Water Problems **- Teacher’s copy**

For these problems you will be examining the terrain people walk to get to their water supply.

Open the problem’s folder in the sidebar menu. Select the path to the water by control-clicking on “path” in the sidebar menu if you have a Mac, or Right-click if you have a PC. Select: *Show Elevation Profile*. If you move your cursor in the graphing window that appears, you will notice that a red arrow will appear above at the corresponding point on the path in the main window above.

**Complete the tables for the following two problems using the elevation profiles.**

1. Position the red arrow below each lettered placemark and record the elevation.
2. Determine the change from one point to the next and record the difference.
3. Be sure to include a “+” for an elevation gain and a “–“ for a loss in elevation.

**Burkina Faso Nepal village A**

|  |  |  |
| --- | --- | --- |
|  | **Elevations** | **+/- difference** |
| A | 1850 m \* |  |
|  |  | – 28 |
| B | 1822 m \* |  |
|  |  | – 54 |
| C | 1768 m \* |  |
|  |  | – 228 |
| D | 1540 m \* |  |
|  |  | + 177 |
| E | 1717 m \* |  |
|  |  | – 317 |
| F | 1400 m \* |  |
|  |  | – 88 |
| G | 1312 m \* |  |
|  |  | – 184 |
| H | 1128 m \* |  |

|  |  |  |
| --- | --- | --- |
|  | **Elevations** | **+/- difference** |
| A | 261 m |  |
|  |  | + 3 |
| B | 264 m |  |
|  |  | + 3 |
| C | 267 m |  |
|  |  | + 3 |
| D | 270 m \* |  |
|  |  | + 2 |
| E | 272 m \* |  |
|  |  | – 2 |
| F | 270 m \* |  |
|  |  | – 4 |
| G | 266 m \* |  |
|  |  | – 5 |
| H | 261 m \* |  |
|  |  | – 3 |
| I | 258 m \* |  |
|  |  | – 2 |
| J | 256 m \* |  |
|  |  | – 1 |
| K | 255 m \* |  |

 \* Approximate values \*

Total difference: – 722 m

Total difference: – 6 m

\*Make sure students understand how to display the elevation profile. They should be trying to line the red arrow **below** the lettered placemarks. The values above are approximations and may change by a few meters depending on their view in Google Earth.

**Of course, you realize that once the water is gathered it must be hauled back to the village. The weight of the water carried could be 10-50 lbs. What does the return trip look like?**

\* The question above should be pursued. Discuss what the integer values would be for the return trip (opposite).

\*\*The Nepal problem A path certainly is not the most direct route to water. Discuss what factors may lead to this. It may be that this is the most stable path, or there may be hazards in other directions. Perhaps there are restrictions on what land they can cross? Nepal has a caste society and so there is a status order for water and other resources. A higher caste will not accept water from someone from a lower caste. People in lower castes may have to travel farther for water. The “Water and Development” resource listed on the Real World Math page goes into this in great detail.

**Nepal village B**

Complete the tables for the three paths using their elevation profiles. You’ll find the values at the top of the elevation profile window. Make sure you record the correct numbers.

**Path #1**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Minimum elevation** | 972 m | **Distance** | 2.16 km | **Elevation gain** | + 66.5 m | **Average slope** | + 28.8% |
| **Maximum elevation** | 1519 m | **X 2 = Total** | 4.32 km | **Elevation loss** | – 592 m | **Average slope** | – 29.6% |

**Path #2**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Minimum elevation** | 1004 m | **Distance** | 2.2 km | **Elevation gain** | + 4.02 m | **Average slope** | + 2.8% |
| **Maximum elevation** | 1520 m | **X 2 = Total** | 4.4 km | **Elevation loss** | – 519 m | **Average slope** | – 24.2% |

**Path #3**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Minimum elevation** | 1027 m | **Distance** | 2.35 km | **Elevation gain** | + 28.3 m | **Average slope** | + 9.5% |
| **Maximum elevation** | 1530 m | **X 2 = Total** | 4.7 km | **Elevation loss** | – 521 m | **Average slope** | – 25% |

\*Make sure students understand where to find these values in the elevation profile. It gives more numbers than are asked for so there may be confusion. For example, the elevations are given in the order of minimum, average, and maximum, yet only the maximum and minimum values are asked for.

\*\*Encourage them to zoom in and pitch their viewing angles to view the paths. Also, the Elevation Profile window can be expanded by hovering near the top of the window and pulling up when they see this symbol “⇳”. This will amplify the graph and give them an enhanced perspective of the slopes.]

Best path choice?

Worst path choice?

\*Be sure to have a class discussion on what each group decided. Make sure students use data values to support their choices. Is this all of the data they need? What other factors could be considered? Trail condition? Shade? Something else? Looks can be deceiving but so can statistics.

**Nepal village C**

For this problem you are trying to determine the best path to the river from village C and back. What factors would you weigh the most? Slope? Distance? You may take another route for your return trip if you wish. You’re loaded with water now; would you change your strategy?

Use the path tool to draw several paths and examine the elevation profiles of each. Experiment with different routes and discuss their merits. Use the tables below to record values from the elevation profiles.

**Be sure to save your path in your *My Places* to share with others.**

\*Make sure students know how to use the Path tool. Give directions on how you want students to save and/or share their paths. A kmz file of their path can be saved to their desktop or a thumb drive, or emailed. Have them title their path with their name or you wont know who’s it is.

**Path #1**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Minimum elevation** |  | **Distance** |  | **Elevation gain** | + | **Average slope** | + |
| **Maximum elevation** |  | **X 2 = Total** |  | **Elevation loss** | – | **Average slope** | –  |

**Path #2**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Minimum elevation** |  | **Distance** |  | **Elevation gain** | + | **Average slope** | + |
| **Maximum elevation** |  | **X 2 = Total** |  | **Elevation loss** | – | **Average slope** | –  |

**Path #3**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Minimum elevation** |  | **Distance** |  | **Elevation gain** | + | **Average slope** | + |
| **Maximum elevation** |  | **X 2 = Total** |  | **Elevation loss** | – | **Average slope** | –  |

