Name_____

Divide & Conquer Note-Taking from Photo Show

Topic 1. What sorts of professions survey stream cross-sections?

Geographers and _____ and _____

Topic 2. What 3 things typically get measured in stream surveys?

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Topic 3. What happened to the Salt River near ASU between 1935 and 2002?

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Topic 4. What happened to Winkelman, Arizona, in 1993 during flooding?

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Did the same thing happen to Tempe, Arizona, in this same flood? Why not?

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Topic 5. What did the City of Scottsdale do to Indian Bend Wash, instead of leaving it a dry river channel?

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Topic 6. Have you ever seen pictures on the news or in the paper of people who try to cross a river when it is flooded? Do you think that you would ever try this? Explain.

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Divide & Conquer Note Taking Answer KEY

1. What sorts of professions survey stream cross-sections?

Geographers and hydrologists and civil engineers

2. What 3 things typically get measured in stream surveys?

geometry of the cross section
vegetation
sizes of river rocks

3. What happened to the Salt River near ASU between 1935 and 2002?

The Salt River used to be flowing naturally in a wide channel. It was narrowed by people and forced to flow between levees

4. What happened to Winkelman, Arizona, in 1993 during flooding?

The parts of town near the river flooded.

Did the same thing happen to Tempe, Arizona, in this same flood? Why not?

No and yes.
No, the town was not flooded. The floodwaters stayed between the levees.
and
Yes, the same thing did happen. There was destruction of property from floodwaters, but the damage stayed inside the levees.

5. What did the City of Scottsdale do to Indian Bend Wash, instead of leaving it a dry river channel?

They turned the channel into a place of recreation for golfers and skateboarders and rollerbladers.

6. Have you ever seen pictures on the news or in the paper of people who try to cross a river when it is flooded? Do you think that you would ever try this? Explain.

