The Hypotenuse - Worksheet

Skill

Group A - Substitution

Substitute the values into the appropriate formula/rule and solve.

1) $c^2 = a^2 + b^2$

$a = 10,\ b = 3$

2) $c^2 = a^2 + b^2$

$c = 12,\ a = 4$

3) $sin(\theta) = \frac{O}{H}$

$\theta = 60,\ H = 4$

4) $cos(\theta) = \frac{A}{H}$

$\theta = 72,\ A = 14.8$

5) $tan(\theta) = \frac{O}{A}$

$\theta = 15,\ A = 7.87$

6) $\theta = sin^{-1}\left(\frac{O}{H}\right)$

$O = 4.4,\ H = 7.8$

7) $\theta = cos^{-1}\left(\frac{A}{H}\right)$

$A = 0.02,\ H = 0.03$

8) $\theta = tan^{-1}\left(\frac{O}{A}\right)$

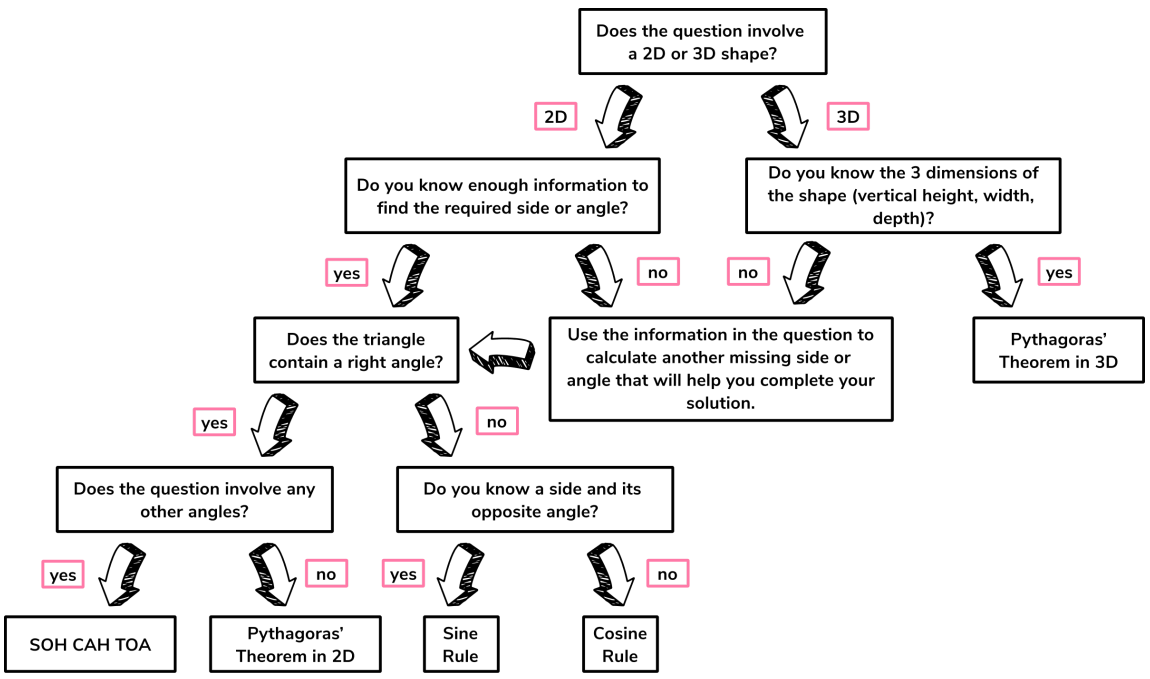
$O = 4\sqrt{3},\ A = 2$

9) $D = \sqrt{x^2 + y^2 + z^2}$

$x = 3.2,\ y = 2.4,\ z = 5.6$

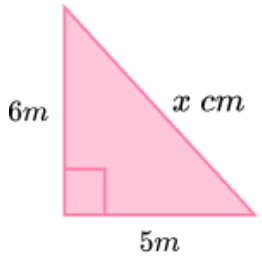
Group B - Using the flowchart

Look at each of the diagrams and deduce whether you would use Pythagoras' Theorem in 2D, Pythagoras' Theorem in 3D, trigonometry, or a combination to find the missing side or angle of the right angle triangle.

