**ANGLES OF ELEVATION & DEPRESSION**

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| Angle of elevation (inclination) is the angle made between the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and the line of sight \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to an object.  **KEY WORDS**  Horizontal line  Upward  Horizontal line  Downward  Identify, angle, side  Model, right  Angle  Write, trig  Known  Therefore  Angle of depression is the angle made between the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and the line of sight \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to an object. |

**APPLICATION PROBLEMS**

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| Steps to solving problems using trigonometric ratios   1. \_\_\_\_\_\_\_\_ what needs to be calculated (\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_) 2. \_\_\_\_\_\_\_ the problem with a \_\_\_\_\_\_\_\_\_\_\_ triangle (draw a picture) 3. Label the relevant sides associated with the \_\_\_\_\_\_\_\_\_\_\_\_ 4. \_\_\_\_\_\_\_\_\_ an equation using the \_\_\_\_\_\_\_\_\_\_\_\_ ratios 5. Substitute \_\_\_\_\_\_\_\_\_ values 6. Solve for the unknown measure, and write \_\_\_\_\_\_\_\_\_\_\_\_\_ statement. |

**Example 1:** While walking to school you pass a barn with a silo. Looking up to the top of the silo you estimate the angle of elevation to be about . You continue walking and find that you were 40 m from the silo. Using this information and our knowledge of trigonometric ratios, calculate the height of the silo. (10m)

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**Example 2:** A helicopter sights a campfire at an angle of from the horizontal. The helicopter is hovering 400 m above the ground. What is the horizontal distance between the helicopter and the campfire? (476.7m)



smokesignalscampfire

**Example 3:** A sailboat that is 2 km due East of a lighthouse sends a signal to the lighthouse that   
it is in distress. The lighthouse quickly signals the coast guard that is due South of the lighthouse and   
7 km Southwest of the sailboat. What heading from due north should the coast guard take in order to intercept the troubled sailboat? (16.6o)





**Example 4:** Safety by-laws state that for a ladder to be stable, the angle the base of the ladder makes with the ground should be between and . A safety inspector at a construction site notices a painter on a 10 m ladder that is leaning against a wall. The base of the ladder is 1.5 m away from the wall. Does the inspector have cause to be concerned? Explain. (81.4o)

**Primary Trigonometry Ratio Application Practice**

1. A 5-m ladder is resting against a wall. The base of the ladder is 2 m along the ground from the base of the wall. What angle does the base of the ladder make with the ground? Express your answer to the nearest tenth of a degree. (66.4o)
2. An 80-m tower is supported by a guy wire attached to the top of the tower. If the wire forms an angle of elevation of , how long is it? Express your answer to the nearest tenth of a metre. (81.5m)
3. The highest point along a cliff is 80 m above the lakeshore. A surveyor stands on the top of the cliff, looking through a 1.5 m tall transit instrument. He spots a boat out on the lake, at an angle of depression of . How far, to the nearest tenth of a metre, is it from the boat to the base of the cliff? (104.3m)
4. Michael stands 10.0 m from the base of a building. He measures the angle of elevation to the top of the building to be . Michael’s measurement was made from 1.5 m above the ground. Determine the height of the building to the nearest metre. (23m)
5. Two buildings are 60 m apart. The angle of depression from the top of the taller building to the top of the shorter building is . The height of the shorter building is 30.4 m. What is the height of taller building? Express your answer to the nearest tenth of a metre. (46.5m)
6. From the top of a 150 m high cliff, the angles of depression of two boats on the water are  and . How far apart are the boats? (90.4m)
7. Two buildings are 20 m apart. The angle from the top of the shorter building to the top of the taller building is . The angle from the top of the shorter building to the base of the taller building is . What is the height of the taller building? (74.9m)
8. The CN Tower is 553.33 m high. Lina looks up at the top of the tower at a  angle of elevation. She calculates the distance, *d*, from the base of the tower as follows: (2065.05m)

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| d **≅**149 | Explain why Lina’s solution is incorrect.  Write a correct solution |