Topical Applications of Mathematics
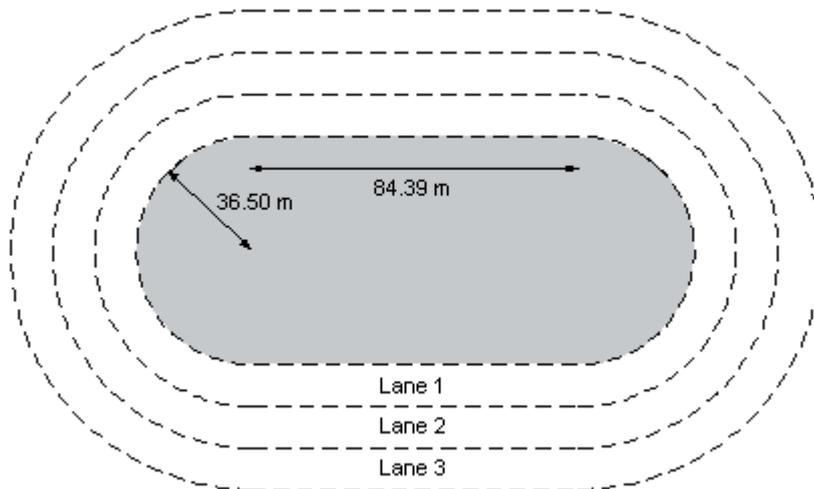
Athletics Track Layout   PUPIL TEXT

The sketch below shows the two main dimensions of a standard 400 m running track.

Activity 1

Calculate the inside perimeter of this track. Why do you think that it is NOT equal to 400 metres?

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The runners on the inside track (Lane 1) cannot run on the inner edge of this lane (there is usually a small kerb to ensure that the runner stays inside the lane). So how far is it assumed that the runner keeps from the very edge of the lane? If we say that the runner stays x cm from the edge, then the length run by this athlete, in cm, is

$$407.04 - 400 \quad = 7.04 \text{ m} \quad 2\pi \; 3650 + x \; + 2 \times 8439$$

Activity 2

Equate this distance run to 400 m. What is the value of x ?

Is this realistic?

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The width of each lane is 1.22 m and it is assumed that all runners, except those in Lane 1, run at an average of 20 cm from the inside of their lane. There is only a white line to distinguish lanes, not a kerb as on the inside lane: putting a foot over the inside line would result in disqualification.

Activity 3

(a)   *What distance does the athlete in Lane 2 cover if they complete one lap of the track?*

(b)　　If it is a 400 m race, how does this affect the
*　　　runner in Lane 2?*

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Clearly a stagger, where runners start at different positions, is needed as the athlete in the outer lanes will otherwise run further than those in the inner lanes.

Worked Example 1

Work out the stagger for the athlete in Lane 2.

Solution

If running a complete lap, the athlete will cover a distance of

$$2\pi\ (3650 + 122 + 20)\ + 16878 \approx 40704 \text{ cm}$$

So the extra distance run is

$$(407.04 - 400)\ = 7.04 \text{ m}$$

Activity 4

Calculate the stagger needed for Lanes 3 to 8.

What is the stagger from Lane 1 to Lane 8 ?

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Activity 5

Data Sheet 2 shows an accurate drawing of the track with 8 lanes.

Assuming that the FINISH is at the end of a straight section, illustrate the required stagger for all the runners in Lanes 2 – 8.

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Activity 6

What are the advantages/disadvantages of running in Lane 1 or Lane 8?

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