

PHYZ SPRINGBOARD: INTRO TO MOMENTUM



AREA

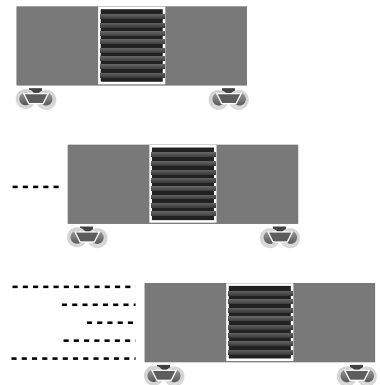
How can a rectangle with a small base have the same area as a rectangle with a large base? Answer and explain using words and diagrams.

MOMENTUM

1. Consider the following findings regarding momentum.

- a. The railroad car at rest has _____.
- b. The railroad car moving slowly has _____.
- c. The railroad car moving quickly has _____.

What might you conclude about momentum based on these findings?



2. Consider the following findings regarding momentum.

- a. The slow-moving fly has _____.
- b. The slow-moving railroad car has _____.

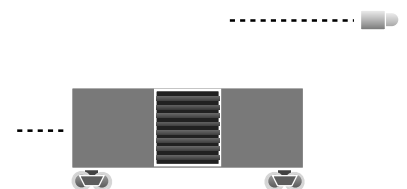
What might you conclude about momentum based on these findings?



3. Consider the following findings regarding momentum.

- a. The high-speed bullet has _____.
- b. The slow-moving railroad car has _____.

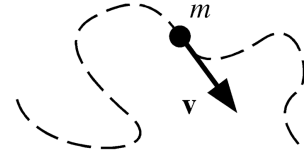
What might you conclude about momentum based on these findings?



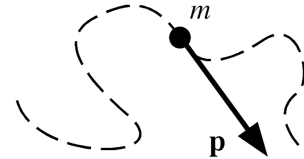
4. What are the units of measure for momentum?

5. Consider the following findings regarding momentum.

a. A snapshot is taken of a particle moving erratically. The path of the particle is illustrated with the dashed line. At the moment of the snapshot, the particle's instantaneous velocity vector is indicated by the arrow marked \mathbf{v} in the diagram.



b. The particle's momentum at the instant the snapshot was taken is indicated by the vector labelled \mathbf{p} in the diagram.



What might be concluded about momentum based on these findings?

6. Sample calculations.

a. If $m = 5 \text{ kg}$ and $v = 8 \text{ m/s}$, what is momentum p ?

$$p = mv = 5 \text{ kg} \cdot 8 \text{ m/s} = 40 \text{ kg}\cdot\text{m/s}$$

b. If $v = 4 \text{ m/s}$ and $m = 6 \text{ kg}$, what is momentum p ?

c. What is the momentum of a 0.02 kg bullet moving at 500 m/s ?

d. What is the momentum of a $10,000 \text{ kg}$ railroad car moving at 0.001 m/s ?

e. What is the speed of a 0.05 kg baseball moving with $2 \text{ kg}\cdot\text{m/s}$ of momentum?

f. What is the mass of a car moving at 20 m/s if its momentum is $30,000 \text{ kg}\cdot\text{m/s}$?