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Problem 43.27 (RHK)

A girl is standing in front of a large plane mirror, contemplating her image. If she moves toward the mirror at speed v , we have to calculate the speed with which her image moves toward her; (a) in her own reference frame and (b) in the reference frame of the room in which the mirror is at rest.



Solution:

(b)

The distances of an object and its image from a mirror are equal. Therefore, in the reference of the room in which the mirror is at rest, as the girl is moving toward the mirror with speed v , her image will also move toward the mirror with speed v but in opposite direction.

(a)

In her rest frame she will observe that her image is moving toward her with speed $2v$, which by velocity addition theorem is $v + v$.