

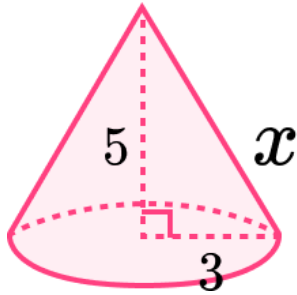
## 3D Pythagoras' Theorem - Worksheet

### Skill

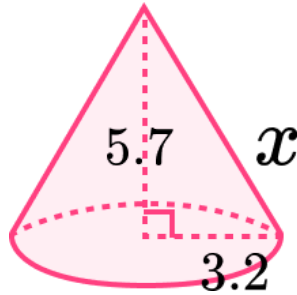
#### Group A - Cones

Give your answers correct to 2 d.p. where necessary. All lengths are in cm. Find the length  $x$ :

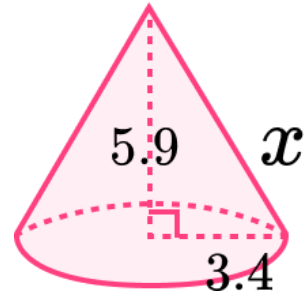
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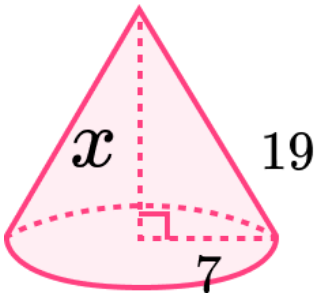
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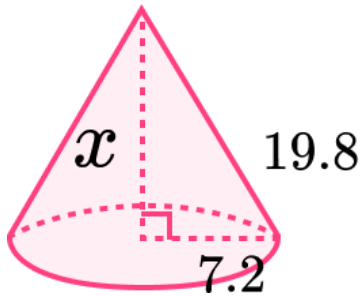
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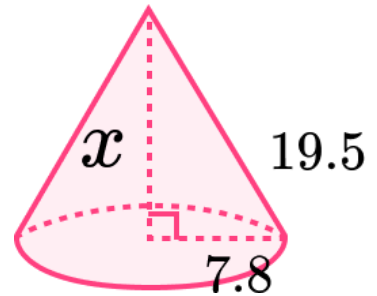
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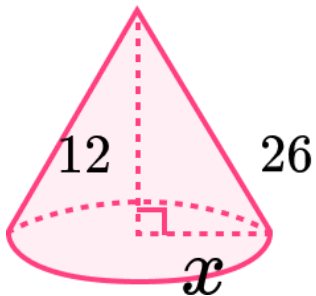
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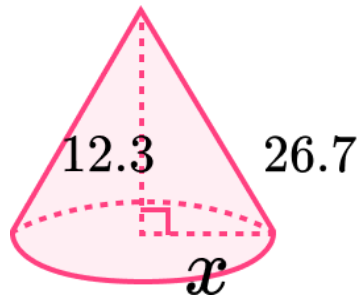
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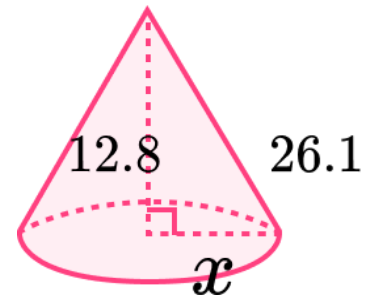
7)



8)



9)

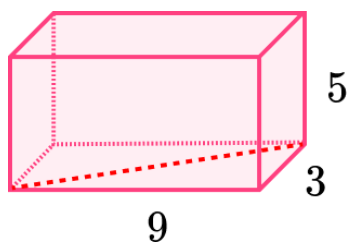


## 3D Pythagoras' Theorem - Worksheet

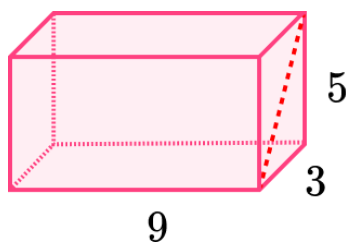
### Group B - Cuboids

Give your answers correct to 2 d.p. where necessary. All lengths are in cm. Find the length of the red diagonal:

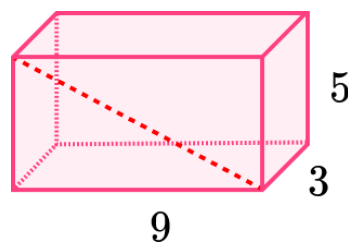
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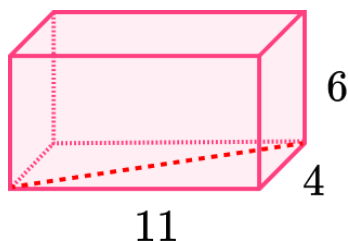
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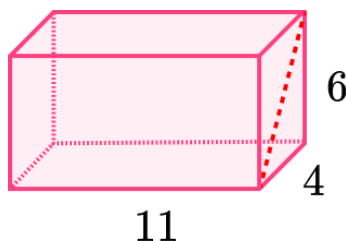
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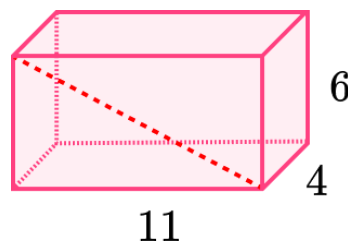
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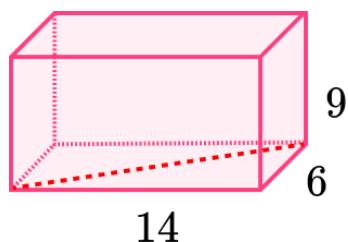
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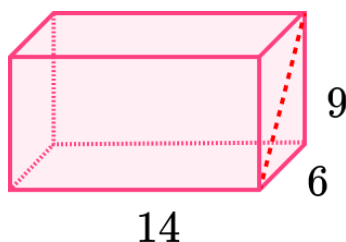
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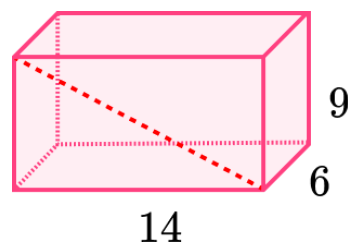
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9)

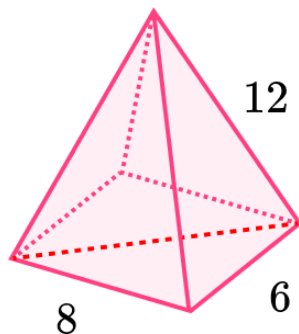


## 3D Pythagoras' Theorem - Worksheet

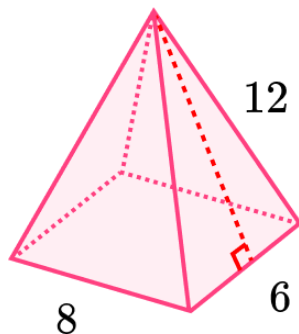
### Group C - Rectangular-based pyramids

Give your answers correct to 2 d.p. where necessary. All lengths are in cm. Find the length of the red dotted line:

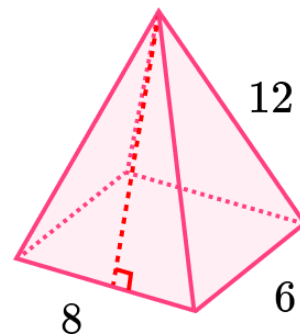
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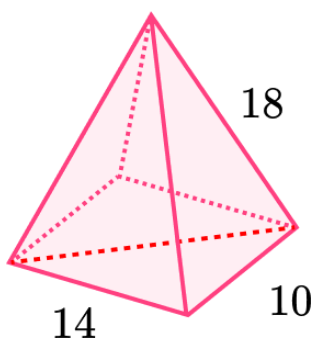
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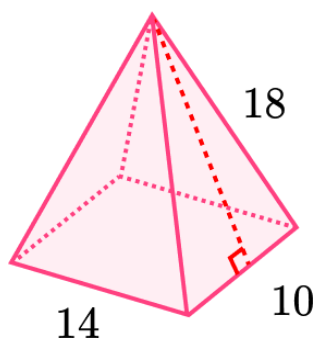
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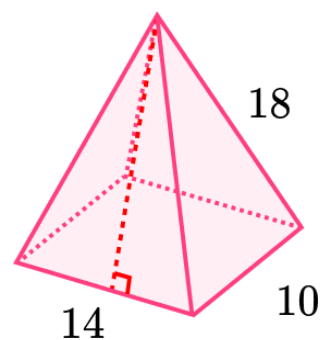
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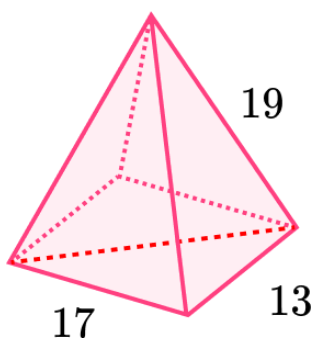
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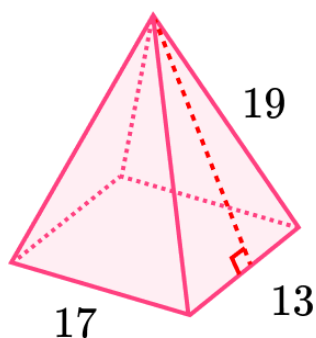
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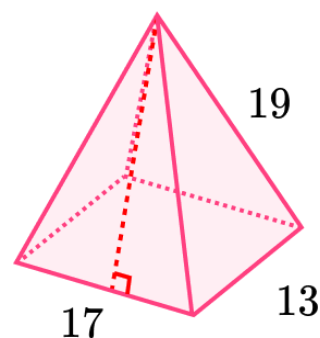
7)



