μNIT TEST #8-2A | Australian Curriculum Mathematics | February 2025

ACACIA TUTORING

Pythagoras' Theorem, Volume, Surface Area, Congruence, and Similarity

8 μnit Test

Free and always will be!

Instructions: Read all questions carefully to ensure you understand what is being asked. When completing your official tests / exams, your grade will be based upon your: **understanding, fluency, reasoning, and problem solving,** so ensure you show all lines of working and draw accurate, labelled diagrams where necessary. (ACiQ|9.0 Mathematics standard elaborations found on final page (general assessment marking standards)). [Practise tests are marked out of a score of 10]. For multiple choice questions, tick or fill in the circle next to the corresponding letter under the question.

Check your work if you have time. *Remember:* you don't have to start at question one, it's always best to firstly look through the test, highlight the easy looking questions and complete them first, then secondly, go back through and work on the harder questions. Good luck! And remember to breathe!

$$\sum = \frac{\quad}{10} = \quad \%$$

Part 1: Multiple Choice (2 marks)

Question 1:

For a right-angled triangle with legs of $6\,units$ and $8\,units$, the length of the hypotenuse is:

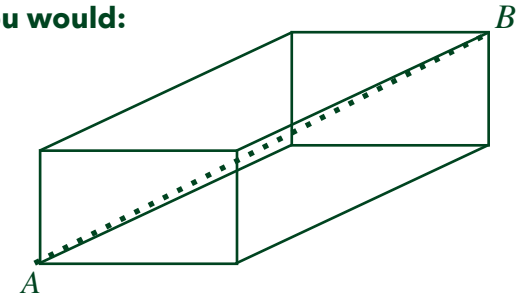
A. $10\,units$ **B.** $12\,units$ **C.** $14\,units$ **D.** $16\,units$

◯ **A** ◯ **B** ◯ **C** ◯ **D**

Space for question 1:

Question 2:

In a 3D context, if you want to calculate the length of a diagonal in a rectangular based prism, [from one corner (A) , through the middle to the other corner (B)] you would:



A. Use the Pythagorean theorem twice
B. Sum the three sides
C. Use the volume formula
D. Multiply the three sides

◯ **A** ◯ **B** ◯ **C** ◯ **D**

Space for question 2:

Part 2: Short Answer (4 marks)

Question 3:

A ladder leaning against a wall forms a right angle with the ground. If the ladder is $10\,metres$ long and the base of the ladder is $6\,metres$ from the wall, how high up the wall does the ladder reach?

Question 4:

Find the length of the diagonal of a square with sides of $7\,cm$.

Part 3: Problem Solving (4 marks)

Question 5:

A rectangular box has dimensions $3\,cm$, $4\,cm$, and $5\,cm$. Calculate the length of the diagonal from one corner of the box to the opposite corner.

Question 6:

A triangular prism has a right-angled triangle base with legs of $3\,cm$ and $4\,cm$, and a height of $10\,cm$. What is the length of the longest diagonal in the prism?

Solutions

1. (1 mark)

A. $10\,units$.

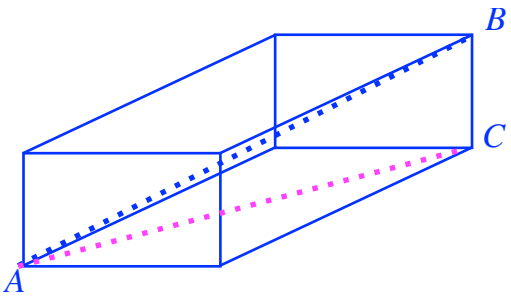
- Using Pythagoras' Theorem:

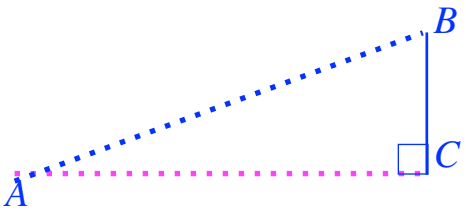
$$c = \sqrt{6^2 + 8^2}$$
$$= \sqrt{36 + 64}$$
$$= \sqrt{100}$$
$$= 10\,.$$

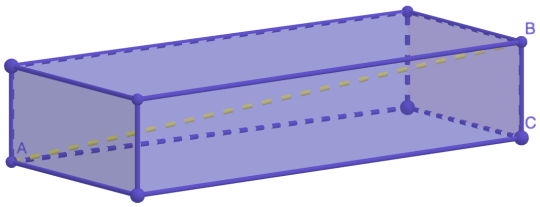
2. (1 mark)

