

Question 7

(50 marks)

- (a) A cattle feeding trough of uniform cross section and 2.5 m in length, is shown in **Figure 1**.
 The front of the trough (segment ABC) is shown in **Figure 2**.
 The front of the trough is a segment of a circle of radius 90 cm.
 The height of the trough, $|DB|$, is 30 cm.
 $|OA| = |OC| = |OB| = 90$ cm. $[OB] \perp [AC]$.

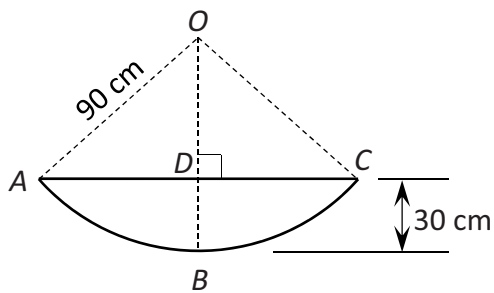


Figure 2

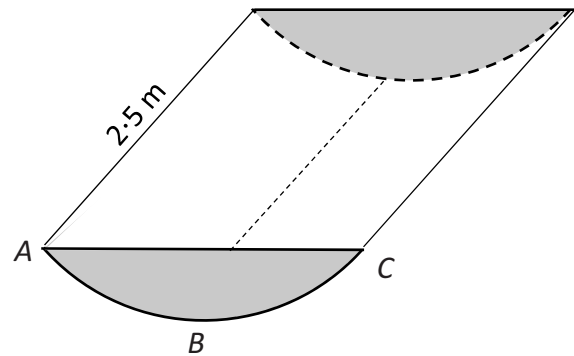
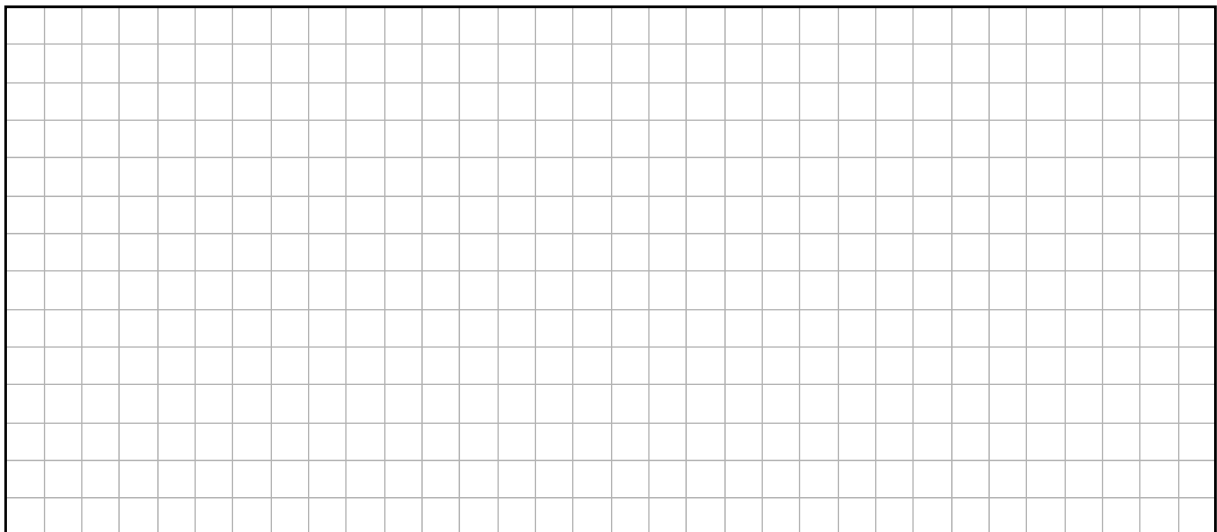
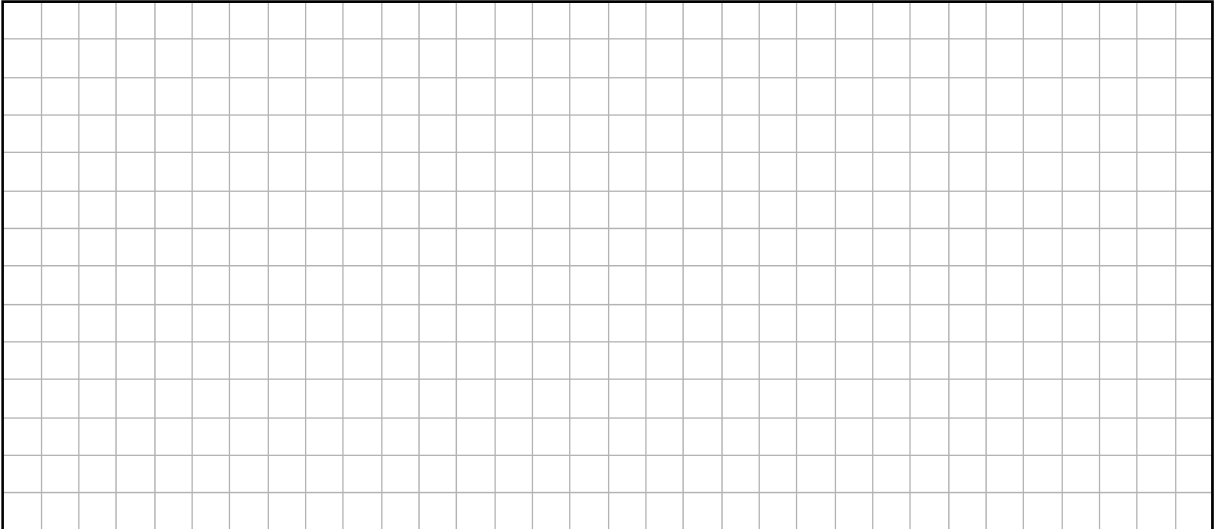


