Set Your Course

Nº. 37

SENIOR

Geography

LESSON SUMMARY

Students will learn about orienteering using a map and compass, and why it is still a valuable skill in today's digital world.

FORESTS ONTARIO

Focus on Forests

Cabela's OUTDOOR FUND

Activity Information

Grade Level: 9

Estimated Duration: 2 classes

Materials:

Day 1

- Class set of compasses (1 for every 2 students if possible)
- Gathering Bearings hand-out (1 per compass)

Day 2

- Class set of compasses (1 for every 2 students if possible)
- 1 map of the schoolyard per student group
- 1 Forestry Fact per student group
- Coloured yarn
- Red Pens
- Clipboards
- Rulers, protractors
- Pylons, bean bags, or other marker to indicate a stop

Setting: Indoors, outdoors

Key Vocabulary: Orienteering, compass bearing, forestry, forest management plan, point of interest

Learning Goals: By the end of the lesson students will be able to:

- Take bearings and navigate using a compass
- Understand the importance of using and developing maps in forestry

Curriculum Connections:

A2.1 describe ways in which geographic investigation can help them develop skills, including spatial technology skills and the essential skills in the Ontario Skills Passport (i.e. using maps, measurement and calculation), that can be transferred to the world of work and to everyday life.

C1.1 describe strategies that industries and governments have implemented to increase the sustainability of Canada's natural resources (i.e. sustainable forest management, forest certification systems).

Teacher Background

In a world rich with mapping technologies and Geographic Information Systems (GIS), using a map and compass is still a relevant skill. By learning how to navigate without digital assistance, students can develop a greater sense of spatial awareness and gain a better understanding of how two-dimensional maps relate to the three-dimensional world.

What is orienteering and why is it relevant?

Orienteering is an activity in which participants use a map and compass to navigate between checkpoints along an unknown route. It is commonly practiced as a sport where competitors race to find checkpoints and fill a punch card to complete the course. While basic compared to some modern technologies and navigational equipment, compasses are still a practical tool that are handy to anyone travelling on foot.

All compasses contain a permanently magnetized needle that is free to pivot around a fixed point, spinning in the horizontal plane. The Earth's magnetic field causes the needle to rotate until it aligns itself in the direction of the magnetic field and points to magnetic north, which is roughly approximate to true north in most locations.

Mapping in forestry

Forestry is an industry that is focused on the use of forests as a renewable resource. Most forestry operations in Ontario take place on publicly owned Crown forests that are protected under law by the Ministry of Natural Resources and Forestry (MNRF). The Crown Forest Sustainability Act and the Environmental Assessment Act work together to provide the legislative framework for forest management on Crown lands in our province.

Before any logging operations can start in a management unit, a forest management plan must be developed to ensure that the land is used sustainably and that there is a balance of social, economic, and environmental values. These plans which typically cover a 10-year period, are prepared over the span of about 2.5 years by a Registered Professional Forester (RPF) and include input from Indigenous communities, stakeholders, and the general public. These plans must answer important questions, such as where and how much harvesting can occur, how much of the forest must be replanted, and what habitats or features of the forest must remain intact to maintain biodiversity and ecosystem health.

Maps are a key component to any forest management plan. They ensure that all involved parties understand the location and scale of operations. In fact, many aspects of forestry rely upon maps and map-making – and not just from satellite images! Forest inventories, for example, are performed by professionals and are designed to collect qualitative and quantitative information about forests and forest ecosystems in a specific area. This information can include the locations of cavity trees (where many different types of animals may have established homes) and mast trees (which produce seeds and fruit vital to animal diets), determine

canopy cover, and locate specialized habitats or species at risk whose habitats much be protected under the Endangered Species Act. The collected data is then used to develop forest management plans that are designed to protect and preserve wildlife while allowing for forest operations to take place.

Forest surveying frequently relies on data that has been collected and mapped using GIS; however, the professionals undertaking the surveys must ensure that they know their bearings and have a general awareness of their location when reporting such data. Surveying can be conducted in remote locations where satellite or phone signal is poor. Sometimes, a map and compass are the only way to go!