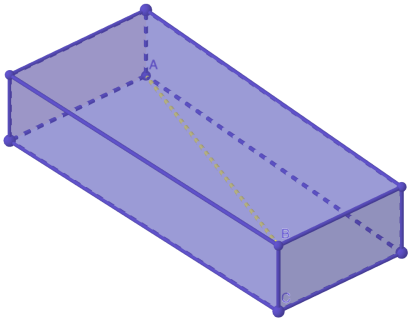
A. Use the Pythagorean theorem twice:

- First, find the diagonal on one face (magenta dotted line A to C), then use that as the base length of a the second triangle $\triangle BAC$, to find the length of the diagonal from (A) to (B).





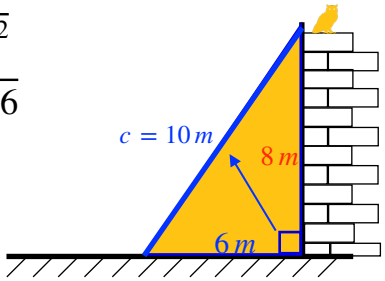




3. (2 marks)

Using Pythagoras' Theorem where the ladder (hypotenuse) is 10 metres, and the base is 6 metres:

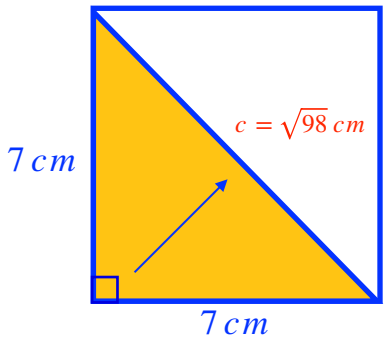
$$\begin{aligned} h &= \sqrt{10^2 - 6^2} \\ &= \sqrt{100 - 36} \\ &= \sqrt{64} \\ &= 8\,m\,. \end{aligned}$$



The ladder reaches 8 metres up the wall.

4. (2 marks)

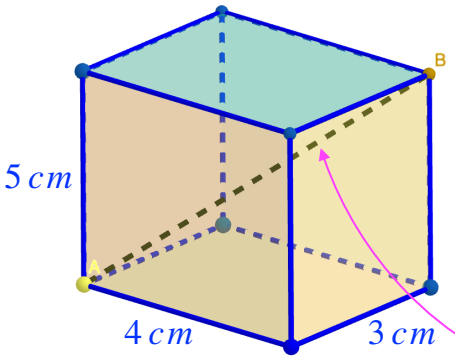
For a square, the diagonal forms the hypotenuse of a right-angled triangle with sides equal to the side length of the square:



$$\begin{aligned} c &= \sqrt{7^2 + 7^2} \\ &= \sqrt{49 + 49} \\ &= \sqrt{98}\,cm \\ &= \sqrt{49 \times 2} \\ &= \sqrt{49} \times \sqrt{2} \\ &= 7\sqrt{2}\,cm\,. \end{aligned}$$

5. (2 marks)

First, find the diagonal on the base $(3\,cm$ by $4\,cm)$:



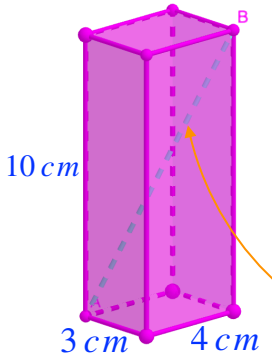
$$\begin{aligned} d_{\text{base}} &= \sqrt{3^2 + 4^2} \\ &= \sqrt{9 + 16} \\ &= \sqrt{25} \\ &= 5\,cm\,. \end{aligned}$$

Then, use this diagonal along with the height to find the space diagonal:

$$\begin{aligned} d_{\text{space}} &= \sqrt{5^2 + 5^2} \\ &= \sqrt{25 + 25} \\ &= \sqrt{50} \\ &= 5\sqrt{2}\,cm\,. \end{aligned}$$

6. (2 marks)

First, find the hypotenuse of the base triangle:



$$c_{\text{base}} = \sqrt{3^2 + 4^2}$$
$$= \sqrt{9 + 16}$$
$$= \sqrt{25}$$
$$= 5\,cm\,.$$

Now, consider this hypotenuse and the height of the prism as legs of another right triangle:

$$d_{\text{prism}} = \sqrt{5^2 + 10^2}$$
$$= \sqrt{25 + 100}$$
$$= \sqrt{125}$$
$$= 5\sqrt{5}\,cm\,.$$

$$\sum = \frac{}{10} = \quad \%$$

Volume, and Surface Area

8

μnit Test

Free and always will be!

