

Science Olympiad - Road Scholar

The Last Season

The sequel to "Between Two Seasons"

A Homemade Road Scholar Practice Packet

Number of Questions: 126

Test Version: 4 (Last Edit February 22, 2020)

**Please note that this test version lacks a complete answer key.

**Author's Note: This test is best worked on over multiple sessions.

Maps Required:

- Nevada / Utah AAA Highway Map
- Creve Coeur 7.5 minute Topographic Map
- Clayton 7.5 minute Topographic Map
- Zion National Park Map
- Bryce Canyon National Park Map

Topographic maps are available for download online from USGS or the uploaded files accompanying this test. You may also use your own copy of the Zion and Bryce Canyon National Park maps, if you still have them from past visits!

Due to its availability online on the scioly.org test archive, this test and its questions should not be used or reused in any form of official competition.

This test is property of Ladue Middle School Science Olympiad, Division B Road Scholar.

Good luck, and most importantly: learn something and have fun!

Names: _____

Score: _____ / 375

The Last Season

Road Scholar Practice Packet

Carson heard a doorbell ring. Surprised, he got up to answer it. When he opened the door, he found his good friend Francis coming in for a visit. "Welcome! Come in!" yelled Carson.

"I planned another trip," said Francis. "I realized you didn't get to see what fall season was like, so I wanted to take you to a couple of places."

"Seriously? Haven't I seen enough? Can't I work in peace now?"

"You haven't seen everything. Fall is much more beautiful in the places I'm taking you to."

Carson recalled his strong desire to find out what the seasons looked like just 6 months ago, when he went with Francis to see St. Louis's flowering spring, New Jersey's warm beaches, and Colorado's snowy ski resorts. He could sense that feeling once again; he had not seen autumn's warm colors in such a long time.

"Sure... I'll go..." Carson packed his suitcases, his conscience eager but his mind reluctant, and hopped into Francis's car. "You sure you don't want to take a St. Louis topographic map?" "I couldn't find a new one; I'll just take a couple of relatively newer ones that I have." And so they went off, with Carson holding two topographic maps in his hand: Creve Coeur and Clayton.

Francis talked about the places they were going to explore. "First off, I put the maps and guides of these two places right here. I'm sure you'll enjoy them." Carson looked down to where Francis pointed, where he saw a Zion National Park guide and a Bryce Canyon National Park guide.

"Don't tell me we're going hiking. I'm not ready for this." said Carson.

"Oh, sure you are! Neither parks have trails that are *that* difficult. Let's go!"

"Fine, but are we taking airplane or are we taking a road trip? I almost got carsick on that last trip."

"There's not that many curvy roads on this trip. We're taking airplane, but I booked Frontier Airlines this time. They've got a flight to Las Vegas for \$60."

"Las Vegas??? Isn't that far away from Zion and Bryce Canyon?"

"Carson, I needed a cheap flight."

"Sure then..."

The conversation ended and the ride to St. Louis airport commenced, and Carson gazed at his Creve Coeur map.

1. "There's quite a lot of construction going on in this map, Francis." What letters are shown next to the roads that are under construction? One of them is in sector 8.

2. "Yep. There's been tons of improvements to the county area, if you paid attention last time. Highways are constantly being assigned and removed, too." The now-defunct MO-140 used to run in conjunction with what highway?

3. "My friend also lives around here. His kid just finished high school at Ladue."
 - a. Find the latitude and longitude of the southwesternmost point of the Ladue Horton Watkins High School building.

 - b. What class of building is this? What does this mean?

4. At the time of the map's photorevision, the Great Flood of 1993 was occurring. To predict the extent of the flood, Carson made a profile along the dashed orange line extending from the Missouri River to the road in Sector 1. Construct this profile.

5. "Really, Carson? Why do you like profiles so much? I never could figure it out." exclaimed Francis, as they entered the quadrangle from the south neat line driving North. What is the value of this southern neat line?

6. What do those ticks next to the corners of the quadrangle represent?

7. "Oh, look. Two of the big hospitals in the area," observed Carson, as they passed underneath I-64. What is the PLSS of the campus of St. John's Hospital?

