Name _____ Date _____ Class _____

Read the material and follow the instructions. Then answer the questions that follow.

Excellence in Math

Brake Pedal Ratios

You have learned that the brake hydraulic system increases both pressure and braking force. However, there is another force multiplier—the brake pedal ratio. In the figures below, the brake pedal ratios are B to A or B/A. The brake pedal ratio is the ratio of the lengths of the lever arms on the pedal assembly. The brake pedal ratio for **Fig. A** is 3 to 1 or 9″ divided by 3″. The brake pedal ratio for **Fig. B** is 5 to 1 or 10″ divided by 2″.

The mechanical advantage supplied by the brake pedal assembly is determined by the brake pedal ratio. The ratio chosen depends on whether the brake system is equipped with a power booster. If a booster is present, the pedal assembly does not need to increase the force as much.

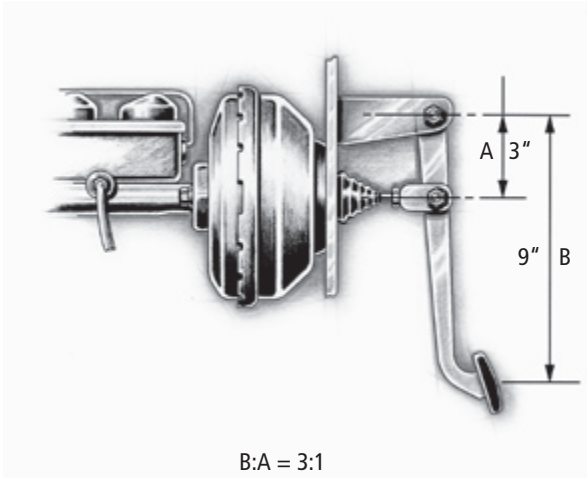
A driver applies a force of 50 lb [23 kg] to the unboosted brake pedal. **Fig. B**. The force on the master cylinder pushrod will be:

$$50 \text{ lb} \times 10''/2'' = 250 \text{ lb}$$

Apply It!

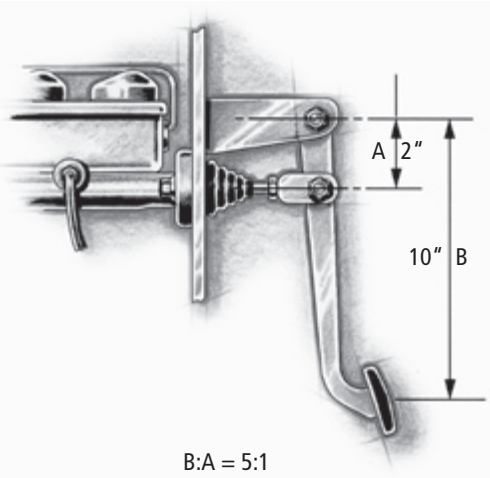
Meets NATEF Math and Science Standards for levers and ratios.

1. The driver applies the same 50 lb. of force to the pedal of the power brake system. **Fig. A.** What is the force on the master cylinder pushrod?
2. How much additional force must be provided by the booster to create the same brake input force as in the unboosted system?



B:A = 3:1

Fig. A Brake pedal ratio for a power assisted brake.



B:A = 5:1

Fig. B Brake pedal ratio for a brake without power assist.

1. Calculate the force exerted on the master cylinder pushrod by a driver exerting 75 lbs. of force on the brake pedal. Use a system similar to the one shown in Fig. B, with A = 1.5 in. and B = 9.0 in.

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2. Design a brake pedal system that would exert 360 lbs. of force on the master cylinder pushrod with 80 lbs. of force on the brake pedal. Determine the length of A and B in a system similar to Fig B.

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