

YEAR 9 MAINSTREAM MATHEMATICS 2024



**ISLAMIC COLLEGE
OF MELBOURNE**

MEASUREMENT

Task Type:	Take-Home Project	Weighting:	20%
Date Due:	Term 4, Week 3	Teacher:	Ms. Hafsa Wazeer
Full Name(s):		Homeroom:	

Student Category	
SAP	MAINSTREAM
VC2M9M01	solve problems involving the volume and surface area of right prisms, cylinders and composite objects using appropriate units.
VC2M9M02	solve problems involving very small and very large measurements, timescales and intervals expressed in scientific notation.

Context:

During this unit, students have explored various concepts related to measurement. They have learned to calculate absolute, relative, and percentage error to assess measurement accuracy. Additionally, students have studied the perimeter and circumference of shapes, as well as the area of common geometrical figures. They have also explored the area and perimeter of sectors, the surface area of rectangular and triangular prisms, and the surface area of cylinders. Furthermore, students have deepened their understanding of volume by calculating the volume of prisms and cylinders.

- In order to complete this task, you will:**
- Write your FULL NAME in the space provided above.
 - All responses must be in English and blue or black ink (except sketches).
 - Students:
 - May work by themselves, in pairs or groups of three
 - May work on the project at home
 - Will be provided with at least two periods in class to work on the project

<i>In class</i>	<i>Total Time</i>
Minimum 2 periods	2 weeks

<i>Parts</i>	<i>Number of Marks</i>	<i>Total Marks</i>
Step 1: Design and Sketch	/ 6	/80 = %
Step 2: Measurements	/ 59	
Step 3: Frosting Calculations	/ 10	
Step 4: Slicing the Cake	/ 5	

Comments:

TASK DESCRIPTION

Ms. Hafsa, a pastry chef, has been hired to create a unique four-layer cake for a math-themed celebration. Her client, Ms. Razia, wants each layer to represent a different geometric shape to reflect her passion for mathematics. The cake needs to serve 8 people, with the base layer having a diameter between 20 and 40 cm. Each layer should be a different polygonal prism, with the bottom layer being cylindrical. Ms. Razia also wants to know the cake's total surface area (in cm^2) and volume (in cm^3) to determine the amount of frosting needed.

Your task is to help Ms. Hafsa by creating a detailed sketch of the cake, calculating the necessary measurements, and figuring out how much frosting will be required to cover the cake, excluding the areas between layers and the bottom of the cake.

