

Home > Maths > Exponentials and Logs

Exponentials and Logs



Part A Sketching

Consider the curve $y=6\times 5^x$, sketch it and find the value of the y intercept of the curve.

What is the value of the *y* intercept of the curve?

The following symbols may be useful: y

Part B Find x-coordinate

The point P on the curve $y=9^x$ has y-coordinate equal to 150. Use logarithms to find the x-coordinate of P.

Give the x-coordinate of P to 3 significant figures.

Part C New x-coordinate

The curves $y = 6 \times 5^x$ and $y = 9^x$ intersect at the point Q. Find the exact value of the x-coordinate at point Q, giving any logarithms in base three.

Give the exact value of the x-coordinate at point Q, giving any logarithms in base three (log_3).

When typing \log_3 into the answer box, use the syntax: $\log(\text{number, base})$, i.e. $\log_3 2 = \log(2,3)$.

The following symbols may be useful: log(), x

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Home > Maths > Expansions and Algebra

Expansions and Algebra

A Level

Part A Indices and surds

Simplify $2x^{\frac{2}{3}} imes 3x^{-1}$.

The following symbols may be useful: \boldsymbol{x}

Part B Indices

Express $2^{40} imes 4^{30}$ in the form 2^n .

The following symbols may be useful: n

Part C Simplifying expressions

Express $rac{26}{4-\sqrt{3}}$ in the form $a+b\sqrt{3}$.

The following symbols may be useful: a, b

Part D Binomial expansions

Find the first four terms in the expansion, in ascending powers of x, of

$$(1+3x)^8$$
.

The following symbols may be useful: \boldsymbol{x}

Part E Summing binomial expansions

Show that, if terms involving \boldsymbol{x}^4 and higher powers of \boldsymbol{x} may be ignored,

$$(1+3x)^8 + (1-3x)^8 = a + bx^2$$

Enter $a + bx^2$, substituting in the values for a and b.

The following symbols may be useful: x

Part F Estimating

.,

Use the equation from the previous part $\left(1+3x\right)^8+\left(1-3x\right)^8=a+bx^2$ to solve this question.

Find the value of $1.000\,003^8+0.999\,997^8$ correct to 12 decimal places.

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Home > Maths > Circles and Geometry

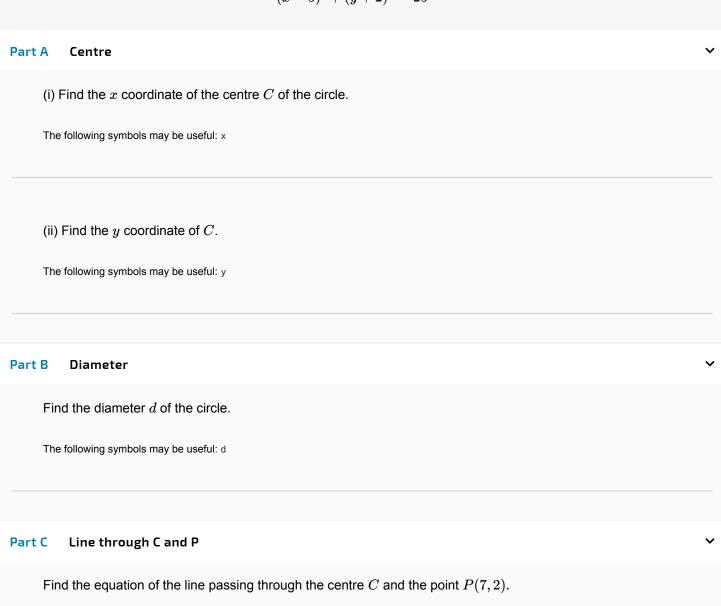
Circles and Geometry

The following symbols may be useful: x, y



A circle has equation

$$(x-5)^2 + (y+2)^2 = 25$$



Part D	Length of CP and position of P	~
(i)	Calculate the exact length of CP.	
(ii)	Using the previous result, determine which one of these statements is correct. P lies outside the circle. P lies inside the circle. P lies on the circumference of the circle.	
Part E Relation to the line $y=2x$		
WI	hich one of the choices below best describes how the circle is related to the line $y=2x$? The line meets the circle once tangentially. The line intersects the circle at two distinct points. The line and circle do not meet.	
the) If the line and circle do meet, give the x -coordinate of point of intersection with the largest x coordinate. If ey do not meet, give the largest positive value of a for which the line $y=ax$ meets the circle. e following symbols may be useful: a	

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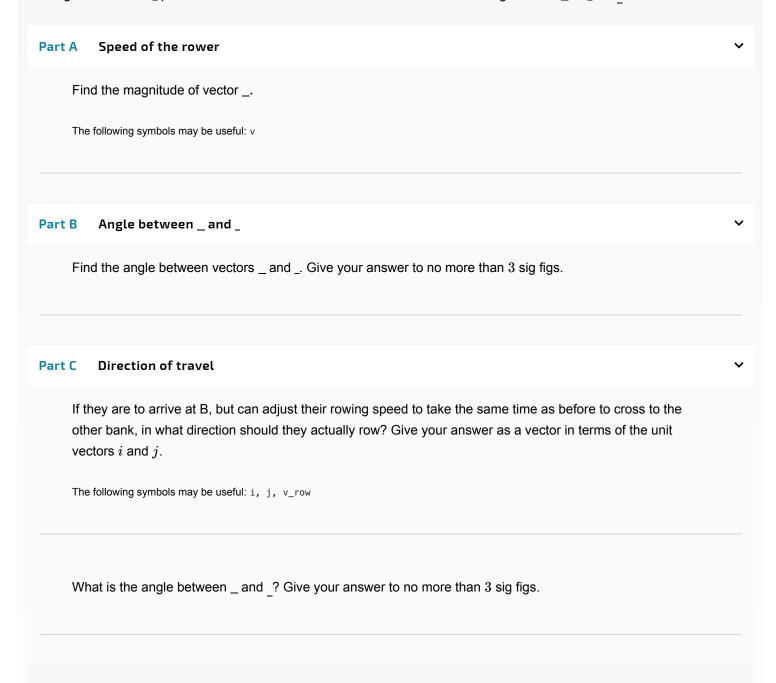
Home > Maths > Applying Trigonometry

Applying Trigonometry



A rower attempts to row across a river from a place A where the banks of the river are straight and parallel. They wish to reach a point B which is directly opposite to A on the other bank (i.e. on a line perpendicular to the bank at point A).

They start to row towards B, keeping the boat aligned in a direction parallel to _, but discover that there is a current flowing in a direction _ parallel to the banks, such that their resultant travel is along a vector $_= _+4$.



A tower in the distance Part D Figure 1: The tower, and points A and B. Some walkers see a tower, T, in the distance and want to know how far away it is. They take a bearing from point A and walk for $50\,\mathrm{m}$ in a straight line before taking another bearing from point B. They find that the angle TAB is 70° and angle TBA is 107° (see **Figure 1**). Find the distance of the tower from A. Give you answer to three significant figures. Distance from C Part E They continue walking in the same direction for another $100\,\mathrm{m}$ to a point C, so that AC is $150\,\mathrm{m}$. What is the distance of the tower from C? Give your answer to three significant figures. Part F Shortest distance from A to C Find the shortest distance of the walkers from the tower as they walk from A to C. Give your answer to three significant figures. Part G Area swept out D is the point on AC such that TD is the shortest distance of the walkers from the tower.

Find the area of ground represented by the triangle ATD. Give your answer in ${\rm km}^2$ and to 3 significant figures.

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