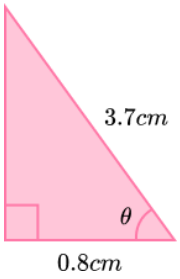


The Hypotenuse - Worksheet

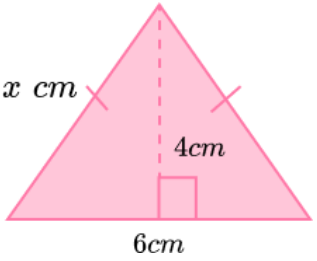
1)



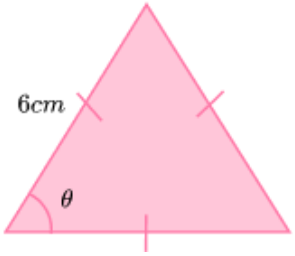
2)



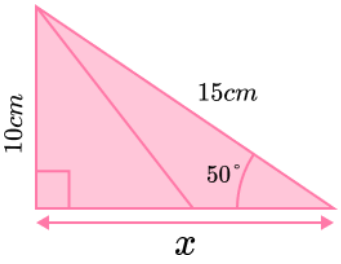
3)



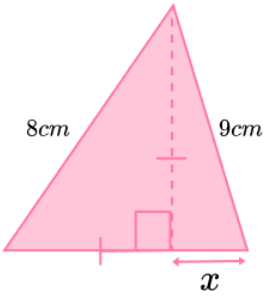
4)



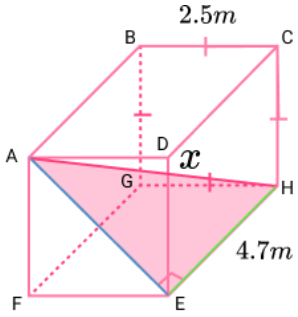
5)



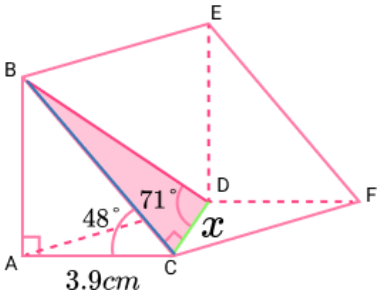
6)



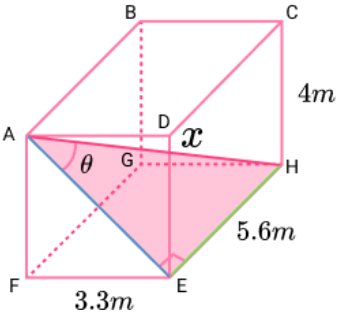
7)



8)



9)

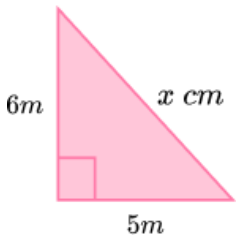


The Hypotenuse - Worksheet

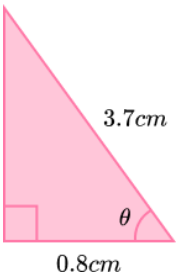
Group C - Solving simple hypotenuse problems

Using your solutions to Group B or otherwise, calculate the missing side or angle for the following 2D and 3D shapes.

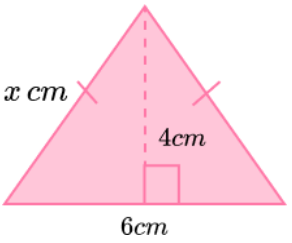
1)



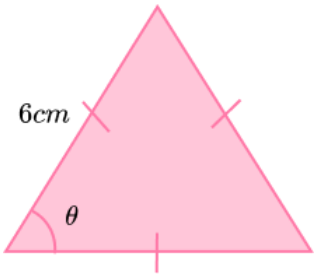
2)



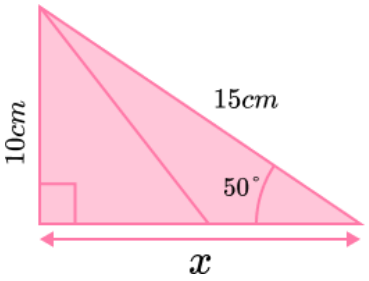
3)