8)



9)



## 3D Pythagoras' Theorem - Worksheet

### Applied

- 1) (a) A cone has radius of  $6\text{cm}$  and slant length of  $9\text{cm}$ . Find the height of the cone.

- (b) Find the volume of the cone using the formula:

$$V = \frac{1}{3}\pi r^2 h$$

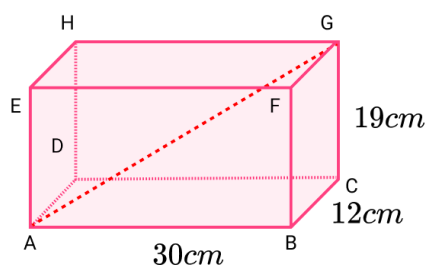
- 2) (a) A cone has height  $15\text{cm}$  and radius  $8\text{cm}$ . Find the slant length of the cone.

- (b) Find the total surface area of the cone using the formula:

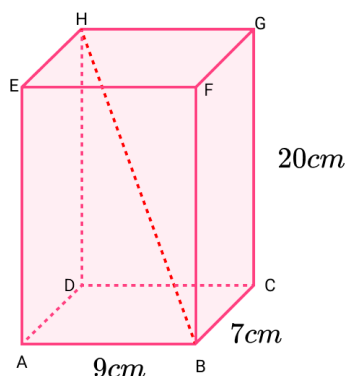
$$\text{Total Surface Area} = \pi r^2 + \pi r l$$

- 3) Here is a cuboid  $ABCDEFGH$ . Find the length  $BH$ . Give your answer correct to 1 decimal place.

(a)

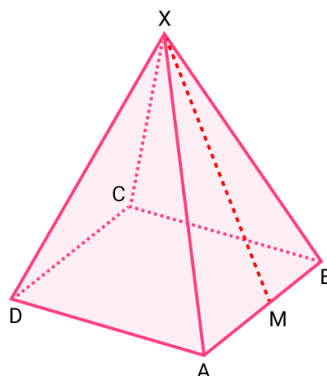


(b)



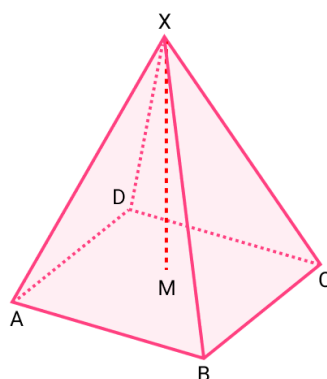
## 3D Pythagoras' Theorem - Worksheet

- 4) (a) The diagram shows a square-based pyramid  $ABCDX$ .  
 $AB = BC = 10cm$   
 $AX = BX = CX = DX = 15cm$   
 The point  $M$  is the midpoint of  $AB$ . Calculate the length  $MX$ .



- (b) Find the total surface area of the square-based pyramid. Give your answer correct to 1 decimal place.

- 5) (a) The diagram shows a square-based pyramid  $ABCDX$ .  
 $AB = BC = 10cm$   
 $AX = BX = CX = DX = 15cm$   
 $M$  is the centre of the square base  $ABCD$ . Calculate the length  $MX$ .



- (b) Find the volume of the square-based pyramid using the formula:  

$$V = \frac{1}{3} \times \text{area of a base} \times h$$
  
 Give your answer correct to 1 decimal place.

