FS
fundamentals of surveying
practice exam
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7. You are to set slope stakes along the roads within a subdivision. Typical cut and fill sections are shown below. At Station 2+00 the finish grade elevation is 110.31 at the edge of the road, and the distance from the centerline to the edge of the road is 12.0 ft. The rod is being held at a distance of 28.5 ft from the centerline and the rod reading is 12.1 ft while the H.I. is 119.77 ft. Your next step would be to:

- A. move in about 6 ft and try again
- B. move in about 10 ft and try again
- C. move out about 6 ft and try again
- D. drive in a stake since you are at the slope stake

8. In differential leveling over long distances, what effects must be taken into consideration?

Select **all** that apply.

- A. Focal length of the instrument
- B. Curvature of the earth
- C. Latitude of the observations
- D. Atmospheric refraction
- E. Latitude of observer
12. Match each term to its correct location on the diagram.

13. An airplane carrying a camera with a 6-in. focal length is flying at 10,000 ft above mean sea level. If the average terrain is 1,500 ft above mean sea level, what is the average scale of the photo?
   - A. 1:16,000
   - B. 1:17,000
   - C. 1:18,000
   - D. 1:20,000

14. A binary public file format used to interchange three-dimensional light detection and ranging data is called:
   - A. ASCI
   - B. LAS
   - C. USGS DEM
   - D. TIFF
15. List the following title elements in order of importance from most important to least important.

<table>
<thead>
<tr>
<th>Element</th>
<th>Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area</td>
<td>Most Important</td>
</tr>
<tr>
<td>Called-for monument</td>
<td></td>
</tr>
<tr>
<td>Senior rights</td>
<td></td>
</tr>
<tr>
<td>Right of possession</td>
<td></td>
</tr>
<tr>
<td>Distance</td>
<td>Least Important</td>
</tr>
</tbody>
</table>

16. In order to determine the height of a tower on top of a building, as shown in the figure below, a surveyor measured Angle A to be 22°. The surveyor then moved the theodolite 100 ft toward the tower and measured Angle B to be 42°. The height (ft) of the tower, assuming it is vertical, is __________.

Enter your response in the blank. Round your answer to the nearest tenth.
17. Place the parts of most metes and bounds legal descriptions in order of appearance.

1. Qualifying clauses
2. Augmenting clauses
3. Caption or heading
4. Body

18. The original government record of a fractional lot in the northwest quarter of Section 5 shows the following dimensions in chains: north side 19.83, east side 19.09, west side 19.31, and south side 20.14. The area (acres) of the lot on the original township plat would be most nearly:

- A. 38.33
- B. 38.35
- C. 38.37
- D. 38.39

19. The standard determination of the principal tidal datums (e.g., mean high water, mean low water, mean higher high water) is determined in the United States based on the average observations of a period of __________ years.

Enter your response in the blank.
6. THE CORRECT ANSWER IS: D

7. 

Ground elev. = 119.7 – 12.1 = 107.67 
The test point (road edge) is above the ground by 110.31 – 107.67 = 2.64 ft 
The section is in fill \[\therefore\] use 4:1 side slope 
Move 2.64 \times 4 = 10.56 right of road edge 
From road side, move 28.50 – 22.56 \approx 6 ft 

THE CORRECT ANSWER IS: A

8. The curvature of the earth and atmospheric refraction both affect the path of light over distance.

THE CORRECT ANSWERS ARE: B AND D

9. \[S = \frac{6.75}{8.10} \times \frac{1}{12,000} = 1/14,400\]

THE CORRECT ANSWER IS: D
10. Topographical surveys are essential for showing natural terrain features as well as man-made features such as roads and sanitary and storm drain systems.

THE CORRECT ANSWER IS: B

11. This is a standard principle of simultaneous conveyances.

THE CORRECT ANSWER IS: D

12. The scale of an aerial photograph is computed using the following equation:

\[
\text{Scale} = \frac{\text{focal length}}{\text{height above mean terrain}}
\]

\[
\text{Scale} = \frac{6 \text{ in.}}{10,000 \text{ ft} - 1,500 \text{ ft}} = \frac{6 \text{ in.}}{8,500 \text{ ft}} = \frac{6 \text{ in.}}{8,500 \text{ ft} \times 12 \text{ in.}} = 1:17,000
\]

THE CORRECTLY LABELED FIGURE IS SHOWN ABOVE.

THE CORRECT ANSWER IS: B
14. ASCI files are not binary. USGS DEM is a file format developed by the U.S. Geological Survey for storing raster-based digital elevation models. TIFFs are tagged imagery files.

THE CORRECT ANSWER IS: B

15. The correct order from most to least important is:

1. Right of possession
2. Senior rights
3. Called-for monument
4. Distance
5. Area

THE CORRECT ORDER IS SHOWN ABOVE.

16. \( \angle C = 180^\circ - 42^\circ = 138^\circ \)

\( \angle D = 180^\circ - 138^\circ - 22^\circ = 20^\circ \)

from the law of sines

\[
\frac{\text{dist}_{ab}}{\sin \angle A} = \frac{\text{dist}_{DA}}{\sin \angle D} \Rightarrow \frac{\text{dist}_{ab}}{\sin 22^\circ} = \frac{100}{\sin 20^\circ} \Rightarrow \text{dist}_{ab} = 109.5 \text{ ft}
\]

for the right triangle (abc):

\[
\cos \theta = \frac{\text{adjacent side length}}{\text{hypotenuse length}}
\]

\[
\cos E = \frac{\text{adjacent side length}}{109.5}
\]

\( \angle E = 180^\circ - 90^\circ - 42^\circ = 48^\circ \)

\[
\cos 48^\circ = \frac{\text{adjacent side length}}{109.5} \Rightarrow \text{adjacent side length} = \text{height of tower} = 73.5 \text{ ft}
\]

THE CORRECT ANSWER IS: 73.1–73.5
17. The correct order is:

1. Caption or heading
2. Body
3. Qualifying clauses
4. Augmenting clauses

THE CORRECT ORDER IS SHOWN ABOVE.

18. \[
\left( \frac{19.31 + 19.09}{2} \right) \left( \frac{19.83 + 20.14}{2} \right) = 383.71 \text{ sq ch}
\]

\[
A = \frac{383.71}{10 \text{ sq ch} / \text{acre}} = 38.37 \text{ acres}
\]

THE CORRECT ANSWER IS: C

19. The determination of the principal tidal datums is determined in the U.S. based on the average observations of a 19-year period.

THE CORRECT ANSWER IS: 19

20. THE CORRECT ANSWER IS: C

21. Merger of title between the dominant and servient tenement causes the easement to merge into fee ownership.

THE CORRECT ANSWER IS: B

22. All others are important to researching the title, but the creation and recording dates will determine senior rights and whether conveyances were sequential or simultaneous.

THE CORRECT ANSWER IS: A