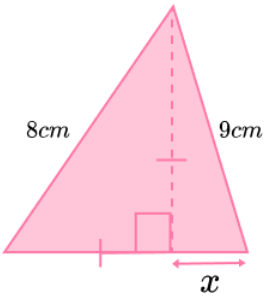
4)



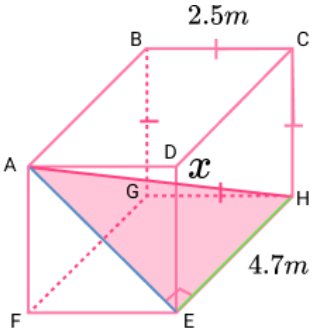
5)



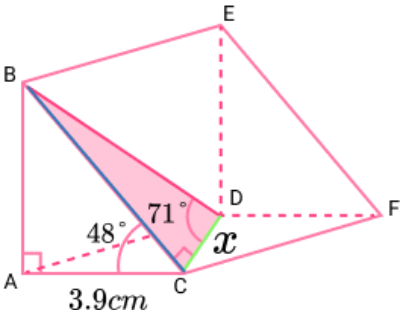
6)



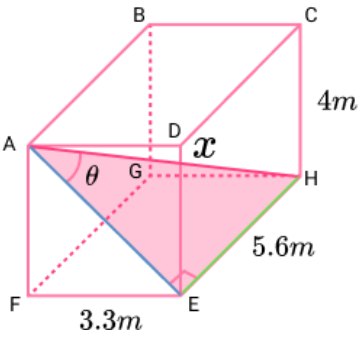
7)



8)



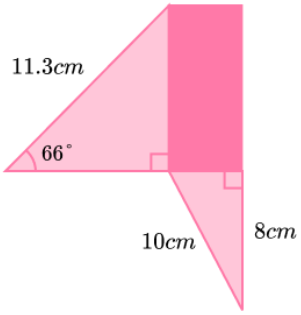
9)



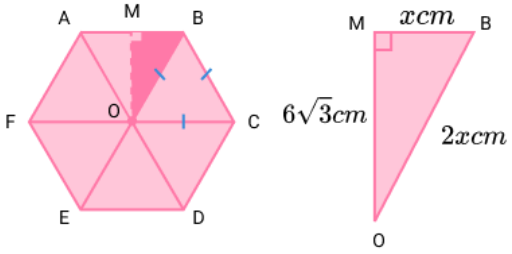
The Hypotenuse - Worksheet

Applied

1) Calculate the area of the shaded rectangle, correct to 2 decimal places.



2) Using the information provided, calculate the perimeter of the regular hexagon $ABCDEF$.



- $AB = 2x$
- $MO = 6\sqrt{3}$
- Each triangle is equilateral.
- M is the midpoint of AB.
- O is the centre of the hexagon.

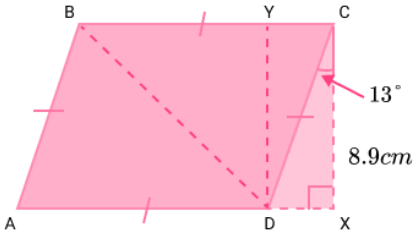
3) A garden tool storage box is designed in the shape of a cuboid with the following dimensions:

- Height = $1.16\ m$
- Width = $2.02\ m$
- Depth = $1.04\ m$

Given that $3\ ft = 91.44\ cm$, would an $8\ ft$ garden cane fit inside the box? Explain your answer.

The Hypotenuse - Exam Questions

1) **(a)** Work out the area of the rhombus $ABCD$:



.....

(2)

(b) The point Y is directly above D. Calculate the length of the diagonal BD.

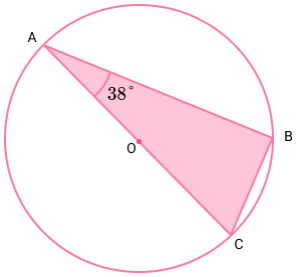
.....

(4)

(6 marks)

---

2) A circle has a radius $r = 5.9cm$. Each point of the triangle ABC is on the circumference of the circle.