Careers that involve being out in the field, such as many in the forestry and natural resource management sectors, require some knowledge on how to navigate in remote locations. Compasses are easy to use, light to carry, and relatively cheap. Understanding how best to use this tool is an important skill to have if you ever plan on going into the woods, even if you have a handheld device that can show you your exact position on a map. With a compass in hand, anyone can gain a new sense of awareness of their surroundings and reduce their chances of getting lost.

Teacher Preparation

Day 1 Prep: In this activity, students will rotate between a set of locations and determine the bearings or direction of the other marked locations. Either in the classroom or outside, lay out markers as shown in Figure 1. *Optional:* make your own classroom map and mark out key classroom features (e.g. the door, the teacher's desk, a stapler on a student desk).

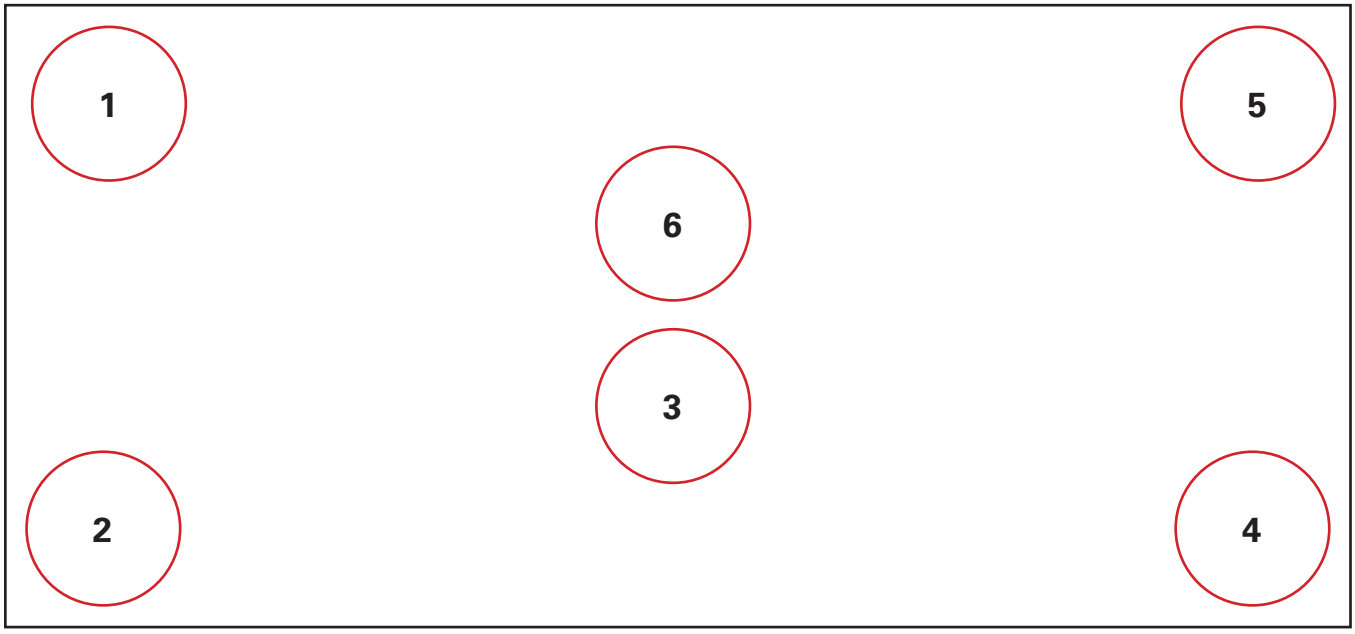

Figure 1: A sample diagram showing the locations where students are to take bearings from in a classroom or outside space. Can be adjusted to suit your classroom's needs.

Day 2 Prep: In this activity, teams of students will be labelling a map of the schoolyard, designing their own orienteering route, and using a compass and a map from another team to find a Forestry Fact.

