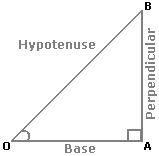
**Height and Distance**

### *Important Formulas*

1. **Trigonometry**:

In a right angled http://www.indiabix.com/_files/images/aptitude/1-sym-tag.gif OAB, where http://www.indiabix.com/_files/images/aptitude/1-sym-ang.gifBOA = http://www.indiabix.com/_files/images/aptitude/1-sym-tta.gif,



|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| i.   sin http://www.indiabix.com/_files/images/aptitude/1-sym-tta.gif = | Perpendicular | = | AB | ; |
| Hypotenuse | OB |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ii.   cos http://www.indiabix.com/_files/images/aptitude/1-sym-tta.gif = | Base | = | OA | ; |
| Hypotenuse | OB |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| iii.  tan http://www.indiabix.com/_files/images/aptitude/1-sym-tta.gif = | Perpendicular | = | AB | ; |
| Base | OA |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| iv.  cosec http://www.indiabix.com/_files/images/aptitude/1-sym-tta.gif = | 1 | = | OB | ; |
| sin http://www.indiabix.com/_files/images/aptitude/1-sym-tta.gif | AB |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| v.   sec http://www.indiabix.com/_files/images/aptitude/1-sym-tta.gif = | 1 | = | OB | ; |
| cos http://www.indiabix.com/_files/images/aptitude/1-sym-tta.gif | OA |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| vi.  cot http://www.indiabix.com/_files/images/aptitude/1-sym-tta.gif = | 1 | = | OA | ; |
| tan http://www.indiabix.com/_files/images/aptitude/1-sym-tta.gif | AB |

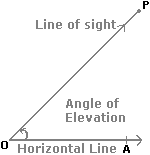
1. **Trigonometrical Identities:**
   1. sin2 http://www.indiabix.com/_files/images/aptitude/1-sym-tta.gif + cos2 http://www.indiabix.com/_files/images/aptitude/1-sym-tta.gif = 1.
   2. 1 + tan2 http://www.indiabix.com/_files/images/aptitude/1-sym-tta.gif = sec2 http://www.indiabix.com/_files/images/aptitude/1-sym-tta.gif.
   3. 1 + cot2 http://www.indiabix.com/_files/images/aptitude/1-sym-tta.gif = cosec2 http://www.indiabix.com/_files/images/aptitude/1-sym-tta.gif

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1. **Values of T-ratios:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| http://www.indiabix.com/_files/images/aptitude/1-sym-tta.gif | 0° | (http://www.indiabix.com/_files/images/aptitude/1-sym-pi.gif/6)  30° | (http://www.indiabix.com/_files/images/aptitude/1-sym-pi.gif/4)  45° | (http://www.indiabix.com/_files/images/aptitude/1-sym-pi.gif/3)  60° | (http://www.indiabix.com/_files/images/aptitude/1-sym-pi.gif/2)  90° |
| sin http://www.indiabix.com/_files/images/aptitude/1-sym-tta.gif | 0 | http://www.indiabix.com/_files/images/aptitude/1-div-1by2.gif | |  | | --- | | 1 | | 2 | | |  | | --- | | 3 | | 2 | | 1 |
| cos http://www.indiabix.com/_files/images/aptitude/1-sym-tta.gif | 1 | |  | | --- | | 3 | | 2 | | |  | | --- | | 1 | | 2 | | http://www.indiabix.com/_files/images/aptitude/1-div-1by2.gif | 0 |
| tan http://www.indiabix.com/_files/images/aptitude/1-sym-tta.gif | 0 | |  | | --- | | 1 | | 3 | | 1 | 3 | not defined |

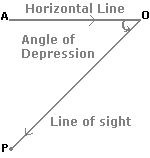
1. **Angle of Elevation:**



Suppose a man from a point O looks up at an object P, placed above the level of his eye. Then, the angle which the line of sight makes with the horizontal through O, is called the **angle of elevation** of P as seen from O.

* Angle of elevation of P from O = http://www.indiabix.com/_files/images/aptitude/1-sym-ang.gifAOP.

1. **Angle of Depression:**



Suppose a man from a point O looks down at an object P, placed below the level of his eye, then the angle which the line of sight makes with the horizontal through O, is called the **angle of depression** of P as seen from O.

### *General Questions*

|  |  |
| --- | --- |
| 1. | **Two ships are sailing in the sea on the two sides of a lighthouse. The angle of elevation of the top of the lighthouse is observed from the ships are 30° and 45° respectively. If the lighthouse is 100 m high, the distance between the two ships is:** |
| |  |  | | --- | --- | | [**A.**](javascript:%20void%200;) | 173 m | | [**B.**](javascript:%20void%200;) | 200 m | | [**C.**](javascript:%20void%200;) | 273 m | | [**D.**](javascript:%20void%200;) | 300 m |   **Answer:** Option **C**  **Explanation:**  Let AB be the lighthouse and C and D be the positions of the ships.  http://www.indiabix.com/_files/images/aptitude/1-z-647-005.gif  Then, AB = 100 m, http://www.indiabix.com/_files/images/aptitude/1-sym-ang.gifACB = 30° and http://www.indiabix.com/_files/images/aptitude/1-sym-ang.gifADB = 45°.   |  |  |  |  | | --- | --- | --- | --- | | AB | = tan 30° = | 1 | http://www.indiabix.com/_files/images/aptitude/1-sym-imp.gif     AC = AB x 3 = 1003 m. | | AC | 3 |  |  |  | | --- | --- | | AB | = tan 45° = 1     http://www.indiabix.com/_files/images/aptitude/1-sym-imp.gif     AD = AB = 100 m. | | AD |  |  |  | | --- | --- | | http://www.indiabix.com/_files/images/aptitude/1-sym-tfr.gif CD = (AC + AD) | = (1003 + 100) m | |  | = 100(3 + 1) | |  | = (100 x 2.73) m | |  | = 273 m. | |

