1. Forces and Motion

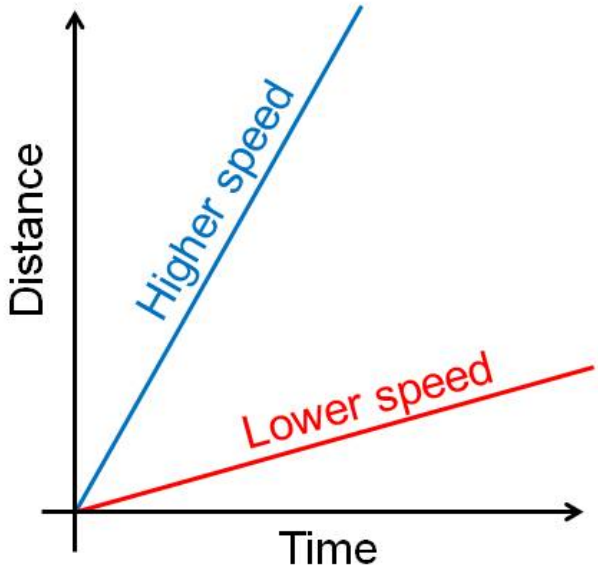
Units:

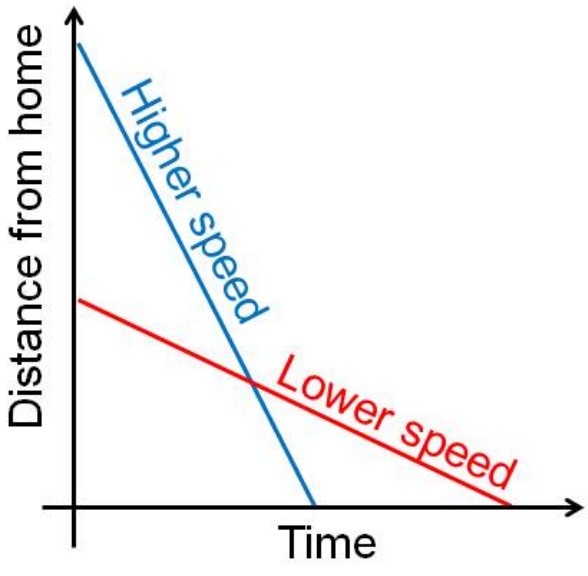
- Kilogram(kg)
- Meter (m)
- Meter per second (m/s)
- Meter per second squared (m/s^2)
- Newton (N)
- Seconds (s)
- Newton per kilogram (N/kg)
- Newton meter (Nm)
- Kilogram meter per second (N/kg)

1.3

Distance Time graphs

For a distance-time graph, speed = gradient





1.4

Average speed = (Distance moved)/(time taken)

