

Name:

### 1) Linear Momentum

A fireworks rocket is moving at a speed of 45.0 m/s. The rocket suddenly breaks into two pieces of equal mass, which fly off with velocities  $\mathbf{v}_1$  and  $\mathbf{v}_2$ , as shown in the fig. 1. What are the magnitudes of the velocities  $\mathbf{v}_1$  and  $\mathbf{v}_2$ ? [1.0 pt]

This is a verbatim copy of the problem 62, Chapter 7, Physics, by Cutnell & Johnson, 9th edition.

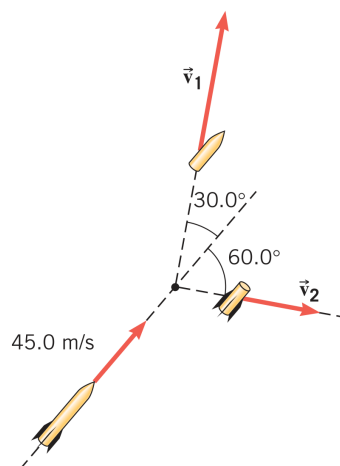


Figure 1: A rocket breaking to two equal mass parts.

### 2) Rotational Kinematics

You are riding a bike. At each time  $T = 5$  s you are doing a total turn with pedals. The gear in front has radius  $r_F = 15$  cm and the gear at the back has radius  $r_B = 5$  cm. The radius of the wheels are  $R = 30$  cm. There is no sliding involved. Find the velocity of the bike. [1.0 pt]

### 3) Rotational Dynamics

A person with mass  $m = 70$  kg is doing push-ups. Holding the position as shown in fig. 2, find the normal force exerted by the floor on each hand and each foot.  $l_1 = 0.41$  m and  $l_2 = 0.84$  m. [1.0 pt]

This is a copy of the problem 12, Chapter 9, Physics, by Cutnell & Johnson, 9th edition.

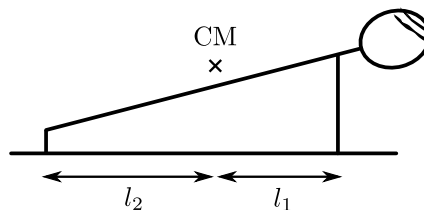


Figure 2: A person doing push-up.