

* DO NOT forget your units!

Study Guide on Motion

Name KEY

- 1) What is the difference between a vector and a scalar?
 A vector includes both magnitude $\hat{=}$ direction while a scalar only includes magnitude
- 2) Place the following words in the correct category as being a vector or scalar:

Speed, velocity, distance, displacement, and acceleration

Vector	Scalar
velocity	speed
displacement	distance
acceleration	

- 3) What is the formula to calculate speed and velocity? * Remember velocity includes direction!
- $V = \text{distance} / \text{time} = \frac{d}{t}$

- 4) If a superhero is flying 1000 Km in 10 seconds, what is her speed? *Put your answer in m/s

$V = \frac{d}{t}$ $\Delta \rightarrow m$ $V = \frac{1,000,000 \text{ m}}{10 \text{ s}} = \boxed{100,000 \text{ m/s}}$

1000 Km = 1,000,000m

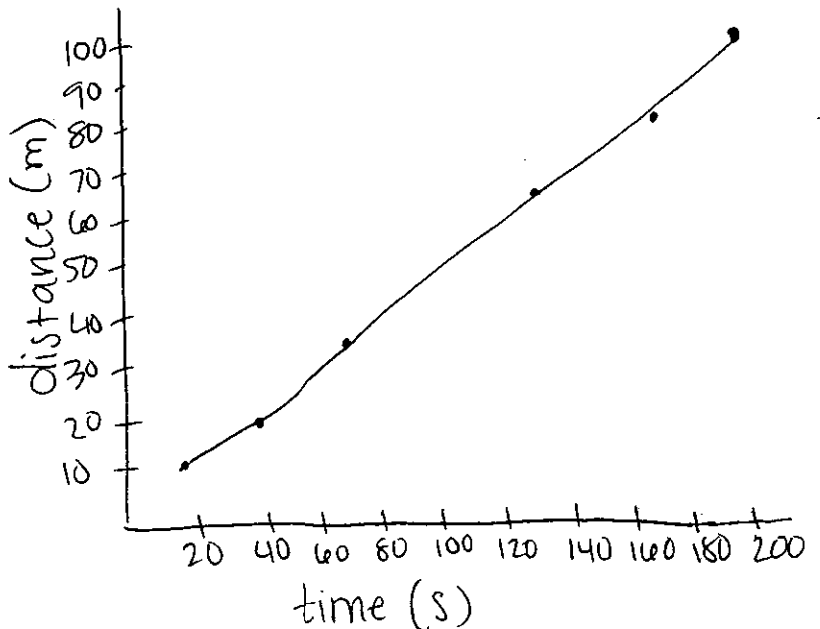
- 5) If you are jogging 0.5 m/s, and you have been running for 10 minutes, what distance have you ran?

\downarrow Velocity \downarrow time = 600 s

* You have to Δ minutes to seconds! $V = \frac{d}{t}$ so $d = V \cdot t = 0.5 \text{ m/s} \times 600 \text{ s} = \boxed{300 \text{ m}}$

- 6) Directions: Using the data in the following table, construct a graph of distance vs. time. Then answer the questions about that graph. * Label axis on the graph!

Distance (m)	Time (sec)
10	20
20	40
35	70
65	130
85	170
100	200



See me during zero period if you need help with the graph

Speed & velocity are both represented w/ a V.

- 7) Does this graph represent constant or changing speed? How do you know?
 Constant. $V = \frac{d}{t}$? if you calculate V @ any point, it is 0.5 m/s.
 8) Speed, velocity, or acceleration? The dog ran 10 miles/hour up the hill

Velocity b/c "up the hill" is a direction

- 9) Speed, velocity, or acceleration? The race cars are going around the curve
 acceleration b/c there is a Δ in direction

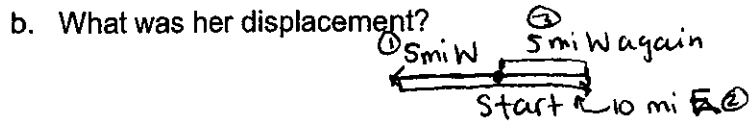
- 10) What is the formula to calculate acceleration?
 $a = \frac{V_f - V_i}{t}$ or you can derive it from $F = ma \Rightarrow a = \frac{F}{m}$

- 11) While traveling along a highway a driver slows from 24 m/s to 15 m/s in 12 seconds. What is the automobile's acceleration? (Remember that a negative value indicates a slowing down or deceleration.)

$a = \frac{V_f - V_i}{t}$ ~~$a = \frac{15 - 24}{12}$~~ $V_f = 15 \text{ m/s}$ $V_i = 24 \text{ m/s}$ $t = 12 \text{ s}$
 $a = \frac{15 \text{ m/s} - 24 \text{ m/s}}{12 \text{ s}} = \boxed{0.75 \text{ m/s}^2}$

- 12) Sue ran 5 miles west, 10 miles east, and then 5 miles west again.

a. What distance did Sue run?
 $5 \text{ mi} + 10 \text{ mi} + 5 \text{ mi} = \boxed{20 \text{ mi}}$



* She ended where she started so her displacement is zero.

