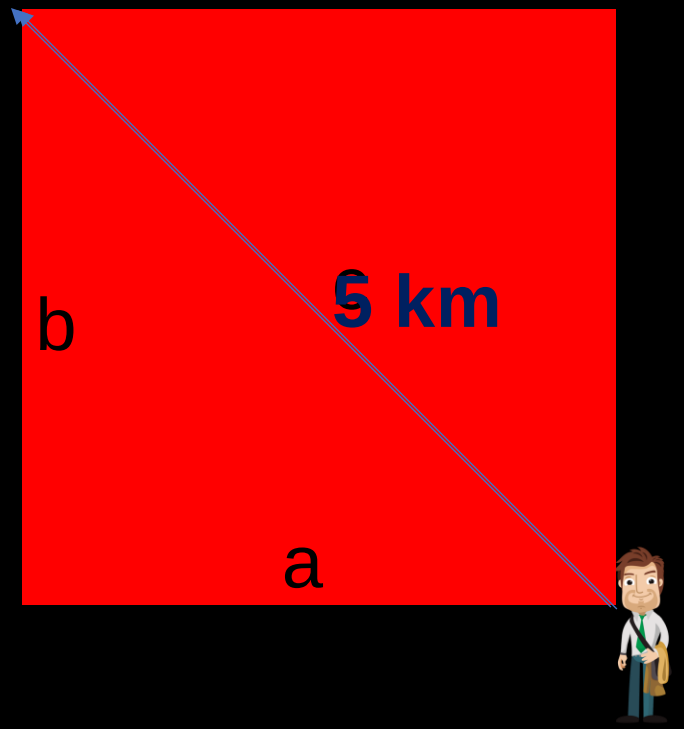

MOTION
CALCULATION
RECAP
BY
JACK LIM WEI JYE

DISTANCE DISPLACEMENT	s	m	
SPEED VELOCITY	v	$m\ s^{-1}$	$\frac{s}{t}$
ACCELERATION	a	$m\ s^{-2}$	$\frac{v-u}{t}$

EXAMPLE QUESTION 1



What's the distance and displacement?

DISTANCE:

3 + 4 = 7km

DISPLACEMENT:

$3^2 + 4^2 = x^2$

$x = \sqrt{(3^2 + 4^2)}$

$x = \sqrt{(9 + 16)}$

$x = \sqrt{(25)}$

$x = 5$

PYTHAGORAS THEOREM:

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

EXAMPLE QUESTION 2

I walk at a uniform speed of 1 ms^{-1} before coming to stop in 5 seconds. What is my deceleration?

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

$u = 1\ ms^{-1}$ $v = 0\ ms^{-1}$ $t = 5\ s$

EXAMPLE QUESTION 2

I walk at a uniform speed of 1 ms^{-1} before coming to stop in 5 seconds. What is my deceleration?

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

$u = 1\ ms^{-1}$ $v = 0\ ms^{-1}$ $5\ s$

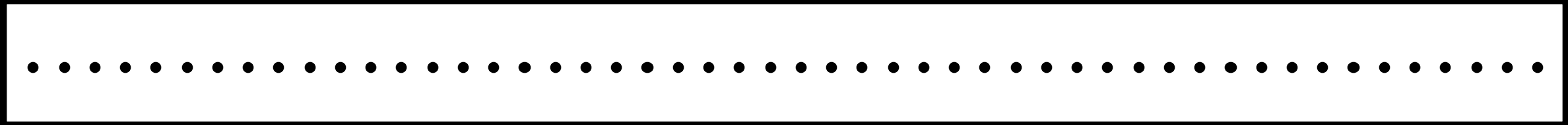
$$a = \frac{0\ ms^{-1} - 1\ ms^{-1}}{5\ s}$$

$$a = -0.1/5$$

$$a = -0.02\ ms^{-2}$$

TICKER TIMER

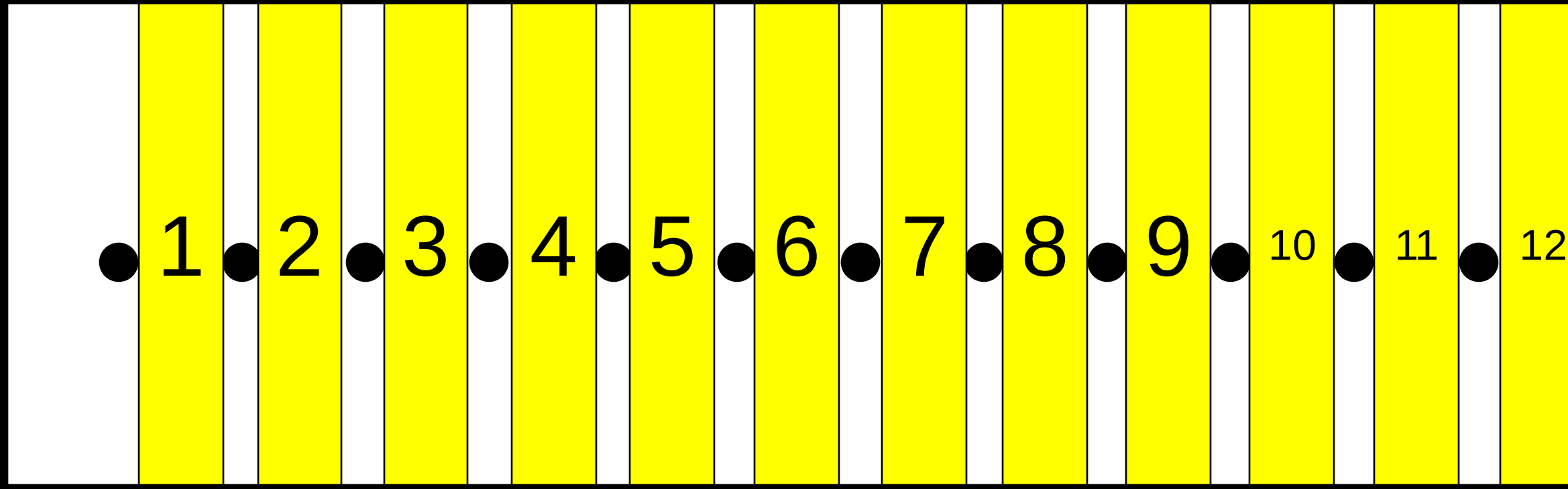
50hz (a.c. supply)