INSTRUCTIONS

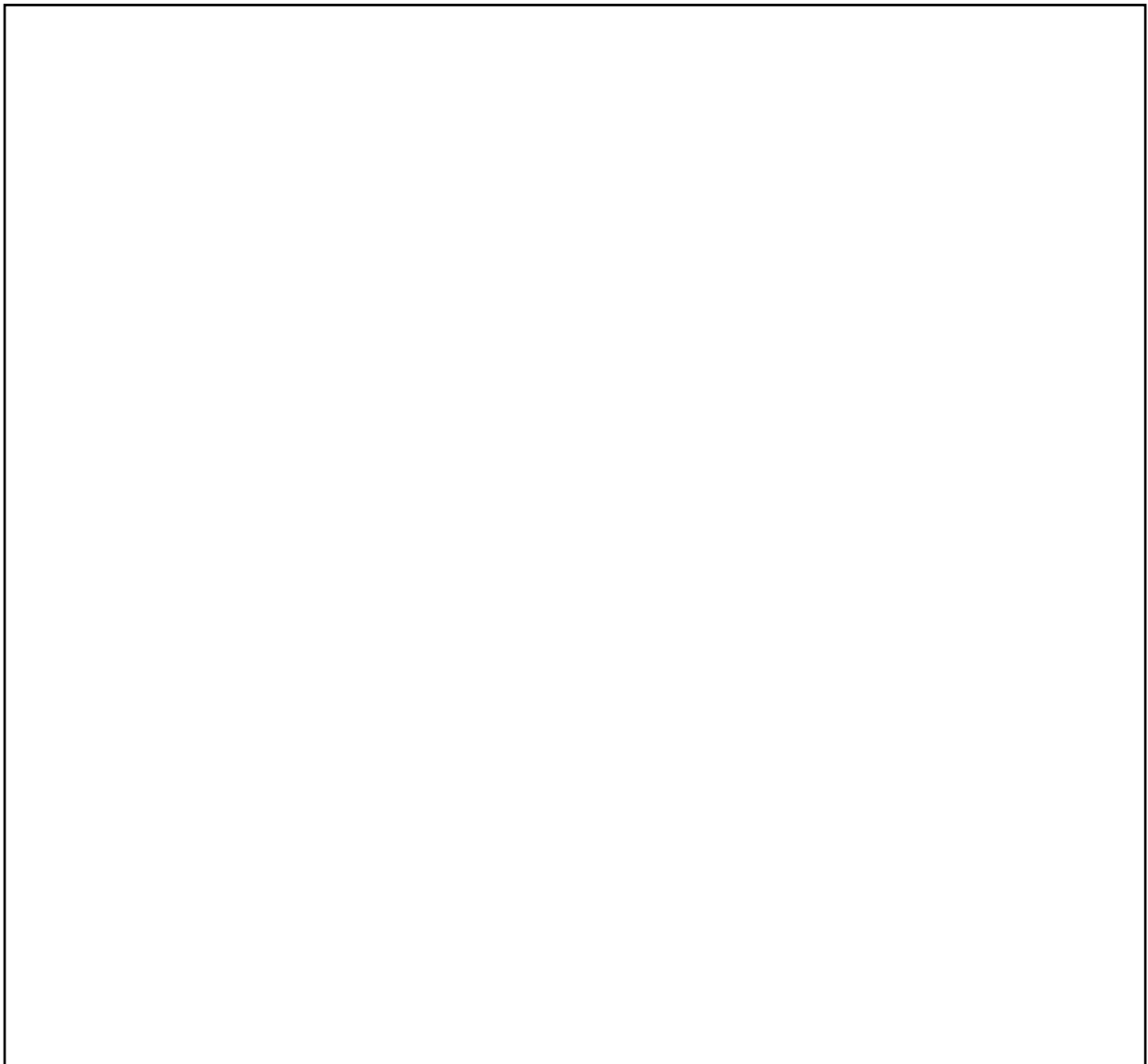
- Sketch the cake with four different geometric layers.
- Determine the shape, dimensions, surface area, and volume of each layer
- How much frosting will Ms Hafsa need and how much is she going to have to spend?
- Determine the dimensions of a slice of the cake.

STEP 1: DESIGN AND SKETCH (6 MARKS)

Choose a shape (which meets the requirements outlined below) and draw (or use an online software and print and affix) a detailed sketch of the cake, labelling each layer's shape and dimensions (height and width).

Requirements:

- Bottom (First) Layer = Cylinder
- Second Layer = a Four-Sided Prism
- Third Layer = Triangular Prism
- Top (Fourth) Layer = Hexagonal Prism



STEP 2: MEASUREMENTS (59 MARKS)

Determine the dimensions of each of the layers. Ensure, you use cm , cm^2 and cm^3 as your units, include formulas and show working where necessary.

Bottom Layer: Cylinder

Sketch of the Cylinder (include measurements)	Net of Cylinder (include measurements)
[2 marks]	[2 marks]

Diameter	Radius	Height	Circumference of the Top Surface	Area of the Top Surface	Surface Area of Cylinder	Volume of Cylinder
[1 mark]	[1 mark]	[1 mark]	[2 marks]	[2 marks]	[2 marks]	[2 marks]

Second Layer: Four-Sided Prism

Sketch of Four-Sided Prism (include measurements)	Net of Four-Sided Prism (include measurements)
[2 marks]	[2 marks]

Length(s)	Width	Height	Perimeter of the Top Surface	Area of the Top Surface	Surface Area of the Prism	Volume of the Prism
[1 mark]	[1 mark]	[1 mark]	[2 marks]	[2 marks]	[2 marks]	[2 marks]

Third Layer: Triangular Prism

Sketch of Triangular Prism (include measurements)	Net of Triangular Prism (include measurements)
[2 marks]	[2 marks]

Lengths of the Three-Sides	Height of the Prism (h)	Perimeter of the Triangle	Area of the Triangle	Surface Area of the Prism	Volume of the Prism
[1 mark]	[1 mark]	[2 marks]	[2 marks]	[2 marks]	[2 marks]

Top (Fourth) Layer: Hexagonal Prism

Sketch of Hexagonal Prism (include measurements)	Net of Hexagonal Prism (include measurements)
[2 marks]	[2 marks]

