

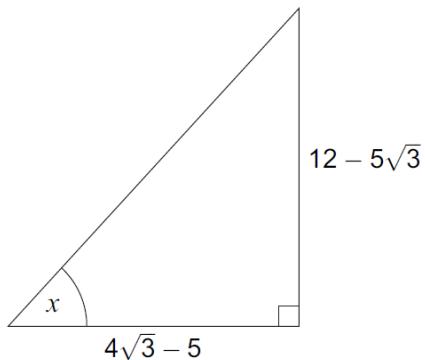
Further Maths GCSE Topics Tests

**x** means non Calculator Paper and **✓** means Calculator Paper.

**1. Trigonometry**

**1**

Show that angle  $x = 60^\circ$

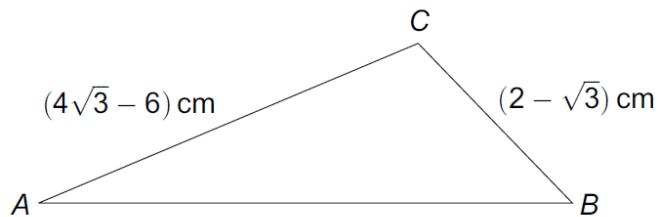


You **must** show your working.

**x**

**2**

Triangle ABC has an obtuse angle at C.



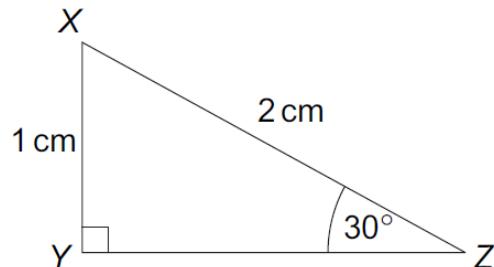
N  
ε

Given that  $\sin A = \frac{1}{4}$ , use triangle ABC to show that angle  $B = 60^\circ$

**x**

**3**

XYZ is a right-angled triangle.

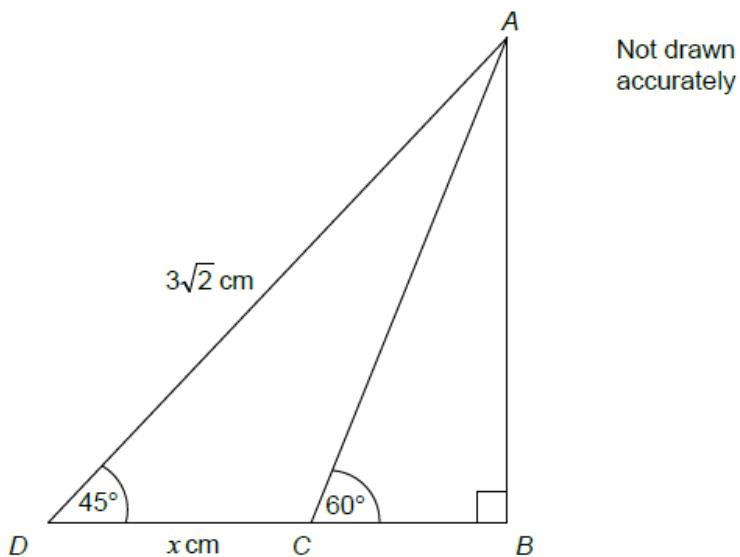


Use triangle XYZ to show that  $\sin 60^\circ = \frac{\sqrt{3}}{2}$

**x**

4

In the diagram,  $DCB$  is a straight line.



Work out the length of  $DC$ , marked  $x$  on the diagram.

Write your answer in the form  $a - \sqrt{b}$

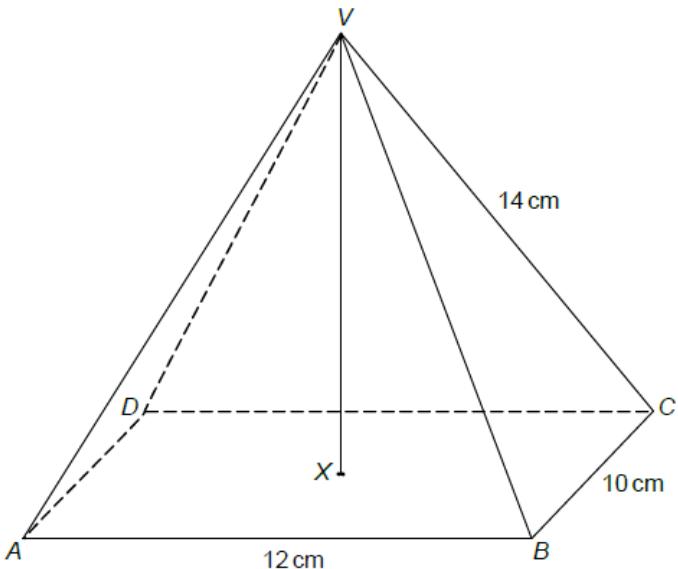
✗

5

$VABCD$  is a rectangular based pyramid.

$AB = 12\text{ cm}$ ,  $BC = 10\text{ cm}$  and  $VC = 14\text{ cm}$

The base  $ABCD$  is horizontal and the vertex  $V$  is directly above  $X$ , the centre of the base.



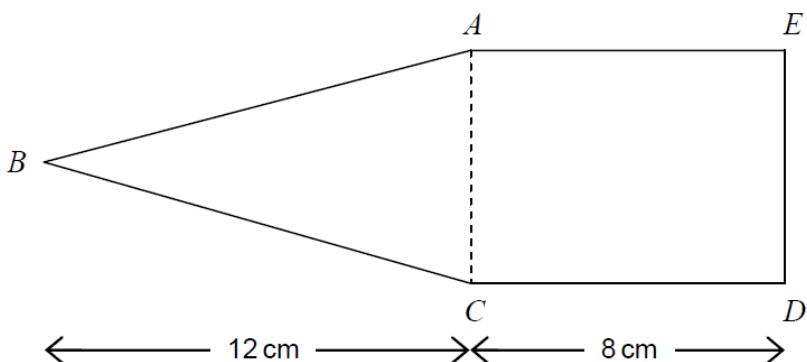
Work out the height of the pyramid,  $VX$ .

