

Gopher Science Olympiad Invitational – Road Scholar 2018 Answer Key; 60 points total

MN State Highway map (15 points)

What is the scale of this map?

1/16 inch = 1 mile (1 point for number, 1 point for units)

Your team is starting in Minneapolis. What grid location is Minneapolis in?

J16 or J17 (1 point), hard to say which one

What is the main interstate to drive up to Duluth?

35 or 35W or 35E (1 point), all are acceptable

Along this interstate, how many full rest stops will you pass?

5 (1 point)

What is the minimum number of counties your team will set foot in when travelling between Minneapolis and Duluth? You may take any route possible but must stay on roads shown on the map.

6 (1 point); Hennepin, Anoka, Chisago, Pine, Carlton, St. Louis

What county is Duluth located in?

St. Louis (1 point)

What is the distance from Minneapolis to Duluth, computed via trunk highways?

155 miles (1 point) – see chart at top of map

What is the approximate population of Duluth?

50,000 and over (1 point)

Your team wants to stop at St. Cloud on the way to visit their famous Munsinger Gardens. How much added distance will this detour add, as the crow flies, if your team first drives to St. Cloud then to Duluth?

214 miles total, adds 59 miles (1 point) – see chart at top of map

In addition to St. Cloud, your team wants to visit the Northwest Co. Fur Post, a State Historic Site. What major city is nearest to this site?

Pine City (1 point)

Another option when driving to Duluth is to take state highway 23, marked as a scenic byway. Which city does state highway 23 originate?

Sandstone (1 point)

For some reason, some teammates want to drive through Wisconsin and take the minimum number of highways possible. Therefore, you should take MN State Highway 36 east to Wisconsin, followed by which Wisconsin State Highway all the way to Duluth?

35 (1 point)

After the tournament, your team wants to explore the parks in northern Minnesota. After much debate, the team decided to visit Lutsen, MN, home of the Superior National Forest and various other mountains, along the shoreline of Lake Superior.

Which state highway should you drive along from Duluth to arrive at Lutsen (P7)? How far away are the two cities in miles?

61 (1 point), ~90 miles (1 point)

Lutsen Maps (20 points)

What county is Lutsen located in?

Cook County (1 point)

What arc length area of latitude and longitude does this map cover?

7.5' (1 point) x 7.5' (1 point)

What are the grid and magnetic declinations for this area? Include direction (clockwise/counter-clockwise)

Grid: 1° 43' (1 point) clockwise (1 point)

Magnetic: 2° 18' (1 point) counterclockwise (1 point)

What is the name of the quadrangle directly west of the Lutsen quadrangle?

Honeymoon Mountain (1 point)

What is the contour interval?

10 feet (1 point)

What coordinate system does the yellow grid and corresponding axis numbers belong to?

Universal Transverse Mercator (UTM) (1 point)

What coordinate system does the red grid belong to?

Public Land Survey System (PLSS) (1 point)

What lake is located at PLSS NW $\frac{1}{4}$ SE 8 T60N R3W?

Barker Lake (1 point)

What mountain is located at UTM 15T 670000m E 5280000m N?

Moose Mountain (1 point)

Driving along Highway 61, how far away is Ski Hill Road from Massie Road in miles?

2.4 miles (1 point)

How long is the North Shore State Trail as shown on the map as the crow flies, in miles?

4.5 miles (1 point)

What is the maximum elevation of White Sky Rock?

1620 feet (1 point)

What is the stream gradient of Mistletoe Creek, starting at Halls Pond and ending at Tait River, in feet per 1000 feet? (Find the total change in elevation then divide by the total distance the creek travels)

Change in elevation: 160 feet (1 point), Distance travelled: 3.5 miles = 18,480 feet = 18.48 thousand feet (1 point)

Gradient is 8.658 ft / 1000 ft (1 point)