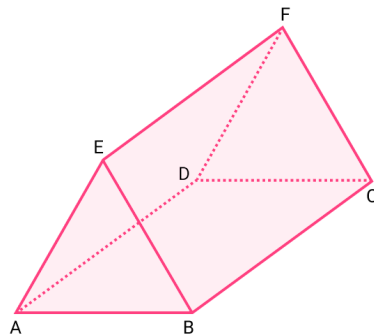
## 3D Pythagoras' Theorem - Exam Questions

- 1) Rectangle  $ABCD$  is the horizontal base of a triangular prism  $ABCDEF$ .

.....  
(5 marks)

$$AE = BE \quad AB = 20\text{cm}$$

$$AE = 17\text{cm} \quad BC = 25\text{cm}$$



Work out the volume of the prism. Give your answer correct to 3 significant figures.

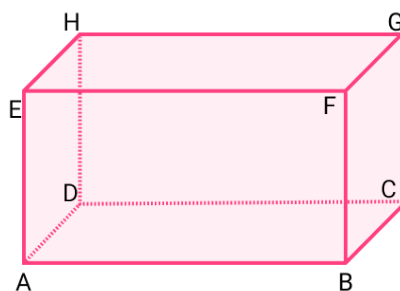
- 2) The diagram shows a box in the shape of a cuboid  $ABCDEFGH$ .

.....  
(3 marks)

$$AB = 21.3\text{cm}$$

$$AE = 16.2\text{cm}$$

$$BC = 9.4\text{cm}$$



A string runs diagonally across the box from  $C$  to  $E$ . Calculate the length of the string  $CE$ . Give your answer correct to 3 significant figures.

## 3D Pythagoras' Theorem - Exam Questions

- 3) Here is a cone. Its diameter is  $18\text{cm}$ . The volume of the cone is  $2000\text{cm}^3$ . Find the curved surface area of the cone.

.....  
(5 marks)

Give your answer correct to 3 significant figures.

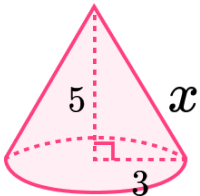
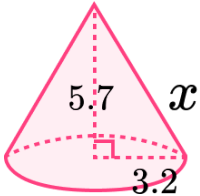
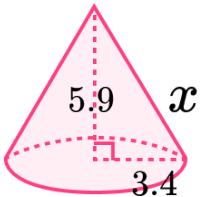
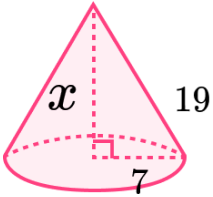
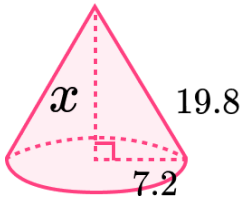
The formula for the curved surface area of a cone is:

$$\text{Curved Surface Area} = \pi r l$$

The formula for the volume of a cone is:

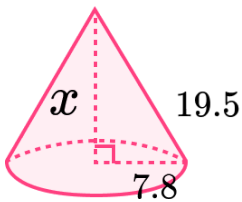
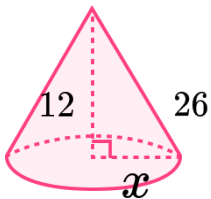
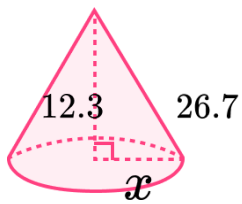
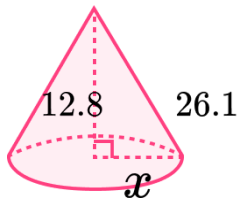
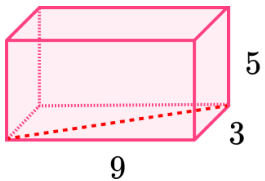
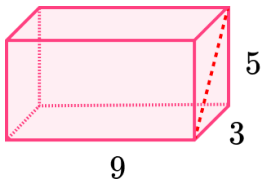
$$\text{Volume} = \frac{1}{3}\pi r^2 h$$