Work out the angle between  $VC$  and the plane  $ABCD$

✓

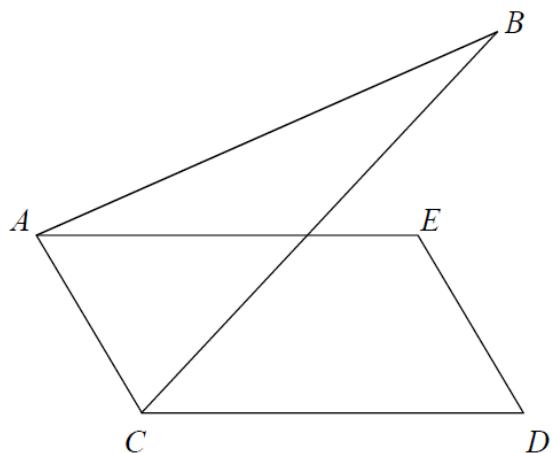
6

*ABCDE* is a piece of card in the shape of a rectangle and an isosceles triangle.



Not drawn  
accurately

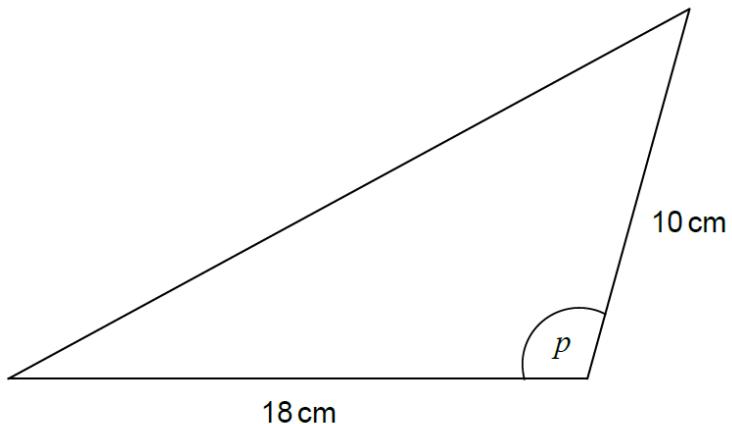
*ABCDE* is folded along  $AC$  so that  $B$  is vertically above the midpoint of  $DE$ .



Work out the angle between the planes  $ABC$  and  $ACDE$ . ✓

7

The area of this triangle is  $27 \text{ cm}^2$ .



Work out the size of obtuse angle  $p$ . ✓

8

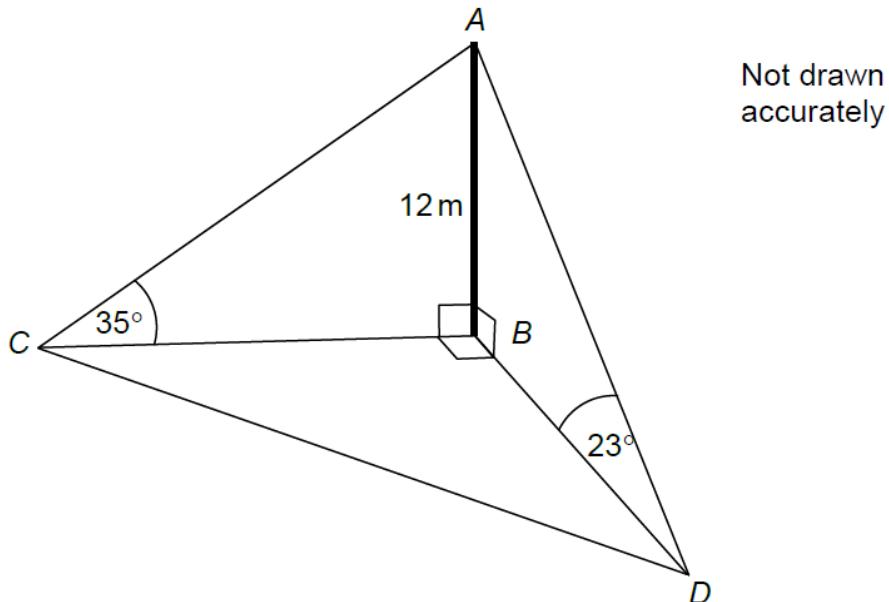
The diagram shows a vertical mast,  $AB$ , 12 metres high.  
 Points  $B$ ,  $C$  and  $D$  are on a horizontal plane.

Point  $C$  is due West of  $B$ .

The angle of elevation of  $A$  from  $C$  is  $35^\circ$ .

Point  $D$  is due South of  $B$ .

The angle of elevation of  $A$  from  $D$  is  $23^\circ$ .



Not drawn  
accurately

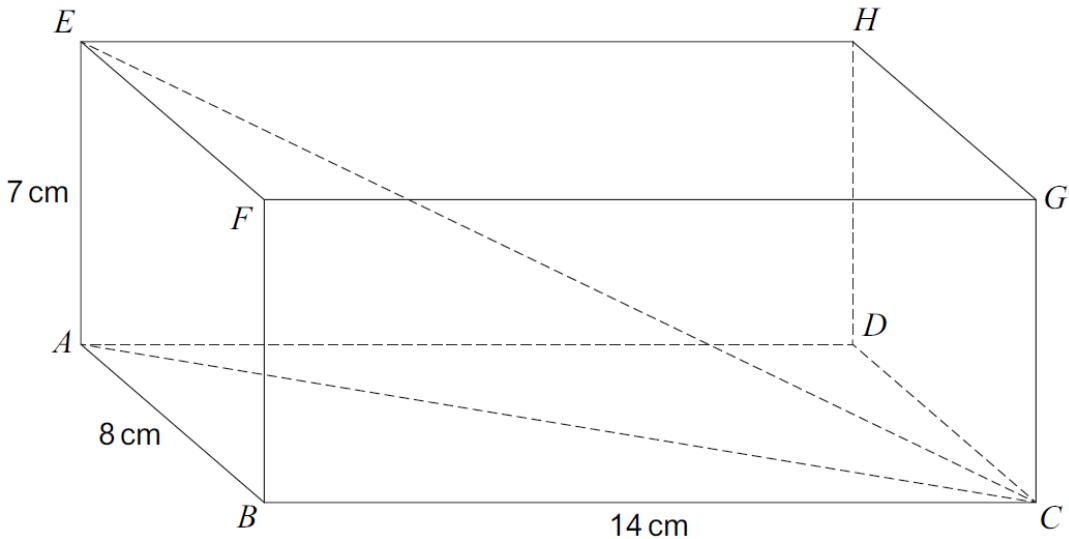
Calculate the distance  $CD$ .

Calculate the Bearing of  $D$  from  $C$  to the nearest degree



9

$ABCDEFGH$  is a cuboid.

