Road Construction Problem

Look at the roadworks drawing on the following page.

Highway construction workers prepare road beds to create the finished elevations proposed in engineering plans.

Question 1

How much lower will the roadbed be at the end of the 85.4 metre section shown in the plan than it was at the start?

_____

Question 2

The existing ground elevation at the fifth station (0+60) is at 81.639 metres. What depth of fill does the excavator need to add to raise it to finished grade?

_____

Question 3

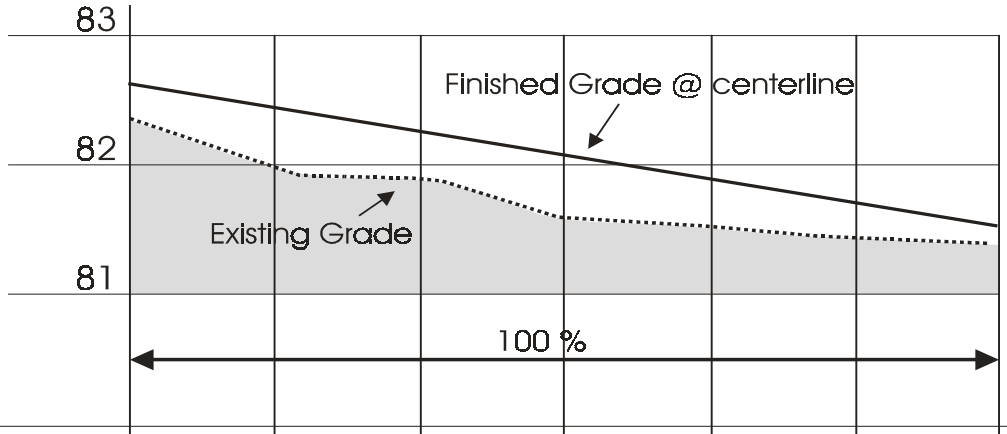
A later section of the highway is to be constructed at a 3.4% uphill grade.

a. Over a distance of 100 metres how much will the highway rise?

_____

b. The finished road elevation at the beginning of a 120 metre section is 42.518 metres. What should the elevation be at the end of the section if the uphill grade is 3.4%?

_____



Proposed Finished Paving Elev's	82.518	82.368	82.218	82.068	81.918	81.768	81.664
Existing Elevations	82.368	82.039	81.914	81.856	81.639	81.450	81.508
Stationing	0+00	0+15	0+30	0+45	0+60	0+75	0+85.4

Project: Roadworks - Thorncliffe Drive	Drawing 1 of 1	
	Drawn by: BT	Design: BT

Note: All measurements in metres

Answers - Road Construction Problem

1. *How much lower will the roadbed be at the end of the 85.4 metre section shown in the plan than it was at the start?*

   82.518 - 81.664 = **.854 metres**

2. *The existing ground elevation at the fifth station (0+60) is at 81.639 metres. What depth of fill does the excavator need to add to raise it to finished grade?*

   81.918 - 81.639 = **.279 metres**

3. *A later section of the highway is to be constructed at a 3.4% uphill grade.*

   a. *Over a distance of 100 metres how much will the highway rise?*

      100 x .034 = **3.4 metres**

   b. *The finished road elevation at the beginning of a 120 metre section is 42.518 metres. What should the elevation be at the end of the section if the uphill grade is 3.4%?*

      42.518 + (120 x .034) = **46.598**

Does TOWES test mathematics?

This problem set, like most TOWES items, tests skills in more than one domain. The numeracy dimension of these questions involves some 'mathematical operations,' but a significant portion of the complexity in the first two questions comes from the need to search for information in a rather complex and unfamiliar document. This makes 'numeracy' a wider skill than merely knowing how to carry out isolated arithmetic 'operations.' In the workplace, the numbers needed to carry out a calculation are seldom 'given.' Workers need to navigate documents, take measurements, and make inferences to arrive at the correct values for any calculation. The actual arithmetic, like the addition and subtraction of decimals in the first two questions, is fairly straightforward.

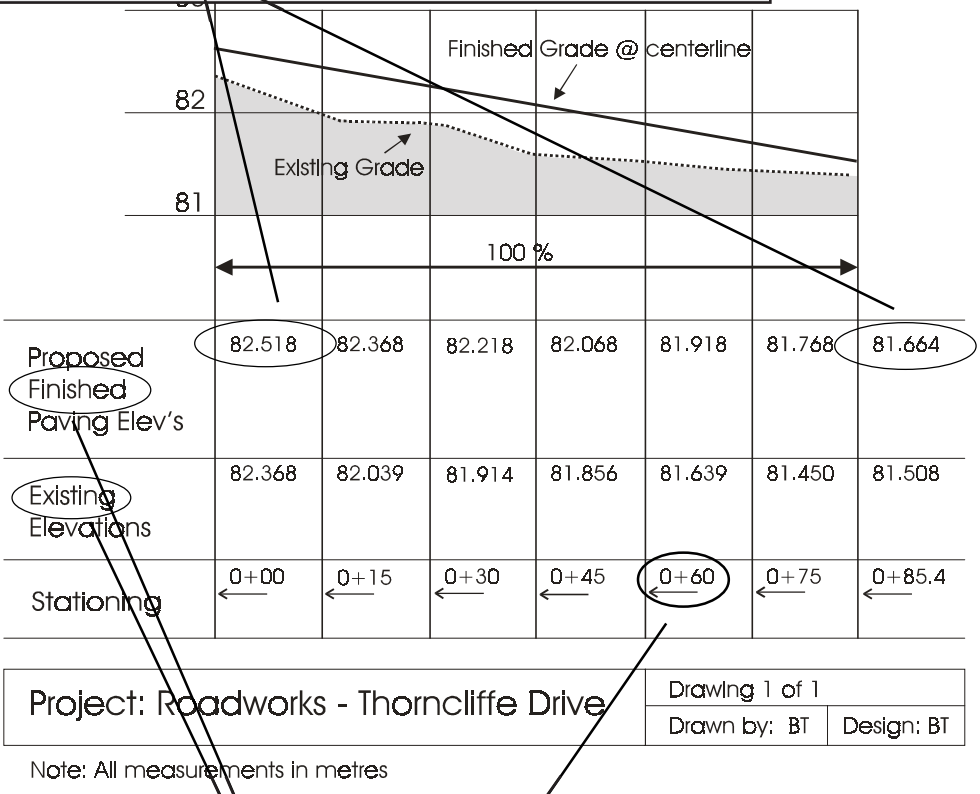
Questions 3a and 3b ask the test taker to generalize the principle of 'slopes' illustrated in the first two questions. While the workplace context may be unfamiliar, test takers should be able to transfer knowledge and skills from other similar applications.

Q1 Starting elevation - ending elevation = distance lower

Match 'finished elevation' in the question to the same term in the elevations table. It's a literal match between given and requested information.

Infer that the '0' and '85.4' in the 'Stationing' row are the start and finish of the slope. The same information can be found using the drawing above the table.

Locate elevations 82.518 and 81.664 in the 'finished' elevation row.



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Q2 Existing elevation + fill = finished elevation, or finished - existing = fill.

Match 0 + 60 in the question with the same term on the table.

Match the 'finished' and 'existing' row headings.

Locate elevations 81.918 and 81.639.