8. As the duo drove along, Carson noticed that they passed through a strangely short Township border line. How long is this line, in feet?

a. Calculate the UTM of the west endpoint of this line.

9. Carson gazed at the map with a puzzled expression as Francis approached the I-270 / MO-364 / MO-D interchange. "What?", Francis asked. "This map is really old... there was no 364 back then!" How long does the heavy-duty highway forming MO-D extend west past I-270 until it becomes a light-duty road, in feet?

10. Before long, the duo reached I-70. They turned East onto the highway towards St. Louis Lambert Airport. This highway is also known as what?

11. Carson and Francis drove over Natural Bridge Rd and Lindbergh Blvd. Then, they passed over Coldwater Creek. What is the number of bridges, shown on this map, that pass over Coldwater Creek?

a. Calculate the stream gradient of the entire segment of Coldwater Creek mapped on the Creve Coeur quadrangle.

12. Carson then grabbed the Clayton Quadrangle as they entered it. "Oh... so much orange on this map!" Only what kind of buildings are shown in these orange areas?
13. Carson recalled when he once went to the city's Washington University to study with a topography professor. On its Danforth Campus in sector 8, there is only one flag symbol displayed on the map to represent the school. What is the latitude and longitude of the center of this flag symbol?
14. After the two arrived at the airport and checked into Frontier Airlines for their flight to Las Vegas, they sat down at the gate and Carson unfolded the Zion National Park guide. What plateau is located on the North side of this park?
15. The intercom turned on and announced: "At this time, we will start boarding for the flight to Las Vegas." "Carson, hurry up!" Francis urged. "Wait! Let me do this stream gradient first." If he uses the Zion park map's elevations and scale to calculate the stream gradient from Blue Springs Reservoir to the town of Virgin, what value does Carson obtain? Assume that when the stream passes Virgin, it is at the elevation listed next to the city.
16. When the two boarded the plane, Carson took out his AAA Nevada Highway Map. "Carson, will you ever do something other than maps?" Francis asked. "I just want to know when we're getting to McCarran." Assuming the plane takes off from STL Lambert International Airport at 7:00pm Central time, the distance between Lambert and Las Vegas McCarran airports is 1,380 miles, the average cruising speed of the airplane is 450 mph relative to the Earth, and conditions are ideal, what is the time, in **Pacific time**, that the aircraft will land at McCarran International Airport?

17. "Carson, why do you need to specify so many things? Geez..." said Francis, as he leaned over and started counting the number of counties in Nevada. How many are there? Do not include the independent city of Carson City.
18. "Y'know, there's a lot of interesting things about Nevada's eastern state line," said Carson. "What's so interesting about a straight line?" asked Francis.
- "Well, that straight line portion is pretty much even with longitudinal lines." What is the longitude of the state line?
 - "There's some interesting symbols there, too." What do the T's represent?
 - "It passes through so many things, like some dams, a reservation, a couple recreational areas, a couple lakes, a few streams, a mountain peak, and even a desert!" Name these features.
 - "The highest point of Nevada is on the state line, too, but not on the east." What mountain range is this peak in?
19. Find the slope gradient from nearby Mustang Mountain to Montgomery Pass.
20. Carson and Francis gradually started to become bored. To cope with this extreme boredom, Francis challenged Carson to a game. "I bet you can't find more ghost towns than me on this map." "Bet." In this game it was determined that each city named would score one point. Can you find all of them?

21. As the airplane landed, Francis asked, "Alright, where do you want to stay?" "I dunno," said Carson, "let's go rent a car and then look." They did so, and then went out of the airport from the South. Why can't they exit west onto Sunset Rd?

22. They can get onto the Strip via I-215, though. What exit would they take off of this Bruce Woodbury Beltway to get to Las Vegas Blvd?