Open-ended response

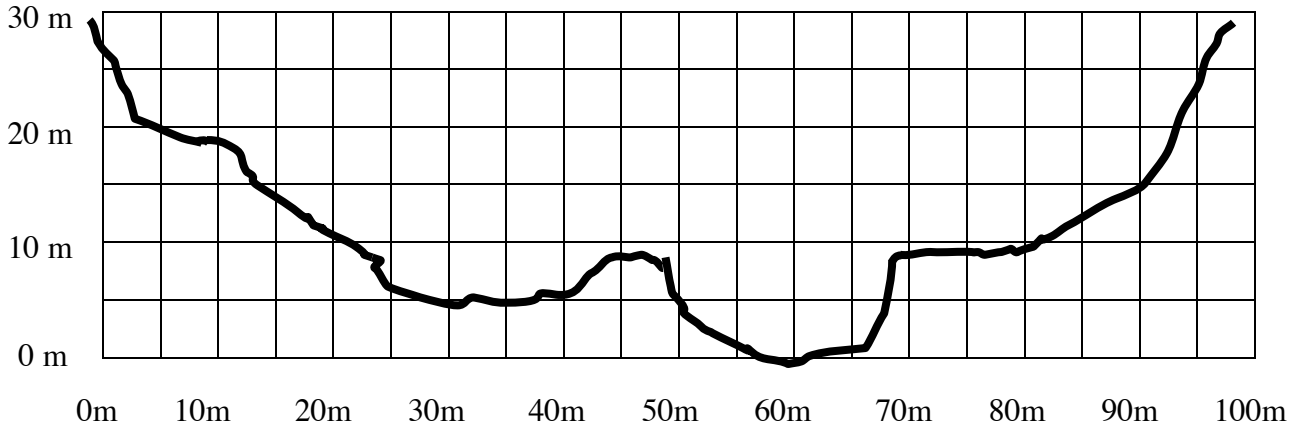
Divide and Conquer Practice

Useful Formulas for Area

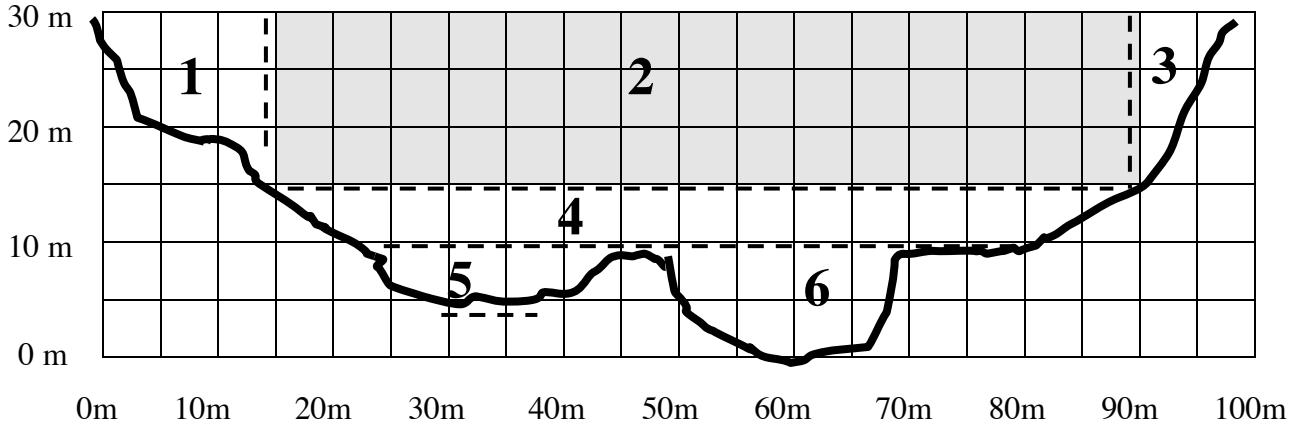
Square: A = b • h Rectangle: A = b • h
Trapezoid: A = 0.5 • h • (a + b) Triangle: A = 0.5 • b • h
Circle: A = πr^2 Use 3.14 for π

What is the cross-sectional area of a natural stream?

❶ **Survey** the natural cross-section of the stream. The result of the survey is shown below.

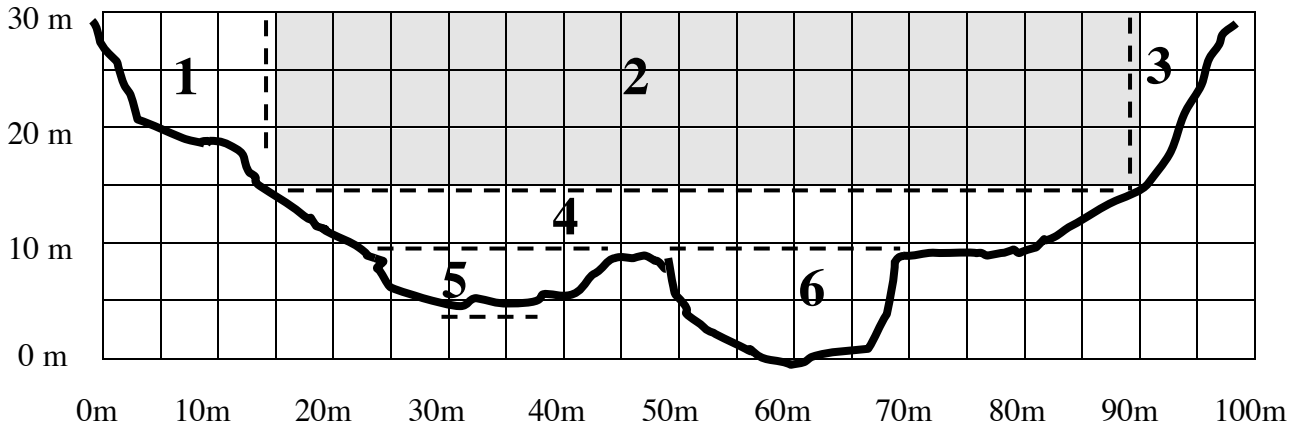


❷ **Divide into Shapes.** Divide the cross-section into segments that are close to regular geometric shapes. In the diagram below; segments 1 and 3 approximate triangles, segment 2 is a rectangle, segments 4 and 5 approximate trapezoids, and segment 6 approximates a half circle.



