

Simple Machines are Everywhere on the Farm!

TEACHER GUIDE (GRADE 5)

Grade 5 Curriculum Connections

Grade 5 Science - Forces and Simple Machines	
5-3-10	Identify and describe types of simple machines. Include: levers, wheel and axle, pulley, gear, inclined plane, screw, and wedge
5-3-06	Identify common devices and systems that incorporate pulleys and/or gears.
Science - Global Learning Outcomes	
B1	Describe scientific and technological developments, past and present, and appreciate their impact on individuals, societies, and the environment, both locally and globally.

Lesson Plan

MATERIALS:

- 1 printed Activity Worksheet for each student
- Answer Key

PRE-KNOWLEDGE:

- Students should have already been introduced to the different types of simple machines.

NEW KNOWLEDGE:

- Students will review and identify the 7 types of simple machines.
- Students will identify the simple machines found on modern farm machinery.
- Students will be introduced to the main types of farm machinery and their uses.
- Science and technology have increased the productivity of Canadian farmers so much that they currently produce enough food to feed us as well as people in over 200 countries throughout the world.

VIDEO RESOURCES:

Students can explore the latest tractor innovation and technology being used by farmers in these 2 videos:

- The CNH Industrial Autonomous Tractor Concept 2:27, <https://www.youtube.com/watch?v=ALmqer12oqM>
- Autonomous 8R Tractor | John Deere Precision Ag 3:35, <https://www.youtube.com/watch?v=QvFoRk4JsPc>



TEACHER BACKGROUND INFORMATION:

Using GPS and auto steer systems on farm equipment provides advantages for the farmer's health, the environment and the farm's profitability. Some of these advantages are:

- Overlap is reduced to almost zero when seeding, fertilizing and spraying.
 - This reduces the amount of fuel, seed, fertilizer, spray and equipment run time used while maintaining or increasing crop productivity. Lowering these input costs increases farm profitability.
 - Using fewer inputs helps protect the environment. Less fuel means fewer emissions. No overlap when fertilizing means there is no unused fertilizer to leach away into waterways.
- Reduces driver fatigue.
 - Using auto steer leaves farmers less fatigued. This in turn leads to fewer mistakes and accidents which improves safety on the farm. It also allows for better life balance between work and family time.

Scientific research and the application of new technologies have allowed farm productivity to increase in North America. Further innovation will be needed to produce enough food to feed an increasing world population.

- In 1960, 1 hectare of farm land produced enough to feed 2 people.
- In 1995, 1 hectare of farm land produced enough to feed 4 people.
- Due to the ever increasing world population, in 2025, 1 hectare will need to produce enough to feed 5 people.

(Source: video 'Agriculture is under Pressure', International Seed Federation, 2:49 minutes <http://www.youtube.com/watch?v=2jF2lsicD-C4&feature=related>)

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ANSWER KEY:

Page 1

Lever

Screw

Wedge

Wheel and Axle

Inclined Plane

Gear

Pulley

Page 2

Tractor Part	Simple Machine
1 - Used to steer the tractor.	Wheel and axle
2 - Used to shift gears.	Lever
3 - Ladder used to climb into the cab of the tractor.	Inclined plane
4 - Used to turn the belt to transfer power to the alternator and fan in the diesel engine of the tractor.	Pulley

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Air Drill Part	Simple Machine
5 - The disk's sharp edge cuts open the ground where the seed and fertilizer will be dropped.	Wedge
6 - This simple machine turns to pack the earth back over the seed.	Wheel and axle

Sprayer Part	Simple Machine
7 - Parts the crop so wheels don't damage it.	Wedge
8 - Part of the transmission that changes the sprayer into reverse, neutral, low, or high and different speeds.	Gear
9 - Moves the sprayer.	Wheel and axle

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Combine Part	Simple Machine
10 - Knife blades for cutting the plant.	Wedge
11 - Turns the header so it can gather and push the plants against the cutting blades.	Wheel and axle
12 - Turns to gather the swathed (cut) plants into the center so that they can move up into the combine.	Screw
13 - Turns to move the grain from the combine hopper to the waiting truck or grain cart.	Screw

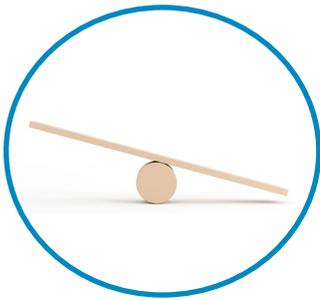
Simple Machines are Everywhere on the Farm!

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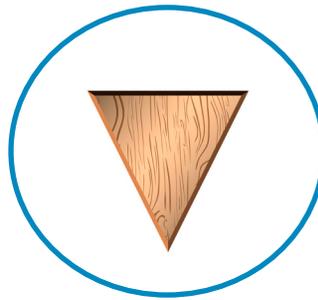
A. Below are pictures of different kinds of simple machines. Using this list, label each simple machine shown below.