23. "Alright, let's start touring the Strip. Maybe we can find a good hotel."

a. Francis looked to the side at Luxor's hotel. "Hopefully our future days in this world are as bright as Luxor's sky beam." This famed 42.3-billion-candela light beam was of no interest to Carson, currently calculating the area of the land in Luxor. What is the approximate area, in **square kilometers**, bounded by Luxor Rd and Mandalay Bay Rd?

b. "Check out CityCenter Las Vegas! It's got cool stuff in its buildings. Maybe we can stay here?" What is the only resort listed by the map in this urban complex?

c. "Looks like there's a monorail over there. Maybe we can stay in a hotel that's served by that monorail for easy transport." Based on the station names only, how many hotels, resorts, or other places are served by the monorail?

d. They continued down the road to Wynn Las Vegas. What is the grid coordinate of the location above **as depicted in the map**?

24. "Hey," said Carson, "doesn't the Old Spanish Trail run through here?" "I see you're back at it again with your random thoughts," sighed Francis. Calculate the length of the portion of the Old Spanish Trail shown in the Las Vegas inset.

The duo reached the end of the strip, where Resorts World Las Vegas was under construction. They decided to stay at Bellagio to see its fountains and turned back.

25. On what streets is the nearest AAA office to the north end of the strip on the corner of?

Next morning...

"Wake up, Carson!" shouted Francis. Carson opened his eyes to an alarm clock displaying "7:00 A.M." "Alright, let's go." The two had their breakfast, checked out of Bellagio, admired its world-famous fountains, and hopped in the car to go to Zion National Park.

26. "Okay, Carson, how long will it take to get to St. George if I do an average of 70 miles an hour?"

27. "Hmph. Okay. What year is the edition of this map?"

Francis shrugged. "I thought it was faster, but I can't argue with that, I guess." They started driving.

28. "Hey, Francis, looks like a lot of military places here are named after this Nellis guy," said Carson. "Lieutenant Nellis was a great plane fighter," said Francis, "and he fought over in Europe during World War II. He got shot down three times, and survived the first two. How crazy is that?" What military facilities are named after this man?

29. As the duo passed exit 64, Carson looked North to see Fike Dry Lake. "Why are all these lakes just drying up nowadays??" "Don't worry," said Francis, "We're in a desert: what do you expect?" How many dry lakes are in, or partially in, military land?

30. Carson was still poring over the highway map as they passed Exit 93: NV-169. "The Valley of Fire state park is around here. Maybe we could camp one day." "Ah," remarked Francis, "now you want to go outside. I've finally accomplished my goal for you." Are there camp facilities in Logandale, according to AAA's Tourbook Guide?

a. What about in Overton?

31. The duo entered Arizona. Looking towards the Southeast, Carson tried to see the landscapes of the great Grand Canyon - Parashant National Monument. However, when they passed the town of Littlefield, what landform probably prevented any more sightseeing?

32. Of course, the Colorado River formed the national park south of this place, the Grand Canyon. At what latitude does the river enter the Utah map?

a. At what longitude does the river exit the map?

b. What two lakes does this famous river form?

c. South of one of these lakes is a collection of grey lines. What does this represent?

33. North of Cataract Canyon along the Colorado River is a tributary flowing from Stillwater Canyon. What is this tributary?
- Nine Mile Creek flows into this river, and forms the Nine Mile Canyon, famous for its rock art by people of Fremont culture and the Ute people. Most of Nine Mile Creek on this map is covered by the road giving access to the canyon. Based solely on its name, what percentage of this creek is uncovered?
 - This river also has two other tributaries in the Indian Reservation where Nine Mile Creek joins the river. Name these two tributaries.
34. The river from problem 33 enters the map from what reservoir?
35. "Carson?" Francis was worried about Carson's sudden quietness.
- Alas, Carson was still entranced in Utah's map. One of the tributaries of the river in question 33 has a source at what special feature of Utah? Describe this feature as the map describes it.
 - What area is this feature located in?
36. Calculate the slope gradient from this feature to Wilson Peak.
37. "Carson!" Carson snapped out of his trance and looked up. He looked out and saw a sign for Exit 23: UT-228 / Leeds. The highway marker reminded him that they were heading North. Francis then asked, "What exit do we take to get into the main part of Zion?"
38. "We should go into Kolob Canyons sometime," remarked Carson. What kinds of vehicles should not go into the Kolob Canyons via UT-9? Why?
(switch to the National Park Map for this and following problems)

