

Two-Car Collision Forces Key



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The crumple zone concept was developed in 1952 for Mercedes-Benz. It divided the car into 3 sections:

- a crumple zone in the front of the car
- a rigid non-deforming passenger compartment
- a crumple zone in the rear of the car

Prior to this, designers had believed that to be safe, all of these parts of the vehicle had to be rigid.

Examine the 2 screenshots above. The brown car was designed in 1959 and lacks a crumple zone. The silver car was designed in 2009 and has a crumple zone.

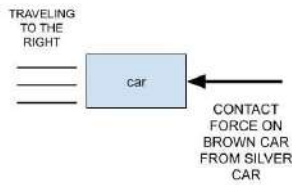
1. In the boxes below, draw a free-body diagram for each car that shows the net force(s) acting on the car during the collision.

Brown Car (1959)

Silver Car (2009)

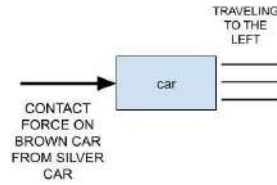
Sample below

(The force vector on this car should be similar in size/length to that of the other car.)



Sample below

(The force vector on this car should be similar in size/length to that of the other car.)



2. How do the magnitude and direction of the net force on the brown car compare to the net force on the silver car?

They are equal in magnitude but opposite in direction.

3. How can you represent that relationship in your 2 force diagrams? (If necessary, adjust your force diagrams to demonstrate the relationship.)

Their arrows should be equal in size but pointing in opposite directions.