Simple Machines

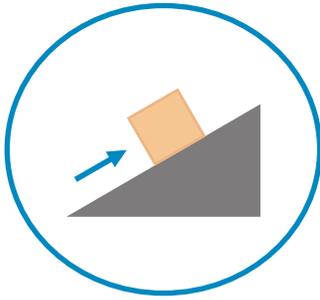
Wheel and Axle Wedge Pulley Screw Gear Inclined Plane Lever















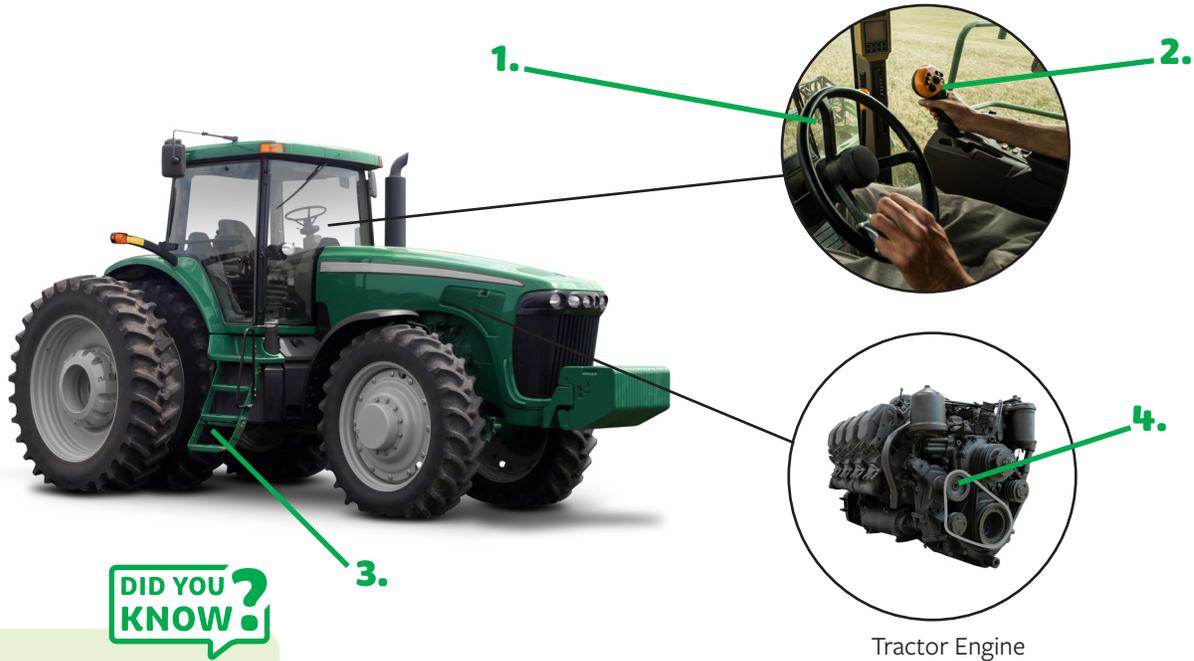
A **simple machine** helps us lift, lower, split, cut, divide, fasten and move!

A **compound machine** is a machine made up of 2 or more simple machines.

Farmers use many different types of both simple and compound machines to help them grow food on their farm.

B. Complete the charts by naming the simple machine that the arrow is pointing at on each of the farm machines below.

The most common farm machine is a **tractor**. The tractor is used to pull and power many other farm implements or machines used to seed, protect and harvest plants on cropping farms or make and put out feed for animals on livestock farms.



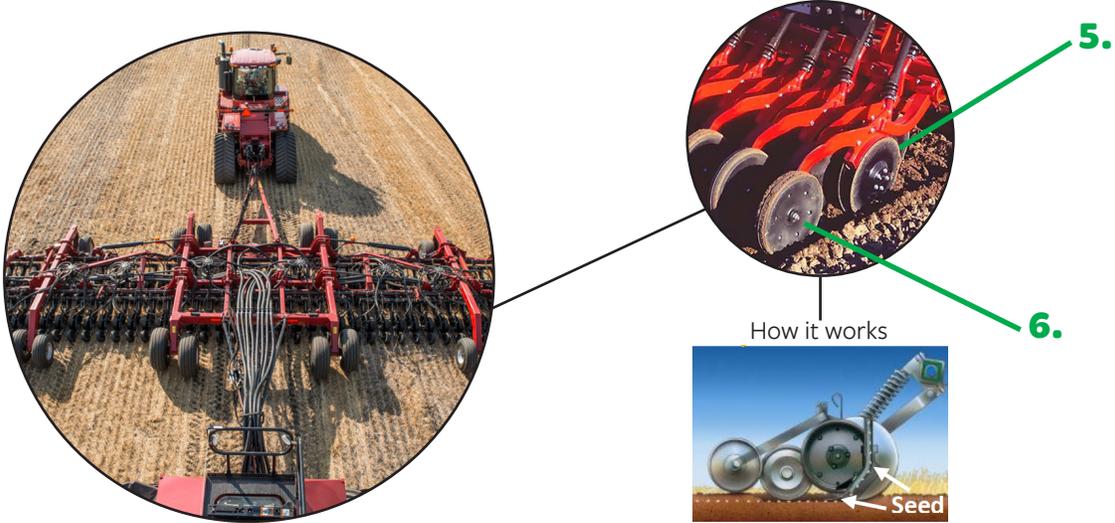
DID YOU KNOW?