39. They duo passed by the ghost town Grafton. How is its representation on the National Park Service map different from the symbols used to mark ordinary cities?
40. "Apparently they used to have an oil well on Zion," commented Francis. "Now, it's in ruins." What kind of stream are these located on?
41. How can one get to the Chinle Trailhead from UT-9?
42. Carson looked out the window in an easterly direction to see a river forking into two different directions. The tributary going east enters what canyon?
43. What vehicles are allowed on Zion Canyon Scenic Drive in the winter?
44. "Alright, Carson. Where do you want to go?"
- a. "Let's go to the Narrows," said Carson. Since they have to take the shuttle to get to the Narrows of the National Park, what station do they have to get off at?
 - b. What facilities does this station have?
45. "Hey Francis, do you know what trail takes people to the Narrows?"
- a. How long is this trail, in miles?

46. "Gee, I wish I could do a profile of this place," Carson said, as the duo boarded the shuttle. "Can't you make a smaller map instead, for once?" exclaimed Francis. He took out some paper, drew an 7 in. by 7 in. square on it, and gave it to Carson.
- a. "Alright. The scale of this map is 1:10560. Centered in this map is section 6 with township 6 N and range 7 W. Label other section squares, and make township and range borders thicker than section borders."
 - b. "Alright now. You see that big 'ol rock right there? My friend climbed that and said it was the most difficult trail here. The top of that place is called Angel's Landing. Put a horizontal control mark in the center of this square with an elevation of 5790 ft."
 - c. "The trail from that peak goes $\frac{1}{8}$ miles at an azimuth of 315° , then proceeds $\frac{1}{8}$ miles at an azimuth of 345° ."
 - d. "I'm going to have you put 3 index contours around this portion of the trail, 87 ft apart and at an interval of 200 ft. The top contour is 87 ft away from the trail on both sides and is at 5600 ft. This contour intersects the trail at halfway through to form an ellipse. The next contour intersects the trail $\frac{2}{3}$ of the way through to form an ellipse. The left side of the last contour intersects the endpoint of the trail you just drew and both sides go off the map at an azimuth of 0° . Oh, and I like contours labeled."
 - e. "The trail then turns back for $\frac{1}{12}$ miles at an azimuth of 195° , and then goes for $\frac{5}{12}$ miles at an azimuth of 165° ."
 - f. "The next three index contours (whoops) go around the right side of the last contour that I described two steps ago, and are spaced 165 ft apart. When you get to the endpoint of the trail you just drew, draw these three index contours such that they turn and then run off the map towards $S 80^\circ W$."
 - g. "The trail then goes at a bearing of $S 60^\circ W$ for another $\frac{1}{12}$ miles and then turns and runs off the map at an azimuth of 170° ."
 - h. "Virgin River flows out of the South of the map at $\frac{1}{2}$ a mile from the West border of the square. The river averages 85 ft wide as it flows through Zion Canyon. Draw the river at an azimuth of 350° for $\frac{1}{8}$ miles and label 'Refrigerator Canyon' $\frac{1}{12}$ miles north of this segment endpoint with a spot elevation of 4300'. For simplicity, I won't make you draw the contours."
 - i. "The river then bends 100° to the East and continues for $\frac{1}{4}$ miles. Then, it bends 110° towards the North and flows until it exits the map."
 - j. "Zion Canyon Scenic Drive is a light-duty Road and follows the river throughout. It is 165 ft South and East of the river bank at all times."
 - k. "Last thing: at $\frac{1}{12}$ miles east of the SW corner, the Spearhead has a horizontal control elevation at 5850'. Again, no contours. Too much."

47. "Ok. Relax. You're done drawing." Carson sat back as the bus approached the final station. He was suddenly exhausted. "Wait," said Francis, "What's the slope gradient from Angel's Landing to Refrigerator Canyon?"

a. What's the distance and azimuth from Angel's Landing to the Spearhead?

