

Internet. These may contain mistakes, or they may have been written by a younger student.

- Answers will vary. Intended audiences can be young children, pre-teens, teenagers, adults, or select groups of people (women, men, people who like dogs, etc.).
- Answers will vary.

Skill Sheet 5.1: Preparing a Bibliography

No student responses are required.

Skill Sheet 5.1: Mass, Weight, and Gravity

- Answers are:
 - 22 newtons
 - 8.1 newtons
 - 8.9 N/kg
- Answers are:
 - 65 kilograms
 - 640 newtons
 - 240 newtons
- Answers are:
 - 23.1 N/kg
 - 0.6 N/kg
 - 4.9 newtons
- Answers are:
 - 195,700 newtons
 - 19,970 kilograms
 - 146,800 newtons
 - weight of toy-filled boxes = 48,900 newtons.
mass of toy-filled boxes = 4,990. kg

Skill Sheet 5.1: Gravity Problems

Table 1 answers:

Planet	Force of gravity in Newtons (N)	Value compared to Earth's gravity
Mercury	3.7	0.38
Venus	8.9	0.91
Earth	9.8	1
Mars	3.7	0.38
Jupiter	23.1	2.36
Saturn	9.0	0.92
Uranus	8.7	0.89
Neptune	11.0	1.12
Pluto	0.6	0.06

- 9.5 pounds on Neptune
- 1,029 newtons on Saturn
- The baby weighs 44.1 Newtons on Earth which is equal to 9.8 pounds.
- Venus, Jupiter, Neptune, Pluto, then Saturn
- Answer:

$$\text{Gravity} = \left(\frac{6.67 \times 10^{-11} \text{ N} \cdot \text{m}^2}{\text{kg}^2} \right) \frac{(6.4 \times 10^{24})(5.7 \times 10^{26})}{(6.52 \times 10^{11})^2}$$

$$= 5.72 \times 10^{17} \text{ N}$$

Skill Sheet 5.1: Universal Gravitation

- $F = 9.34 \times 10^{-6} \text{ N}$. This is basically the force between you and your car when you are at the door.
- $5.28 \times 10^{-10} \text{ N}$
- 4.42 N
- 7.33×10^{22} kilograms
- Answers are:
 - 9.8 N/kg = 9.8 kg-m/sec²-kg = 9.8 m/sec²
 - Acceleration due to the force of gravity of Earth.
 - Earth's mass and radius.
- $1.99 \times 10^{20} \text{ N}$
- 4,848 N
- $3.52 \times 10^{22} \text{ N}$

Skill Sheet 5.2: Friction

- Answers are:
 - rolling friction
 - Sliding friction is generally greater than rolling friction, so it would probably take more force to transport the blocks in the sled.
 - The friction force would increase, because more blocks would mean more weight force squeezing the two surfaces together.
 - static friction
- Answers are:
 - viscous friction
 - The friction force would increase because the boat would sit lower in the water.
- Answers are:
 - rolling friction and air friction
 - rolling friction
- Answers are:
 - Student responses will vary. Encourage students to look for a sports car rather than a professional racing car. Racing car spoilers may serve a different purpose.
 - Sports car spoilers are generally designed to increase downforce on the rear of the car, causing greater friction between the rear tires and the road.
 - Spoilers on hybrid cars and sport utility vehicles are usually designed to create a smoother, less turbulent airflow over the rear of the vehicle. This reduces drag (air friction). Sports car spoilers are most often designed to increase rolling friction, not to decrease air friction. Spoilers on different types of cars serve different purposes.