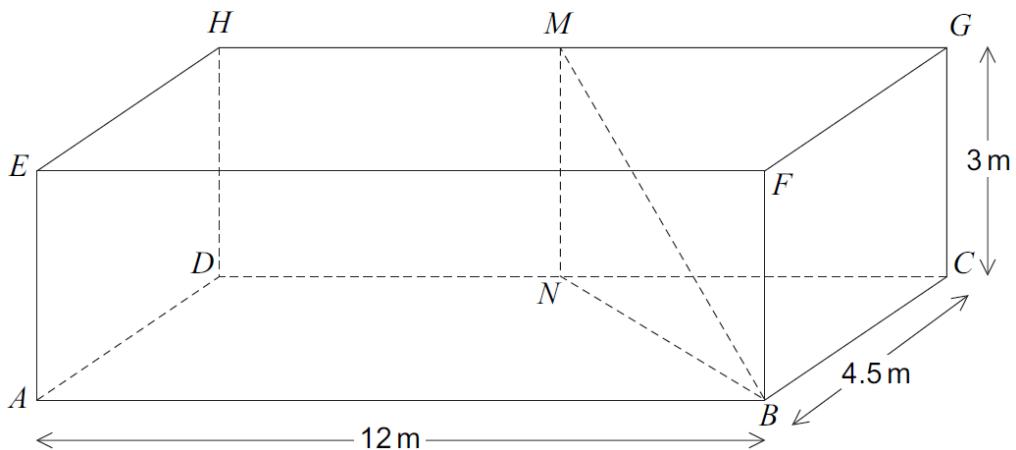


Work out the angle between  $EC$  and  $ABCD$ .



10

$ABCDEFGH$  is a cuboid.  
 $M$  is the midpoint of  $HG$ .  
 $N$  is the midpoint of  $DC$ .



Show that  $BN = 7.5 \text{ m}$

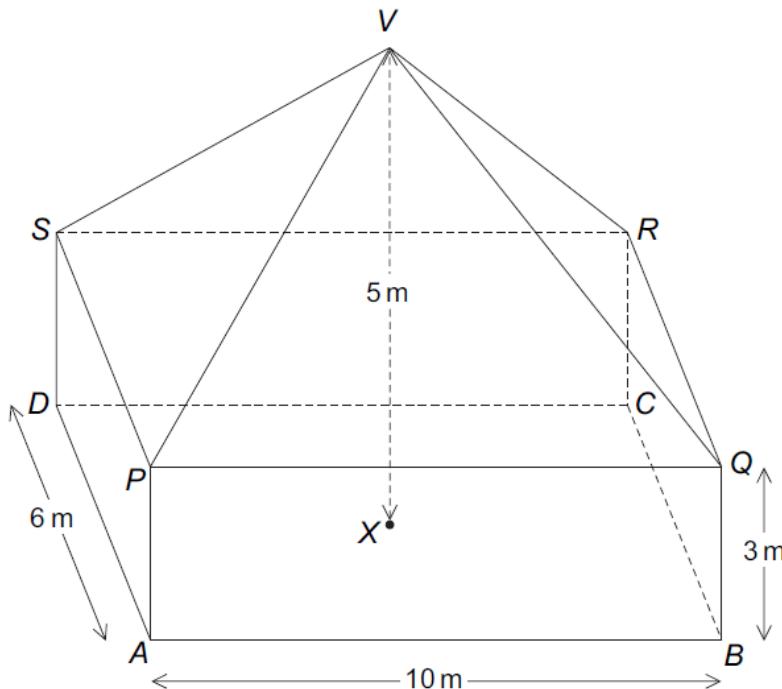
Work out the angle between  $MB$  and the plane  $ABCD$

Work out the obtuse angle between the planes  $MNB$  and  $CDHG$



11

The diagram shows a cuboid  $ABCDPQRS$  and a pyramid  $PQRSV$ .  $V$  is directly above the centre,  $X$ , of  $ABCD$ .



The total height,  $VX$ , is 5 metres.

Work out the angle between  $VA$  and the plane  $ABCD$

Work out the angles between the planes  $VQR$  and  $PQRS$



## 2. Circles

1

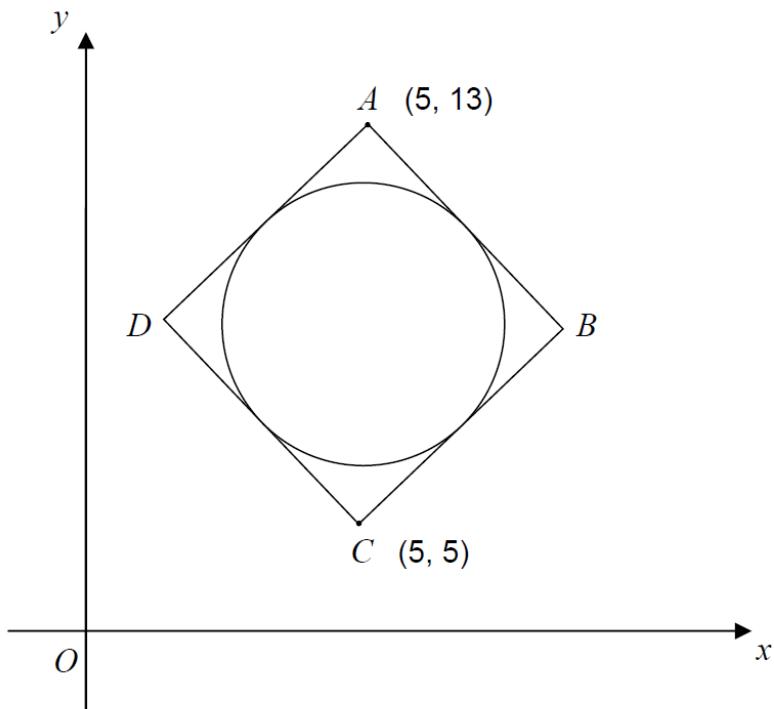
Circle A has equation  $x^2 + y^2 = 16$

Circle B has equation  $(x + 6)^2 + (y - 8)^2 = 25$

Work out the distance between the centres of the circles.