48. "Francis, you annoy me sometimes. Especially when you randomly switch between bearings and azimuths," remarked Carson, as they stepped off of the bus. "Wow. I spent my time to have this trip with you and you treat me like this?" exclaimed Francis. "Well, guess what. We're going to another national park."

a. Once the duo got back into their car and plopped down into the seats, tired from the trail, Francis asks, "What are the restrictions in Mount Carmel Tunnel? I don't think they apply to us, but I'm curious."

b. Once they pass through Mount Carmel Tunnel after navigating an uncomfortably windy road, Francis feels the urge to use the restroom. He can hold it for now, but where are there restrooms later on the highway?

49. Carson takes out the Utah Highway Map as Francis goes to relieve himself, and notices green dots next to the road that they are on. What do these represent?

50. After Francis turns north from Mount Carmel Junction, how many miles are left until the duo reaches Bryce Canyon City?
(return to Nevada / Utah Highway Map for this and following questions)

51. "Bryce Canyon National Park? I see," said Carson, as he opened the Bryce Canyon National Park Guide. By whom was the image of the mountain lion on the information side of the guide copyrighted?

52. What phases does a canyon wall go through before eventually becoming another one of the highlighting features of Bryce Canyon National Park, the hoodoo?
53. "Hey, this illustration of the Grand Staircase looks pretty cool."
a. What cliffs constitute the Grand Staircase Monument? List in order from bottom to top.
- b. Bryce Canyon can be sighted from what plateau?
54. Carson flipped over the AAA highway map as Francis drove into Garfield County, which Carson observed "looks a lot like Tennessee to me." Much of Tennessee's eastern border is surrounded by Smoky Mountain National Park. What national area surrounds the eastern border of Garfield County?
55. Carson observed the information section of the Bryce Canyon map as the duo went on.
a. What factors make Bryce Canyon one of the Earth's darkest places?
- b. "It's getting a bit late, we should probably reserve a room in the lodge." Since there's a bit of cellular signal around here, Carson can still call Bryce Canyon Lodge to reserve a room. What number does he call?
- c. Drivers are warned, in the information section, to be alert for what entities?
- d. What photographer copyrighted the photo of Utah's state flower?

56. Carson then redirected his attention to the interesting part of the guide: the map.

- a. How many mile markers are placed along UT-63 throughout the park?
- b. Assuming the azimuth to the North on this map is 0° , find the bearing from Bryce Canyon Visitor Center to Rainbow Point Overlook.
- c. How many total overlooks are available in this whole park?
- d. The Under-the-Rim trail along Bryce Canyon offers a better look at the hoodoos of the park. The National Park Service institutes a fee for anyone who would like to camp there overnight. Groups can also camp in this trail, like at the Yellow Creek Group site at an elevation of 6800 ft. What is the slope gradient **per 100 meters** from this campsite to Paria View Overlook?
- e. What national lands border Bryce Canyon National Park?

57. Carson then switches his focus to the Bryce Amphitheater inset.

- a. Purple surrounding the Navajo Loop Trail indicates what?
- b. This trail takes a sightseer to two aweing rock formations. What are these?
- c. All of these can be accessed from Sunset Point, containing what facilities?
- d. A gate is located on UT-63 which is closed during snow storms. How many miles from mile marker 0 is this gate? Round to the nearest hundredth.

- e. Horses can walk on trails indicated by what symbol? Describe or illustrate.
 - f. Bryce Creek, with a source at many places in Bryce Amphitheater, is what type of stream?
 - g. After almost eight hours on the road, Francis and Carson stretched their legs on the Bristlecone Loop Trail. A continuous speed of 4mph would take how long to complete this trail?
58. After a long day, Francis and Carson checked in at the Bryce Canyon Lodge, flopped down on their beds, and took a nap. Once Francis woke up, he went to the Bryce Canyon General Store. What facilities are available there?
59. The next morning, the duo got up and had their breakfast. "Do you think you've seen enough of autumn?" said Francis. "Maybe we can do these trips another time," said Carson, "I really like 'em." Francis was overjoyed; but, he had already booked another flight back home that day. So, with the flight at 8:30pm, the duo had to get back to Las Vegas pretty soon. They drove to UT-12 and turned west. What canyon will they pass through?
(return to Nevada / Utah Highway Map for this and following problems)
60. The duo turned south on US-89 and then west onto UT-14. Assuming an average speed of 61.5mph, how long will it take to arrive at Cedar City?
- a. Cedar City has a Tony Award-winning theater with an annual festival performing the works of what famous playwright? (its namesake)
 - b. Cedar City has an airport with service to Salt Lake City. What is its airport code?



