Name:_____ Date:_____

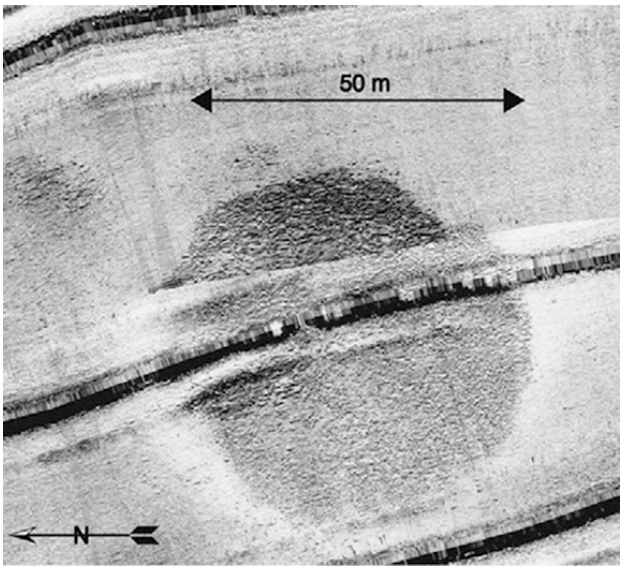
Mysterious Structures

Big Picture:	Success Criteria:
We are learning to use volume, capacity and surface area to solve real-life problems.	*I can:* ☑ research, describe, and report on volume and capacity ☑ solve problems involving surface area, volume, and capacity ☑ demonstrate an understanding of the properties of circles and polyhedrons and their real world applications ☑ construct a circle and a polyhedron from a net

Background Information: Mysterious Stone Monument Under the Sea

A giant stone structure discovered beneath the waters of the Sea of Galilee in Israel has archaeologists puzzled as to its purpose and even how long ago it was built.

The mysterious structure is **cylinder-shaped** and weighs an estimated **60,000 tonnes** the researchers said. That makes it heavier than most modern-day warships.



Rising nearly **10 meters high**, it has a **chord of about 50 meters across the top** and is **70 meters in diameter.** To put that in perspective, the outer stone circle of Stonehenge has a diameter just half that with its tallest stones not reaching that height. They believe it dates to about 4000 years ago, the same age as Stonehenge.

They say it is definitely human-made and probably was built on land, only later to be covered by the Sea of Galilee as the water level rose. "The shape and composition of the submerged structure does not resemble any natural feature. We therefore conclude that it is man-made and might be termed a cairn [a man-made pile of rocks]," the researchers write. They are unsure what it was used for or why it was built.

Your Challenge

1) Part One: Draw the structure (/10)
2) Part Two: Determine the volume, capacity and surface area (/10)
3) Part Three: Structure Comparisons (/10)
4) Part Four: Modern Structures (/15)

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Part One: Drawings

a) Draw the structure from its top and side views, making sure to create an appropriate scale (1 mark). For the top view, make sure to use a compass to make your drawing accurate (2 marks). Label all parts of the structure (including radius, height, diameter, circumference)(4 marks).

/7

b) *How do you think researchers determined the mass of the structure? Do you think they weighed it with a giant scale? What could they have done instead?*

/3

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Part Two: Volume, Capacity, Surface Area

For the structure:

a) Determine the volume:

/3

b) Determine the surface area:

/4

c) Determine the capacity:

/3

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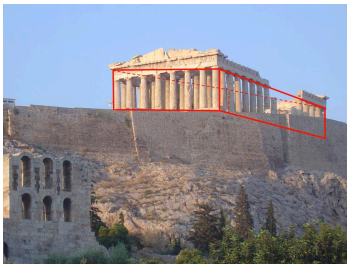
Part Three: Structure Comparisons

a) Choose one of the non-cylindrical structures below:

☐ The Parthenon in Athens (*rectangular prism)*

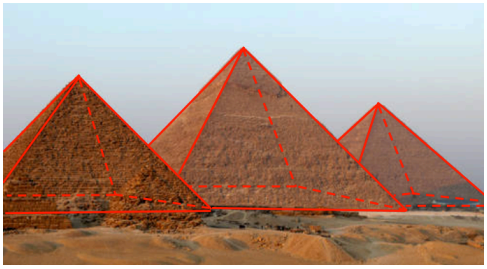


width: 30.86m
length: 69.51m
height: 24.0m

☐ The Transfiguration Church in Queens (*triangular prism)*

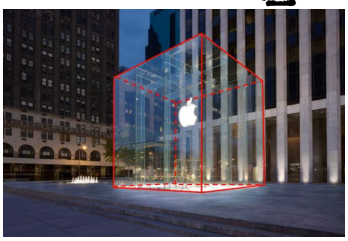
width: 16.76m
length: 23.16m
height: 17.23m

☐ The Great Pyramid in Giza (*pyramid)*



width: 230m
length: 230m
height: 146.61m

☐ The Cube in New York City (*cube)*



width: 146.3m
length:146.3m
height: 146.3m

a) *Calculate the volume, capacity and mass of your second structure.* /7

b) Compare the measurements of the second structure to the mystery structure. Which is bigger overall? What inferences can you make from this? /3

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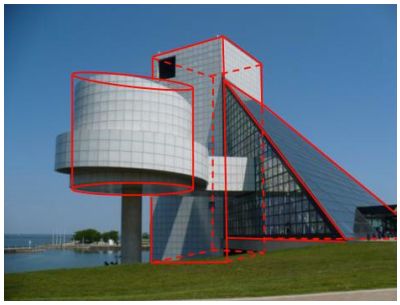
Part Four: Modern Structures Part Four: Modern Structures



The Rock and Roll Hall of Fame is an example of a modern architectural wonder. All the different shapes make the building, on its own, look amazing. The one section, out on a single concrete pillar, is a cylinder. The section with the glass walls is a triangular prism. Finally the lone remaining section is a rectangular prism.

You have been hired to design a modern building to house the Toronto Rock and Roll Hall of Fame. Your design must fit the following requirements:

- ☐ It must incorporate at least **two** different 3D shapes
- ☐ One shape must have a capacity of **4000L**
- ☐ The other shape must have a volume of **2500m^3**

*a) Draw the design of your building, including a **top view**, **side view**, and the **nets** of each shape. **Make sure to include dimensions that work with the required capacity and volume**:* /8

b) Complete the chart below for your building's 3D shapes:

3D Shape	V (vertices)	F (faces)	E (edges)

/6

c) Do your shapes follow Euler's Formula? Explain.

/1