50 tick

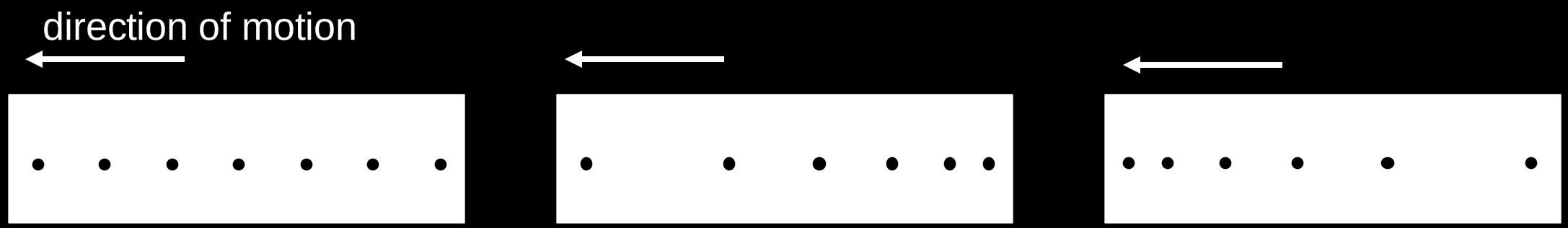
TICKER TIMER

50hz (a.c. supply)



50 tick = **50** dot-space

TICKER TIMER

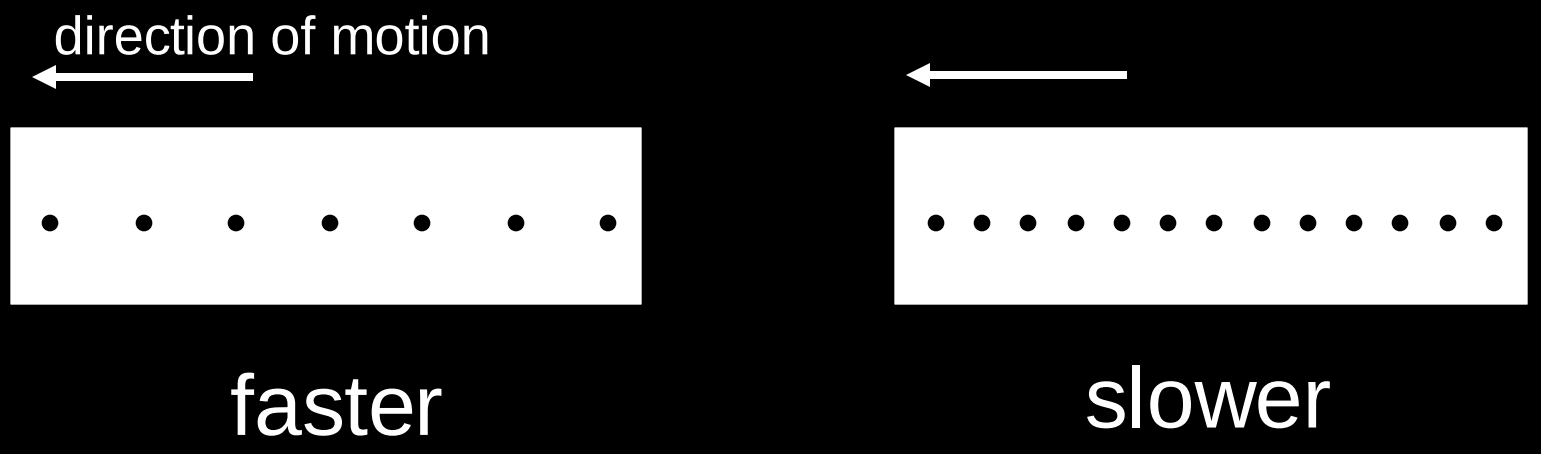


constant velocity

decelerates

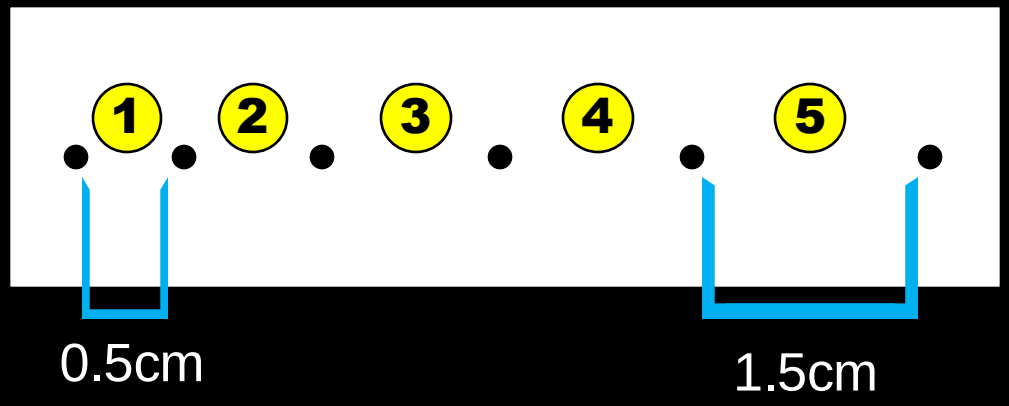
accelerates

TICKER TIMER



EXAMPLE QUESTION 1

direction of motion



Calculate the acceleration.