✓ ✗

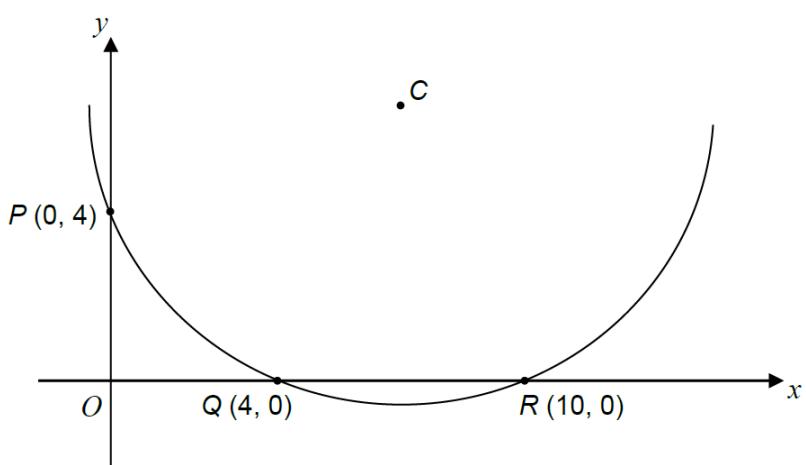
2



Work out the equation of the circle.

✓ ✗

3



Explain why the centre of the circle lies on the line  $x = 7$ .

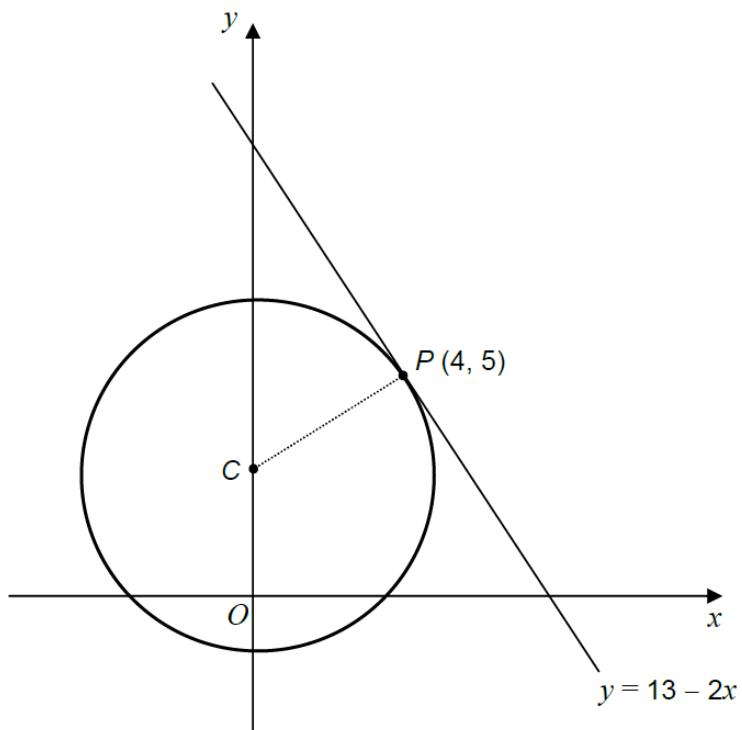
Work out the equation of the circle.

✓ ✗

4

The sketch shows point  $P$  on a circle, centre  $C$ .

The equation of the tangent at  $P$  is  $y = 13 - 2x$



Work out the gradient of  $PC$ .

Work out the equation of the circle.

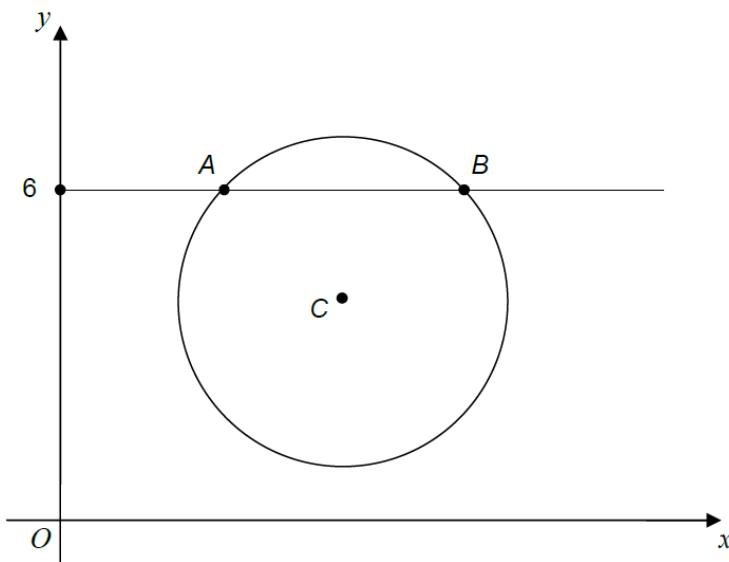
✓ ✗

5

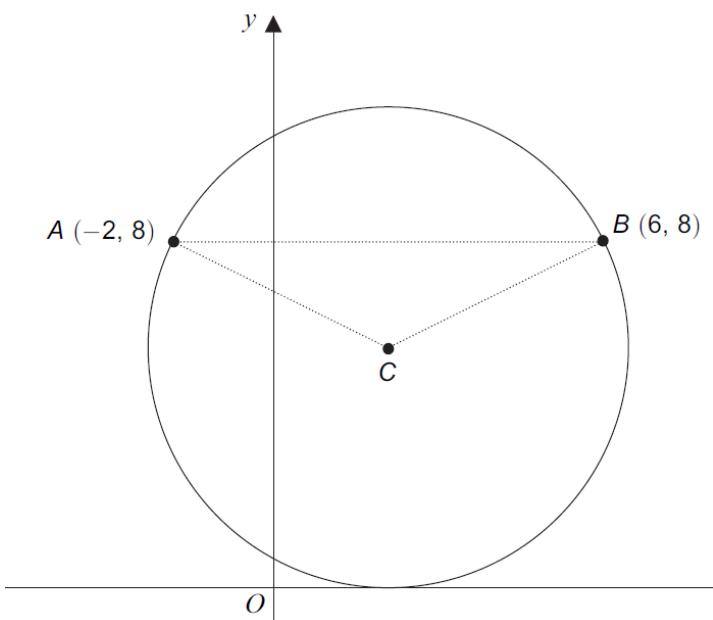
The diagram shows a sketch of the circle  $(x - 7)^2 + (y - 4)^2 = 9$  with centre  $C$ .

The line  $y = 6$  intersects the circle at  $A$  and  $B$ .

