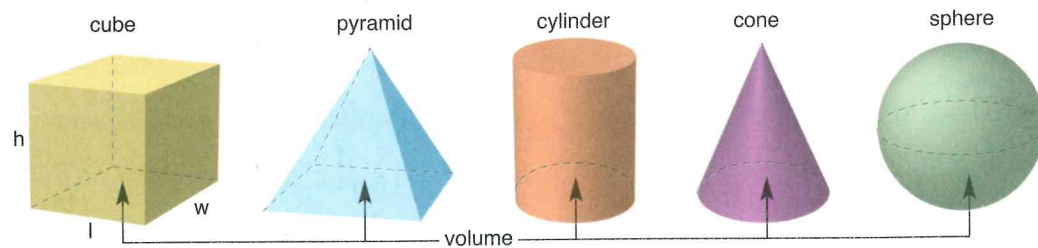




Section 1 Vocabulary

A. Read the text and look at the diagram.



Three-dimensional (3D) shapes

A line has only one dimension: length. A square has two dimensions: length and height. Some shapes have **three dimensions**: length, height and width (w). **Cubes, pyramids, cylinders, cones** and **spheres** are three-dimensional shapes.

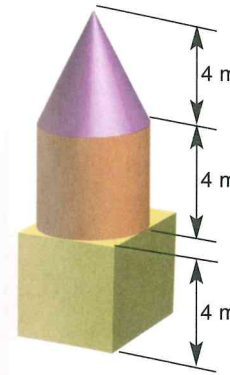
Two-dimensional shapes have area. Three-dimensional shapes have **volume**.

Cuboid shapes are based on a square or a rectangle. The volume is simply the area ($l \times h$) times the width. For example, a cuboid which is $4 \text{ cm} \times 3 \text{ cm} \times 2 \text{ cm}$ has a volume of 24 **cubic centimeters** (cc or cm^3). A pyramid is based on a rectangle but the formula is a little more complicated. It is $(l \times h \times w) \div 3$. So a pyramid with a base of $4 \text{ cm} \times 3 \text{ cm}$ and a height of 3 cm has a volume of $36 \div 3 = 12 \text{ cc}$.

Cylindrical, conical and **spherical** shapes are based on circles, so the formulas for volume use the constant, π . The formulas are shown in Table 1.

Object	Formula
cylinder	$\pi r^2 h$
cone	$\frac{\pi r^2 h}{3}$
sphere	$\frac{4 \pi r^3}{3}$

Table 1: Formulas for volume of cylinder, cone and sphere

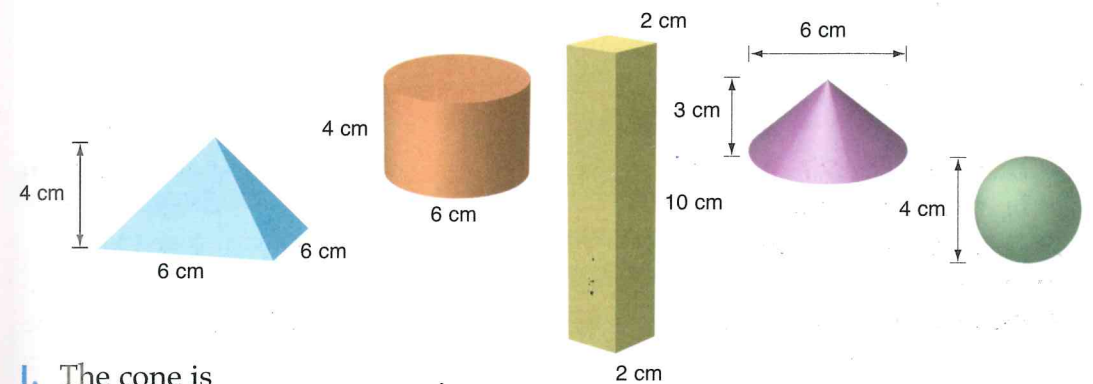


B. Look at the figure on the left. Complete the sentences.

- The bottom shape is a _____.
- The center shape is a _____.
- The top shape is a _____.
- The height of the cylinder is _____.
- The radius of the cone is _____.
- The _____ has the smallest volume.

C. Look at the shapes and complete the sentences. Use the correct volume in the box.

113 cm^3 / 33.515 cm^3 / 40 cm^3 / 48 cm^3 / 28.278 cm^3



- The cone is _____.
- The pyramid is _____.
- The sphere is _____.
- The cylinder is _____.
- The cuboid is _____.