(a) Calculate the area of the circle. Write your answer in the form $\frac{a}{b}\pi$.

.....

(1)

(b) Using your answer to part (a), calculate the percentage of the circle that is shaded, to 2 significant figures.

.....

(6)

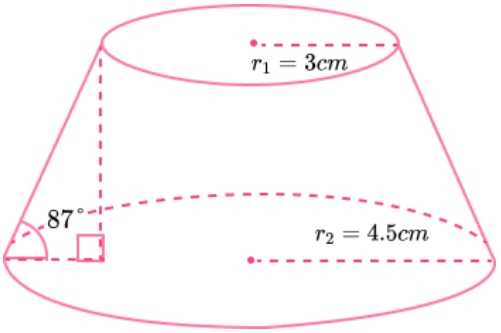
(7 marks)

The Hypotenuse - Exam Questions

3) The volume of a frustum can be written as

$$V = \frac{\pi h}{3}(r_1^2 + r_2^2 + (r_1 \times r_2))$$

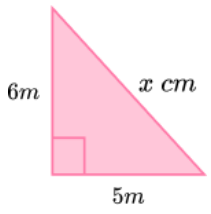
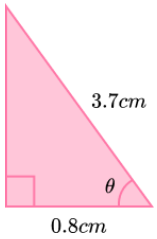
Calculate the volume of the frustum given below. Write your answer in litres.



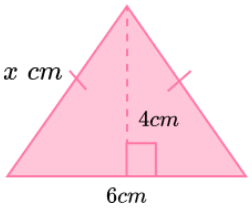
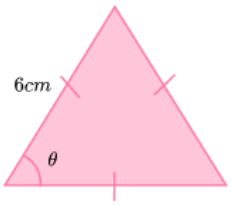
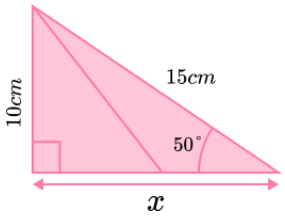
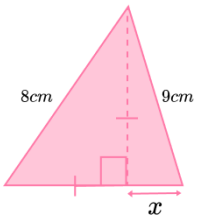
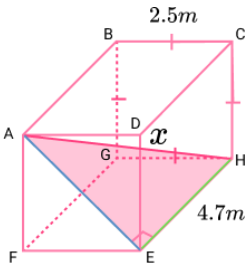
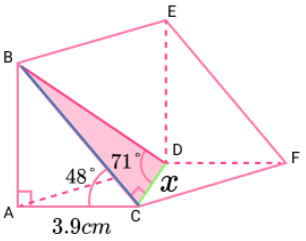
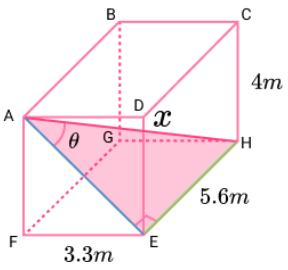
.....

(4 marks)

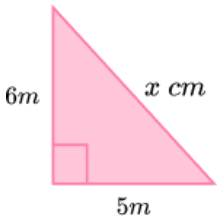
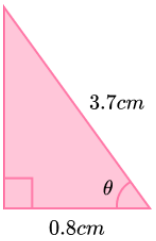
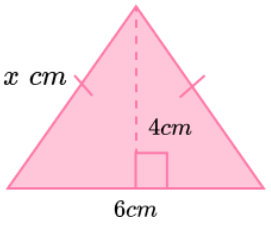
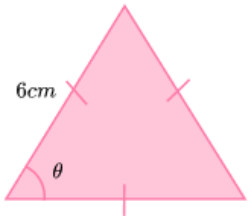
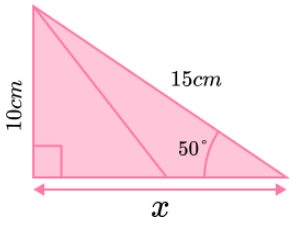
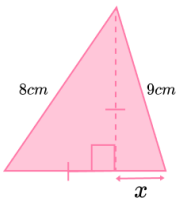
The Hypotenuse - Answers

