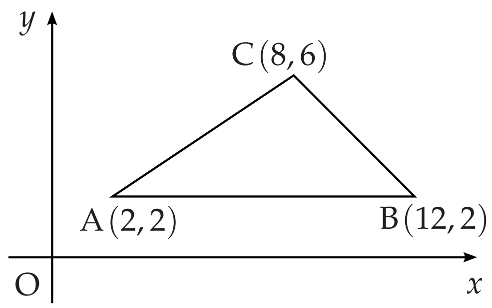
Geometry Calculator AB Grade

[SQA] 1. Triangle ABC has vertices A(2, 2), B(12, 2) and C(8, 6).



(a) Write down the equation of l_1, the perpendicular bisector of AB. **1**

(b) Find the equation of l_2, the perpendicular bisector of AC. **4**

(c) Find the point of intersection of lines l_1 and l_2. **1**

(d) Hence find the equation of the circle passing through A, B and C. **2**

2. Circle C_1 has equation $(x+1)^2 + (y-1)^2 = 121$.

A circle C_2 with equation $x^2 + y^2 - 4x + 6y + p = 0$ is drawn inside C_1.

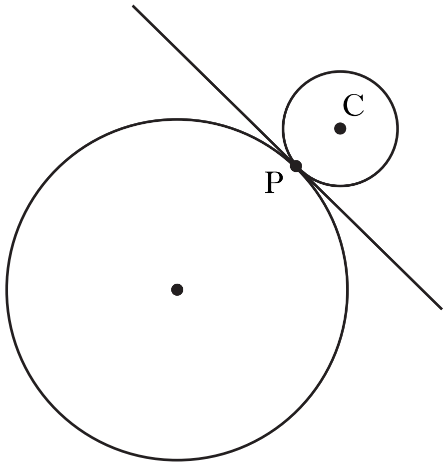
The circles have no points of contact.

What is the range of values of p? **9**

3. (*a*) (i) Show that the line with equation $y = 3 - x$ is a tangent to the circle with equation $x^2 + y^2 + 14x + 4y - 19 = 0$.

(ii) Find the coordinates of the points of contact, P. **5**

(*b*) Relative to a suitable set of coordinate axes, the diagram below shows the circle from (*a*) and a second smaller circle with centre C.

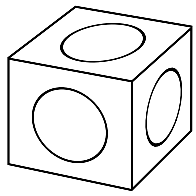


The line $y = 3 - x$ is a common tangent at the point P.

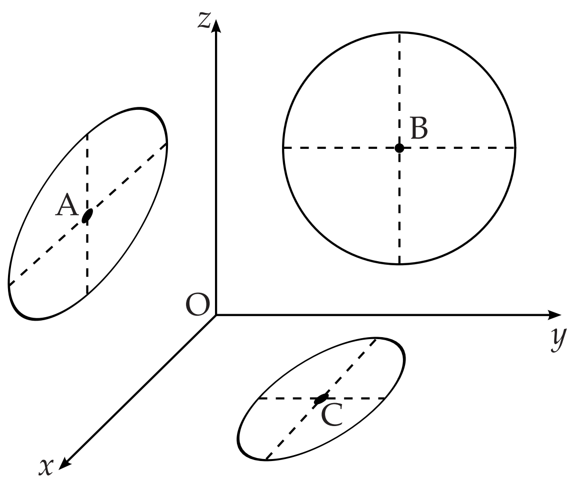
The radius of the larger circle is three times the radius of the smaller circle.

Find the equation of the smaller circle. **6**

[SQA] 4. A box in the shape of a cuboid is designed with **circles** of different sizes on each face.



The diagram shows three of the circles, where the origin represents one of the corners of the cuboid. The centres of the circles are $A(6, 0, 7)$, $B(0, 5, 6)$ and $C(4, 5, 0)$.

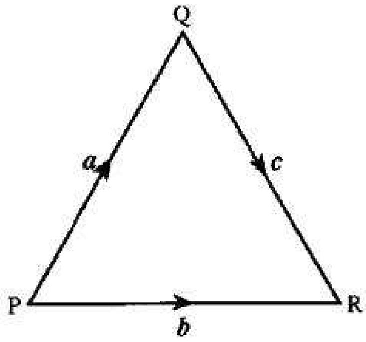


Find the size of angle ABC. **7**

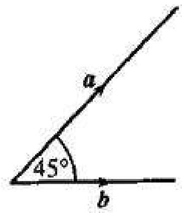
[SQA] 5. PQR is an equilateral triangle of side 2 units.

$\overrightarrow{PQ} = \boldsymbol{a}$, $\overrightarrow{PR} = \boldsymbol{b}$ and $\overrightarrow{QR} = \boldsymbol{c}$.

Evaluate $\boldsymbol{a}.(\boldsymbol{b}+\boldsymbol{c})$ and hence identify two vectors which are perpendicular. **4**



[SQA] 6. The diagram shows two vectors $\boldsymbol{a}$ and $\boldsymbol{b}$, with $|\boldsymbol{a}| = 3$ and $|\boldsymbol{b}| = 2\sqrt{2}$. These vectors are inclined at an angle of 45° to each other.



(*a*) Evaluate (i) $\boldsymbol{a}.\boldsymbol{a}$

(ii) $\boldsymbol{b}.\boldsymbol{b}$

(iii) $\boldsymbol{a}.\boldsymbol{b}$ **2**

(*b*) Another vector $\boldsymbol{p}$ is defined by $\boldsymbol{p} = 2\boldsymbol{a} + 3\boldsymbol{b}$. Evaluate $\boldsymbol{p}.\boldsymbol{p}$ and hence write down $|\boldsymbol{p}|$. **4**

[END OF QUESTIONS]