$$v = \frac{s}{t} \qquad a = \frac{v-u}{t}$$

INITIAL VELOCITY

$$u = \frac{0.5}{0.02}$$

$$u = 25 \text{ cm s}^{-1}$$

FINAL VELOCITY

$$v = \frac{1.5}{0.02}$$

$$v = 75 \text{ cm s}^{-1}$$

TIME TAKEN

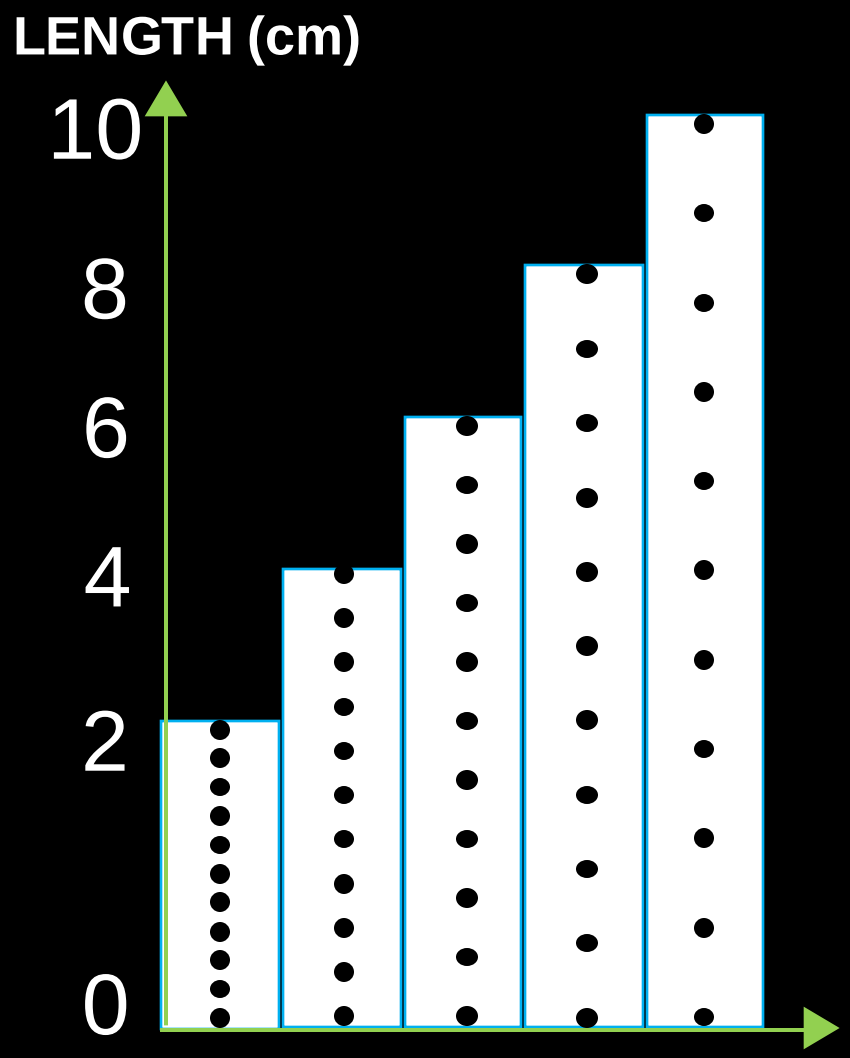
$$0.02 \times 5 = 0.1\text{s}$$

ACCELERATION

$$a = \frac{75-25}{0.1}$$

$$a = 500 \text{ cm s}^{-2}$$

EXAMPLE QUESTION 2



Calculate the

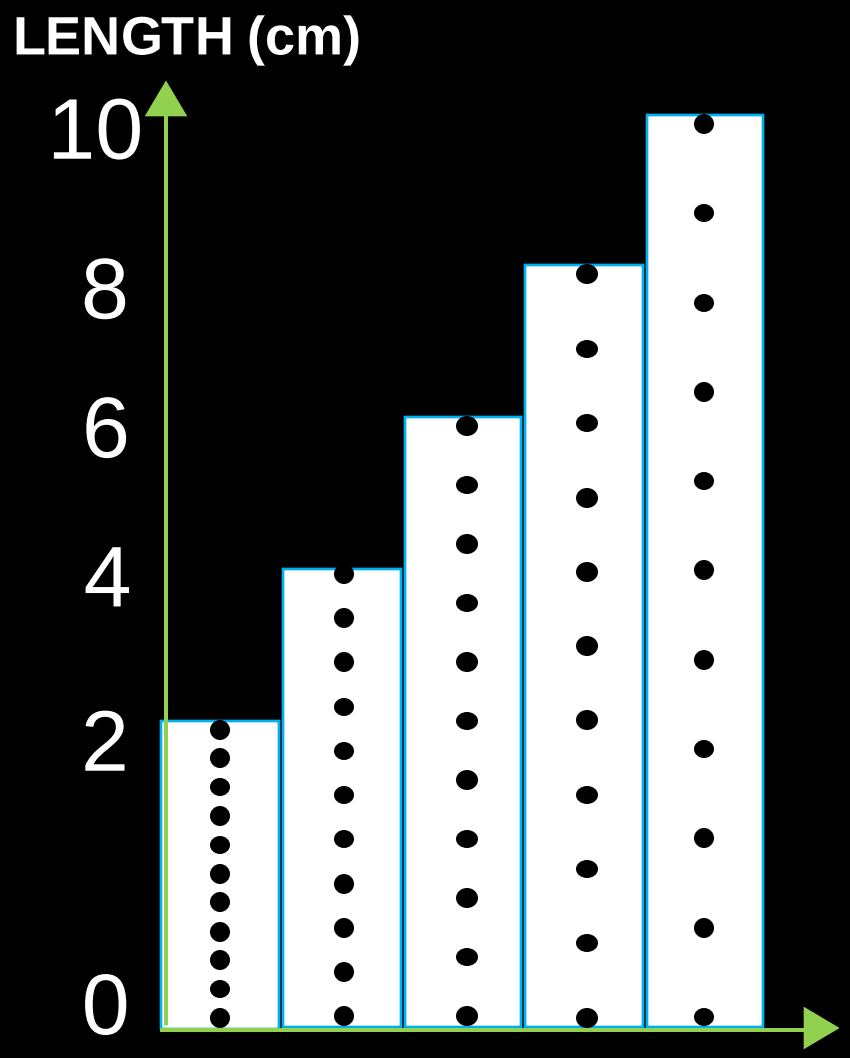
a) total distance travelled

b) total time taken

c) average velocity

d) acceleration

EXAMPLE QUESTION 2



Calculate the

a) total distance travelled

b) total time taken

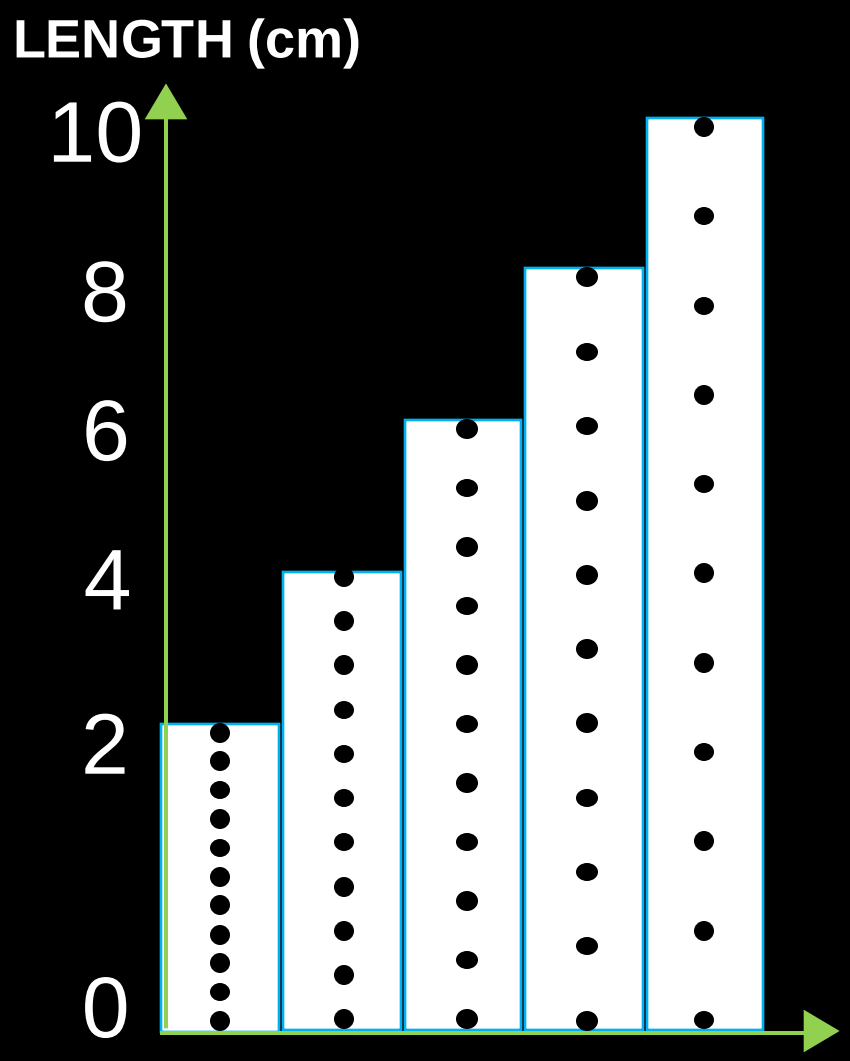
c) average velocity

d) acceleration

TOTAL DISTANCE TRAVELLED

2+4+6+8+10 = 30cm

EXAMPLE QUESTION 2



Calculate the

a) total distance travelled

total time taken

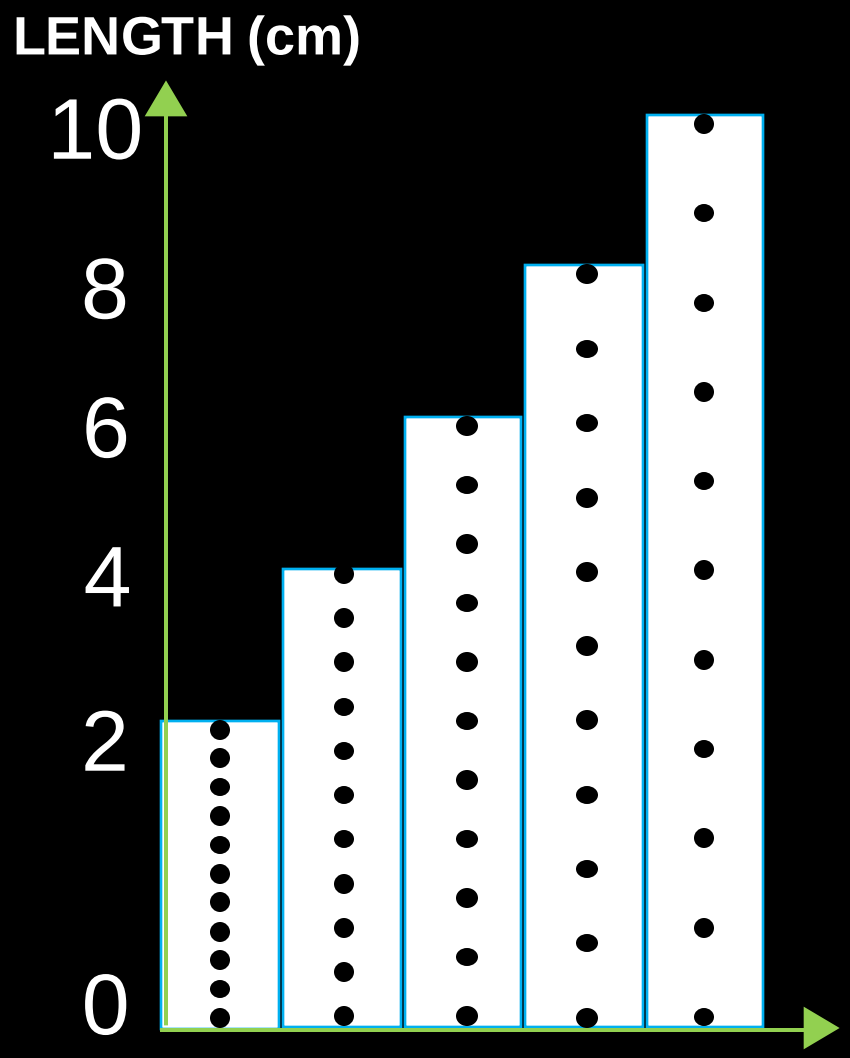
c) average velocity

d) acceleration

TOTAL TIME TAKEN

$$0.02x(5x10)$$
$$=0.02x50$$
$$=1s$$

