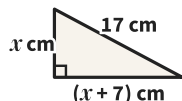


1 Finding the hypotenuse

- a) Find the exact distance between the points $(-2, 3)$ and $(4, -1)$. Give it as a surd in its simplest form.

b) Find x .



Not drawn accurately

$$a) \sqrt{6^2 + 4^2} = \sqrt{52} = 2\sqrt{13}$$

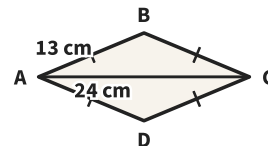
$$b) x^2 + (x + 7)^2 = 289, x^2 + 7x - 120 = 0$$

$$(x + 15)(x - 8) = 0, \text{ so } x = 8$$

2 Finding a shorter side

- a) Find the exact area of an equilateral triangle with sides of 10 cm.

- b) ABCD is a rhombus. Find its area.



Not drawn accurately

$$a) \text{ height } \sqrt{10^2 - 5^2} = \sqrt{75} = 5\sqrt{3}$$

$$\frac{1}{2} \times 10 \times 5\sqrt{3} = 25\sqrt{3} \text{ cm}^2$$

$$b) \sqrt{13^2 - 12^2} = 5, \text{ so } BD = 10$$

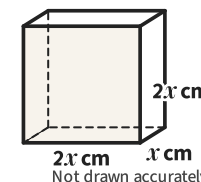
$$\frac{1}{2} \times 24 \times 10 = 120 \text{ cm}^2$$

3 Pythagoras in 3D

A box is a cuboid.

- a) Show that its space diagonal is $3x$ cm long.

- b) A rod 27 cm long fits exactly along the space diagonal. Find the volume of the box.



Not drawn accurately

$$a) \sqrt{(4x^2 + x^2 + 4x^2)} = \sqrt{9x^2} = 3x$$

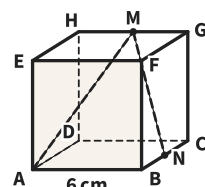
$$b) x = 9, \text{ so } 18 \times 9 \times 18 = 2916 \text{ cm}^3$$

4 Pythagoras in 3D

ABCDEFGH is a cube with edges of 6 cm. M is the midpoint of GH and N is the midpoint of BC.

- a) Find the length AM.

- b) Find the exact length MN in its simplest form.



Not drawn accurately

$$a) AM = \sqrt{3^2 + 6^2 + 6^2} = \sqrt{81} = 9 \text{ cm}$$

$$b) MN = \sqrt{3^2 + 3^2 + 6^2} = \sqrt{54} = 3\sqrt{6} \text{ cm}$$

6 Trigonometry: finding a side

A ship sails 12 km from H on a bearing of 070° . It then sails 9 km on a bearing of 160° to Q. Give each answer to 1 decimal place.

- a) How far east of H is Q?

- b) How far south of H is Q?

$$a) 12 \sin 70^\circ + 9 \sin 20^\circ = 11.28 + 3.08 = 14.4 \text{ km}$$

$$b) \text{ north } 12 \cos 70^\circ = 4.10, \text{ south } 9 \cos 20^\circ = 8.46$$

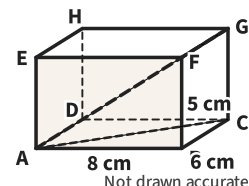
$$8.46 - 4.10 = 4.4 \text{ km}$$

7 Trigonometry: finding an angle

ABCDEFGH is a cuboid.

- a) Find the angle between AG and the base ABCD to 1 decimal place.

- b) The height CG is changed so that this angle is 60° . Find the exact new height.



Not drawn accurately

$$a) AC = \sqrt{8^2 + 6^2} = 10, \tan^{-1}(5 \div 10) = 26.6^\circ$$

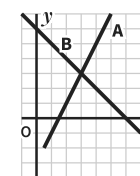
$$b) CG = 10 \tan 60^\circ = 10\sqrt{3} \text{ cm}$$

8 Trigonometry: finding an angle

Line A is $y = 2x - 3$ and line B is $y = 6 - x$. Give each answer to 1 decimal place.

- a) Find the acute angle between line A and the x axis.

- b) Find the acute angle between lines A and B.



$$a) \tan^{-1} 2 = 63.4^\circ$$

$$b) B \text{ is at } 45^\circ: 180 - 45 - 63.435 = 71.6^\circ$$

Pythagoras' theorem and trigonometry revision mat answers