	Question	Answer
	Skill Questions	
Group A	Substitute the values into the appropriate formula/rule and solve. **1)** $c^2 = a^2 + b^2, a = 10, b = 3$ **2)** $c^2 = a^2 + b^2, c = 12, a = 4$ **3)** $\sin(\theta) = \frac{O}{H}, \theta = 60, H = 4$ **4)** $\cos(\theta) = \frac{A}{H}, \theta = 72, A = 14.8$ **5)** $\tan(\theta) = \frac{O}{A}, \theta = 15, A = 7.87$ **6)** $\theta = \sin^{-1}\left(\frac{O}{H}\right), O = 4.4, H = 7.8$ **7)** $\theta = \cos^{-1}\left(\frac{A}{H}\right), A = 0.02, H = 0.03$ **8)** $\theta = \tan^{-1}\left(\frac{O}{A}\right), O = 4\sqrt{3}, A = 2$ **9)** $D = \sqrt{x^2 + y^2 + z^2}, x = 3.2, y = 2.4, z = 5.6$	**1)** $c = \sqrt{109}$ **2)** $b = 8\sqrt{2}$ **3)** $O = 2\sqrt{3}$ **4)** $H = 47.9$ **5)** $O = 2.11$ **6)** $\theta = 34.3^\circ$ **7)** $\theta = 48.2^\circ$ **8)** $\theta = 73.9^\circ$ **9)** $D = \frac{4\sqrt{74}}{5}$
Group B	Look at each of the diagrams and deduce whether you would use Pythagoras' Theorem in 2D, Pythagoras' Theorem in 3D, trigonometry, or a combination to find the missing side or angle of the right angle triangle. **1)**  **2)** 	**1)** Pythagoras **2)** Trigonometry

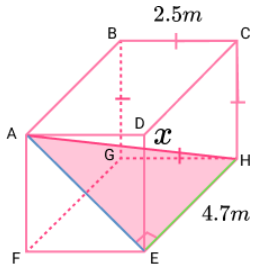
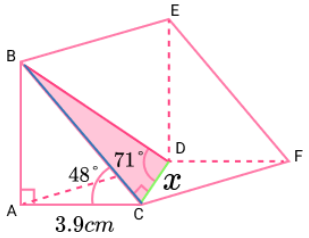
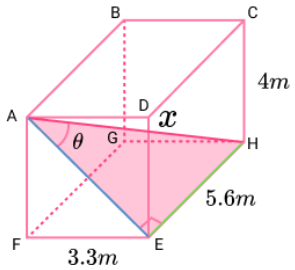
The Hypotenuse - Answers

Group B Contd	**3)** 	**3)** Pythagoras
	4) 	**4)** Trigonometry
	5) 	**5)** Pythagoras or trig
	6) 	**6)** Pythagoras x2
	7) 	**7)** Pythagoras (3D)
	8) 	**8)** Trigonometry x2
	9) 	**9)** Pythagoras and trig

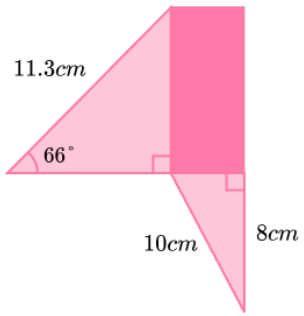
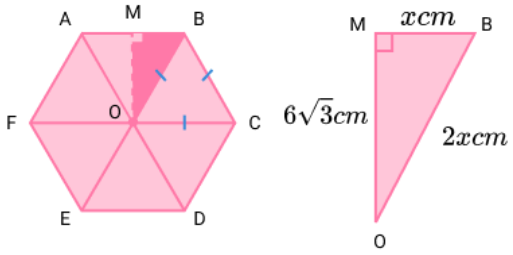
The Hypotenuse - Answers

Group C	Using your solutions to group B or otherwise, calculate the missing side or angle for the following 2D and 3D shapes. **1)**  **2)**  **3)**  **4)**  **5)**  **6)**  	**1)** $x = \sqrt{61}m$ **2)** $\theta = 77.5^{\circ}$ **3)** $x = 5cm$ **4)** $\theta = 60^{\circ}$ **5)** $x = 5\sqrt{5}\ cm$ **6)** $x = 7\ cm$