## 3D Pythagoras' Theorem - Answers

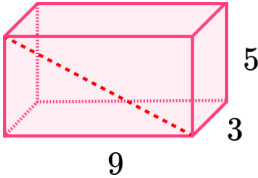
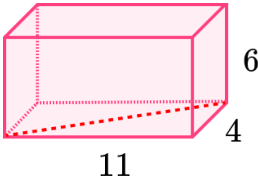
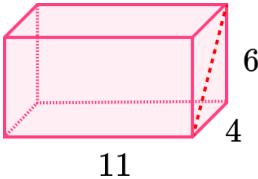
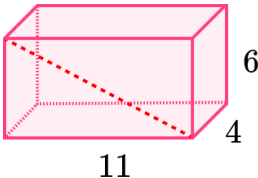
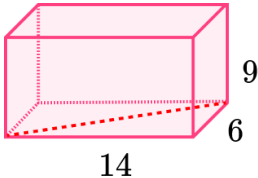
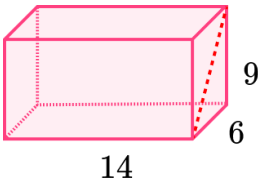
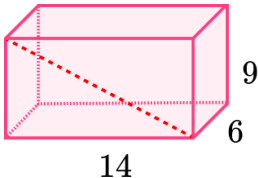
|         | Question  | Answer  |
|---------|---|---|
|         | Skill Questions   |   |
| Group A | <p>Give your answers correct to 2 d.p. where necessary. All lengths are in cm. Find the length <math>x</math>:</p> <p>1)</p>  <p>2)</p>  <p>3)</p>  <p>4)</p>  <p>5)</p>  | <p>1) 5.8cm</p> <p>2) 6.5cm</p> <p>3) 6.8cm</p> <p>4) 17.7cm</p> <p>5) 18.4cm</p> |



## 3D Pythagoras' Theorem - Answers

|         |  |   |
|---------|--|---|
|         | <p>6)</p>  <p>7)</p>  <p>8)</p>  <p>9)</p>  | <p>6) 17.9cm</p> <p>7) 23.1cm</p> <p>8) 23.7cm</p> <p>9) 22.7cm</p> |
| Group B | <p>Give your answers correct to 2 d.p. where necessary. All lengths are in cm. Find the length of the red diagonal:</p> <p>1)</p>  <p>2)</p>   | <p>1) 9.49cm</p> <p>2) 5.83cm</p>                                   |

## 3D Pythagoras' Theorem - Answers

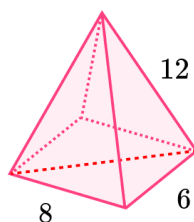
|    |   |            |
|----|---|------------|
| 3) |    | 3) 10.30cm |
| 4) |    | 4) 11.70cm |
| 5) |   | 5) 7.21cm  |
| 6) |  | 6) 12.53cm |
| 7) |  | 7) 15.23cm |
| 8) |  | 8) 10.82cm |
| 9) |  | 9) 16.64cm |

## 3D Pythagoras' Theorem - Answers

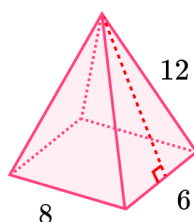
### Group C

Give your answers correct to 2 d.p. where necessary. All lengths are in cm. Find the length of the red dotted line:

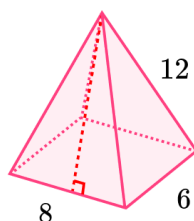
1)



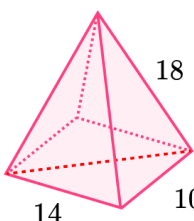
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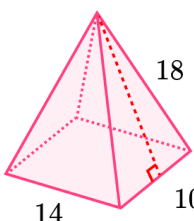
3)



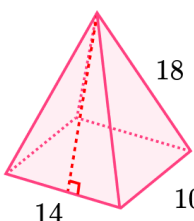
4)



5)



6)



1) 10cm

2) 11.62cm

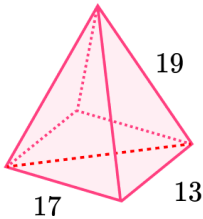
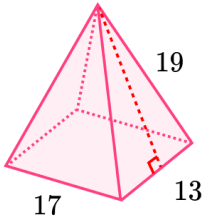
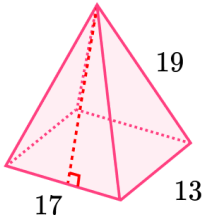
3) 11.31cm