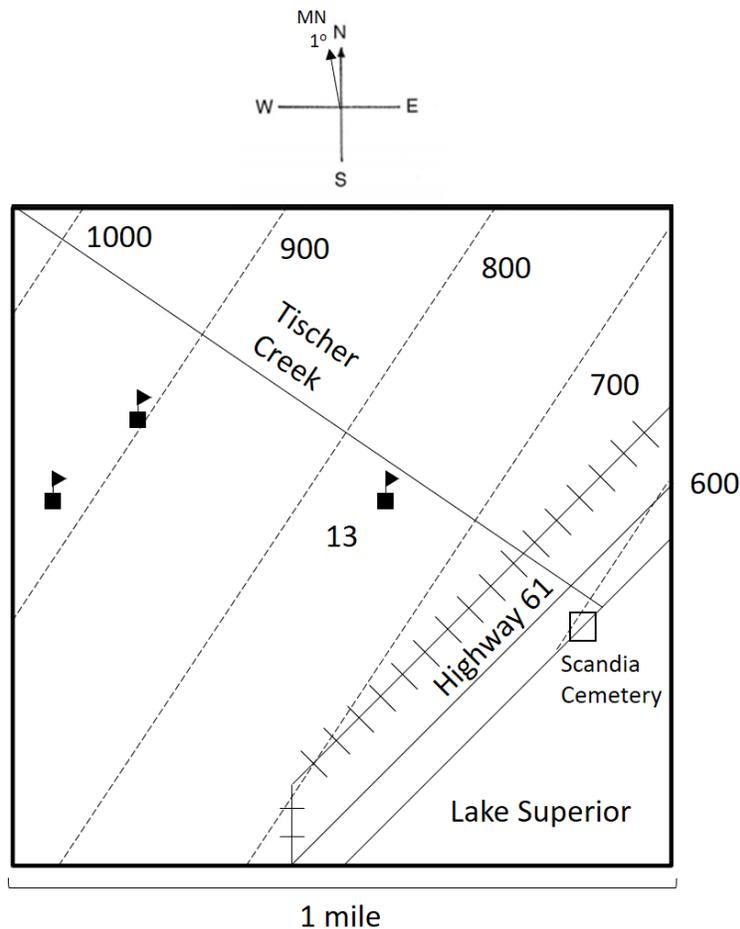
What approximate direction does Tait River flow?

Southeast (1 point)

Map Drawing – 25 points

The square below represents one square mile of area, representing section 13 of a new map of Duluth. Please draw the features below:

1. The shoreline is a straight line connecting the midpoints on the east and south sides. Label Lake Superior on the southeast side.
2. Highway 61 is parallel to the shoreline and starts 0.1 miles west of the shoreline. Label the highway.
3. A railroad starts at the same position as highway 61 on the southern border. The first section is 0.1-mile long and north-bearing, then is parallel to highway 61.
4. Tischer Creek starts at the northwest corner of the section and flows in a straight line at a 125° azimuth and ends at Lake Superior. Label the creek.
5. The bed of Tischer Creek starts at 1000 feet of elevation and decreases linearly until 600 feet at the Lake Superior shoreline. The contours are perpendicular to the creek. Use dashed lines and a contour interval of 100 feet, and label all contours.
6. The Scandia Cemetery is on the southern bank of the creek, located where the creek intersects with the shoreline. Mark with the appropriate symbol and include a label.
7. There are three schools in this section, mark with the appropriate symbol: SW ¼ SW ¼ NW ¼, NE ¼ SW ¼ NW ¼, and SW ¼, SW ¼, NE ¼
8. Label the scale, section, and add a magnetic declination of 1° counterclockwise.



1. The shoreline is a straight line connecting the midpoints on the east and south sides. Label Lake Superior on the southeast side.
2 points; 1 point for shoreline in correct place, 1 point for Lake Superior label
2. Highway 61 is parallel to the shoreline and starts 0.1 miles west of the shoreline. Label the highway.
3 points; 1 point for correct position, 1 point for highway 61 parallel to shoreline, 1 point for label
3. A railroad starts at the same position as highway 61 on the southern border. The first section is 0.1-mile long and north-bearing, then is parallel to highway 61.
3 points; 1 point for two sections of railroad total, 1 point for correct shape, 1 point for correct railroad indication (perpendicular hash)
4. Tischer Creek starts at the northwest corner of the section and flows in a straight line at a 125° azimuth and ends at Lake Superior. Label the creek.
2 points; 1 point for correct angle, 1 point for label
5. The bed of Tischer Creek starts at 1000 feet of elevation and decreases linearly until 600 feet at the Lake Superior shoreline. The contours are perpendicular to the creek. Use dashed lines and a contour interval of 100 feet, and label all contours.
4 points; 1 point for 5 contours total, 1 point for correct contour labels, 1 point for dashed contour lines, 1 point for contours perpendicular to creek
6. The Scandia Cemetery is on the southern bank of the creek, located where the creek intersects with the shoreline. Mark with the appropriate symbol and include a label.
3 points; 1 point for correct location, 1 point for correct symbol, 1 point for label
7. There are three schools in this section, mark with the appropriate symbol: SW $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$, NE $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$, and SW $\frac{1}{4}$, SW $\frac{1}{4}$, NE $\frac{1}{4}$
4 points; 1 point for correct symbol, 1 point for each correct location x3
8. Label the scale, section, and add a magnetic declination of 1° counterclockwise.
4 points; 1 point for scale (either as shown above or $\frac{1}{4}$ mile = 1 inch), 1 point for section 13 label in the middle, 1 point for 1° in correct direction, 1 point for MN label