Using either Google Maps (on 'map view') or the Government of Ontario Topographical Map website, make a map of your schoolyard with a visible scale and a set of lines pointing north. This can be done by printing a single map, drawing a series of straight lines with arrows, and then copying that map. Tip: Google Maps should automatically put the top of your screen as true north.

Print out the last page of this lesson plan and cut out each 'Forestry Fact'. Each team will receive a unique fact to mark their end point to differentiate it from others.

Consider what restrictions you may want to put on your students' map-making endeavors. Examples include, 'no routes longer than 50 m,' 'cannot go within 5 meters of soccer field', and 'the end marker has to be out of sight from the starting point.' There may be limitations on how the students can use the outdoor space at the school that should be considered as part of the rules.

Students should mark each stop along their route with a pylon, stake with coloured yarn, a bean bag, or some other indicator to other teams that they are on the right path. The end of each could should be marked with a Forestry Fact tied to a tree (if possible) or attached to a marker.

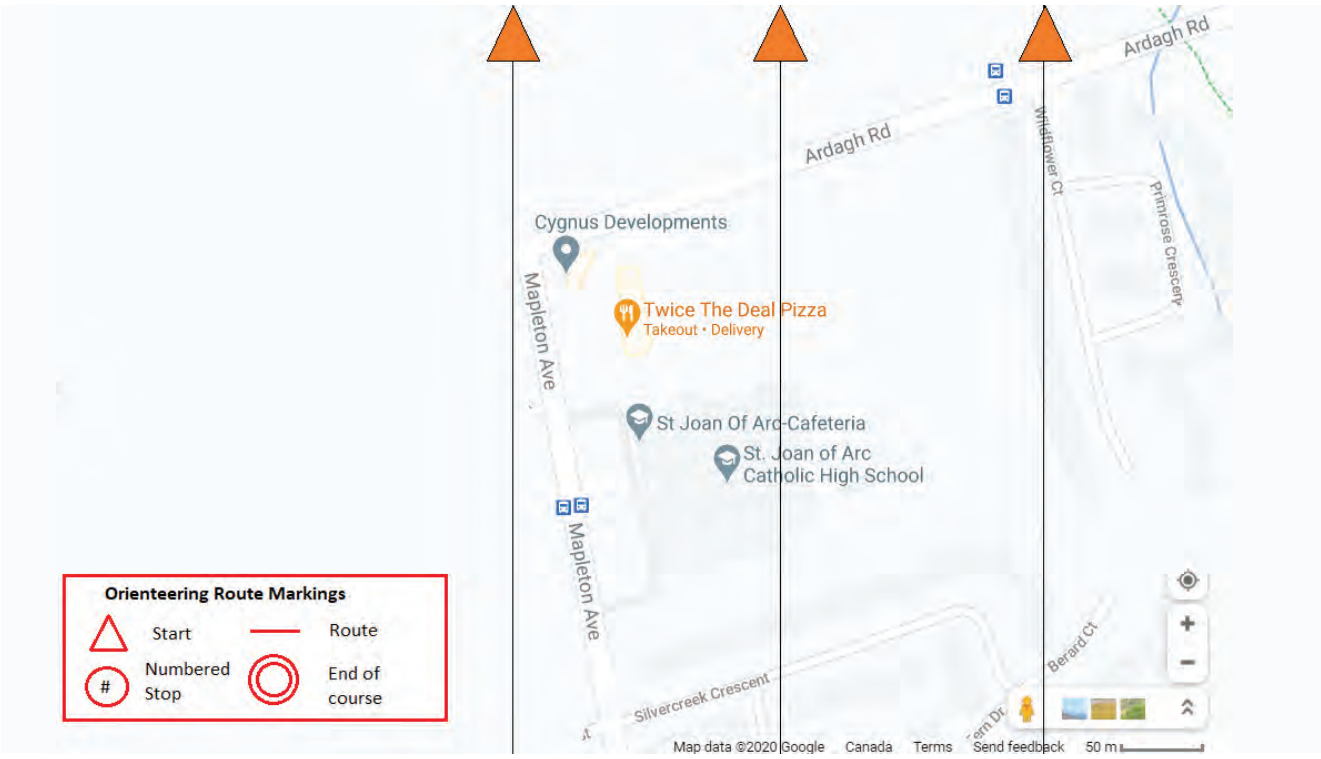

Figure 2: A sample map to give to students, cut and paste from Google Maps into Microsoft Paint. Lines and arrows indicate true north in relation to the map, while the route markings key shows students the symbols they should draw on their maps to denote their orienteering course to direct the other team to their Forestry Fact. Space has been left for the students to add their own key and title.