ARIZONA GEOGRAPHIC ALLIANCE

❸ **Estimate the dimensions.** You will approximate the base and height measures. Use the scale on the graph and round your answers to the nearest whole number.



❹ **Calculate the area of each segment.**

Segment	Shape	Shape Formula	Plug it in	Area
1	Triangle	A = 0.5 • b • h		
2	Rectangle	A = b • h		
3	Triangle	A = 0.5 • b • h		
4	Trapezoid	A = 0.5 • h • (a + b)		
5	Trapezoid	A = 0.5 • h • (a + b)		
6	Circle (half)	A = πr^2 Divide area by 2		

❺ **Conquer** the total cross-sectional area of the stream by adding up the areas.

Total area = _____ m^2 Area rounded to nearest hundred _____ m^2

Divide and Conquer Practice Answer KEY

❹ **Calculate the area of each segment.**

Segment	Shape	Shape Formula	Plug it in	Area
1	Triangle	A = 0.5 • b • h	0.5 • 15 • 15	112.5 m^2
2	Rectangle	A = b • h	75 • 15	1125 m^2
3	Triangle	A = 0.5 • b • h	0.5 • 10 • 15	75 m^2
4	Trapezoid	A = 0.5 • h • (a + b)	0.5 • 1 • (75 + 55)	65 m^2
5	Trapezoid	A = 0.5 • h • (a + b)	0.5 • 1 • (20 + 10)	15 m^2
6	Circle (half)	A = πr^2 Divide area by 2	(3.14 • 2^2) ÷ 2	6.28 m^2

❺ **Conquer** the total cross-sectional area of the stream by adding up the areas.

Total area = **1398.78 m^2** Area rounded to nearest hundred **1400 m^2**

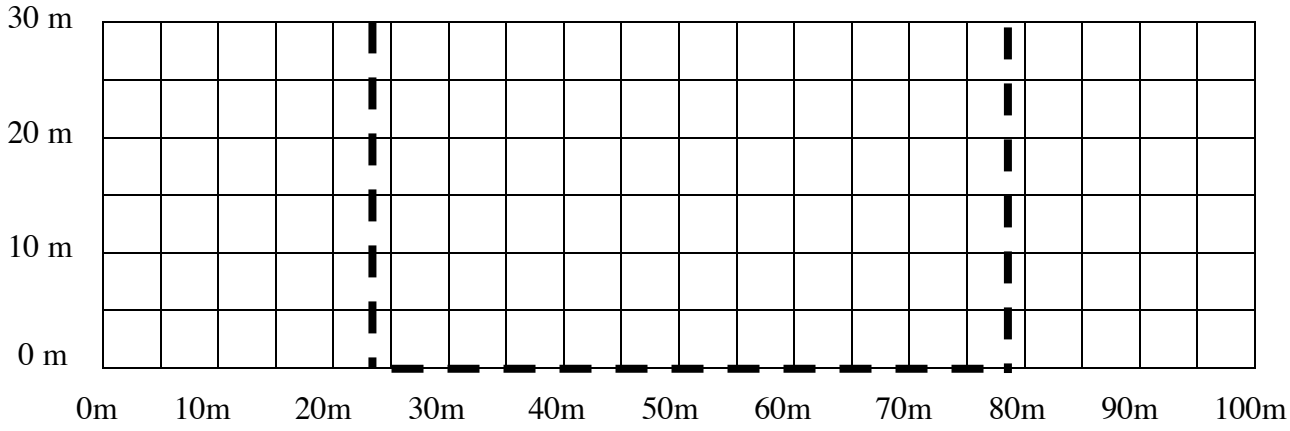
Changing the Channel Assessment

You are part of a team studying a plan for the channel of a river that runs next to a campground called Big Creek. Every three years, heavy winter rains cause the river to flood the campground. The Forest Service needs to install a new bridge to the campground. The channel will be narrowed to accommodate the new bridge. At the same time, any change in the channel shape must help prevent flooding of the campground.

