

1 Introduction

In this report we measure the distance between the two telescopes on the roof of the R.W. James building without going onto the roof of the building ourselves.

2 Apparatus and Method

To make this measurement we used a pair of shoes and a ruler. We went to the south side of the building, onto the balcony that runs almost the full width of the building, and approximated that the box the first telescope sits on starts at the same place the wall starts lower down and the box for the second telescope starts at the same place as a line that conveniently runs down the side of the building. Assuming both of these features are constructed with sufficient precision, measuring the distance between them will give us the same result as measuring the distance between the two boxes. Assuming that the telescopes are both situated directly in the centre of their respective boxes, measuring the distance between the start of the boxes is equivalent to measuring the distance between the peaks of the domes of the telescopes.

We placed one shoe in front of the other for the whole distance we were measuring and then measured the length of the shoe.

3 Results

We found the distance to be 75 shoes long and each shoe to be 30.5 cm long. Using this we find the distance between the peaks of the domes of the telescopes to be

$$2287.5 \text{ cm} = 22.875 \text{ m}$$

The uncertainty for this measurement comes from the uncertainty on the length of the shoe and the uncertainty on the number of shoe-lengths it took to cover the side of the building. On the measurement of the shoe we can use an analogue pdf with our interval $a = 0.5 \text{ cm}$ to get $u(\text{shoe}) = \frac{0.5}{2\sqrt{6}} = 0.10$. Since our shoe was the smallest unit we had when measuring the side of the building, we must take that as our interval. So $a = 1$ gives us $u(\text{shoe-lengths}) = \frac{1}{2\sqrt{6}} = 0.20$. This means that our final uncertainty is $\sqrt{(75 \cdot 0.1)^2 + 0.2^2} = 7.5 \text{ cm}$.

4 Conclusion

We found the distance between the telescopes to be $(22.875 \pm 0.075) \text{ m}$.