4) 17.20cm

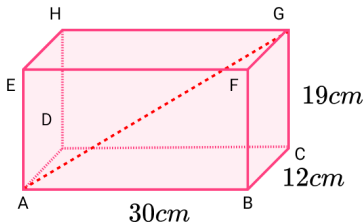
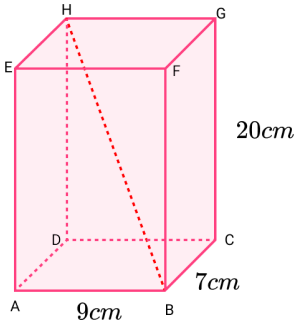
5) 17.29cm

6) 16.58cm

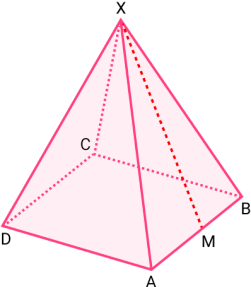
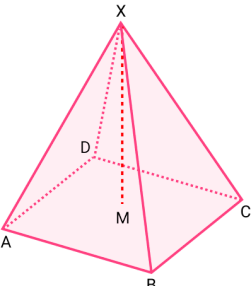
## 3D Pythagoras' Theorem - Answers

|  |  |   |
|--|--|---|
|  | <p>7)</p>  <p>8)</p>  <p>9)</p>  | <p>7) 21.40cm<br/>8) 17.85cm<br/>9) 16.99cm</p> |
|--|--|---|

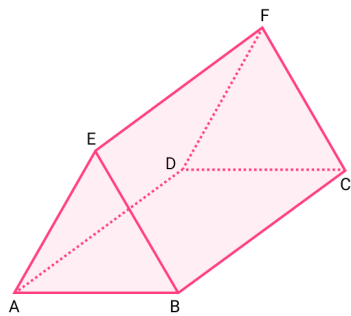
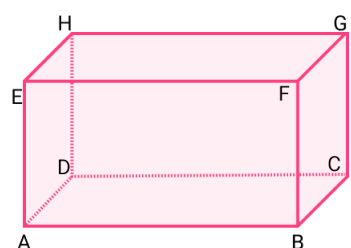
## 3D Pythagoras' Theorem - Answers

|    | Question   | Answer   |
|----|--|--|
|    | Applied Questions  |  |
| 1) | <p>(a) A cone has radius of <math>6\text{cm}</math> and slant length of <math>9\text{cm}</math>. Find the height of the cone.</p> <p>(b) Find the volume of the cone using the formula: <math>V = \frac{1}{3}\pi r^2 h</math></p>  | <p>(a) <math>3\sqrt{5} = 6.7082\dots \text{cm}</math></p> <p>(b) <math>252.9\text{cm}^2</math></p> |
| 2) | <p>(a) A cone has height <math>15\text{cm}</math> and radius <math>8\text{cm}</math>. Find the slant length of the cone.</p> <p>(b) Find the total surface area of the cone using the formula:<br/>Total Surface Area = <math>\pi r^2 + \pi r l</math></p>   | <p>(a) <math>17\text{cm}</math></p> <p>(b) <math>200\pi = 628.3\text{cm}^2</math></p>              |
| 3) | <p>Here is a cuboid <math>ABCDEFGH</math>. Find the length <math>BH</math>. Give your answer correct to 1 decimal place.</p> <p>(a) </p> <p>(b) </p> | <p>(a) <math>37.5\text{cm}</math></p> <p>(b) <math>\sqrt{530} = 23.0\text{cm}</math></p>           |

## 3D Pythagoras' Theorem - Worksheet

|                  |   |   |
|------------------|---|---|
| <p><b>4)</b></p> | <p>The diagram shows a square-based pyramid <math>ABCDX</math>.</p> <p><math>AB = BC = 10cm</math></p> <p><math>AX = BX = CX = DX = 15cm</math></p> <p>The point <math>M</math> is the midpoint of <math>AB</math>. Calculate the length <math>MX</math>.</p> <div style="text-align: center;">  </div> <p><b>(a)</b></p> <p><b>(b)</b> Find the total surface area of the square-based pyramid. Give your answer correct to 1 decimal place.</p>  | <p><b>(a)</b> <math>MX = 10\sqrt{2} = 14.1421\dots</math></p> <p><b>(b)</b> Total surface area = <math>382.8cm^2</math></p> |
| <p><b>5)</b></p> | <p><b>(a)</b> The diagram shows a square-based pyramid <math>ABCDX</math>.</p> <p><math>AB = BC = 10cm</math></p> <p><math>AX = BX = CX = DX = 15cm</math></p> <p><math>M</math> is the centre of the square base <math>ABCD</math>. Calculate the length <math>MX</math>.</p> <div style="text-align: center;">  </div> <p><b>(b)</b> Find the volume of the square-based pyramid using the formula: <math>V = \frac{1}{3} \times \text{area of a base} \times h</math>. Give your answer correct to 1 decimal place.</p> | <p><b>(a)</b> <math>MX = 14.790\dots cm</math></p> <p><b>(b)</b> Volume = <math>493 cm^3</math></p>                         |