Figure 1

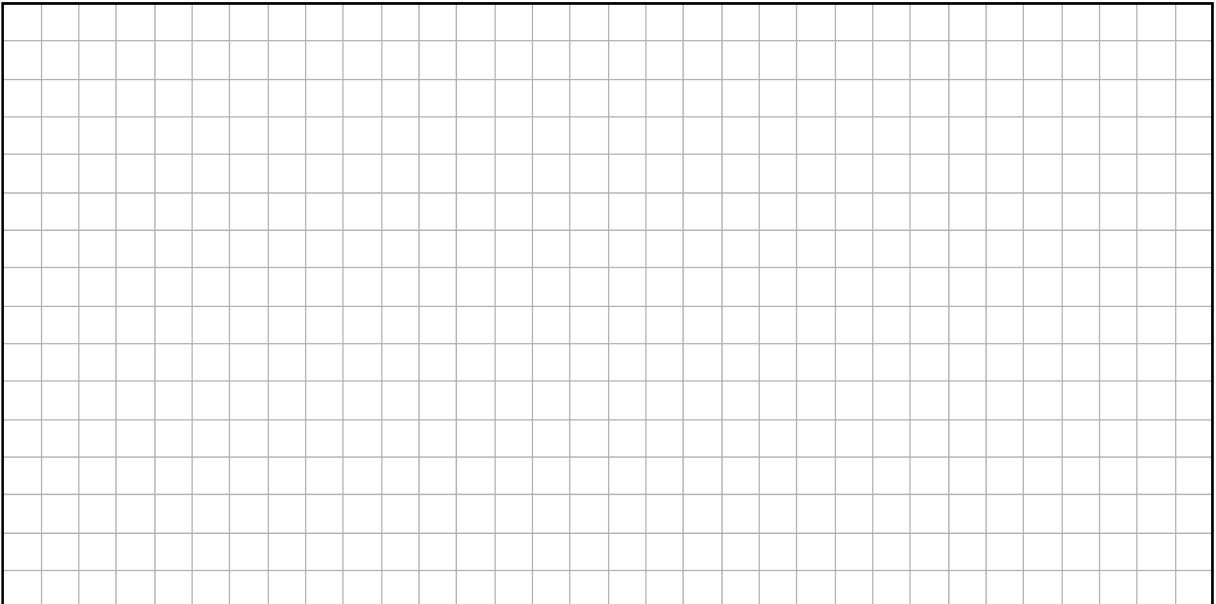
- (i) Find $|AD|$. Give your answer in the form $a\sqrt{b}$ cm, where $a, b \in \mathbb{Z}$.



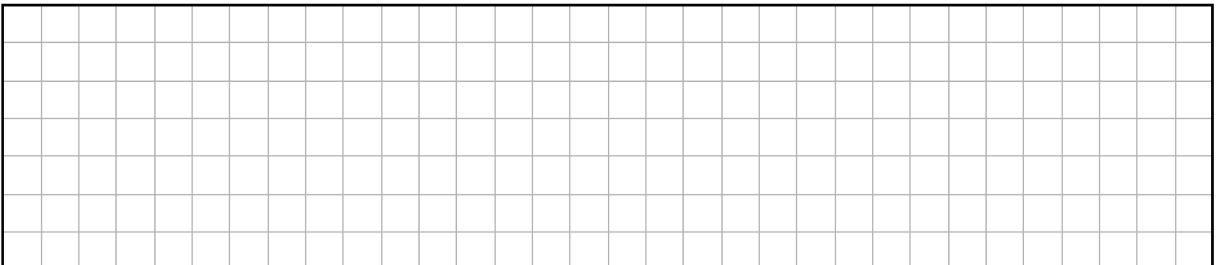
(ii) Find $|\angle DOA|$. Give your answer in radians, correct to 2 decimal places.



(iii) Find the area of the **segment** ABC . Give your answer in m^2 correct to 2 decimal places.