Day 1 – Getting your bearings

Step 1: Discuss the following as a class or in small groups:

- What are compasses used for?
- Why are compasses important?
- What do compass readings mean?
- When is a compass useful?

Step 2: Review how to use a compass. Give a compass to each student or each group of students.

1) Point the direction of travel arrow at the feature you wish to get the bearings of. Keeping the compass level, rotate the compass housing until the orientating arrow and the magnetic needle are in-line.

2) Read off the magnetic bearing from the index line, located under the direction of travel indicator. This is the angle of the feature you are looking at compared to magnetic north.

3) To convert the measurement from magnetic north to true north or grid north, calculate the magnetic declination (the difference between magnetic north and true north) by using an online magnetic declination calculator (e.g. NOAA Mobile Declination).

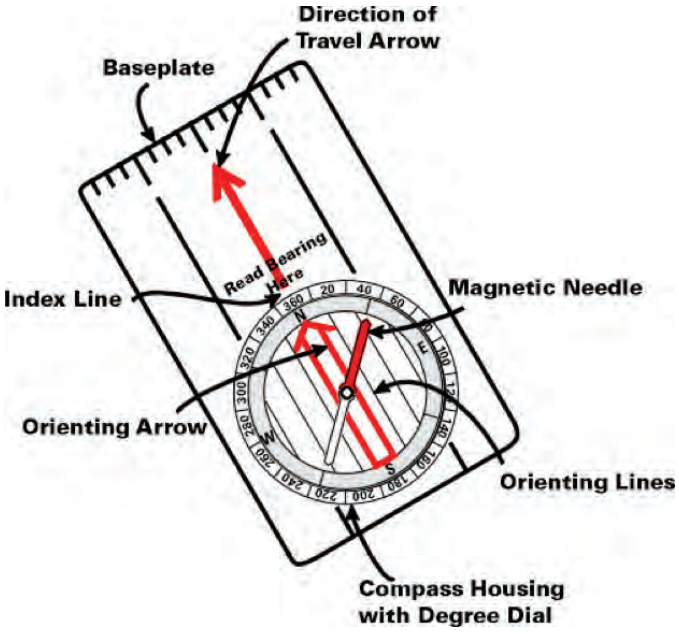

Figure 3: A diagram showing the components of a standard baseplate compass.

Ask students to determine the bearing of the blackboard, a specific window, or some other points of interest in the classroom as a test run.

Step 3: Gathering Bearings

Give each group of students the following chart as a hand-out and assign them a starting station (as per the diagram in the teacher prep section). Students must mark the magnetic bearing from their station to the other five points of interest (i.e. if at point 1, fill out the row indicating the bearings of points 2-6).

Once all the students have gathered the bearings for the other points of interest, have them rotate to the next station. Repeat this process until everyone has filled out their charts.

Magnetic Bearings to Other Locations

Station Number	1	2	3	4	5	6
1						
2						
3						
4						
5						
6						

Step 4: Discussion

Compare the results from each team to make a class data set. Discuss the following:

- Why is finding your bearings important?
- What landmarks in a forest would be a good point of interest?
- What landmarks in a forest would be a bad point of interest?

Day 2 – Map making and orienteering

Step 1: Discussion

As a group, ask students the following,

- What can a small-scale map show that a larger one cannot?
- What features would be important to mark on a small-scale map?
- How would you use a small-scale map?

Step 2: Building teams

Split students into teams with 3-5 students each.

Give each team a satellite image of the schoolyard, a clipboard, ruler and protractor.