Your job is to determine which plan for the new, narrower artificial channel will be best. You must also draw your own channel design that will keep the bridge length as short as possible and have a cross sectional area that is no less than that of the natural channel (1400 m^2).

The Plans

Plan A

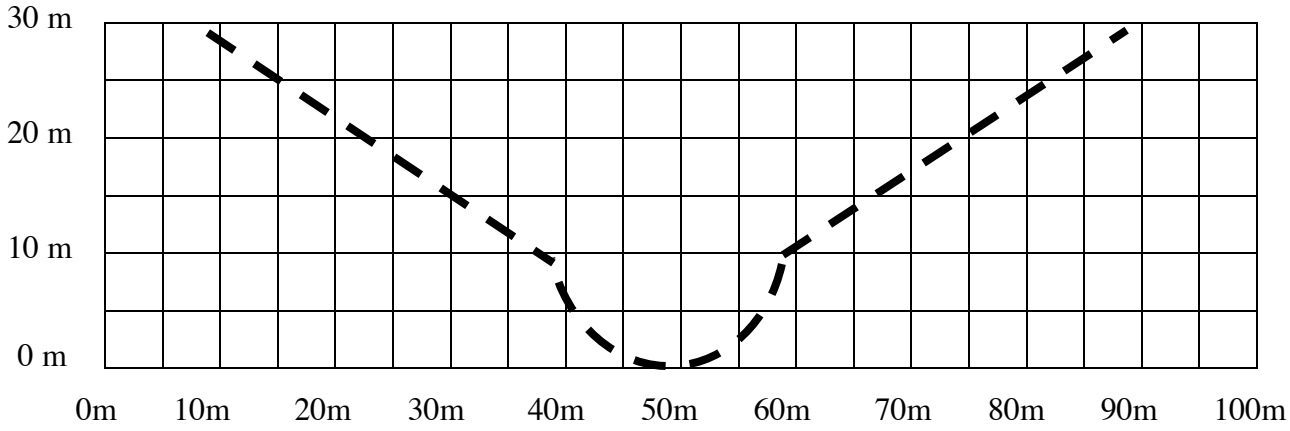


Cross Section Calculations:

Total Cross Section Area: _____

Is this a good plan for a new channel? Why? Why not?

Plan B

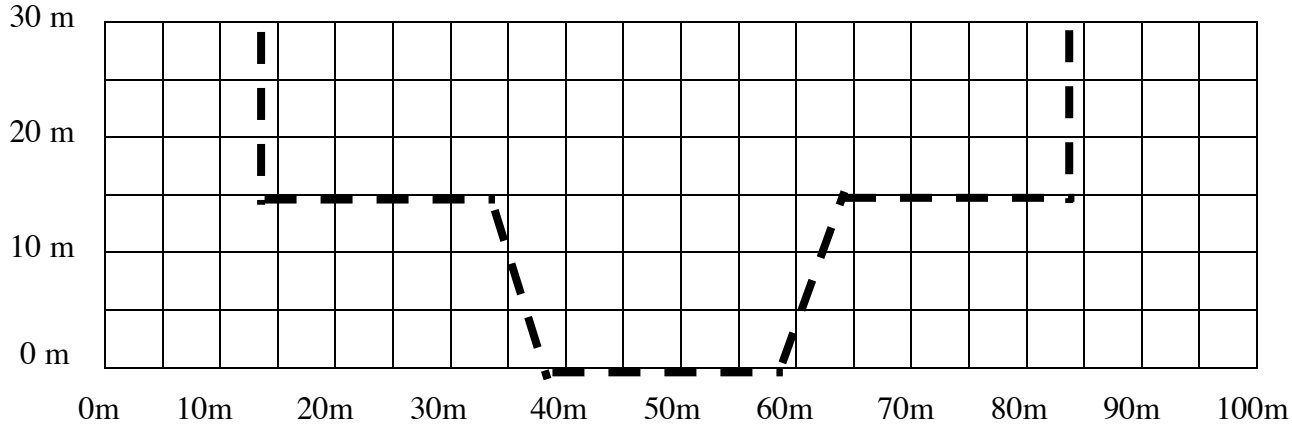


Cross Section Calculations:

Total cross section area: _____

Is this a good plan for a new channel? Why? Why not?