61. Carson pulled up a satellite map of the famous city of Los Angeles, CA on his phone. What he saw is above: *(derived from Google Earth)*
- In which section of the map does the Los Angeles area seem to be located? Answer as N, S, E, or W.
 - The shapes in the North indicate what type of human activity?
 - Castaic Lake State Park can be found to the right of the middle of this map. The two “legs” formed by the lake’s V-shape can be measured using the scale of 1 inch = 10 miles. Find the total length of each of these “legs” to the nearest mile.
 - Once can access Castaic Lake by the nearby Interstate 5, which travels between the mountains in the middle portion of the map. Assuming the elevation at the north fork above the intersection of the green borders in the middle of the map is 3800 ft, the elevation at the south fork when it exits the mountains and enters Los Angeles area is 1000 ft, and the scale in the previous problem applies, find the slope gradient **along the highway**.

62. Carson took out the Zion National Park map again, just to look at. He flipped to the information side and looked at the greyscale image of the Colorado Plateau.

- a. Assuming a scale of 1 inch = 6 miles for this map, what is the slope gradient from Cedar Breaks National Monument to where Virgin River exits this image?
- b. Located at the western border of the Colorado Plateau is what feature?
- c. Carson had also studied geologic maps in his adult life and looked down to see the layer of Shinarump Conglomerate. What is this rock layer made of?
- d. Evidence of what creatures' existence can be studied in Kayenta mudstone?

63. As the duo approached Las Vegas, Carson didn't bother to again study the Las Vegas inset. He studied Carson City instead.

- a. How many miles of the state border line crosses Lake Tahoe?
- b. The Thunderbird Lodge Historic Site, preserved by a non-profit organization, operates closest to what harbor?
- c. The area surrounding Lake Tahoe is one of the many great places for skiing in the United States, which can be demonstrated by the slope gradient between, for example, Mount Pluto and Carnelian City. Assuming the elevation of Carnelian City equals the elevation of the lake, calculate this gradient.
- d. Lake Tahoe is surrounded by four state highways, two of which run only around the surrounding area of Lake Tahoe. List these.
- e. Carson City isn't very big. Its local parks, however, do serve well for its citizens. What is the smallest mapped city park in Carson City, by area?

64. Two hours later at the airport, Carson took out the Creve Coeur quadrangle from his suitcase. Franics glanced over and sighed. "Carson, will you ever stop?"
- a. What is the yellow highlight / brown dotted area in the NW corner of the map?
 - b. Carson wants to finally answer the question that's plagued him since the beginning of his career: what's the area of this whole map? Provide your answer in **square meters** and **square miles**.
 - c. If one driving continuously at an average of 40mph West on MO-340 exits the map into the western quadrangle, how long would it take to get to Ellisville?
 - d. What feature can be found at approximately (719,400E; 4,282,000N)?
 - e. What year North American Datum is this coordinate based on?
 - f. Use this datum on the map to calculate the UTM of the flag symbol of the unlabelled school located E of Tiemeyer Park in Sector 3.
 - g. The state highway designations of MO-AB and MO-JJ were recently removed from part of Ladue Rd and all of New Ballas Rd, respectively. Find the latitude and longitude of the intersection point of these two roads.
 - h. Carson wants to make up a new coordinate system that is convenient for navigation in the USA. The coordinate notation is (x Carse W/E, y Franc N/S) for values x and y. The unit Carse represents the distance west or east from longitude $98^{\circ}34'45''$ W, and the unit Franc represents the distance north or south from latitude $39^{\circ}49'45''$ N, where 1 Carse = 1 Franc = 1000m (in UTM). Assuming 1 minute longitude = 2400m and 1 minute latitude = 3100m, find the coordinates of BM 720 west of Stacy Park Reservoir. Round each coordinate to the nearest thousandth.