EXAMPLE QUESTION 2



Calculate the

a) total distance travelled

b) total time taken

average velocity

d) acceleration

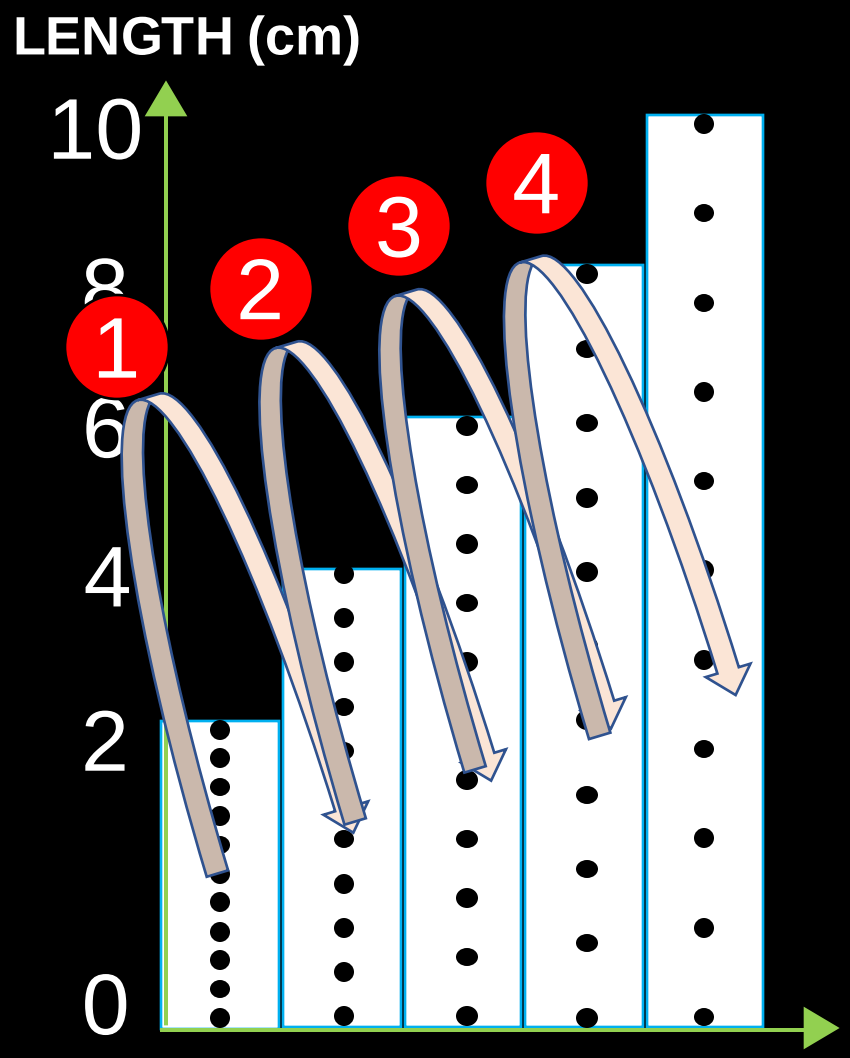
AVERAGE VELOCITY

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

$$v = \frac{30\text{cm}}{1\text{s}}$$

$$v = 30 \text{ cm s}^{-1}$$

EXAMPLE QUESTION 2



Calculate the

a) total distance travelled

b) total time taken

c) average velocity

acceleration

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

ACCELERATION

$v = 50$ $u = 10$ $t = 0.8$

$$a = \frac{v-u}{t} = \frac{40}{0.8}$$

$$a = 50 \text{ cm s}^{-1}$$

EQUATIONS OF LINEAR MOTION

$$v = u + at$$

$$s = \frac{1}{2}(u+v)t$$

$$s = ut + \frac{1}{2}at^2$$

$$v^2 = u^2 + 2as$$

s= displacement
u= initial velocity
v= final velocity
a= uniform velocity
t= time interval

EXAMPLE QUESTION 1

A car accelerates from 20 m s^{-1} with an acceleration of 2 m s^{-2}.

What is the velocity after 8 seconds?