Plan C

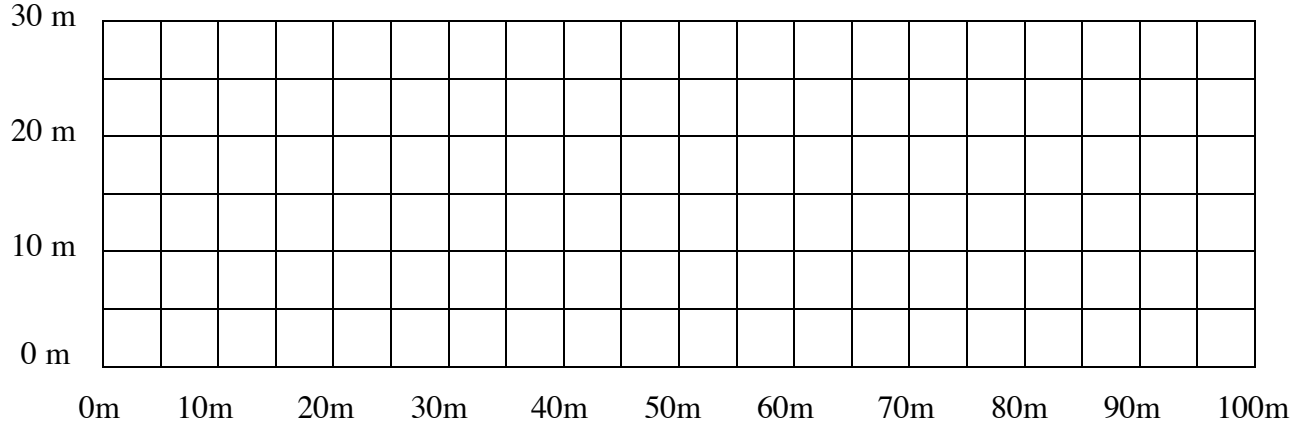


Cross-Section Calculations:

Is this a good plan for a new channel? Why? Why not?

Your Plan: Try drawing a cross section that keeps the bridge length as short as possible and has a greater cross-sectional area than the natural channel.

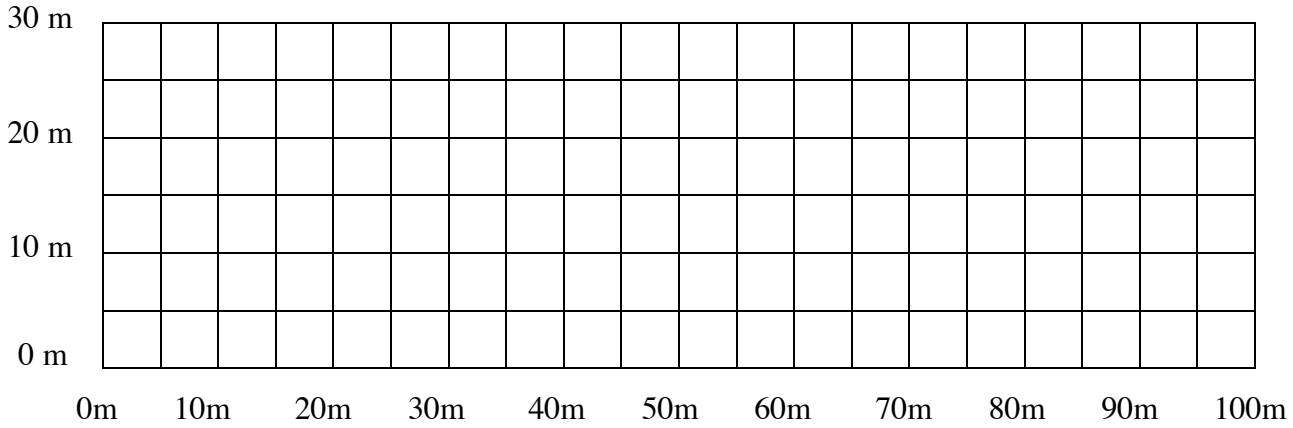
Draft Plan



Cross-Section Calculations:

Is this a good plan for a new channel? Why? Why not?

