Three dimensional trigonometry

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A sample from this topic. The complete topic collection contains three different resources and worked solutions.

Read the explanation and worked example. Show your working; use a calculator only where asked.

What you will practise

- Identify perpendicular planes and use right triangles to solve spatial problems.
- Explain a method and check the reasonableness of a result.

Useful starting skills: Use the prerequisite operations and representations shown in the worked example.

In a rectangular prism, find a diagonal of a face first, then combine it with the perpendicular third edge. This gives the space diagonal $d=\sqrt{(l^2+w^2+h^2)}$. Draw and label the particular right triangle used at each step.

The angle a line makes with a horizontal plane is measured between the line and its perpendicular projection onto that plane. In a right square pyramid, a slant edge to a corner and a slant height to a side midpoint use different horizontal distances.

Worked example

A rectangular prism is 6 m by 8 m by 10 m. Find its space diagonal.

The base diagonal is $\sqrt{(6^2+8^2)}=10$ m.

The space diagonal is $\sqrt{(10^2+10^2)}=10\sqrt{2}$ m.

Answer: $10\sqrt{2}$ m

Try it yourself

Name: _____ Date: _____

1. Find the space diagonal of a 3 cm by 4 cm by 12 cm rectangular prism.

2. A line rises 12 m above a horizontal projection of 5 m. Find its length.

Answers and explanations

Check the method as well as the final answer. An alternative correct method is also valid.

1. 13 cm

First the base diagonal is 5 cm; then $\sqrt{(5^2+12^2)}=13$.

2. 13 m

The rise and horizontal projection are perpendicular.

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