$$

What is the acceleration of a rabit that accelerates from $8\frac{m}{s}$ *to* $24\frac{m}{s}$ *in* 4 *seconds.*

$$a = \frac{\Delta v}{\Delta t}$$
$$a = \frac{v_f - v_i}{(t_f - t_i)}$$
$$a = \frac{24 - 8}{4 - 0}$$
$$a = \frac{16}{4}$$
$$a = 4\frac{m}{s^2}$$

M10 - 1.7 - $a = \frac{v}{t}, v_f = v_i + at, Notes$

How fast will a fish get if it accelerates from rest at $5\frac{m}{s^2}$ *for* 13 *seconds?*

REST

$a = \frac{v}{t}$

$v_f = v_i + at$

$v_f = v_i + at$
$v_f = 0 + 5(13)$ $\quad v_i = 0$
$v_f = 65\frac{m}{s}$

$a = \frac{v}{t}$
$5 = \frac{v}{13}$
$v = 65\frac{m}{s}$

How long to accelerate to $10\frac{m}{s}$ *from rest at* $2\frac{m}{s^2}$?

$a = \frac{v}{t}$
$t \times 2 = \frac{10}{t} \times t$
$2t = 10$
$t = 5\,s$

$a = \frac{v}{t}$
$t = \frac{v}{a}$
$t = \frac{10}{2}$
$t = 5\,s$

OR

$v_f = v_i + at$
$10 = 0 + 2t$
$t = 5\,s$

$v_f = v_i + at$
$v_f = 0 + at$
$v_f = at$
$a = \frac{v_f}{t}$

How long to accelerate from $6\frac{m}{s}$ *to* $18\frac{m}{s}$ *at* $2\frac{m}{s^2}$?

$v_f = v_i + at$
$18 = 6 + 2t$
$12 = 2t$
$t = 6\,s$

$v_f = v_i + at$
$t = \frac{(v_f - v_i)}{a}$
$t = \frac{18 - 6}{2}$
$t = 6s$

How fast does a car get accelerating at $3\frac{m}{s^2}$ *from* $10\frac{m}{s}$ *for* 6 *seconds?*

$v_f = v_i + at$
$v_f = 10 + (3)(6)$
$v_f = 28\frac{m}{s}$

What is the initial velocity of a truck that reaches $25\frac{m}{s}$ *acclelerating at* $5\frac{m}{s^2}$ *in* 2 *seconds?*

$v_f = v_i + at$
$25 = v_i + 5(2)$
$25 = v_i + 10$
$v_i = 15\frac{m}{s}$

$v_f = v_i + at$
$v_i = v_f - at$
$v_i = 25 - 5(2)$
$v_i = 15\,m/s$