Send students outside with their materials. Ask them to survey the schoolyard and mark out key features (e.g. large trees, portables, running track, nets) and devise a simple key to indicate those features on their map. NOTE: nothing on their map should be marked in red. That colour is reserved for their course (Step 3).

Step 3: Setting the course

Give all teams their own red pen, colourful yarn, and a unique Forestry Fact.

Teams should design their own orienteering course using this map and pen, starting from a common location with the rest of the class (e.g. the front of the school, gym doors, a specific tree) and hitting five stops before reaching an end-point decided by the team.

Each numbered stop should be marked on the landscape to indicate the correct route. At the end point, the teams must tie their Forestry Fact to a tree or attach it to some other marker.

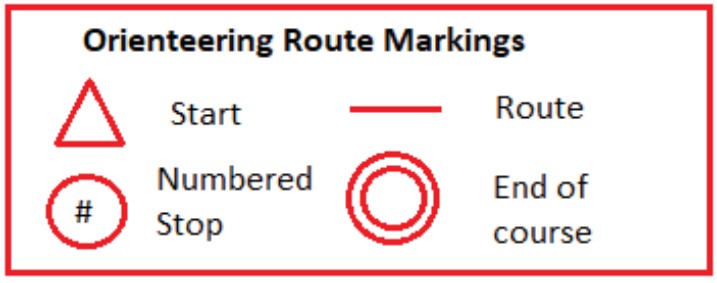

Figure 4: A key to common symbols used to map orienteering routes. These markings are made in either red or purple to stand out from other features on the map.