Show that  $AB = 2\sqrt{5}$



6

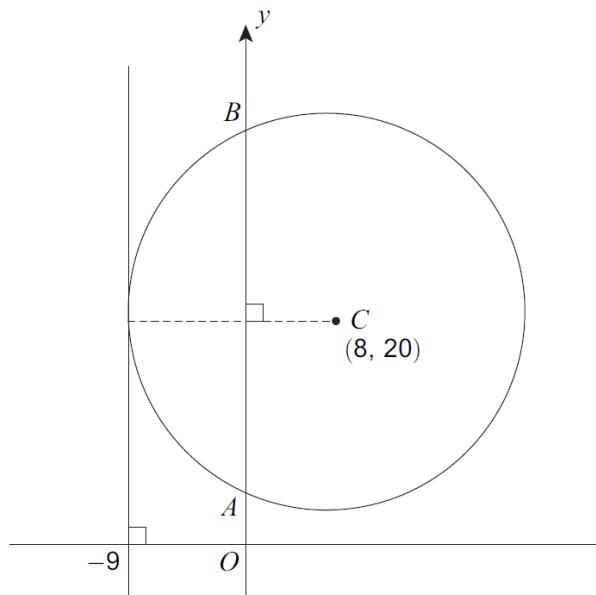


Work out the equation of the circle.

✓ ✗

7

The line  $x = -9$  is a tangent to the circle, centre  $C(8, 20)$



Show that the radius of the circle is 17.

The circle intersects the  $y$ -axis at  $A$  and  $B$ .

Show that the length  $AB$  is 30.

✓

8

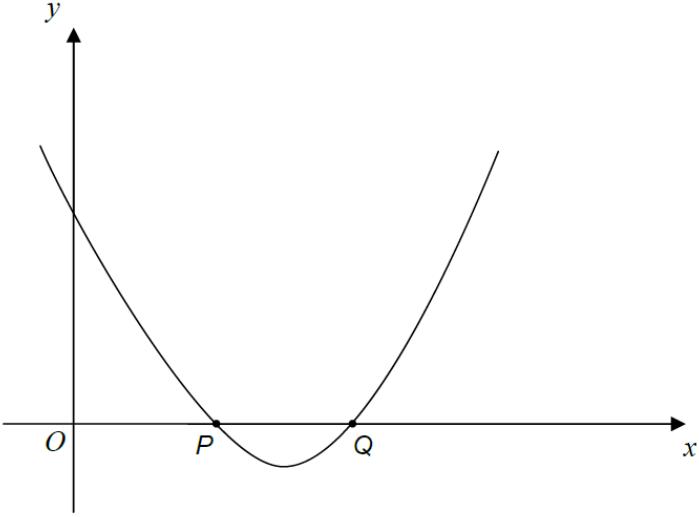
$x^2 - 2x + y^2 - 6y = 0$  is the equation of a circle.

By writing the equation in the form  $(x - a)^2 + (y - b)^2 = r^2$   
work out the centre and radius of the circle.

✓ ✗

### 3. Differentiation Questions

1	Work out the coordinates of the stationary point for the curve $y = x^2 + 3x + 4$	
2	A sketch of the curve $y = (x + 1)(2 - x)$ is shown. $A(0, 2)$ , $P(2, 0)$ and $Q$ are points on the curve.	
	Show that the normal to the curve at $A$ intersects the curve again at $P$ .	
3	The equation of the curve is $y = px^3 - 3x^2 + 8x + r$ where $p$ and $r$ are constants. Use the fact that there is a maximum point at $(2, 10)$ to work out the values $p$ and $r$ .	
4	$y = \frac{3x(2x^4 - 5x)}{x^2}$ Work out $\frac{dy}{dx}$	
5	Work out the gradient of the curve $y = (3x - 4)(x + 2)$ at the point $(2, 8)$	
6	$y = 10 - 8x - x^3$ for all values of $x$ .  Show that $y$ is a decreasing function for all values $x$ .	
7	A curve has gradient function $\frac{dy}{dx} = 2x^2 - 7$  Work out the gradient of the curve when $x = -3$  Work out the values of $x$ for which the rate of change of $y$ with respect to $x$ is 1.	
8	$y = x^{\frac{1}{2}}(x^{\frac{7}{2}} - x^{\frac{1}{2}})$ Work out $\frac{dy}{dx}$ .	

9	<p>A curve has equation <math>y = 4x^3 + 6x^2 + 3x + 5</math></p> <p>Work out the coordinates of any stationary points on this curve and determine their nature.</p>	
10	<p>The graph shows a sketch of <math>y = (x - 2)(x - 3)</math></p> <p>The curve intersects the <math>x</math>-axis at <math>P</math> and <math>Q</math>.</p> 	
11	<p>A curve has equation <math>y = x^2(x - 2)</math></p>	
	<p>Work out the gradient of the curve at the point <math>(3, 9)</math>.</p>	
12	$y = (5x - 3)^2$	
	<p>Work out <math>\frac{dy}{dx}</math></p> <p>Give your answer in the form <math>a(bx - c)</math> where <math>a</math>, <math>b</math> and <math>c</math> are integers <math>&gt; 1</math></p>	
13	<p>The curve <math>y = x^3 + bx + c</math> has a stationary point at <math>(-2, 20)</math>.</p> <p>Work out the values of <math>b</math> and <math>c</math>.</p>	
14	<p>For what values of <math>x</math> is <math>y = 150x - 2x^3</math> an increasing function?</p>	

15	<p>The curve <math>y = f(x)</math> is such that <math>\frac{dy}{dx} = -x(x - 2)^2</math></p> <p>The stationary points of the curve are at <math>\left(0, \frac{4}{3}\right)</math> and <math>(2, 0)</math>.</p> <p>Determine the nature of each stationary point. You <b>must</b> show your working.</p>	<span style="color: green;">✓</span> <span style="color: red;">✗</span>
16	$y = (x^3 - 1)^2 + (\sqrt{x})^8$ Work out $\frac{dy}{dx}$ .	<span style="color: green;">✓</span> <span style="color: red;">✗</span>
17	<p><math>y = 2x^3 + ax</math>, where <math>a</math> is a constant.</p> <p>The value of <math>\frac{dy}{dx}</math> when <math>x = 2</math> is twice the value of <math>\frac{dy}{dx}</math> when <math>x = -1</math></p> <p>Work out the value of <math>a</math>.</p>	<span style="color: green;">✓</span> <span style="color: red;">✗</span>

