

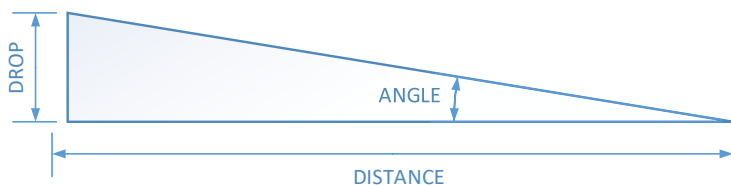
# Classroom to Campus: Math and Stats Challenge

## Grade 12 – MCT4C

### Topic C: Trigonometric Functions

#### Determining Headlight Alignment and Vertical Drop for Optimal Road Illumination

Mrs. Turner recently purchased a new car and noticed that the low beam headlights are positioned in a way that seems to focus lower than expected. She wants to ensure the headlights are properly aligned according to the manufacturer's standards. The manufacturer specifies that the low beam light should drop 85 centimetres vertically for every 40 to 42 metres horizontally in front of the car.



- Determine the range of the angle (in degrees) between the low beam light and the road, using the given vertical and horizontal distances as per manufacturer's specifications. (Round your answers to two decimal places.)
- Mrs. Turner had measured her car's actual vertical drop to be 88 cm over 44-metre distance. Determine the angle (in degrees) between the low beam light of their car and the road. Is the alignment within the manufacturer's standards? (Round your answer to two decimal places.)
- If the angle needs to be increased by 0.05 degree to meet the standards, how much should the vertical drop be adjusted for the same 44-metre distance? (Round your answer to the two decimal places. Include units.)
- If Mrs. Turner installs new LED headlights that project the beam 60 metres instead of 44 metres, determine what the vertical drop be (as a range) to maintain the angle within the manufacturer's specified range of 85 cm drop over 40 to 42 metres. (Round your answers to the two decimal places. Include units.)

**DON'T  
MISS THIS  
CHANCE TO  
SHINE!**

**Explore your  
potential with  
Mohawk College!**

**Put your math and  
stats skills to the test**

Submit your solutions for a chance to win an exclusive experience: selected students and their teachers will receive a VIP guided tour of Mohawk College, where they'll get to be a college student for a day—exploring labs, meeting faculty, and discovering exciting career opportunities.

To submit solutions email  
[\*\*Sigma@mohawkcollege.ca\*\*](mailto:Sigma@mohawkcollege.ca)

**Take your skills to the  
next level!**

Register for the annual SIGMA @ Mohawk College Competition, designed for students in college-stream math courses. Test your problem-solving abilities, compete against peers and experience math and stats in action with real-world applications.

To learn more visit  
[\*\*mohawkcollege.ca/Sigma\*\*](http://mohawkcollege.ca/Sigma)

