TRIGONOMETRIC RATIOS OF COMPLEMENTARY ANGLES

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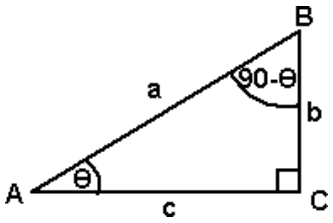
Introduction to Complemtary Angles



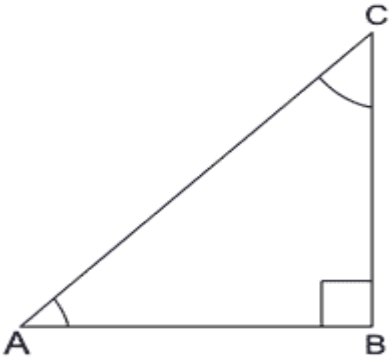
What are Complementary Angles?

A pair of angles is complementary if the sum of their measures is 90 degrees.

In the adjoining ? ABC, ? A and ? C are pair of complementary angles. Following this we have, ? A + ? C = 90°.

Also, ? C = 90° - ? A…(i)

We already are aware oftrigonometric ratios, now we will define all six trigonometric ratios with respect to ? A and ? C.



Trigonometric ratios with respect to ? A

Sin A = BC / AC
Cos A = AB / AC
Tan A = BC / AB (I)
Cosec A = AC / BC
Sec A = AC / AB
Cot A = AB / BC

Trigonometric ratios with respect to ? C

Sin C = AB / AC
Cos C = BC / AC
Tan C = AB / BC (II)

Cosec C = AC / AB
Sec C = AC / BC
Cot C = BC / AB

Substituting C = 90° – A (from (i))
Sin (90° – A) = AB / AC
Cos (90° – A) = BC / AC
Tan (90° – A) = AB / BC (III)
Cosec (90° – A) = AC / AB
Sec (90° – A) = AC / BC
Cot (90° – A) = BC / AB

Now, compare the ratios in (I) and (III)

Sin (90° – A) = AB / AC = Cos A
Cos (90° – A) = BC / AC = Sin A
Tan (90° – A) = AB / BC = Cot A
Cosec (90° – A) = AC / AB = Sec A
Sec (90° – A) = AC / BC = Cosec A
Cot (90° – A) = BC / AB = Tan A

So,
Sin (90° – A) = Cos A
Cos (90° – A) = Sin A
Tan (90° – A) = Cot A
Cosec (90° – A) = Sec A
Sec (90° – A) = Cosec A
Cot (90° – A) = Tan A

For all values of angle A lying between 0° and 90°.

Now, we will check whether this holds for A = 0° or A = 90°

Tan 0° = 0 = Cot 90°
Sec 0° = 1 = Cosec 90°
Sec 90°, Cosec 90°, Tan 90° and Cot 90° are not defined.

On the basis of above discussion, we will solve the following problem:
Evaluate: Tan 65°
Cot 25°

We know: Cot A = Tan (90° – A)
Cot 25° = Tan (90° - 25°) = Tan 65°

That is, Tan 65° = Tan 65° = 1
Cot 65° Tan 65°

Now try it yourself! Should you still need any help,click here to schedule live online session with e Tutor!

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Reference Links:

- http://en.wikipedia.org/wiki/Complementary_angles
- http://www.purplemath.com/modules/basirati.htm

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