#### 4. Factor Theorem Questions

1	Show that $(x - 2)$ is a factor of $x^3 + 8x^2 + x - 42$	<span style="color: green;">✓</span> <span style="color: red;">✗</span>
2	Prove that, for <b>all</b> values of $x$ , $2x^2 - 8x + 9 > 0$	<span style="color: green;">✓</span> <span style="color: red;">✗</span>
3	$x^3 + ax^2 + bx + 150$ factorises to $(x + c)^2(x + d)$ $a, b, c$ and $d$ are positive integers and $c \neq 1$ Work out the values of $a, b, c$ and $d$ .	<span style="color: green;">✓</span> <span style="color: red;">✗</span>
4	$(x + 3)$ is a factor of $x^3 + 6x^2 + ax - 12$  Show that the value of $a$ is 5  Hence, factorise fully $x^3 + 6x^2 + 5x - 12$	<span style="color: green;">✓</span> <span style="color: red;">✗</span>
5	$(x - 5)$ is a factor of $x^3 - 6x^2 + ax - 20$  Work out the value of $a$ .	<span style="color: green;">✓</span> <span style="color: red;">✗</span>
6	$(x - a)$ is a factor of $2x^3 - 7ax + 3a$  Work out the <b>largest</b> possible value of $a$ .	<span style="color: green;">✓</span> <span style="color: red;">✗</span>

7	Use the factor theorem to show that $(x - 1)$ and $(x - 4)$ are factors of $x^3 - 21x + 20$	✓ <span style="color:red">x</span>
8	$f(x) = x^3 + ax^2 + bx + 24$ for all values of $x$ . Two of the factors of $f(x)$ are $(x - 2)$ and $(x + 3)$ . Work out the values of $a$ and $b$ .	✓ <span style="color:red">x</span>
9	Show that $(x - 1)$ and $(x - 4)$ are also factors of $x^3 - 10x^2 + 29x - 20$	✓ <span style="color:red">x</span>

## 5. Sequences Questions

1	The $n$ th term of a different sequence is $n^2 - 6n + 14$ By completing the square, or otherwise, show that every term is positive.	✓ <span style="color:red">x</span>
2	The $n$ th term of a sequence is $n^2 + n$ Two consecutive terms in the sequence have a difference of 32. Work out the two terms.	✓ <span style="color:red">x</span>
3	The first five terms of a quadratic sequence are 4 10 18 28 40 Work out an expression for the $n$ th term.	✓ <span style="color:red">x</span>
4	The first four terms of a quadratic sequence are $\begin{array}{cccc} a + 5b & 2a + 8b & 3a + 12b & 4a + 17b \end{array}$ The $n$ th term of the sequence is $n^2 - 2n + 6$ Work out the values of $a$ and $b$ .	✓ <span style="color:red">x</span>
5	The $n$ th term of sequence X is $an + b$ The $n$ th term of sequence Y is $bn + a$ Show that the sequences have the same first term. The 2nd term of sequence X is equal to the 3rd term of sequence Y. Show that $a = 2b$	

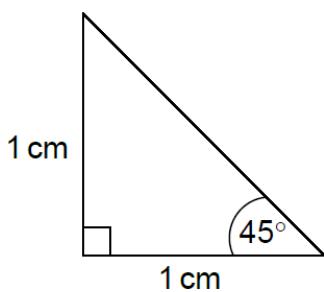
	Prove that $\frac{\text{nth term of sequence } X}{\text{nth term of sequence } Y} = \frac{2n + 1}{n + 2}$	
6	Here are the first four terms of a sequence.  4a              9a              14a              19a  The $n$ th term of the sequence is $\frac{10n - 2}{3}$  Work out the value of $a$ .	
7	The $n$ th term of a sequence is $\frac{2n^2 + 7}{3n^2 - 2}$  Work out the 7th term. Give your answer as a fraction in its simplest form.	
8	Show that the limiting value of $\frac{2n^2 + 7}{3n^2 - 2}$ as $n \rightarrow \infty$ is $\frac{2}{3}$	
9	The $n$ th term of the linear sequence 2    7    12    17    ... is $5n - 3$  A new sequence is formed by squaring each term of the linear sequence and adding 1.  Prove algebraically that all the terms in the new sequence are multiples of 5.	

## 6. Trigonometric Equations and Identities

1	Prove that $\tan^2 x - 1 \equiv \frac{1 - 2\cos^2 x}{\cos^2 x}$	
2	Angle $\theta$ is obtuse and $\sin \theta = \frac{\sqrt{5}}{3}$  Work out the values of $\cos \theta$ .	
3	Expand and simplify $(2s + 1)(s - 1)$  Hence, or otherwise, solve $2\sin^2 \theta - \sin \theta - 1 = 0$ for $0^\circ \leq \theta \leq 360^\circ$	

4

Here is a right-angled triangle.



Not drawn  
accurately

Show clearly that  $\sin 45^\circ = \frac{1}{\sqrt{2}}$

✗

5

Solve  $5\sin^2 x - 2\sin x = 0$  for  $0^\circ \leq x \leq 360^\circ$

✓

6

$f(x) = \sin x \quad 180^\circ \leq x \leq 360^\circ$

$g(x) = \cos x \quad 0^\circ \leq x \leq \theta$

Calculate the value of  $f(210^\circ)$ .

Complete this inequality for the range of  $f(x)$ .

Answer .....  $\leq f(x) \leq$  .....

You are given that  $0 \leq g(x) \leq 1$

Work out the value of  $\theta$ .

✓

7

Express  $1 - \tan \theta \sin \theta \cos \theta$  in terms of  $\cos \theta$ .

✓✗

8

Solve  $3\cos^2 \theta - 1 = 0$  for  $0^\circ \leq \theta \leq 180^\circ$

✓

9

Prove that  $\tan \theta + \frac{1}{\tan \theta} \equiv \frac{1}{\sin \theta \cos \theta}$

✓✗

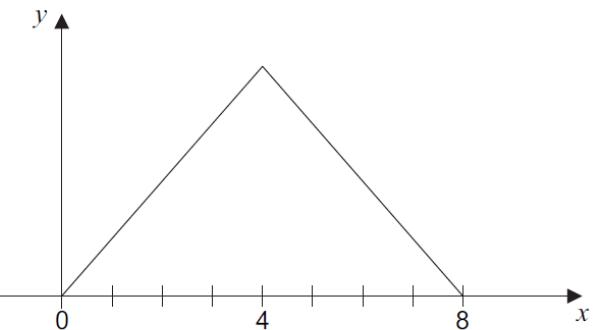
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Solve  $\tan^2 \theta + 3\tan \theta = 0$  for  $0^\circ < \theta < 360^\circ$