## 3D Pythagoras' Theorem - Mark Scheme

|    | Question  | Answer  |
|----|---|---|
|    | Exam Questions  |   |
| 1) | <p>Rectangle <math>ABCD</math> is the horizontal base of a triangular prism <math>ABCDEF</math>.</p> <p><math>AE = BE</math>                      <math>AB = 20\text{cm}</math><br/> <math>AE = 17\text{cm}</math>                      <math>BC = 25\text{cm}</math></p>  <p>Work out the volume of the prism. Give your answer correct to 3 significant figures.</p>                        | <p><math>h^2 = 26^2 - 12^2</math><br/>         for starting to use Pythagoras to find the height (1)</p> <p><math>h = \sqrt{26^2 - 12^2}</math><br/> <math>= 2\sqrt{133} = 23.065125\dots</math><br/>         for finding the height of the triangle (1)</p> <p><math>\text{Area} = \frac{1}{2} \times 24 \times 2\sqrt{133}</math><br/> <math>= 24\sqrt{133} = 276.781\dots</math><br/>         for finding the area of the triangle (1)</p> <p><math>\text{Volume} = 24\sqrt{133} \times 25 = 8857.008</math><br/>         for finding the volume of the triangular prism (1)</p> <p><math>\text{Volume} = 8860\text{cm}^3</math><br/>         for the final volume (1)</p> |
| 2) | <p>The diagram shows a box in the shape of a cuboid <math>ABCDEFGH</math>.</p> <p><math>AB = 21.3\text{cm}</math><br/> <math>AE = 16.2\text{cm}</math><br/> <math>BC = 9.4\text{cm}</math></p>  <p>A string runs diagonally across the box from <math>C</math> to <math>E</math>. Calculate the length of the string <math>CE</math>. Give your answer correct to 3 significant figures.</p> | <p><math>AC = \sqrt{21.3^2 + 9.4^2} = 23.28196\dots</math><br/>         for using Pythagoras to find <math>AC</math> (1)</p> <p><math>CE = \sqrt{23.28196\dots^2 + 16.2^2}</math><br/> <math>= 28.36353\dots</math><br/>         for using Pythagoras to find <math>CE</math> (1)</p> <p><math>CE = 28.4\text{cm}</math><br/>         for the final length (1)</p>  |

## 3D Pythagoras' Theorem - Mark Scheme

|           |   |  |            |
|-----------|---|--|------------|
| <b>3)</b> | <p>Here is a cone. Its diameter is <math>18\text{cm}</math>. The volume of the cone is <math>2000\text{cm}^3</math>. Find the curved surface area of the cone.</p> <p>Give your answer correct to 3 significant figures. The formula for the curved surface area of a cone is: Curved Surface Area = <math>\pi r l</math></p> <p>The formula for the volume of a cone is:<br/> <math display="block">\text{Volume} = \frac{1}{3} \pi r^2 h</math></p> | <p><math display="block">\frac{1}{3} \times \pi \times 9^2 \times h = 2000</math></p> <p>for setting up the equation to find the height of the cone (1)</p> <p><math display="block">h = \frac{3 \times 2000}{9^2 \times \pi} = 23.57851009...</math></p> <p>for finding the height of the cone (1)</p> <p><math display="block">l = \sqrt{23.57851009...^2 + 9^2}</math></p> <p><math display="block">= 25.23779186...</math></p> <p>for finding the slant length of the cone (1)</p> <p><math display="block">CSA = \pi \times 9 \times 25.23779186...</math></p> <p><math display="block">= 713.581...</math></p> <p>for finding the curved surface area of the cone (1)</p> <p><math display="block">CSA = 713.581... = 714 \text{ cm}^2</math></p> <p>insert for the final answer (1)</p> | <b>(5)</b> |
|-----------|---|--|------------|

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