

## Free Particle Model (Inertia and Interactions): Horse and Cart Problem



image from <http://sunwoodfjords.com/carts.htm>

**A horse is pulling on a cart, accelerating the cart forward.**

The cart and rider have a combined mass of 150 kg.

The horse has a mass of 440 kg.

The horse pulls on the cart with 75 newtons of force.

1. Draw and label a force diagram for the cart to the left of the picture and for the horse to the right of the picture. Add quantitative values for as many forces as possible.
2. What is a possible numerical value for how hard the cart pulls back on the horse? Explain why.
3. What is a possible numerical value for the forward force on the horse? Explain why.
4. What is a possible numerical value for the friction force on the cart? Explain why.
5. Explain how Newton's first and third laws are represented in your previous answers.