Length of One Side (s)	Apothem Length (a)	Height of the Prism (h)	Perimeter of the Top Hexagon	Area of the Top Hexagon	Surface Area of the Prism	Volume of the Prism
[1 mark]	[1 mark]	[1 mark]	[2 marks]	[2 marks]	[2 marks]	[2 marks]

STEP 3: FROSTING CALCULATION (10 MARKS)

Determine the amount of frosting your cake will require. Each container of frosting covers 100 square cm and costs \$3.78. Remember, you do not need to put frosting where the tiers/ layers connect or on the bottom base of the bottom tier/ layer. Also ensure to include correct units in your answers.

Note: SA = Surface Area

Layer	(1) Total SA of the Shape	(2) Area of Surface not to be frosted	(3) SA to be frosted = (1) – (2)
SA of Bottom (First) Layer = Cylinder	6283.19cm ²	2513.27cm ²	3769.92cm ²
SA of Second Layer = a Four-Sided Prism	3,750cm ²	1250cm ²	
SA of Third Layer = Triangular Prism	1692cm ²	192	
SA of Top (Fourth) Layer = Hexagonal Prism	3,750cm ²	259.80	
Total Surface Area			

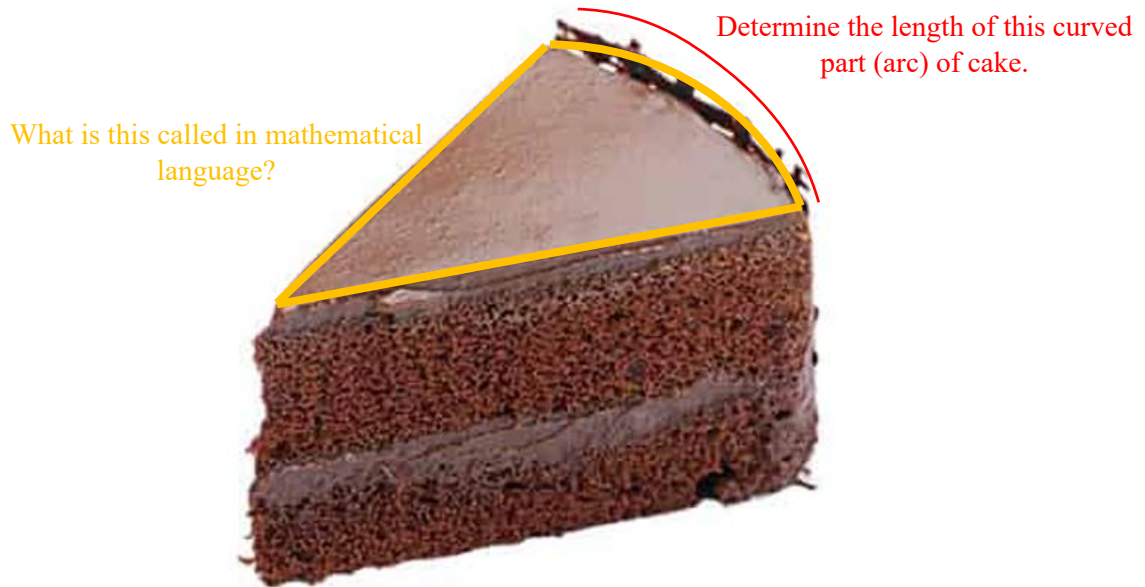
a) Total Surface Area to be frosted: [4 marks]

b) Number of frosting containers needed: [3 marks]

c) Total cost of frosting: [3 marks]

STEP 4: SLICING THE CAKE (5 MARKS)

Ms. Razia separated each layer starting from the centre of the cake, she sliced the circular layer of the cake into 8 equal slices. *What is each slice called in mathematical language? What is the length of the outer edge of each slice? Calculate the surface area and volume of this slice?*



- a) What is each slice called? [1 mark]

Sector

- b) What is the length of the outer edge of each slice? [2 marks]

$$L = \frac{\theta}{360} \times 2(\pi)r$$

$$L = \frac{40}{360} \times 2(\pi) \times 20 = 13.96$$

- c) What is the surface area of each slice? [2 marks]

$$\text{sector: } \frac{\theta}{360} \times (\pi)r^2$$

$$= \frac{40}{360} \times (\pi)20^2$$

$$= 139.6$$