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| **2.** | **A man standing at a point P is watching the top of a tower, which makes an angle of elevation of 30º with the man's eye. The man walks some distance towards the tower to watch its top and the angle of the elevation becomes 60º. What is the distance between the base of the tower and the point P?** |
| |  |  | | --- | --- | | [**A.**](javascript:%20void%200;) | 43 units | | [**B.**](javascript:%20void%200;) | 8 units | | [**C.**](javascript:%20void%200;) | 12 units | | [**D.**](javascript:%20void%200;) | Data inadequate | | [**E.**](javascript:%20void%200;) | None of these |   **Answer:** Option **D**  **Explanation:**  One of AB, AD and CD must have given.  http://www.indiabix.com/_files/images/aptitude/1-z-647-006.gif  So, the data is inadequate. |

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| 3. | **The angle of elevation of a ladder leaning against a wall is 60º and the foot of the ladder is 4.6 m away from the wall. The length of the ladder is:** |
| |  |  | | --- | --- | | [**A.**](javascript:%20void%200;) | 2.3 m | | [**B.**](javascript:%20void%200;) | 4.6 m | | [**C.**](javascript:%20void%200;) | 7.8 m | | [**D.**](javascript:%20void%200;) | 9.2 m |   **Answer:** Option **D**  **Explanation:**  Let AB be the wall and BC be the ladder.  http://www.indiabix.com/_files/images/aptitude/1-z-646-003.gif  Then, http://www.indiabix.com/_files/images/aptitude/1-sym-ang.gifACB = 60º and AC = 4.6 m.   |  |  |  | | --- | --- | --- | | AC | = cos 60º = | 1 | | BC | 2 |  |  |  | | --- | --- | | http://www.indiabix.com/_files/images/aptitude/1-sym-imp.gif BC | = 2 x AC | |  | = (2 x 4.6) m | |  | = 9.2 m. | |

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| 4. | **An observer 1.6 m tall is 203 away from a tower. The angle of elevation from his eye to the top of the tower is 30º. The heights of the tower is:** |
| |  |  | | --- | --- | | [**A.**](javascript:%20void%200;) | 21.6 m | | [**B.**](javascript:%20void%200;) | 23.2 m | | [**C.**](javascript:%20void%200;) | 24.72 m | | [**D.**](javascript:%20void%200;) | None of these |   **Answer:** Option **A**  **Explanation:**  Let AB be the observer and CD be the tower.  http://www.indiabix.com/_files/images/aptitude/1-z-646-004.gif  Draw BE http://www.indiabix.com/_files/images/aptitude/1-sym-plr.gif CD.  Then, CE = AB = 1.6 m,        BE = AC = 203 m.   |  |  |  | | --- | --- | --- | | DE | = tan 30º = | 1 | | BE | 3 |  |  |  |  | | --- | --- | --- | | http://www.indiabix.com/_files/images/aptitude/1-sym-imp.gif DE = | 203 | m = 20 m. | | 3 |  * CD = CE + DE = (1.6 + 20) m = 21.6 m.  |  |  | | --- | --- | | 5. | **From a point P on a level ground, the angle of elevation of the top tower is 30º. If the tower is 100 m high, the distance of point P from the foot of the tower is:** | | |  |  | | --- | --- | | [**A.**](javascript:%20void%200;) | 149 m | | [**B.**](javascript:%20void%200;) | 156 m | | [**C.**](javascript:%20void%200;) | 173 m | | [**D.**](javascript:%20void%200;) | 200 m |   **Answer:** Option **C**  **Explanation:**  Let AB be the tower.  http://www.indiabix.com/_files/images/aptitude/1-z-646-002.gif  Then, http://www.indiabix.com/_files/images/aptitude/1-sym-ang.gifAPB = 30º and AB = 100 m.   |  |  |  | | --- | --- | --- | | AB | = tan 30º = | 1 | | AP | 3 |  |  |  | | --- | --- | | http://www.indiabix.com/_files/images/aptitude/1-sym-imp.gif AP | = (AB x 3) m | |  | = 1003 m | |  | = (100 x 1.73) m | |  | = 173 m. | |  |  |  | | --- | --- | | 6. | **The angle of elevation of the sun, when the length of the shadow of a tree 3 times the height of the tree, is:** | | |  |  | | --- | --- | | [**A.**](javascript:%20void%200;) | 30º | | [**B.**](javascript:%20void%200;) | 45º | | [**C.**](javascript:%20void%200;) | 60º | | [**D.**](javascript:%20void%200;) | 90º |   **Answer:** Option **A**  **Explanation:**  Let AB be the tree and AC be its shadow.  http://www.indiabix.com/_files/images/aptitude/1-z-646-001.gif  Let http://www.indiabix.com/_files/images/aptitude/1-sym-ang.gifACB = http://www.indiabix.com/_files/images/aptitude/1-sym-tta.gif.   |  |  |  |  | | --- | --- | --- | --- | | Then, | AC | = | 3     http://www.indiabix.com/_files/images/aptitude/1-sym-imp.gif     cot http://www.indiabix.com/_files/images/aptitude/1-sym-tta.gif = 3 | | AB |  * http://www.indiabix.com/_files/images/aptitude/1-sym-tta.gif = 30º. |   ---------------------------------------------End---------------------------------------------------------- |