Tractors with GPS systems and auto steer can steer themselves!

Tractor Engine

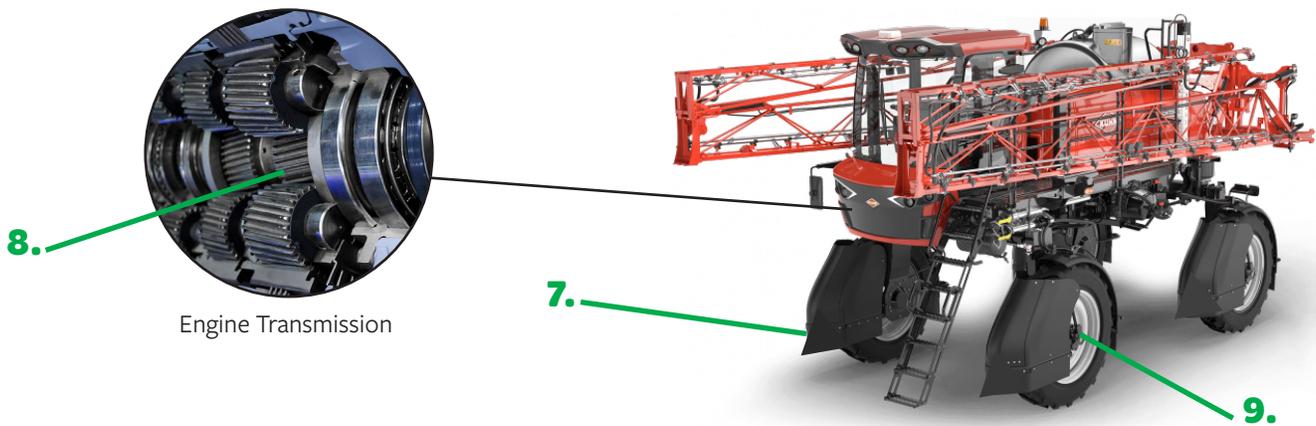
Tractor Part	Simple Machine
1 - Used to steer the tractor.	
2 - Used to shift gears.	
3 - Ladder used to climb into the cab of the tractor.	
4 - Used to turn the belt to transfer power to the alternator and fan in the diesel engine of the tractor.	

In the spring, the farmer can use an **air drill**, like the one pictured below, to plant crops like wheat, canola, barley, oats, corn, lentils and soybeans. The farmer needs to set the machine differently for each type of seed. Fertilizer is also placed close to the seed so it will have nutrients to help it grow. Seeding and fertilizing at the same time reduces the amount of fuel a farmer uses which is good for the environment.



Air Drill Part	Simple Machine
5 - The disk's sharp edge cuts open the ground where the seed and fertilizer will be dropped.	
6 - This simple machine turns to pack the earth back over the seed.	

A **sprayer** is used in the summer to protect crops from diseases or pests and keep the crops healthy and growing.



Sprayer Part	Simple Machine
7 - Parts the crop so wheels don't damage it.	
8 - Part of the transmission that changes the sprayer into reverse, neutral, low or high and different speeds.	
9 - Moves the sprayer.	

During autumn, when crops such as wheat, canola, oats, barley, corn or sunflowers are ripe and ready to be harvested the farmer uses a **combine** to separate the grain or seed, which we use for food, from the rest of the plant. The combine keeps the grain and kicks the rest of the plant, called straw, out of the back of the combine. The straw can be baled to use for bedding to keep livestock, like cows and sheep, warm and dry in the winter or it can be chopped and put back on the field to decay and fertilize the soil.

DID YOU KNOW?

A combine can harvest enough wheat in 9 seconds to make 70 loaves of bread!



Combine Part	Simple Machine
10 - Knife blades for cutting the plant.	
11 - Turns the header so it can gather and push the plants against the cutting blades.	
12 - Turns to gather the swathed (cut) plants into the center so that they can move up into the combine.	
13 - Turns to move the grain from the combine hopper to the waiting truck or grain cart.	

Scientific research and technological inventions over the years have given the Canadian farmer the tools, like these farm machines, to grow greater and greater amounts of good quality food on less land. In fact, only 20% of the food grown by farmers in Canada today is needed to feed Canadians. The other 80% of the food is exported and sent to over 200 countries in the world. Canadian farmers are very proud that they not only feed you but many of the people in the world too!