$u = 20\ m\ s^{-1}$

$a = 2\ m\ s^{-2}$

$t = 8\ s$

$v = ?$

$v = u + at$

~~**$s = ut + \frac{1}{2}(u+v)t$**~~

~~**$s = ut + \frac{1}{2}at^2$**~~

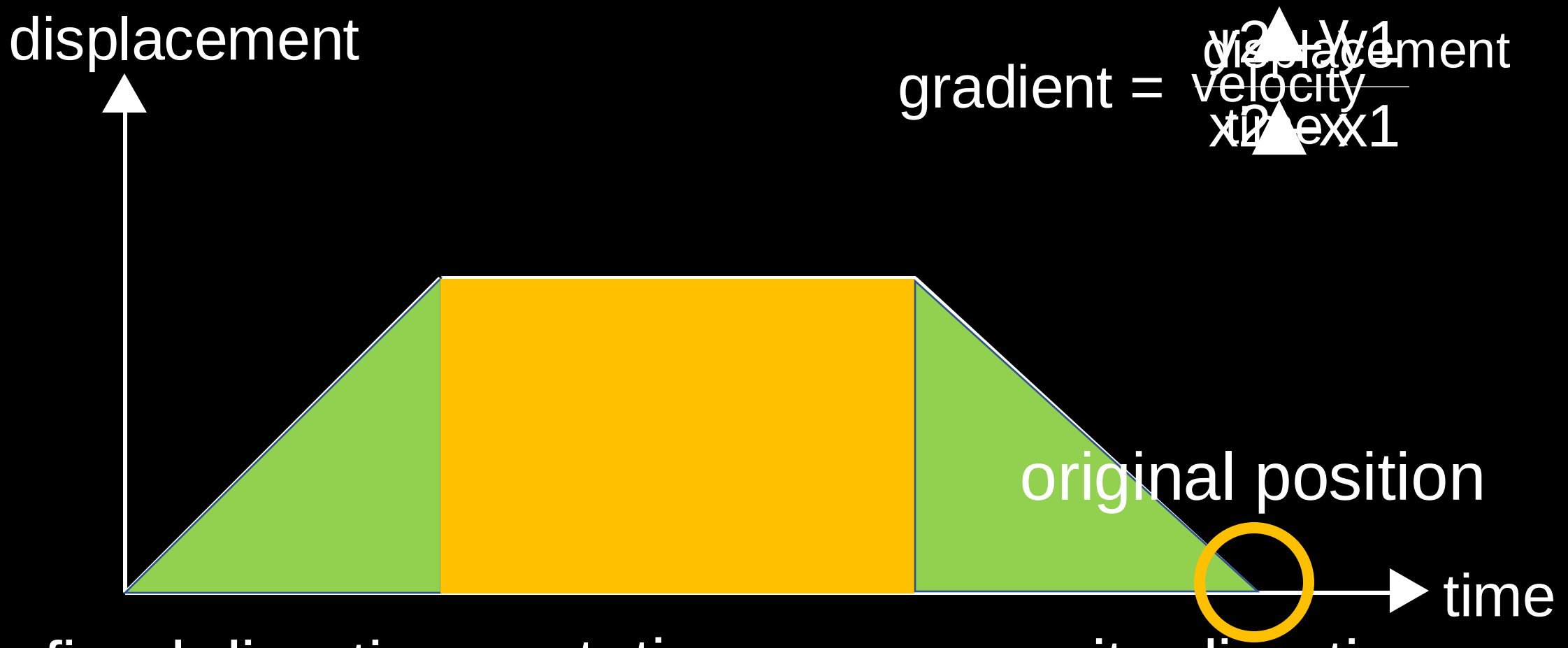
~~**$v^2 = u^2 + 2as$**~~

$v = 20 + 2(8)$

$v = 36\ m\ s^{-1}$

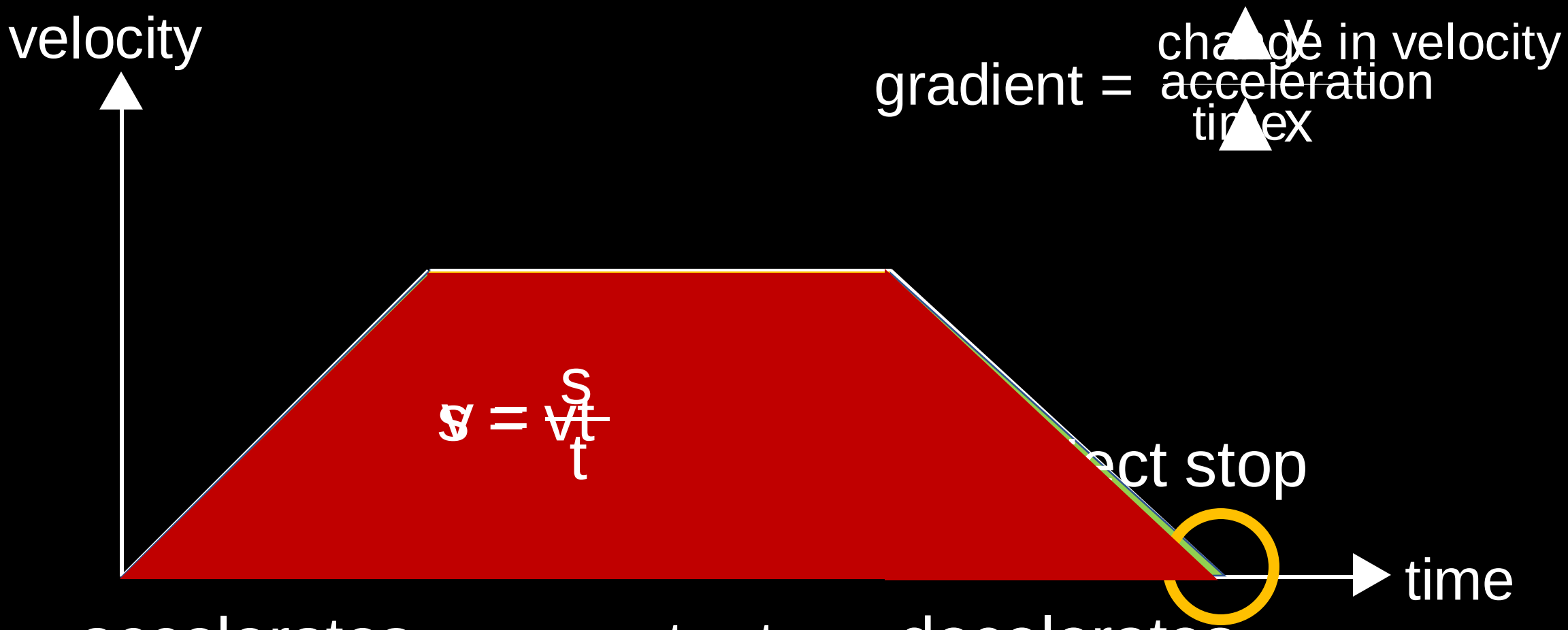
MOTION GRAPH

ST GRAPH

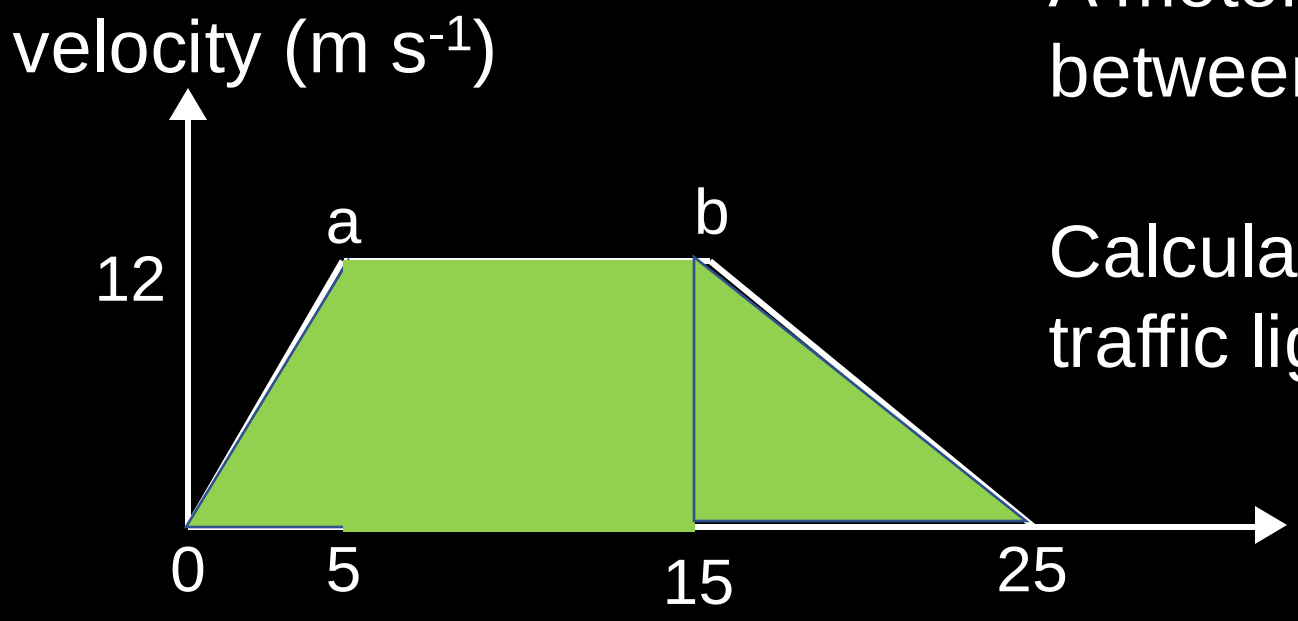


MOTION GRAPH

VT GRAPH



EXAMPLE QUESTION 1