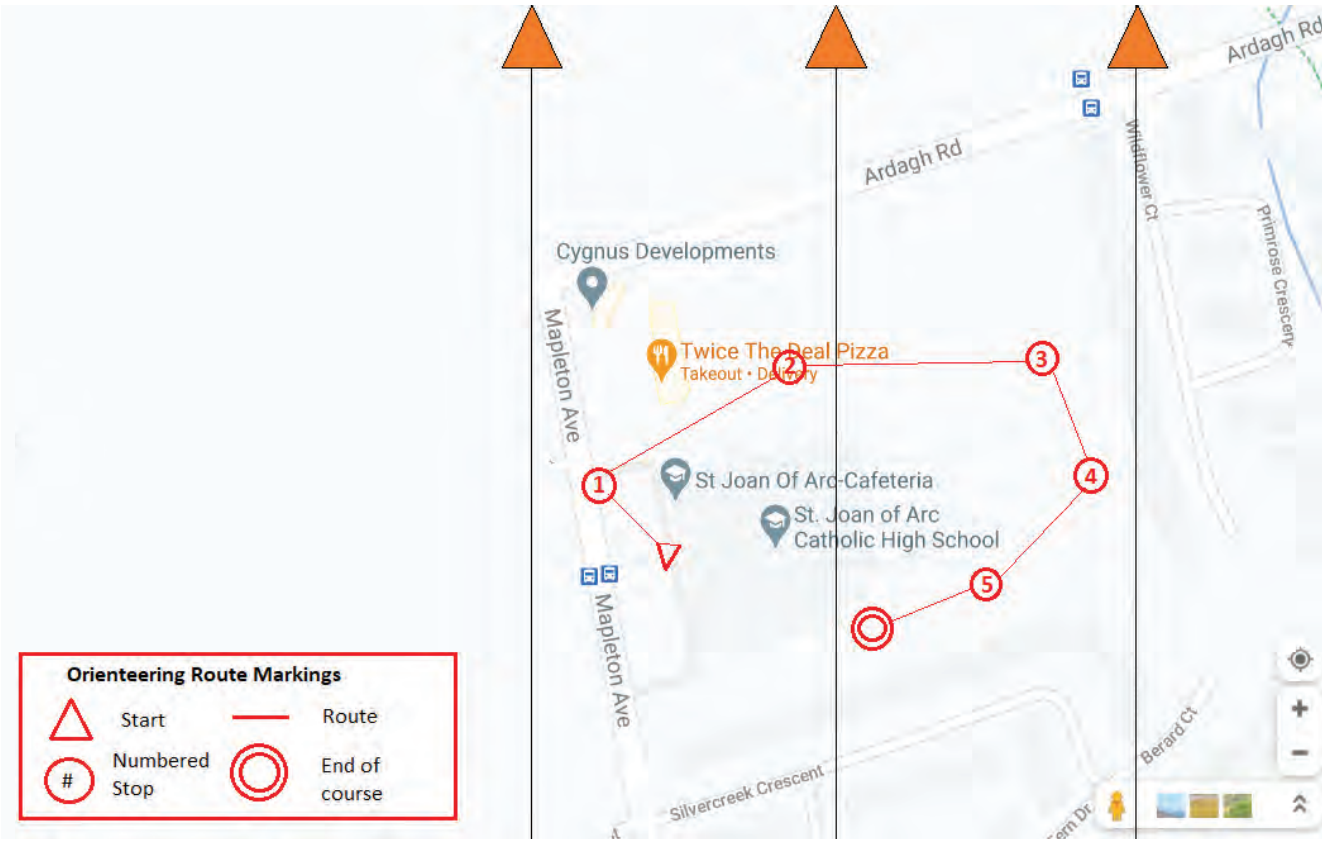

Figure 5: A sample map with a school yard, orienteering lines, a key to the route, and a route with five points before the end.

Step 4: Swap maps

Meeting back at the starting point, have students swap maps with another team. With new maps at hand, teams must use their compasses and new maps to follow the route and reach the end point. At each numbered stop, teams should determine the direction of the next point and write it down along the route.

Upon retrieving the Forestry Fact, students are to return to the starting point. To confirm that they found the correct end marker, students must share the fact that they collected.

Step 5: Discussion

Outside or in the classroom, discuss:

- What was easy?
- What was difficult?
- Maps often have topographical features marked on them; how would you use these topographical features to determine your location when in the woods?
- You are familiar with your schoolyard. Would you feel confident following a similar map in a familiar forest? An unfamiliar forest?
- Show students the video "#ItTakesAForest... to sustain life" found on the Forests Ontario YouTube channel. If you were to map/survey a forest, what would you include?
    - Cavity trees (also known as snags, or dead standing trees)
    - Mast trees (trees that produce seeds and fruit for wildlife)
    - Water (lakes, rivers, creeks, ponds, marshland)
    - Areas with little to no canopy cover (forest fires, insect infestations, etc.)
- Ontario's Crown forests are required to have a forest management plan before any logging operations can begin. What do you think is involved in a forest management plan?
    - Maps/a survey
    - Communication with stakeholders and local Indigenous communities
    - How much harvesting can occur on a site?
    - Anything else?

References

https://files.ontario.ca/the_future_of_our_forests_eng_website.pdf

https://www.ontario.ca/page/forest-management-policies

https://www.ontario.ca/page/forest-management-guides

https://www.ontario.ca/laws/statute/94c25

https://www.geomag.nrcan.gc.ca/mag_fld/compass-en.php

https://www.geomag.nrcan.gc.ca/mag_fld/magdec-en.php

Forestry Facts (end of course markers):

About 90% of the forests in Ontario are located on Crown land and are publicly owned.
A 10-year Forest Management Plan takes about 2.5 years to develop. Sound science and extensive public consultation is a key part of this process.
1 in 100 Ontarians are employed by the forest sector.
Ontario's Crown Forest Sustainability Act ensures all forest values are considered during planning and operations.
Forests bordering bodies of water, regardless of size, are important habitats for terrestrial and aquatic animals. As such, they are generally well protected by the law
Healthy forests and their roots keep water clean.
A key component of sustainable forest management is maintaining special habitat features such as cavity trees, supercanopy trees, and mast trees that produce fruit and nuts for animals to eat.
Some coniferous trees are retained by forest managers in hardwood forests to support biodiversity in a managed landscape.
Sustainable forest management practices emulate natural disturbances, such as forest fires and insect infestations.
Ontario has over 71 million hectares of forest, estimated to contain over 87 billion trees.