- 13) What type of friction (sliding, rolling, static, or fluid)?

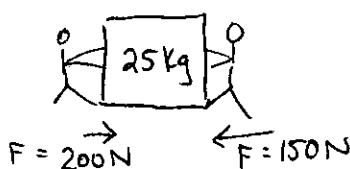
- Ice skater's skates on the ice: sliding
- Bowling ball rolling down the lane: Rolling
- Heavy desk sitting on the floor: static (Not moving)
- Sky diver diving through the air: Fluid
 * Remember liquids & gases are both fluids!

14) fill out the table about Newton's 3 laws of motion

Law	Definition	Example
1	<u>Inertia</u> : An object in rest motion will stay in motion & an object @ rest will stay @ rest unless acted on by a force	<ul style="list-style-type: none"> • Kicking a kick ball. • Hitting a tennis ball
2	$F_{net} = \text{mass} \times \text{acceleration}$ $F = ma$	A bowling ball rolling will have more force than a tennis ball rolling @ the same speed acceleration b/c it has more mass.
3	For every action there is an equal and opposite reaction.	paddling a boat as the paddle goes backward, the boat goes forward

15) Two people are trying to move a 25 Kg box on a frictionless surface. Darodric wants to move the box to the left and pushes with a force of 150 Newtons. Sadie wants to move the box to the right and pushes with a force of 200 Newtons.

a. What is the net force on the box?



$F_{net} = 200N - 150N = \boxed{50N}$

b. What is the acceleration of the box and in which direction will it move?

Use the formula $F = ma$

$F = 50N, m = 25kg, a = ?$

$$a = \frac{F}{m} = \frac{50N}{25kg} = \boxed{2 m/s^2}$$

Circle the correct word/phrase

17) When one object exerts a force on another object, the second object exerts a force back that is (equal in size and opposite in direction) (equal in size and in the same direction.)

18) Balanced forces act on (two different objects) (the same object). *sorry!*

19) Action/reaction force pairs act on (two different objects) (the same object)

} don't worry too much about these

20) What is the formula for force? (look at newton's 2nd law)

$$F = m \times a$$

21) What force is needed to accelerate a 10 kg skateboard at 2 m/s^2

$$F = ? \quad m = 10 \text{ kg} \quad a = 2 \text{ m/s}^2 \quad F = 10 \text{ kg} \times 2 \text{ m/s}^2 = \boxed{20 \text{ N}}$$

22) What is the difference between mass and weight?

MASS does NOT change but weight changes based on acceleration due to gravity. Weight is a force!

23) What is the acceleration due to gravity on Earth?

$$a = 9.8 \text{ m/s}^2$$

24) If an object on Earth has a mass of 30 Kg, how much does it weigh?

Weight is a FORCE
 g is acceleration due to gravity. *SO* if $F = ma$ then $W = mg$
 $W = 30 \text{ kg} \times 9.8 \text{ m/s}^2 = \boxed{294 \text{ N}}$

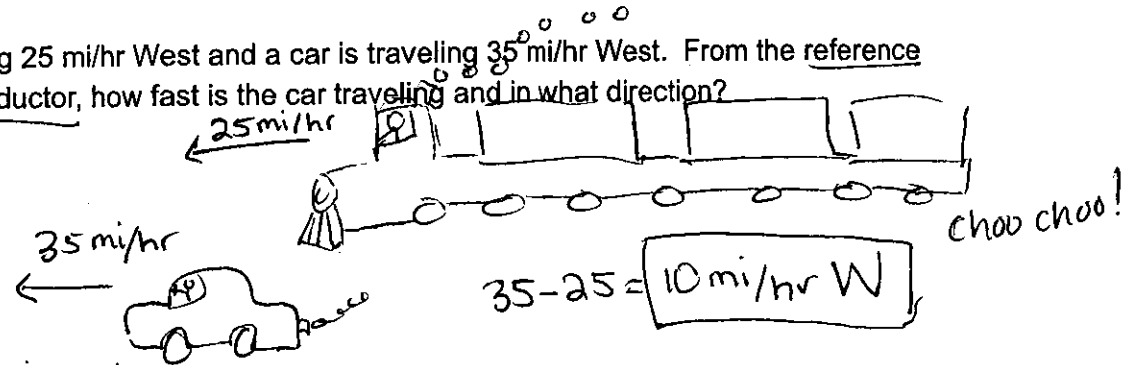
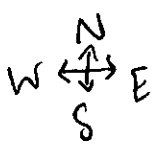
25) a. Why would an object weigh less on the moon?

because the moon is smaller and has less gravitational pull. g on the moon is only 1.6 m/s^2

b. Would it also have less mass?

NO the mass does not change.

26) A train is traveling 25 mi/hr West and a car is traveling 35 mi/hr West. From the reference point of the train conductor, how fast is the car traveling and in what direction?



* They are going in the same direction so subtract!