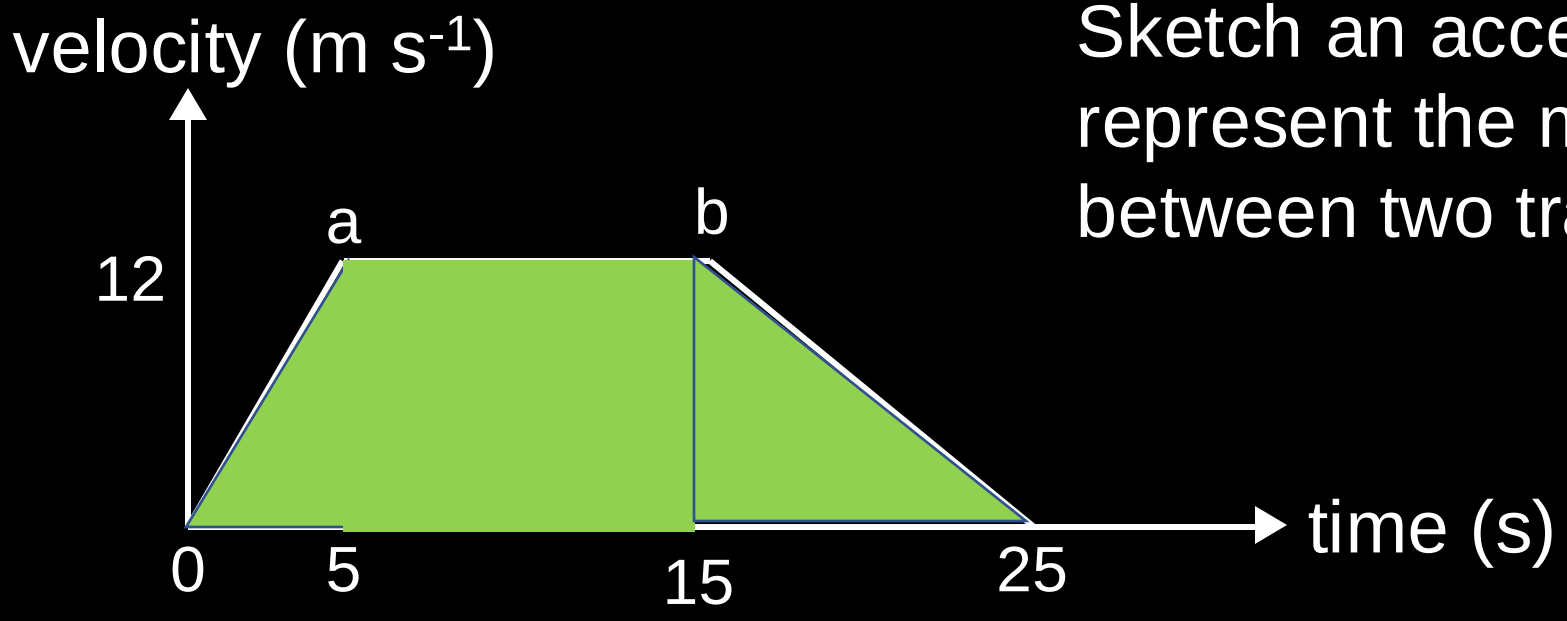


A motorcycle is travelling along the road between two traffic lights.

Calculate the distance between the two traffic lights.

$\frac{12x5}{2}$ =30 10x12=120 $\frac{12x10}{2}$ =60 30 + 120 + 60 = 210 m

EXAMPLE QUESTION 2



Sketch an acceleration-time graph to represent the motion of the motorcycle between two traffic lights

$\frac{12-0}{5-0} = 2.4$ a = 0 $\frac{0-12}{25-15} = -1.2$

