

## STEP II, 2010, Q9

- 9 Two points  $A$  and  $B$  lie on horizontal ground. A particle  $P_1$  is projected from  $A$  towards  $B$  at an acute angle of elevation  $\alpha$  and simultaneously a particle  $P_2$  is projected from  $B$  towards  $A$  at an acute angle of elevation  $\beta$ . Given that the two particles collide in the air a horizontal distance  $b$  from  $B$ , and that the collision occurs after  $P_1$  has attained its maximum height  $h$ , show that

$$2h \cot \beta < b < 4h \cot \beta$$

and

$$2h \cot \alpha < a < 4h \cot \alpha,$$

where  $a$  is the horizontal distance from  $A$  to the point of collision.



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