D. Write the noun for each adjective.

- | | | | |
|-------------------|-------|----------------|-------|
| 1. cylindrical | _____ | 5. square | _____ |
| 2. spherical | _____ | 6. rectangular | _____ |
| 3. cuboid / cubic | _____ | 7. triangular | _____ |
| 4. conical | _____ | 8. circular | _____ |



Section 2 Reading

Introduction

The General Manager asked the Technical Department to look at possible bottle shapes for the new perfume, *Moonlight*, and to recommend the best shape.

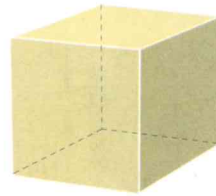


Figure 1: The packaging

Terms of reference

The new bottle has to fit into the existing packaging which is a cube of 4.5-cm sides – see Figure 1. The bottle therefore has to have maximum dimensions of 4 cm in any direction. The bottle has to hold 25 cc (cm³) of perfume. The shape has to be interesting. The Design Department suggests a pyramid, a cylinder, a sphere or a cone. These shapes can be seen in Figure 2.

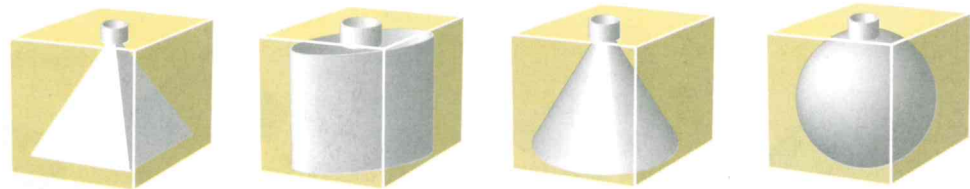


Figure 2: Possible bottle shapes inside packaging

Analysis

The Technical Department looked at the four possible shapes. We calculated the volume for the largest possible bottle of each shape. The results are shown in Table 1.

Shape	Capacity
pyramid	21.3 cm ³
cylinder	50.3 cm ³
sphere	33.5 cm ³
cone	16.8 cm ³

Table 1: Cubic capacity of each shape

Conclusion

The sphere is the only suitable shape for this size of packaging – see Table 1. The cylinder holds too much while the pyramid and the cone do not hold enough.

Recommendation

We should use a spherical shape for the new bottle. We should not use the cylinder, cone or pyramid.

A. Choose the best answer in each case.

- Who is this report from?
 - the Design Department
 - the Technical Department
 - the General Manager
 - We don't know.
- What is the purpose of the report?
 - to recommend a bottle shape
 - to suggest a package shape
 - to suggest possible bottle shapes
 - to recommend a name for the perfume
- The report recommends:
 - the sphere
 - the cylinder
 - the pyramid
 - the cone
- The pyramid is not suitable because:
 - it does not hold enough perfume
 - it holds too much perfume
 - it doesn't fit in the packaging
 - the Design Department doesn't like it
- Which shape holds the least perfume?
 - the sphere
 - the pyramid
 - the cone
 - the cylinder

B. Study the following example sentences.

Talking about necessity

The new bottle **has to** fit into the existing packaging.
 The shape **has to** be interesting.
 We **should** use a spherical shape.
 We **should not** use the cylinder, cone or pyramid.

C. Follow the example and rewrite the sentences using the modals in parentheses.

- It is necessary for the new bottle to fit into the existing packaging.
 The new bottle *has to* fit into the existing packaging. (have to)

- It is necessary for the bottle to hold 50 cc of perfume. (have to)

- It is necessary for the shape to be interesting. (have to)

4. It is necessary for us to use a cylindrical shape. (should)

5. It is necessary for the company not to use the sphere, cone or pyramid. (should)



Section 3 Listening

A. Listen and complete the summary of the reading text in Section 2. Write one word in each space.

The report has five sections. The first section is the _____ which contains the purpose of the report. The second section is the terms of _____ . This explains the problem that has to be solved. The third section is the _____ : what the writer did. The fourth section is the _____ : what the writer discovered. And the final section is the _____ : what the writer thinks the company should do.



B. Listen to the lecture. Choose the best answer in each case.

1. Which statement is true about the length of the diameter of the cone?
 - a. It is greater than that of the sphere.
 - b. It is shorter than that of the sphere.
 - c. It is the same as that of the sphere.
 - d. It is not mentioned.
2. The volume of the cone is:
 - a. 3 cc
 - b. 33.49 cc.
 - c. 16.74 cc
 - d. 50.23 cc
3. The total volume of the object is:
 - a. 15.26 cc
 - b. 16.74 cc
 - c. 33.49 cc
 - d. 50.23 cc

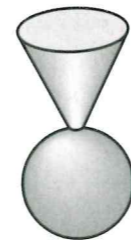


Figure 1