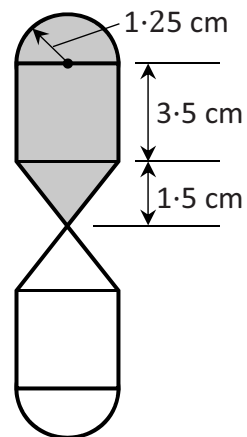


(iv) Find the **volume** of the trough. Give your answer in m^3 , correct to 2 decimal places.

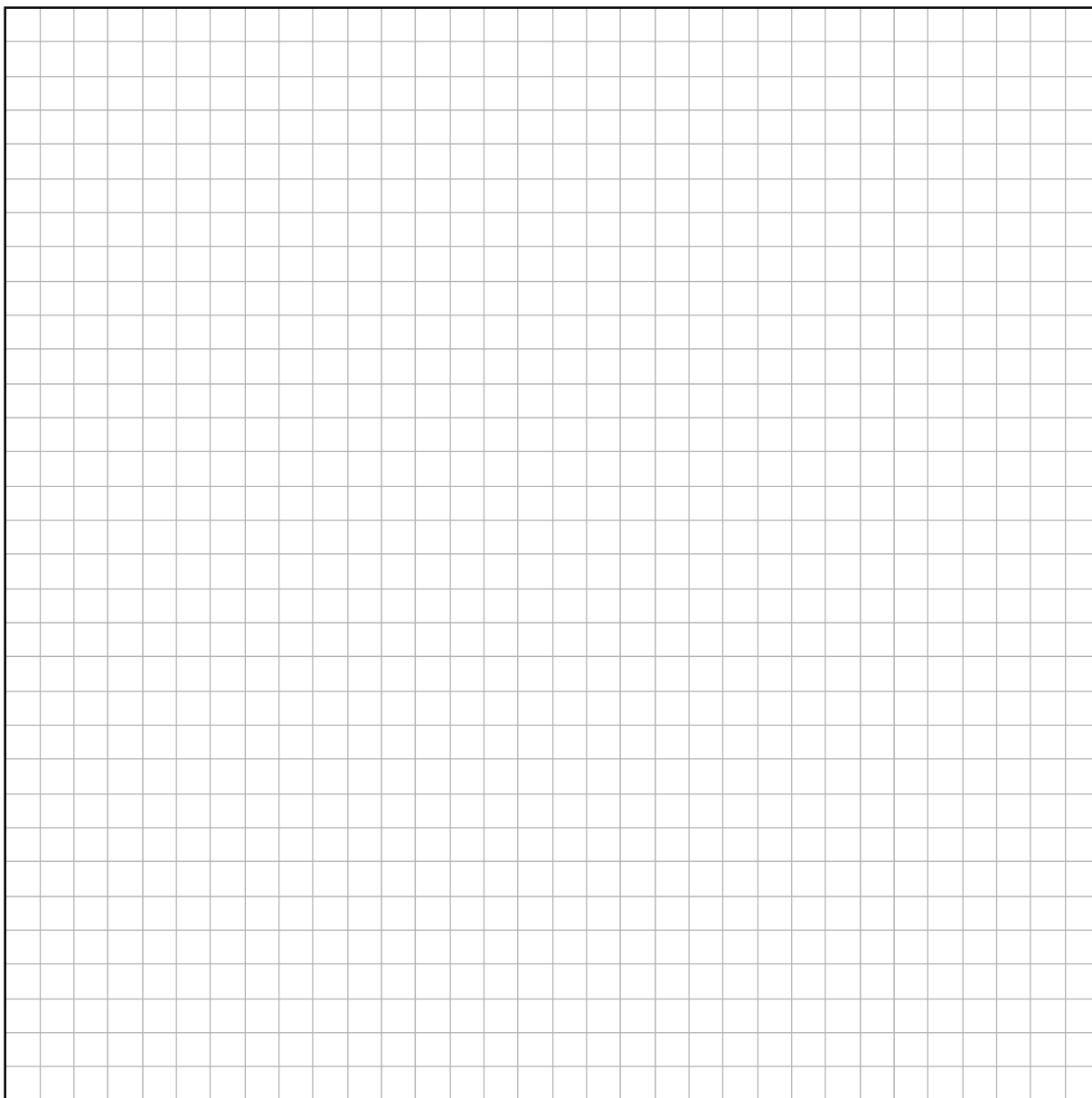


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- (b) A sand timer for games is shown in the diagram. Each half of the timer consists of a hemisphere, a cylinder of height 3.5 cm and a cone of height 1.5 cm. All of the parts have a radius of 1.25 cm.



- (i) The upper half of the timer is full of sand. Find the volume of sand in the upper half of the timer. Give your answer in cm^3 correct to 2 decimal places.



- (ii) Sand flows from the top half of the timer into the bottom part.
 As it flows the top surfaces in both parts remain level.
 At a certain time, 98% of the sand has flowed into the bottom half of the timer.
 Find h , the height of the remaining sand (in the conical part of the top of the timer).
 Give your answer in cm, correct to 2 decimal places.

