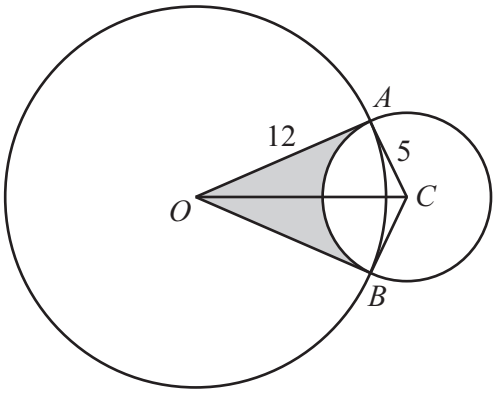
**3** In this question, all lengths are in centimetres and all angles are in radians.




The diagram shows a circle with centre $O$ and radius 12, and a circle with centre $C$ and radius 5.
The circles intersect at the points $A$ and $B$, such that $OA$ and $OB$ are tangents to the circle with centre $C$.

**(a)** Show that the obtuse angle $ACB$ is 2.35 radians, correct to 2 decimal places. [2]

**(b)** Find the perimeter of the shaded region. [2]

**(c)** Find the area of the shaded region. [3]

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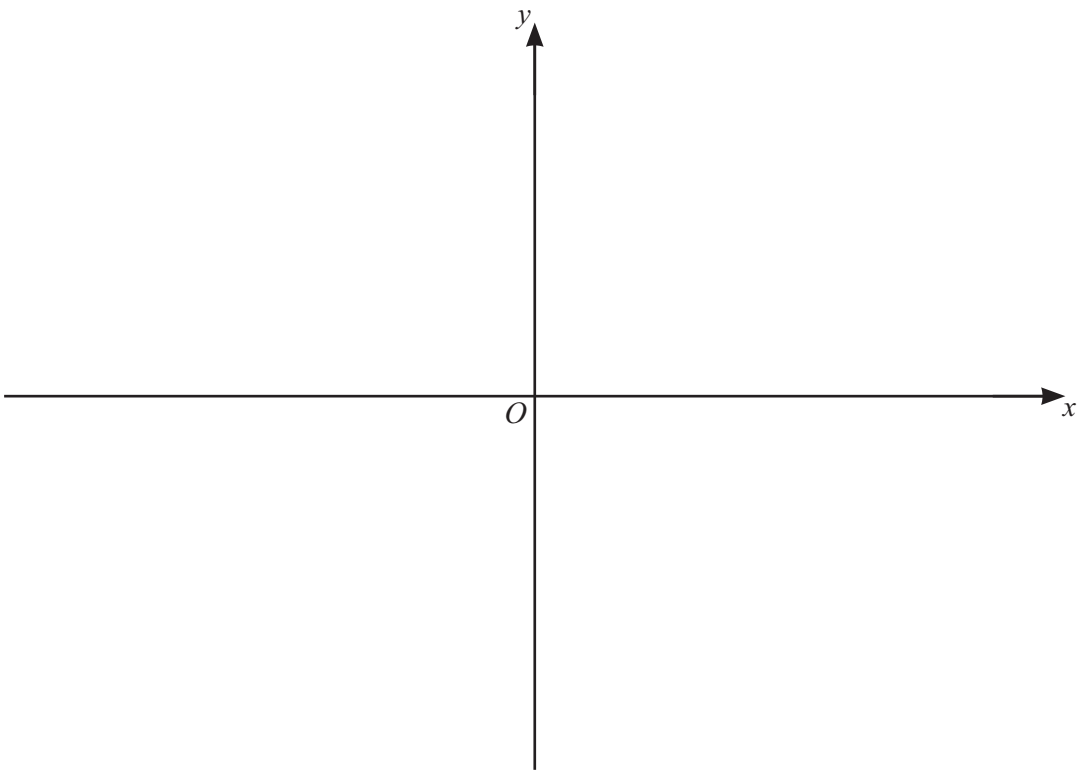
**4** The function f is such that $\mathrm{f}(x) = 4\ln(3x-2)$, for $x > a$, where $a$ is as small as possible.

**(a) (i)** Write down the value of $a$. [1]

**(ii)** Write down the range of f. [1]

**(iii)** Find $\mathrm{f}^{-1}(x)$, stating its domain and range. [4]

**(iv)** On the axes sketch the graphs of $y = \mathrm{f}(x)$ and $y = \mathrm{f}^{-1}(x)$, stating the intercepts with the axes. [4]




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