✓

## 7. Functions Questions

1	<p>A function <math>f(x)</math> is defined as</p> $\begin{aligned} f(x) &= 3x & 0 \leq x < 1 \\ &= 3 & 1 \leq x < 3 \\ &= 12 - 3x & 3 \leq x \leq 4 \end{aligned}$ <p>Calculate the area enclosed by the graph of <math>y = f(x)</math> and the <math>x</math>-axis.</p>
2	$f(n) = n^2 + n$ <p>Show that <math>f(n+1) - f(n) = 2n + 2</math></p> <span style="float: right;"><span style="color: green;">✓</span> <span style="color: red;">✗</span></span>
3	<p>A cubic function <math>f(x)</math> has domain all values of <math>x</math>.</p> <p>The curve <math>y = f(x)</math> has two stationary points.</p> <p>There is a minimum point at <math>(-2, 1)</math>.</p> <p>There is a maximum point at <math>(2, 5)</math>.</p> <p>Sketch the graph of <math>y = f(x)</math> on these axes.</p> <span style="float: right;"><span style="color: green;">✓</span> <span style="color: red;">✗</span></span>
4	$g(x) = x^3 + 3x^2 \quad \text{for all values of } x.$ <p>Show that <math>g(3x) = kx^2(x+1)</math> where <math>k</math> is an integer.</p> <span style="float: right;"><span style="color: green;">✓</span> <span style="color: red;">✗</span></span>

5	<p><math>y = f(x)</math> is a continuous graph.</p> <p>When <math>0 \leq x &lt; 3</math>      <math>\frac{dy}{dx} = 2</math> and this part of the graph passes through <math>(2, 1)</math>.</p> <p>When <math>3 \leq x &lt; 5</math>      <math>\frac{dy}{dx} = 0</math></p> <p>When <math>5 \leq x \leq 8</math>      <math>\frac{dy}{dx} = -1</math></p> <p>Draw the graph of <math>y = f(x)</math> for <math>0 \leq x \leq 8</math></p>	<span style="color: green;">✓</span> <span style="color: red;">x</span>
6	<p>A function <math>f(x)</math> is defined as</p> $\begin{aligned} f(x) &= x + 3 & -3 \leq x < 0 \\ &= 3 & 0 \leq x < 1 \\ &= 5 - 2x & 1 \leq x \leq 2 \end{aligned}$ <p>Draw the graph of <math>y = f(x)</math> for <math>-3 \leq x \leq 2</math></p>	<span style="color: green;">✓</span> <span style="color: red;">x</span>
7	<p>The graph of <math>y = f(x)</math> is a straight line.</p> <p>The domain of <math>f(x)</math> is <math>1 \leq x \leq 5</math></p> <p>The range of <math>f(x)</math> is <math>3 \leq f(x) \leq 11</math></p> <p>Work out <b>one</b> possible expression for <math>f(x)</math>.</p>	<span style="color: green;">✓</span> <span style="color: red;">x</span>
8	<p><math>f(x) = 3x - 5</math> for all values of <math>x</math>.</p> <p>Solve <math>f(x^2) = 43</math></p>	<span style="color: green;">✓</span> <span style="color: red;">x</span>
9	<p>A sketch of <math>y = g(x)</math> for domain <math>0 \leq x \leq 8</math> is shown.</p>  <p>The graph is symmetrical about <math>x = 4</math></p> <p>The range of <math>g(x)</math> is <math>0 \leq g(x) \leq 12</math></p> <p>Work out the function <math>g(x)</math>.</p>	<span style="color: green;">✓</span> <span style="color: red;">x</span>

10	<p>A function <math>f(x)</math> is defined as</p> $\begin{aligned} f(x) &= 4 & x < -2 \\ &= x^2 & -2 \leq x \leq 2 \\ &= 12 - 4x & x > 2 \end{aligned}$ <p>Draw the graph of <math>y = f(x)</math> for <math>-4 \leq x \leq 4</math></p>	<span style="color: green;">✓</span> <span style="color: red;">✗</span>
11	<p>A cubic function <math>f(x)</math> has domain <math>-4 \leq x \leq 4</math></p> <p>The curve <math>y = f(x)</math></p> <ul style="list-style-type: none"> <li>• has a minimum point at <math>(-2, 0)</math></li> <li>• has a maximum point at <math>(1, 4)</math></li> <li>• meets the <math>x</math>-axis at <math>(4, 0)</math>.</li> </ul> <p>Sketch the graph of <math>y = f(x)</math> on these axes. Label any points where the graph meets the <math>x</math>-axis.</p>	<span style="color: green;">✓</span> <span style="color: red;">✗</span>
12	<p><math>f(x) = 10 - x^2</math> for all values of <math>x</math>.</p> <p><math>g(x) = (x + 2a)(x + 3)</math> for all values of <math>x</math>.</p> <p>Circle the correct value of <math>f(-4)</math></p> <p style="text-align: center;">26      -6      36      16      196</p> <p>Write down the range of <math>f(x)</math>.</p> <p><math>g(0) = 24</math></p> <p>Show that <math>a = 4</math></p> <p>Hence solve <math>f(x) = g(x)</math></p>	<span style="color: green;">✓</span> <span style="color: red;">✗</span>