0s-5s

2.4 m s^{-2}

5s-15s

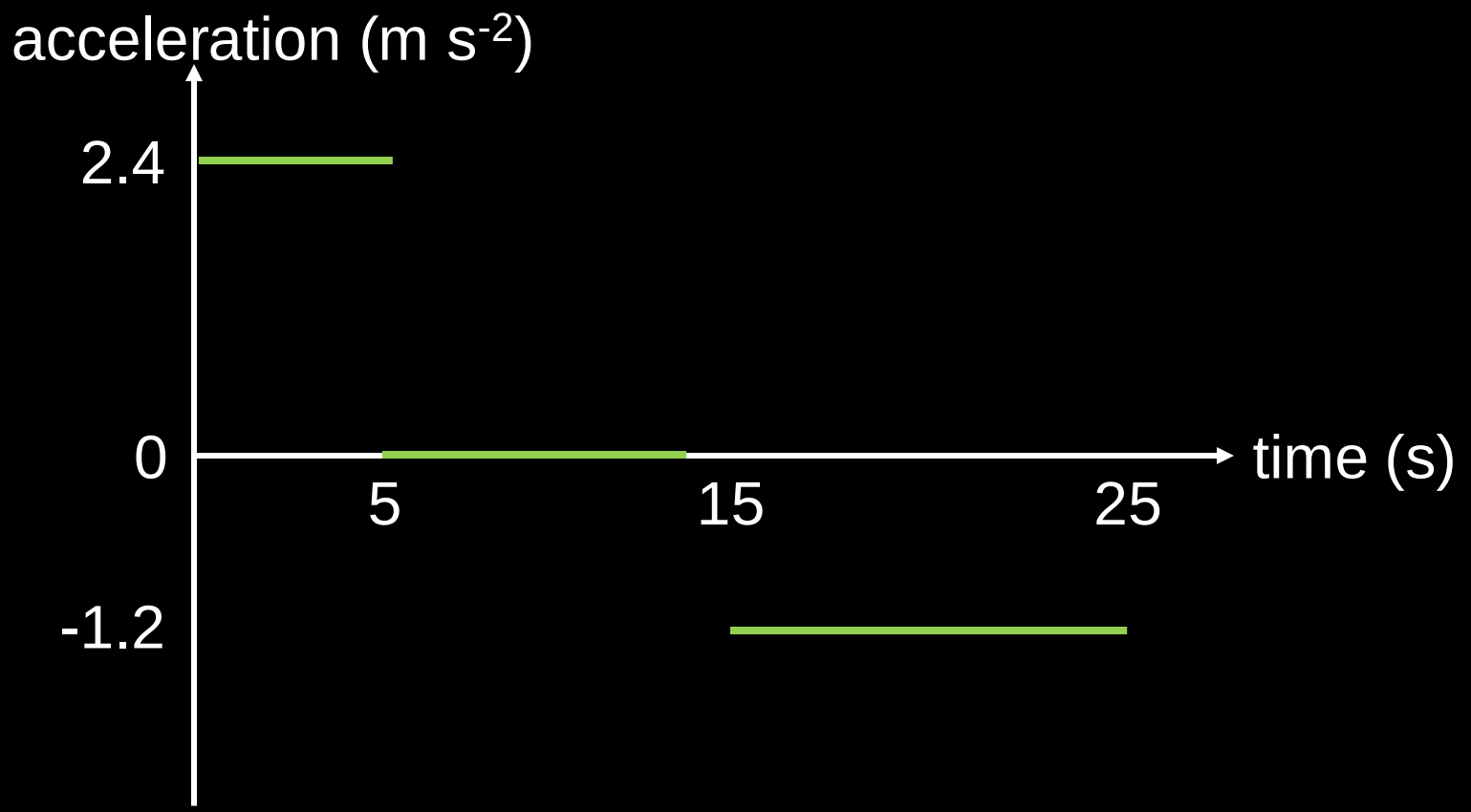
0 m s^{-2}

15s-25s

-1.2 m s^{-2}

EXAMPLE QUESTION 2

0s-5s	**5s-15s**	**15s-25s**
2.4 m s^{-2}	0 m s^{-2}	-1.2 m s^{-2}

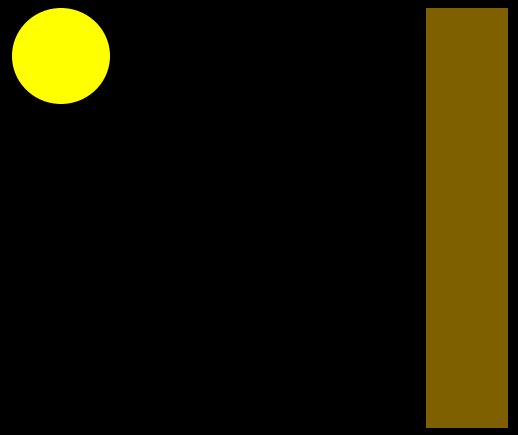


MOMENTUM

mass in motion

$$p = mv$$

EXAMPLE QUESTION 1



A ball of mass 0.8kg strikes a wall at a velocity of 10 m s^{-1} and rebounds at 6 m s^{-1}.