Instructions: Read all questions carefully to ensure you understand what is being asked. When completing your official tests / exams, your grade will be based upon your: **understanding, fluency, reasoning, and problem solving,** so ensure you show all lines of working and draw accurate, labelled diagrams where necessary. (ACiQ|9.0 Mathematics standard elaborations found on final page (general assessment marking standards)). [Practise tests are marked out of a score of 10]. For multiple choice questions, tick or fill in the circle next to the corresponding letter under the question.

Check your work if you have time. *Remember:* you don't have to start at question one, it's always best to firstly look through the test, highlight the easy looking questions and complete them first, then secondly, go back through and work on the harder questions. Good luck! And remember to breathe!

$$\sum = \frac{\quad}{10} = \quad \%$$

Part 1: Multiple Choice (2 marks)

Question 1:

The surface area of a cube with side length $2\,cm$ is:

A. $8\,cm^2$ **B.** $16\,cm^2$ **C.** $24\,cm^2$ **D.** $32\,cm^2$

◯ A ◯ B ◯ C ◯ D

Space for question 1:

Question 2:

What is the volume of a cylinder with a radius of $3\,cm$ and a height of $5\,cm$ (use $\pi = 3.14$) ?

A. $141.3\,cm^3$ **B.** $150.6\,cm^3$ **C.** $47.1\,cm^3$ **D.** $94.2\,cm^3$

◯ A ◯ B ◯ C ◯ D

Space for question 2:

Part 2: Short Answer (4 marks)

Question 3:

Calculate the surface area of a sphere with a radius of $4\,cm$ (use $\pi = 3.14$) .

Question 4:

Find the volume of a cone with a radius of $2\,cm$ and a height of $6\,cm$ (use $\pi = 3.14$) .

Part 3: Problem Solving (4 marks)

Question 5:

A rectangular prism has dimensions $3\,cm$ by $4\,cm$ by $5\,cm$.

i) Calculate its volume.

ii) Calculate its total surface area.

Question 6:

A pyramid has a square base with side length $5\,cm$ and a height of $8\,cm$. Calculate its volume.

Solutions

1. (1 mark)

C. $24\,m^2$.

- Surface area of a cube $= 6 \times (\text{ side length })^2$

$= 6 \times (2\,cm)^2$

$= 6 \times 4\,cm^2$

$= 24\,cm^2$.

2. (1 mark)

A. $141.3\,cm^3$.

- Volume $=$ Area of Base $\times$ Height

$= \pi r^2 \times h$

$= \pi r^2 h$

$= 3.14 \times (3\,cm)^2 \times 5\,cm$

$= 3.14 \times 9\,cm^2 \times 5\,cm$

$= 141.3\,cm^3$.

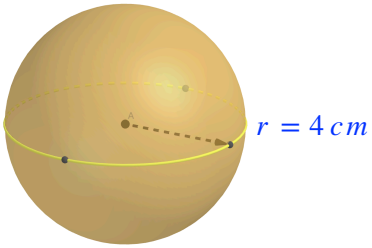
3. (2 marks)

Surface area of a sphere $= 4\pi r^2$:

$= 4 \times 3.14 \times (4\,cm)^2$

$= 4 \times 3.14 \times 16\,cm^2$

$= 201.06\,cm^2$.



4. (2 marks)

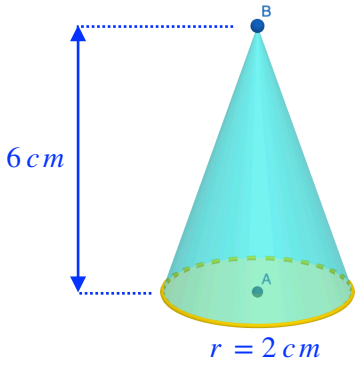
Volume of a cone $= \frac{1}{3}\pi r^2 h$:

$= \frac{1}{3} \times 3.14 \times (2\,cm)^2 \times 6\,cm$

$= \frac{1}{3} \times 3.14 \times 4\,cm^2 \times 6\,cm$

$= \frac{1}{3} \times 3.14 \times 4 \times 6\,cm^3$

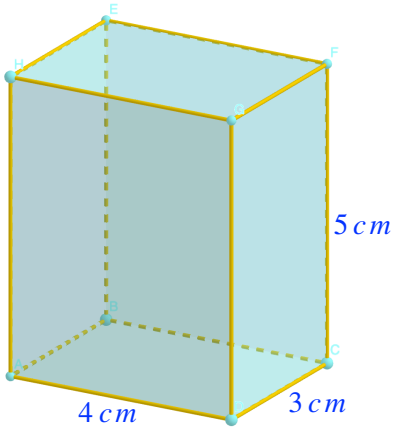
$= 25.12\,cm^3$.



