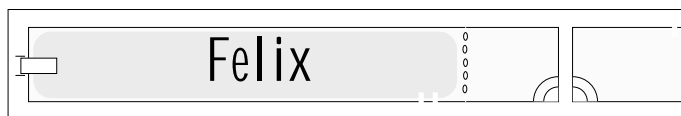


PHYZ SPRINGBOARD: THIS WAY & THAT WAY III

ACCELERATION



1. Both people in the diagram to the right undergo an increase in speed of 3m/s in one second.

a. How can we distinguish the Dude's acceleration (rate of change in velocity) from that of the Dudette? For example, we cannot simply say that each has an acceleration of "3m/s²," since that would imply they're both moving the same way.

Dude: -3m/s^2

Dudette: $+3\text{m/s}^2$

b. How can you—with a straight face—suggest that Dude has a *negative* acceleration? Clearly, he's speeding up! Why did you say his acceleration was negative?

He's speeding up in the **NEGATIVE** direction.



2. Both people in the diagram to the right undergo a change in speed of 3m/s in one second. Do they have the same acceleration? Don't answer yet!

a. The Dudette undergoes an increase in speed. What is her acceleration?

$+3\text{m/s}^2$

b. The Dude undergoes a decrease in speed. What is his acceleration?

$+3\text{m/s}^2$

c. Do the Dude and Dudette have the same acceleration?

YES! Both have accelerations of $+3\text{m/s}^2$.

3. a. What are the two meanings of "positive acceleration"?

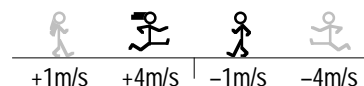
Speeding up in the positive direction or slowing down in the negative direction.

b. What are the two meanings of "negative acceleration"?

Speeding up in the negative direction or slowing down in the positive direction.

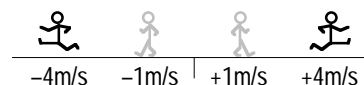
c. What is the meaning of "zero acceleration"?

Neither speeding up nor slowing down; constant velocity.



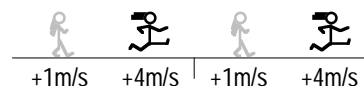
4. a. Both dudes undergo an increase in speed of 3m/s in one second. Do the dudes have the same acceleration?

NO! (One is negative; the other positive.)

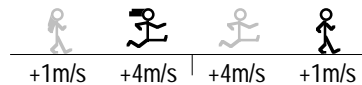


b. Both dudettes undergo an increase in speed of 3m/s in one second. Do the dudettes have the same acceleration?

YES! (Both are positive.)

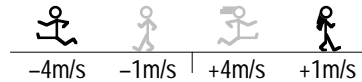


c. The dudette increases her speed by 3m/s in one second; the dude decreases his speed by 3m/s in one second. Do they have the same acceleration?



NO! (One is positive; the other negative.)

d. The dude increases his speed by 3m/s in one second; the dudette decreases her speed by 3m/s in one second. Do they have the same acceleration?



YES! (Both are negative.)

5. a. Indicate whether or not each of the following is possible. Place a check (✓) in the blank of each description that is possible and an x in the blank of each description that is impossible.

- An object has both positive velocity and positive acceleration.
- An object has positive velocity and zero acceleration.
- An object has positive velocity and negative acceleration.
- An object has both negative velocity and negative acceleration.
- An object has negative velocity and zero acceleration.
- An object has negative velocity and positive acceleration.
- An object has both zero velocity and zero acceleration.

b. What relationship—if any—is there between the sign of velocity and the sign of acceleration? Select the correct statement from the choices below.

- The sign of velocity indicates the sign of acceleration.
- The sign of velocity is opposite the sign of acceleration.
- There is no relationship between the sign of velocity and the sign of acceleration.

6. a. If an object has an acceleration of $+5\text{m/s}^2$,

- it is speeding up.
- it is slowing down.
- (not enough information).

b. If an object has a velocity of $+25\text{m/s}$ and an acceleration of $+5\text{m/s}^2$,

- it is speeding up.
- it is slowing down.
- (not enough information).

c. If an object has a velocity of -25m/s and an acceleration of $+5\text{m/s}^2$,

- it is speeding up.
- it is slowing down.
- (not enough information).

7. A number line could be drawn vertically as well as horizontally. In the vertical case, positive and negative displacements would involve moving up and down instead of left and right. With this in mind, what must be true of all objects with

a. positive acceleration? (Hint: consider what is happening to the *values* of velocity.)

The value of the object's velocity is increasing.

b. negative acceleration?

The value of the object's velocity is decreasing.

8. What does deceleration mean? Place a check (✓) in the blank of each description that is correct and an x in the blank of each description that is incorrect.

- negative acceleration
- decreasing values of velocity
- decreasing speed
- velocity approaching zero