65. On the plane, Carson took out the Clayton Quadrangle. "I challenge you," he said.
- a. "Again??" exclaimed Francis. "Alright, what do you want?" Carson sneered and said, "Using my new coordinate system, find the coordinates of the tower in Concordia Seminary." Assume the system described in 64h.

 - b. "Well, that took a long time," said Francis, now exhausted. "Easy question first, cuz' I'm brain-dead. What is the value of the lowest depression contour in Forest Park?"

 - c. "Okay, I'll give you an easy one, but just one: How many miles does it take for MO-N to reach I-270 after it exits the north neat line of the map?"
66. Francis returned Carson's sneer. "Well, it's not break time anymore, I guess! Since you like profiles so much, Carson, draw one along the length of Page Blvd from the east neat line to the first street intersection west of US-67 in Section 26. I'll wait."
- a. Francis looked and nodded in approval. "Okay. Find the distance and azimuth from the SW corner of the map to the NE corner of the map. Could you do that? Huh?"

 - b. "How about a mini map??" exclaimed Carson. "Draw me this story:"
 - i. "Make sure the 4in x 4in square you draw is a scale of 1:15840."
 - ii. "Frank walked a trail starting from the northwest corner of section 14 of Township 16N and Range 15E. He started at a bearing of S 73° E, and walked $\frac{3}{4}$ miles. Then, he gradually turned right in a circular arc of measure 73° and radius $\frac{1}{4}$ mile. He continued straight for $\frac{1}{4}$ mile, and then immediately turned west. He then walked out of the map. Draw his path and the orchard that he walked around.
 - iii. "US Highway 111 also passes through here, on a heavy-duty divided road, and it's perfectly straight along the direction it travels. Draw it $\frac{1}{16}$ miles east from the trail. If you don't label it..."

67. "Wow. You're going to laugh at me. I see," said Francis, as he drew the last bit of the US highway shield. They felt a bump as the aircraft touched down on the rarely used Runway 11-29. "The city of Bridgeton had to sacrifice much of its land to the airport, just for this runway," recalled Carson. Identify the quadrangles that this land lies in.

By now, Carson was also "brain-dead" from all this map studying and fun he had had during this trip. He felt sleepy, but took out his phone to look at a satellite map of Alton, IL anyways: *(derived from Google Maps)*



68. St. Louis Regional Airport can be found in this map. What is the angle between its two runways?

69. The Jefferson River in Montana, the Missouri River (the southern river), and the Mississippi River (the northern river) combine to form the fourth longest river system in the world at a length of 3,209 miles. Assuming a scale of 1 inch = 1 mile, what percentage of this river system is shown in this map?

70. How many bridges are found in this area? List the river(s) they cross.

Carson then fell asleep. The next thing he knew, he was already at his house, being shaken awake by Francis.

"Carson, are you there?"

"Yeah, I'm here." Carson rubbed his eyes.

"You're tired from having so much fun, aren't you?"

"Yup. Maybe I should learn a bit more than topography. Can you take me to one of your little parties sometime?"

Francis looked at him, surprised. "You're telling me you're not going to stay in the house anymore?"

"Yeah. You've convinced me to change myself. I'm no longer a topographic hermit. I shall become a social person once again!"

Francis smiled, but then frowned. Carson didn't notice this, but instead opened the car door to get his luggage. *Maybe he still needs to relearn social skills*, thought Francis, as he opened the trunk.

As Carson pulled his suitcase and his maps out of the trunk, Francis contemplated what he had done over the past week. *I will never see the old Carson again*, he thought. *I like the new Carson, but now that I've tried to change him, I won't be able to enjoy the private, old conversations of convincing him to go outside again*. This saddened him. But for now, he made himself happy by reminding himself of the new Carson that he could introduce his other friends to when they all gathered again.

Carson looked back as he walked back to his home. He shouted, "Thank you for giving me these experiences, Francis! Hopefully, we can have another one sometime soon!"

Francis said, "You betcha'." He sat there and watched as Carson disappeared inside his home. After a long time of vacationing and recovering his map knowledge, Francis realized that he was tired, too. He drove home, looking ahead to the rest of his life with a changed friend that he would be together with during the years ahead.

