# ICSE 2017 Q8 b

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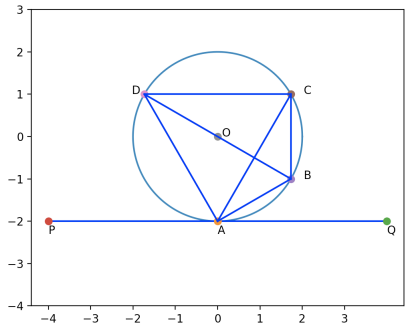
0.1. Solution:

$\angle BAQ = 30°$
$\Rightarrow \angle BAC = 30°$
also $\angle CAP = 180° - \angle CAQ \Rightarrow \angle CAP = 120°$
$\Rightarrow \angle CAD = \angle PAD = 60°$
$\Rightarrow \angle BAD = 90°$
$\Rightarrow BD$ is a diameter
$\angle ADB = \angle ACB = 30°$
[Angle made a chord at two different points ]
Also $\angle CAB = 30°$
$\Rightarrow \triangle ABC$ is an isosceles triangle




Steps for drawing the diagram:

| Symbol | Value | Description |
|---|---|---|
| $r$ | 2 | Radius |
| $O$ | $(0,0)$ | Center |
| $P$ | (-4,-2) | Point on the tangent |
| $Q$ | $(4,-2)$ | Point on the tangent |
| $A$ | $(0,-2)$ | Point of contact of the tangent |
| $B$ | $(1,-\sqrt{3})$ | $(2rsin\theta cos\theta, 2rsin^2\theta - 2)$ |
| $C$ | $(1,\sqrt{3})$ | $(2\text{rsin}\theta cos\theta, 2 - 2rsin^2\theta)$ |
| $D$ | $(-1,\sqrt{3})$ | $(-2rsin\theta cos\theta, 2 - 2rsin^2\theta)$ |

TABLE 0.1.1

Finding the coordinates of the points A.

a) A is on the line segment PQ.
b) The point closest to the circle on the segment lies on a line passing through O and perpendicular to PQ $\Rightarrow A(0,-2)$.

Finding the coordinates of the points B.

a) A(0. -2).
b) $\angle BAQ = 30°$
c) $|AB| = 2$
d) $\Rightarrow B(1,-\sqrt{3})$

Finding the coordinates of the points C.

a) A(0. -2).
b) $\angle CAQ = 60°$
c) $|AC| = 2\sqrt{3}$
d) $\Rightarrow C(1,\sqrt{3})$

Finding the coordinates of the points D.

a) A(0. -2).
b) $\angle DAP = 60°$
c) $|AD| = 2\sqrt{3}$
d) $\Rightarrow D(-1,\sqrt{3})$