**Activity 2: Worksheet answers**

# Practice question 1

**Step 1:** **Plot data as shown.**

A graph showing the cross-section of land.
The x-axis goes from 0 to 10, split into 1 metre intervals. It is labelled: distance across embankment (m)
The y-axis goes from 0 to 3. It is labelled height above datum level (m).

The graph is a line graph in red called "existing terrain" starting at the point 0, 0. It connects to 1, 0, then 2, 0, and so on up to 10, 0.
There is a horizontal line, called "proposed finished embankment level" from 1 on the y-axis across the width of the graph, hitting points 0, 1 then 2, 2, then 4, 3, then 6, 3, then 8, 2 and finally 10, 1.

**Step 2:** **Divide the base width into equal intervals**

Interval width = 10 ÷ 5 = 2 m

**Steps 3 and 4:** **Interval midpoint heights**

Interval 1 = 1.5 m  Interval 2 = 2.5 m

Interval 3 = 3 m  Interval 4 = 2.5 m

Interval 5 = 1.5 m

**Step 5: Interval areas**

Interval 1 area = 1.5 m × 2 m = 3 m2 Interval 2 area = 2.5 m x 2 m = 5 m2

Interval 3 area = 3 m × 2 m = 6 m2  Interval 4 area = 2.5 m × 2 m = 5 m2

Interval 5 area = 1.5 m × 2 m = 3 m2

**Step 6:**

Area of fill = 3 + 5 + 6 + 5 + 3 = 22 m2

**Step 7:**

Total volume of fill material required = 22 × 15 = 330 m3

# Practice question 2

A graph showing the cross-section of land.
The x-axis goes from 0 to 12, split into 1 metre intervals. It is labelled: position across embankment (m).
The y-axis goes from 0 to 5. It is labelled height above datum level (m).

The graph is a line graph in blue called "proposed finished embankment level" starting at the point 0, 2.5. It connects to 2, 3, then 4, 5, then 6, 5, then 8, 5, then 10, 3 and finally 12, 2.5.**Step 1:** **Sketch the embankment onto graph paper using the values in the table.**

|  |  |
| --- | --- |
| **Position (m)** | **Proposed height (m)** |
| 0 | 2.5 |
| 2 | 3 |
| 4 | 5 |
| 6 | 5 |
| 8 | 5 |
| 10 | 3 |
| 12 | 2.5 |

**Step 2:** **Divide the base width into equal intervals.**

The base width is 12 m. The number of intervals is 6.

Therefore, the interval width = 12 ÷ 6 = 2 m

**Steps 3 and 4:** **Find the midpoint heights of each interval.**

Interval 1 = 2.75 m  Interval 2 = 4 m

Interval 3 = 5 m  Interval 4 = 5 m

Interval 5 = 4 m Interval 6 = 2.75 m

**Step 5:** **Calculate the area of each interval.**

Interval 1 area = 2.75 m × 2 m = 5.5 m2  Interval 2 area = 4 m × 2 m = 8 m2

Interval 3 area = 5 m × 2 m = 10 m2  Interval 4 area = 5 m × 2 m = 10 m2

Interval 5 area = 4 m × 2 m = 8 m2  Interval 6 area = 2.75 m × 2 m = 5.5 m2

**Step 6:** **Add up the areas of the intervals to get the total area of the cross-section.**

5.5 + 8 + 10 + 10 + 8+ 5.5 = 47 m2

# Practice question 3

**Step 1:** **Sketch the road onto graph paper using the values in the table.**

A graph showing the cross-section of land.
The x-axis goes from 0 to 10, split into 1 metre intervals. It is labelled: distance across road (m).
The y-axis goes from 0 to 4. It is labelled height above datum level (m).

The graph is a line graph in red called "existing terrain" starting at the point 0, 3.5. It connects to 2, 3, then 4, 3.5, then 6, 3.5, then 8 2.5 and finally 10, 2.
There is a horizontal line, called "proposed new ground level" from 3 on the y-axis across the width of the graph.**Step 2:** **Divide the base width into equal intervals.**

The base width is 10 m. The number of intervals is 5.

Therefore, the interval width is 10 ÷ 5 = 2 m.

**Steps 3 and 4:** **Find the midpoint heights of each interval.**

Interval 1 = 0.25 m  Interval 2 = 0.25 m

Interval 3 = 0.5 m  Interval 4 = 0 m

Interval 5 = –0.75 m

**Step 5:** **Calculate the area of each interval.**

Interval 1 area = 0.25 m × 2 m = 0.5 m2  Interval 2 area = 0.25 m × 2 m = 0.5 m2

Interval 3 area = 0.5 m × 2 m = 1 m2  Interval 4 area = 0 m × 2 m = 0 m2

Interval 5 area = –0.75 m × 2 m = –1.5 m2

**Step 6:** **Add up the areas of the intervals to get the total area of the cross-section.**

0.5 + 0.5 + 1 + 0 – 1.5 = 0.5 m2

**Step 7:** **Calculate the volume of earth needing to be removed.**

0.5 × 9 = 4.5 m3