The Last Season Sample Test Answer Key

Numbers in brackets [x] indicate points awarded for the given answer, or its parts.

- i.e. An answer matching "Topographic map [3]" would earn 3 points.
- i.e. An answer in the range of "10.2 - 13.4 miles [2]" would earn 2 points.

1) [1] UC

2) [1] US-67

3a) [5]

3b) [3] [2] Class 2

[1] This building is inhabitable.

4) [6]: [1.5] for beginning hill from 420 to 440 ft.
[1] for slight dip in middle, crossing 440 ft.
[2] for markings of road, creek, building, road. [0.5] each.
[0.5] for ending elevation above 450 ft, slope flat.
[1] for labels of 420 to 450 ft at a 10 ft interval. -0.25 for each missing.
Units are not required. No penalty for extra labels.

5) [1]

6) [2]

7) [3] E $\frac{1}{2}$ / NW $\frac{1}{4}$ / 15 / T45N R5E

-1 for incorrect format. -0.5 for incorrect section. Minimum 0 points.

8) [2]

8a) [5]

9) [2]

10) [1]

11) [1]

11a) [3]

12) [2]

13) [6]

14) [1]

15) [4]

16) [2]

17) [1]

18a) [3]

18b) [1]

18c) [5, 0.5 each]

18d) [2]

19) [4]

20) [11, 0.5 each]

21) [2] This is a partial interchange.

- 22) [1]
- 23a) [3]
- 23b) [1]
- 23c) [1]
- 23d) [2]
- 24) [3]
- 25) [1, 0.5 each]
- 26) [2]
- 27) [2]
- 28) [2]
- 29) [2]
- 30) [1]
- 30a) [1]
- 31) [2]
- 32) [3]
- 32a) [3]
- 32b) [1]
- 32c) [2]
- 33) [1]
- 33a) [2]
- 33b) [2]
- 34) [2]
- 35a) [2]
- 35b) [1]
- 36) [4]
- 37) [2]
- 38) [2]
- 39) [1]
- 40) [2]
- 41) [2]
- 42) [1]
- 43) [1]
- 44a) [1]
- 44b) [2]
- 45) [1]
- 45a) [2]
- 46) [45] (8 PLSS, 2 horizontal control, 3 trail c, 8 contours d, 3 trail e, 5 contours f, 3 trail g, 4 river h, 2 spot elevation, 3 river i, 2 road j, 2 horizontal control)
- 47) [4]

47a) [3]

48a) [2]

48b) [1]

49) [1]

50) [2]

51) [1]

52) [2]

53a) [3] 0.5 each if not all correct. -0.5 if out of order.

Chocolate Cliffs

Vermillon Cliffs

White Cliffs

Gray Cliffs

Pink Cliffs

53b) [1] Paunsaugunt Plateau

54) [1]

55a) [2] 0.5 each if not all correct: High elevation; clean, dry air; lack of light pollution

55b) [1]

55c) [1] Animals

55d) [1]

56a) [2]

56b) [3]

56c) [2]

56d) [4]

56e) [2] Dixie National Forest and Grand Staircase - Escalante National Monument.

57a) [1] The trail is closed during winter.

57b) [2] Wall Street and Two Bridges

57c) [2]

57d) [3]

57e) [1]

57f) [1]

57g) [2]

58) [1]

59) [2]

60) [2]

60a) [1] William Shakespeare

60b) [1]

61a) [1] Southern (S)

61b) [1] Agricultural activity (indicated by rectangles)

61c) [3]

61d) [4]
62a) [4]
62b) [1]
62c) [1]
62d) [1]
63a) [2]
63b) [2]
63c) [4]
63d) [2, 1 each]
63e) [2]
64a) [1]
64b) [5]
64c) [2]
64d) [3]
64e) [2]
64f) [5]
64g) [5]
64h) [8]
65a) [8]
65b) [1]
65c) [1]
66) [29]
66a) [4]
66b) [16] (2 PLSS, 8 trail + orchard, 6 highway)
67) [2]
68) [2]
69) [2]
70) [2] [1] 2 bridges
[1] One over Mississippi River, one over Missouri River.