## 8. Matrices Questions

1	$\mathbf{M} = \begin{pmatrix} -2 & 0 \\ 0 & -2 \end{pmatrix}$ <p><math>\mathbf{M}</math> represents a single transformation.</p> <p>Describe the transformation fully.</p>	<span style="color: green;">✓</span> <span style="color: red;">✗</span>
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2	$\mathbf{P} = \begin{pmatrix} \sin x & \cos x \\ -\cos x & \sin x \end{pmatrix} \quad \mathbf{Q} = \begin{pmatrix} \sin x & -\cos x \\ \cos x & \sin x \end{pmatrix}$ <p>Work out <math>\mathbf{PQ}</math> Give your answer in its simplest form.</p>	<span style="color: green;">✓</span> <span style="color: red;">x</span>
3	$\begin{pmatrix} 2 & a \\ 1 & -3 \end{pmatrix} \begin{pmatrix} a \\ b \end{pmatrix} = \begin{pmatrix} -1 \\ 2 \end{pmatrix}$ <p>Work out all possible pairs of values of <math>a</math> and <math>b</math>.</p>	<span style="color: green;">✓</span> <span style="color: red;">x</span>
4	$\begin{pmatrix} -7 & 4 \\ 5 & -3 \end{pmatrix} \begin{pmatrix} -3 & -4 \\ -5 & t \end{pmatrix} = \mathbf{I}$ <p>Work out the value of <math>t</math>.</p>	<span style="color: green;">✓</span> <span style="color: red;">x</span>
5	<p>On the grid, draw the image of the unit square after it is transformed using the matrix</p> $\begin{pmatrix} 3 & 0 \\ 0 & 3 \end{pmatrix}.$	<span style="color: green;">✓</span> <span style="color: red;">x</span>
6	<p>Work out the matrix that transforms the unit square by a <math>270^\circ</math> rotation about <math>O</math>.</p>	<span style="color: green;">✓</span> <span style="color: red;">x</span>
7	<p>The matrix <math>\begin{pmatrix} a &amp; b \\ -a &amp; 2b \end{pmatrix}</math> maps the point <math>(5, 4)</math> onto the point <math>(1, 17)</math>.</p> <p>Work out the values of <math>a</math> and <math>b</math>.</p>	<span style="color: green;">✓</span> <span style="color: red;">x</span>
8	<p>Matrix <math>\mathbf{P} = \begin{pmatrix} 2 &amp; 3 \\ a &amp; b \end{pmatrix}</math>      Matrix <math>\mathbf{Q} = \begin{pmatrix} 1 &amp; 1 \\ 0 &amp; 1 \end{pmatrix}</math></p> <p>You are given that <math>\mathbf{PQ} = \mathbf{QP}</math></p> <p>Work out the values of <math>a</math> and <math>b</math>.</p>	<span style="color: green;">✓</span> <span style="color: red;">x</span>
9	<p>The transformation matrix <math>\begin{pmatrix} a &amp; 2 \\ -1 &amp; 1 \end{pmatrix}</math> maps the point <math>(3, 4)</math> onto the point <math>(2, b)</math>.</p> <p>Work out the values of <math>a</math> and <math>b</math>.</p>	<span style="color: green;">✓</span> <span style="color: red;">x</span>

10	$\mathbf{M} = \begin{pmatrix} -2 & -1 \\ 3 & 1 \end{pmatrix}$ Show that $\mathbf{M}^3 = \mathbf{I}$	✓ <span style="color:red">x</span>
11	Work out $\begin{pmatrix} 2 & -1 \\ \frac{1}{3} & 0 \end{pmatrix} \begin{pmatrix} 0 & b \\ a & c \end{pmatrix}$  Give your answer in terms of $a$ , $b$ and $c$ .	✓ <span style="color:red">x</span>
12	The transformation matrix $\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$ maps point $P$ to point $Q$ .  The transformation matrix $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$ maps point $Q$ to point $R$ .  Point $R$ is $(-4, 3)$ .  Work out the coordinates of point $P$ .	✓ <span style="color:red">x</span>
13	Describe fully the <b>single</b> transformation represented by the matrix $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$	✓ <span style="color:red">x</span>
14	$\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$ represents a reflection in the $y$ -axis.  $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$ represents a reflection in the line $y = x$  Work out the matrix that represents a reflection in the $y$ -axis followed by a reflection in the line $y = x$	✓ <span style="color:red">x</span>
15	A transformation is given by the matrix $\mathbf{M}$ , where $\mathbf{M} = \begin{pmatrix} 1 & a \\ 0 & 2 \end{pmatrix}$  The image of the point $(b, 5)$ under $\mathbf{M}$ is $(5, b)$ .  Work out the values of $a$ and $b$ .	✓ <span style="color:red">x</span>

## 9. Other Topics Questions

1	Work out $2\frac{2}{3} - 1\frac{3}{4} \div 1\frac{1}{8}$  Give your answer as a fraction in its simplest form.	✗
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2	The points $A(-1, -7)$ and $B(24, 23)$ are on a straight line $ACB$ . $AC : CB = 2 : 3$ Work out the coordinates of $C$ .	x
3	Explain why the equation $x^2 + 3x + 4 = 0$ has no real solutions.	x
4	Solve the simultaneous equations  $x + y = 4$ $y^2 = 4x + 5$ Do <b>not</b> use trial and improvement.	✓
5	Factorise fully $(x+y)^2 + (x+y)(2x+5y)$	✓ x
6	Factorise fully $(w+4)^3 - (w+4)^2(w+1)$	✓ x
7	Simplify $\frac{x^2 + 4x - 12}{x^2 - 25} \div \frac{x+6}{x^2 - 5x}$	✓ x
8	Simplify fully $\frac{4x^2 + 19x - 5}{9x^2 - 16} \div \frac{x+5}{3x-4}$	✓ x
9	Solve the simultaneous equations  $\frac{x-1}{y-2} = 3 \quad \frac{x+6}{y-1} = 4$ Do <b>not</b> use trial and improvement. You <b>must</b> show your working.	✓ x
10	Write this ratio in its simplest form  $\sqrt{12} : \sqrt{48} : \sqrt{300}$	x

11	$x^{\frac{3}{2}} = 8$ where $x > 0$ and $y^{-2} = \frac{25}{4}$ where $y > 0$  Work out the value of $\frac{x}{y}$ . <span style="color:red;">x</span>
12	Solve $\sqrt{(33 + \sqrt{x})} = 6$ <span style="color:green;">✓</span> <span style="color:red;">x</span>
13	Solve $y(\sqrt{3} - 1) = 8$ Give your answer in the form $a + b\sqrt{3}$ where $a$ and $b$ are integers. <span style="color:red;">x</span>
14	Solve $x^{-\frac{2}{3}} = 7\frac{1}{9}$  Write your answer as a proper fraction. <span style="color:red;">x</span>
15	<p>The value of <math>x</math> is 50% <b>more</b> than the value of <math>t</math>.          The value of <math>y</math> is 10% <b>less</b> than the value of <math>w</math>.</p> <p><math>x = y</math></p> <p>Work out <math>\frac{t}{w}</math></p> <p>Give your answer as a decimal. <span style="color:green;">✓</span> <span style="color:red;">x</span></p>
16	<p>A sphere has radius <math>x</math> centimetres.          A hemisphere has radius <math>y</math> centimetres.          The shapes have equal volumes.</p> <p>Work out the value of <math>\frac{y}{x}</math>.</p> <p>Give your answer in the form <math>a^{\frac{1}{3}}</math> where <math>a</math> is an integer. <span style="color:green;">✓</span> <span style="color:red;">x</span></p>