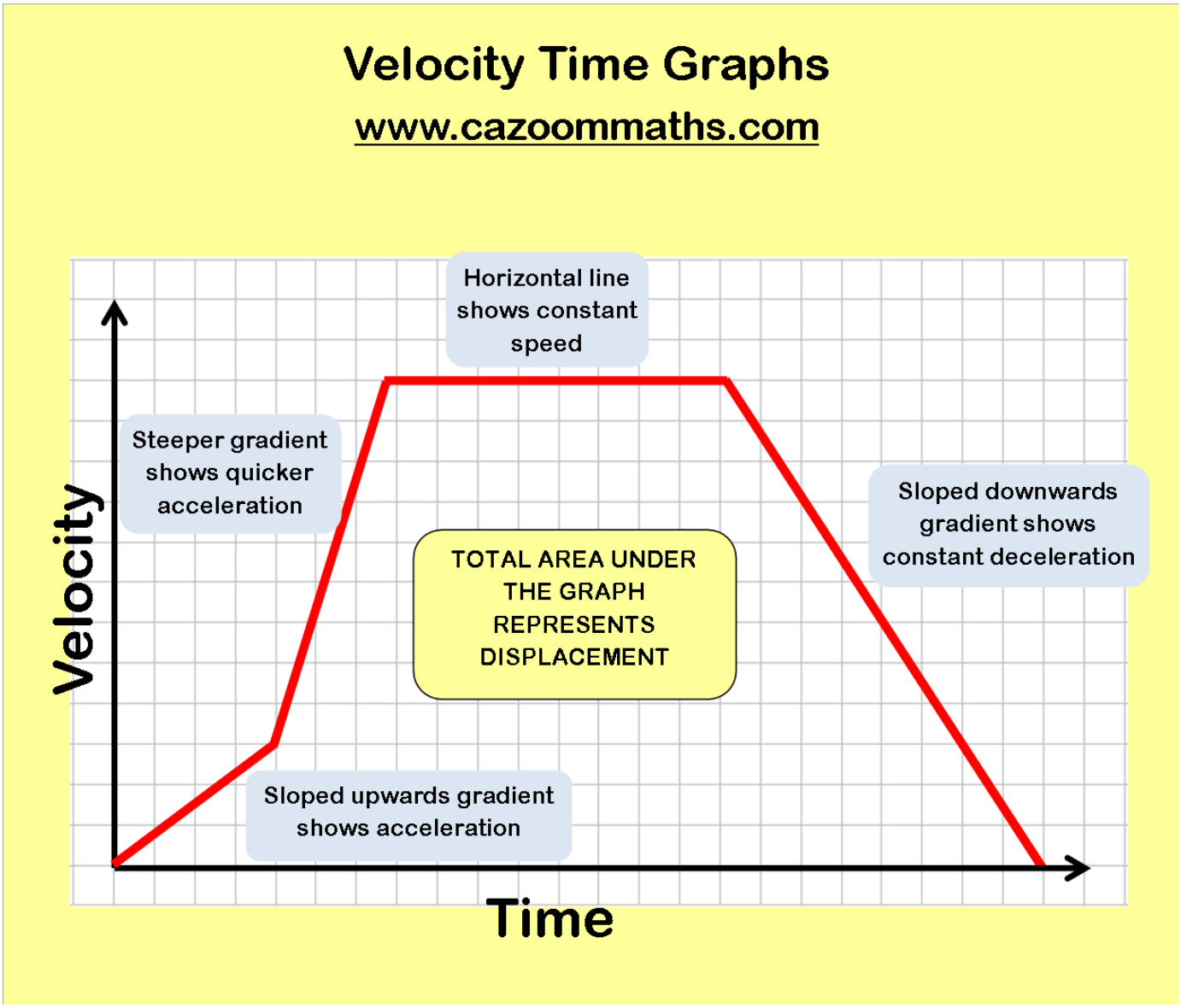
1.6

Acceleration = (change in velocity)/time taken

a=(v-u)/t

1.7

Velocity Time Graph



1.8

Acceleration is determined by the gradient of a velocity - time graph

1.9

Distance traveled is the area in a velocity time graph

(final speed)^2 = (initial speed)^2 + (2 x acceleration x distance moved)

v^2 = u^2 +(2 x a x s)

1.12

Types of forces:

- Frictional Force
- Tension Force
- Normal Force
- Air Resistance Force
- Gravitational Force
- Electrical Force
- Magnetic Force

1.13

Vector and scalar units

Vector units have a direction and magnitude. Scalar units only have magnitude without direction.

Vector Units	Scalar Units
Velocity	Speed
Momentum	Mass
Displacement	Distance
Force	Density
Acceleration	Area

1.16

Friction is force that opposes motion

1.17

Force = mass x acceleration
F = m x a

1.18

weight = mass x gravitational field strength
W = m x g

1.19

Stopping Distance = thinking time + breaking time

1.20

Factors affecting vehicle stopping distance is speed, mass, road condition and reaction time

1.21

Forces acting on falling objects

Terminal velocity - max speed reached when drag equals the weight

1.22

extension varies with applied force for springs with rubber, metal, etc.

1.23

Linear region of a force-extension graph is associated with Hooke's law

F=ke

Force = length extended x spring constant

1.24

Elastic behavior as ability for material to recover its original shape after force causing deformation have been removed

1.25

Momentum = mass x velocity

p = m x v
Momentum - measure of how difficult it is to stop a moving object

1.26

momentum in safety features:

- air bags
- shoe soles

1.27

Momentum is conserved

1.28

force is measured in Newtons (N)

Force = (change in momentum)/time taken
F = (mv-mu)/t

Force diagram

- Direction of each arrow shows the direction of each force
- length of each arrow is proportional to the size of the force

1.29 Newton's laws

- Newton's First Law of Motion - if a body is at rest or moving at a constant speed in a straight line, it will remain at rest or keep moving in a straight line at constant speed unless it is acted upon by force (Law of inertia)

- Newton's Second Law of Motion - a body accelerates in the direction of force if a nonzero net external force acts on it.
    - speed or direction of motion may change
- Newton's Third Law of Motion - If object A exerts a force on object B, then object B exerts an equal but opposite force on object A
    - pairs of forces that act between two objects are action-reaction pairs

1.30

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moment = force x perpendicular distance from the pivot

1.32