5. (2 marks)

$$\begin{aligned}\text{Volume} &= l \times w \times h \\ &= 3 \times 4 \times 5 \\ &= 60\,cm^3\,.\end{aligned}$$

$$\begin{aligned}\text{Surface area} &= 2(lw + lh + wh)\,: \\ &= 2 \times (3 \times 4 + 3 \times 5 + 4 \times 5) \\ &= 2 \times (12 + 15 + 20) \\ &= 2 \times 47 \\ &= 94\,cm^2\,.\end{aligned}$$

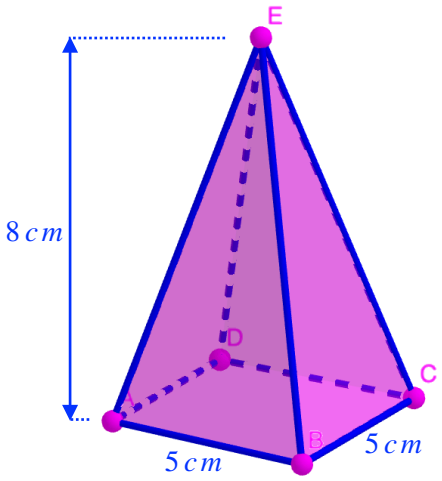


6. (2 marks)

$$\text{Volume of a pyramid} = \frac{1}{3} \times \text{Base Area} \times \text{Height}\,:$$

$$\begin{aligned}\text{Base Area} &= 5 \times 5 \\ &= 25\,cm^2\,,\end{aligned}$$

$$\begin{aligned}\text{Volume} &= \frac{1}{3} \times 25\,cm^2 \times 8\,cm \\ &= \frac{1}{3} \times 200\,cm^3 \\ &= \frac{200}{3}\,cm^3 \\ &\approx 66.67\,cm^3\,.\end{aligned}$$



$$\sum = \frac{}{10} = \quad \%$$

Congruence and Similarity

8

μnit Test

Free and always will be!

Instructions: Read all questions carefully to ensure you understand what is being asked. When completing your official tests / exams, your grade will be based upon your: **understanding, fluency, reasoning, and problem solving,** so ensure you show all lines of working and draw accurate, labelled diagrams where necessary. (ACiQ|9.0 Mathematics standard elaborations found on final page (general assessment marking standards)). [Practise tests are marked out of a score of 10]. For multiple choice questions, tick or fill in the circle next to the corresponding letter under the question.

Check your work if you have time. *Remember:* you don't have to start at question one, it's always best to firstly look through the test, highlight the easy looking questions and complete them first, then secondly, go back through and work on the harder questions. Good luck! And remember to breathe!

$$\sum = \frac{\quad}{10} = \quad \%$$

Part 1: Multiple Choice (2 marks)

Question 1:

Two shapes are congruent if:

A. They have the same shape but different sizes.
B. They have the same area.
C. They are identical in every way including size and shape.
D. Their angles are the same but sides differ.

◯ **A** ◯ **B** ◯ **C** ◯ **D**

Space for question 1:

Question 2:

Which transformation will change the similarity of two triangles?

A. Rotation **B. Stretching one side** **C. Translation** **D. Reflection**

◯ A ◯ B ◯ C ◯ D

Space for question 2:

Part 2: Short Answer (4 marks)

Question 3:

Explain what it means for two triangles to be similar.

Question 4:

If triangle ABC is similar to triangle DEF, where $AB = 4\,cm, BC = 6\,cm$, and the similarity ratio is $1:2$, what are the lengths of DE and EF?

Part 3: Problem Solving (4 marks)

Question 5:

Triangle PQR has sides of $3\,cm, 4\,cm,$ and $5\,cm$. Triangle XYZ is similar to PQR with a similarity ratio of $2:1$. Calculate the lengths of the sides of triangle XYZ.

Question 6:

Two triangles, A and B, are congruent. If triangle A has angles of $45°, 60°,$ and $75°$, what are the angles of triangle B?