The Hypotenuse - Answers

Group C contd	**7)** 	**7)** $x = 5.88\,m$
	8) 	**8)** $x = 2.01\,cm$
	9) 	**9)** $\theta = 47.2^{\circ}$

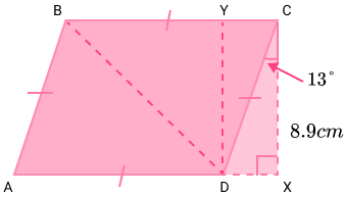
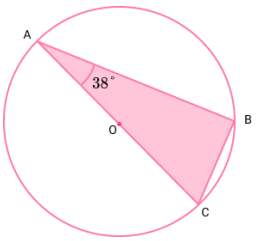
The Hypotenuse - Answers

	Question	Answer
	Applied Questions	
1)	Calculate the area of the shaded rectangle, correct to 2 decimal places. 	$61.94\ cm^2$
2)	Using the information provided, calculate the perimeter of the regular hexagon $ABCDEF$.  • $AB = 2x$ • M is the midpoint of AB. • $MO = 6\sqrt{3}$ • O is the centre of the hexagon. • Each triangle is equilateral.	$72\ cm$

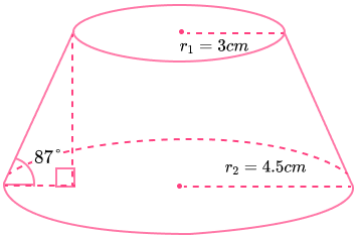
The Hypotenuse - Answers

3)	A garden tool storage box is designed in the shape of a cuboid with the following dimensions:  • Height = $1.16\,m$ • Width = $2.02\,m$ • Depth = $1.04\,m$ Given that $3\,ft = 91.44\,cm$, would an $8\,ft$ garden cane fit inside the box? Explain your answer.	Yes. $AH = 2.55\,m$ which is greater than $8\,ft$ $(2.43m)$.

The Hypotenuse - Mark Scheme

	Question	Answer	
	Exam Questions		
1) (a)	Work out the area of the rhombus $ABCD$: 	**(a)** $CD = \frac{8.9}{\cos(13)} = 9.1341065593\ cm$ $CD \times 8.9 = 81.2935\ cm^2$	**(1)** **(1)**
(b)	The point Y is directly above D. Calculate the length of the diagonal BD.	**(b)** $DX = 8.9\tan(13) = 2.0547269010$ $BY = 7.08\ cm$ $BD = \sqrt{7.08^2 + 8.9^2}$ $BD = 11.37\ cm$	**(1)** **(1)** **(1)** **(1)**
2)	A circle has a radius $r = 5.9\ cm$. Each point of the triangle ABC is on the circumference of the circle.		
(a)	Calculate the area of the circle. Write your answer in the form $\frac{a}{b}\pi$.	**(a)** Area of circle $= \pi \times 5.9^2$ $= \frac{3481}{100}\pi\ cm^2$	**(1)**
(b)	Using your answer to part (a), calculate the percentage of the circle that is shaded, to 2 significant figures.	**(b)** Angle ABC is equal to 90°. $AC = 11.8\ cm$ $BC = 11.8\sin(38) = 7.264805409\ cm$ $AB = 11.8\cos(38) = 9.298526893\ cm$ Area of ABC = $7.26... \times 9.29... \div 2 = 33.77599423\ cm^2$ Area of Triangle ÷ Area of Circle from part (a) × 100 $= 30.9\%$	**(1)** **(1)** **(1)** **(1)** **(1)** **(1)**

The Hypotenuse - Mark Scheme

3)	The volume of a frustum can be written as $V = \frac{\pi h}{3}(r_1^2 + r_2^2 + (r_1 \times r_2))$. Calculate the volume of the frustum given below. Write your answer in litres.  	Vertical height $= 1.5\tan(87)$ $V = \frac{\pi \times 1.5\tan(87)}{3}(3^2 + 4.5^2 + (3 \times 4.5))$ $V = \frac{\pi \times 1.5\tan(87)}{3} \times 42.75$ $V = 1281.32777\ cm^3$ $V = 1.28\ L$	**(1)** **(1)** **(1)** **(1)**