Final Plan

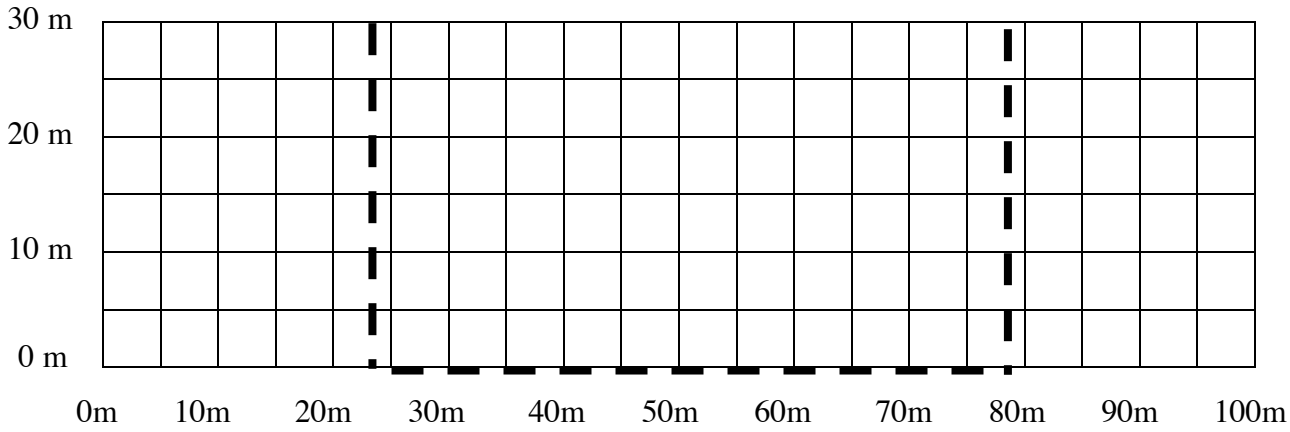


Cross-Section Calculations:

Is this a good plan for a new channel? Why? Why not?