Solutions

1. (1 mark)

C. They are identical in every way including size and shape.

- Congruence means all corresponding parts are equal.

2. (1 mark)

B. Stretching one side.

- Stretching changes the proportions, changing similarity. Rotation, translation, and reflection maintain similarity.

3. (2 marks)

Two triangles are similar if they have the same shape, meaning all corresponding angles are equal, and all corresponding sides are proportional. This can be due to transformations like dilation (scaling) where one triangle is an enlarged or reduced version of the other.

4. (2 marks)

the similarity ratio is $1:2$, DE (which corresponds to AB) is:

$$4\,cm \times 2 = 8\,cm,$$

and EF (which corresponds to BC) is:

$$6\,cm \times 2 = 12\,cm.$$

5. (2 marks)

For a ratio of $2:1$, each side of XYZ is half the length of the corresponding side in PQR :

$$XY = 3\,cm \div 2 = 1.5\,cm.$$
$$YZ = 4\,cm \div 2 = 2\,cm.$$
$$XZ = 5\,cm \div 2 = 2.5\,cm.$$

6. (2 marks)

Since triangles A and B are congruent, all corresponding angles must be equal:
Triangle B also has angles of 45°, 60°, and 75° .

$$\sum = \frac{}{10} = \quad \%$$

General Assessment Marking Standards

Remember: When your official tests are marked, they won't be a score out of 10, they will be a grade (A,B,C,D,E) based on the following standards:

ACiQ | v9.0

Year 8 Mathematics standard elaborations

		A	B	C	D	E
		The folio of student work contains evidence of the following:				
Mathematical proficiencies	Understanding	accurate and consistent identification, representation, description and connection of mathematical concepts and relationships in complex unfamiliar, complex familiar, and simple familiar situations	accurate identification, representation, description and connection of mathematical concepts and relationships in complex familiar and simple familiar situations	identification, representation, description and connection of mathematical concepts and relationships in simple familiar situations	partial identification, representation and description of mathematical concepts and relationships in some simple familiar situations	fragmented identification, representation and description of mathematical concepts and relationships in isolated and obvious situations
	Fluency	choice, use and application of comprehensive facts, definitions, and procedures to find solutions in complex unfamiliar, complex familiar, and simple familiar situations	choice, use and application of effective facts, definitions, and procedures to find solutions in complex familiar and simple familiar situations	choice, use and application of facts, definitions, and procedures to find solutions in simple familiar situations	choice and use of partial facts, definitions, and procedures to find solutions in some simple familiar situations	choice and use of fragmented facts, definitions and procedures to find solutions in isolated and obvious situations
	Reasoning	comprehensive explanation of mathematical thinking, strategies used, and conclusions reached in complex unfamiliar, complex familiar, and simple familiar situations	detailed explanation of mathematical thinking, strategies used, and conclusions reached in complex familiar and simple familiar situations	explanation of mathematical thinking, strategies used, and conclusions reached in simple familiar situations	partial explanation of mathematical thinking, strategies used, and conclusions reached in some simple familiar situations	fragmented explanation of mathematical thinking, strategies used, and conclusions reached in isolated and obvious situations
	Problem-solving	purposeful use of problem-solving approaches to find solutions to problems.	effective use of problem-solving approaches to find solutions to problems.	use of problem-solving approaches to find solutions to problems.	partial use of problem-solving approaches to make progress towards finding solutions to problems.	fragmented use of problem-solving approaches to make progress towards finding solutions to problems.

Key	shading emphasises the qualities that discriminate between the A–E descriptors

IMPORTANT: At Acacia Tutoring we believe all educational resources should be free, as education, is a fundamental human right and a cornerstone of an equitable society. By removing financial barriers, we ensure that all students, regardless of their socioeconomic background, have equal access to high-quality learning materials. This inclusivity promotes fairness, helps bridge achievement gaps, and fosters a society where every individual can reach their full potential.

Furthermore, free resources empower teachers and parents, providing them with tools to support diverse learners and improve outcomes across communities. Education benefits everyone, and making resources universally accessible ensures we build a more informed, skilled, and prosperous future for all.

All documents are formatted as a **.pdf** file, and are completely **FREE** to use, print and distribute - as long as they are not sold or reproduced to make a profit.

N.B. Although we try our best to produce high-quality, accurate and precise materials, we at Acacia Tutoring are still human, these documents may contain errors or omissions, if you find any and wish to help, please contact Jason at info@acaciatutoring.com.au .