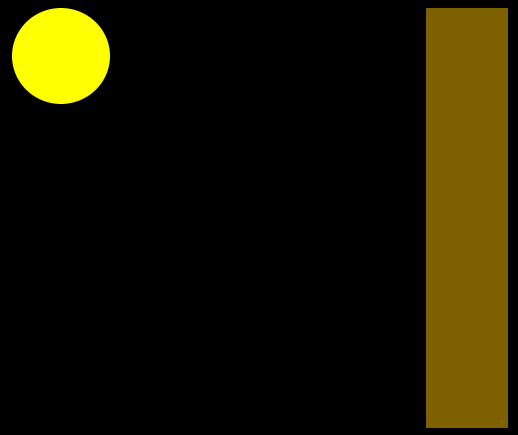
What is the momentum before it strikes the wall?

$p = mv$

$p = 0.8 \times 10$

$p = 8$ kg m s^{-1}

EXAMPLE QUESTION 1



A ball of mass 0.8kg strikes a wall at a velocity of 10 m s^{-1} and rebounds at 6 m s^{-1}.

What is the momentum after the rebound?

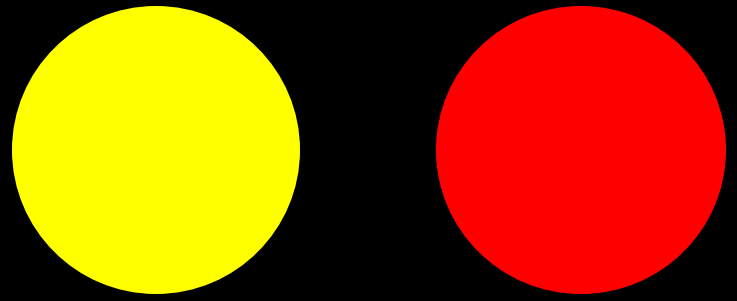
$p = mv$

$p = 0.8 \times (-6)$

$p = -4.8$ kg m s^{-1}

COLLISION

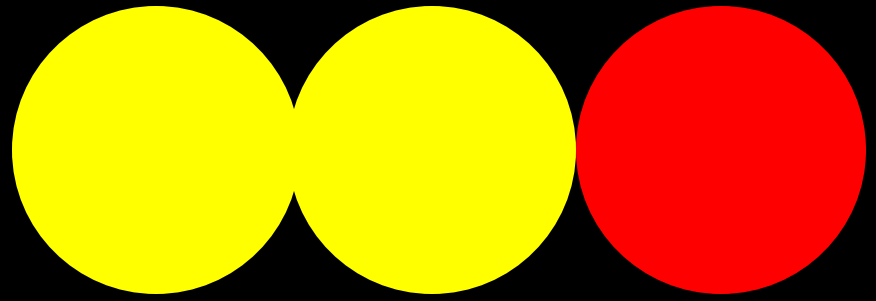
elastic



$$m_1u_1 + m_2u_2 = m_1v_1 + m_2v_2$$

COLLISION

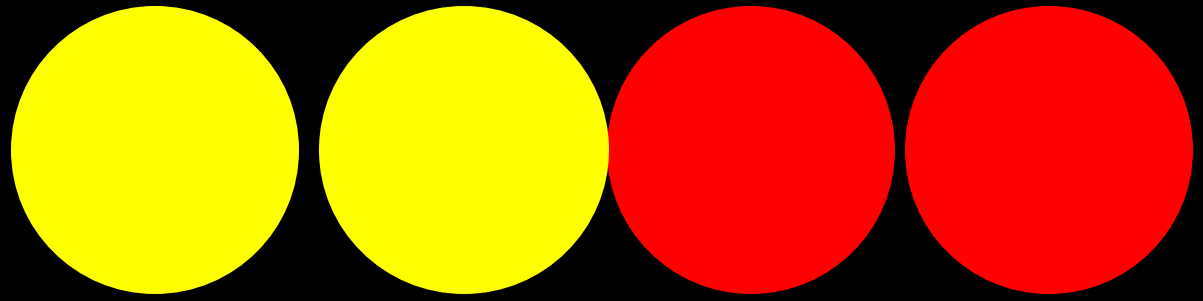
inelastic



$$m_1u_1 + m_2u_2 = (m_1+m_2)v$$

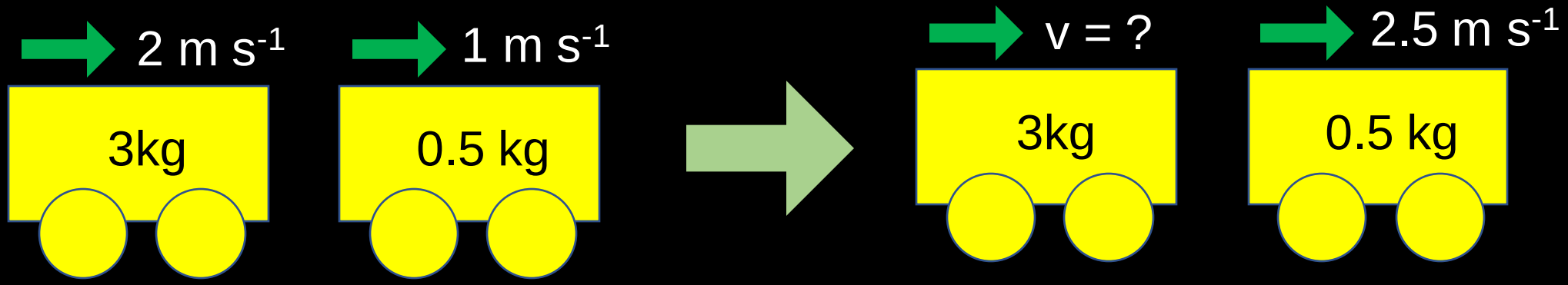
COLLISION

explosion



$$m_1u_1 + m_2u_2 = 0$$

EXAMPLE QUESTION 1



$$m_1u_1 + m_2u_2 = m_1v_1 + m_2u_2$$

$$3(2) + 0.5(1) = 3v + 0.5(2.5)$$

$$6.5 = 3v + 1.25$$

$$v = 1.75 \text{ m s}^{-1}$$


THANK YOU
BY
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