

7.

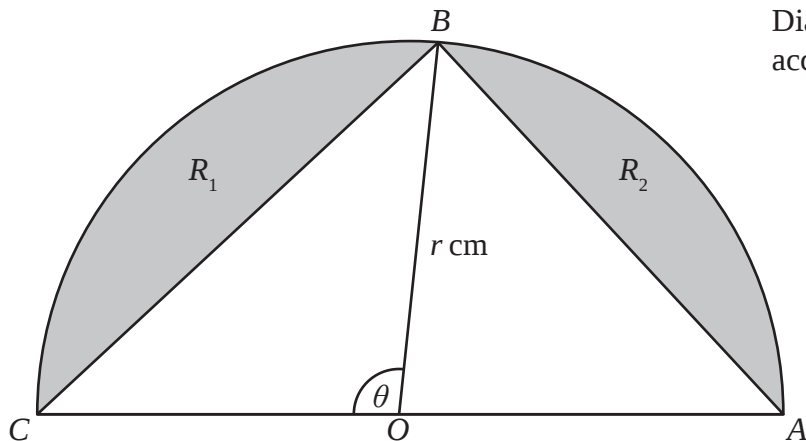


Figure 2

Figure 2 shows a semicircle $OABCO$ with centre O and radius r cm.

Given that

- angle BOC is θ radians
- the region R_1 , shown shaded in Figure 2, is bounded by the arc BC and the chord BC
- the region R_2 , also shown shaded in Figure 2, is bounded by the arc AB and the chord AB
- the area of R_1 is twice the area of R_2

(a) show that θ satisfies the equation

$$p \sin \theta + q\theta - 2\pi = 0$$

where p and q are integers to be found.

(4)

(b) Hence, taking 1.3 as a first approximation for θ , apply the Newton-Raphson method once to obtain a second approximation for θ . Give the answer to 3 decimal places.

(3)