Changing the Channel Answer KEY

Plan A



Cross Section Calculations: **The design is a rectangle.**

A = b • h

A = 55 • 30

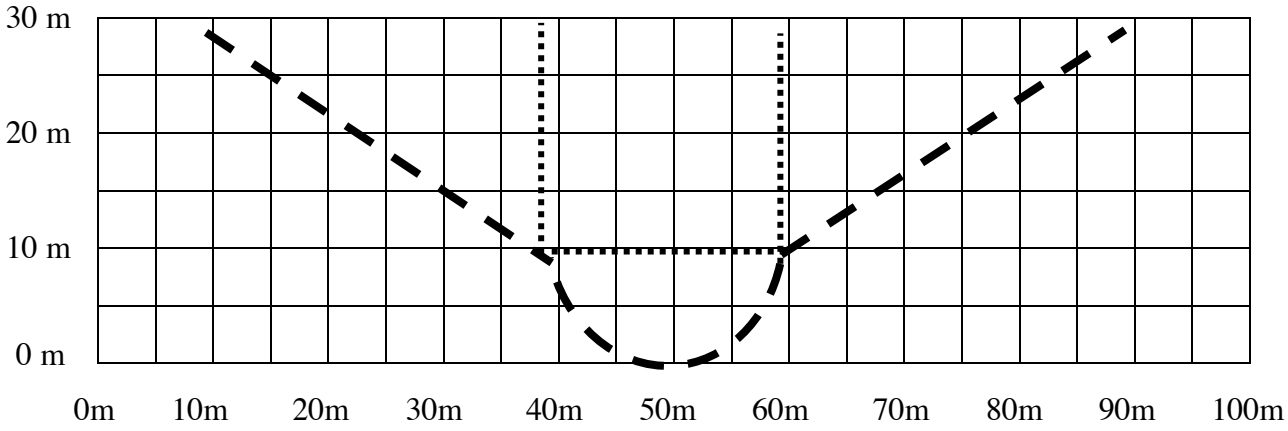
A = 1650 m^2

Total Cross Section Area: **1650 m^2**

Is this a good plan for a new channel? Why? Why not? ***This is a good plan. The cross-sectional area is greater than the natural channel. This means that more water can move past this point. It should help reduce flooding. Also, the new channel is narrower than the natural channel. This fits the guideline for a short bridge length.***

Changing the Channel Answer KEY

Plan B



Cross Section Calculations: **Divide Plan B into 2 triangles and 1 half circle.**

Triangle 1 **A = 0.5 • b • h** **A = 0.5 • 30 • 20** **A = 300**

Triangle 2 **A = 0.5 • b • h** **A = 0.5 • 30 • 20** **A = 300**

Half Circle **A = $(\pi r^2) \div 2$** **A = $(3.14 \bullet 2^2) \div 2$** **A = 6.28**

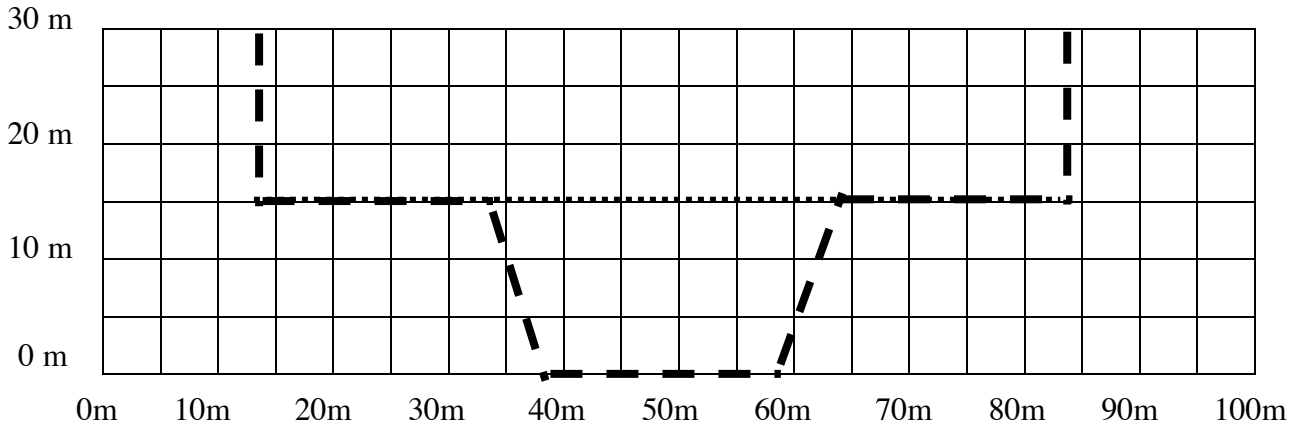
606.28 m^2 Total

Total cross section area: **606.28 m^2**

Is this a good plan for a new channel? Why? Why not? ***This is not a good plan. The cross-sectional area is much less (less than half) the cross sectional area of the natural channel. Flooding will increase, not decrease. Also, this plan would need a longer bridge than Plan A.***

Changing the Channel Answer KEY

Plan C



Cross-Section Calculations: **Divide Plan C into 1 rectangle and 1 trapezoid**

A = b • h **A = 70 • 15** **A = 1050**

A = 0.5 • h • (a + b) **A = 0.5 • 15 • (30 + 20)** **A = 375**

1425 m^2 Total

Total cross section area: **1425m^2**

Is this a good plan for a new channel? Why? Why not? ***This plan is okay. The cross-sectional area is greater (but not by much) than the natural channel. This plan would require a fairly long bridge.***

Student Plans

Answers will vary.