E

d

 3P

 a

 b

D

P

Spring

P

The object of a pinball game is to project the “particle” (the red ball) so that it enters the hole at E. When the spring is compressed and then released the particle is projected along the track which is smooth except for a rough patch between a and b where the coefficient of kinetic friction is f. The particle becomes a projectile at point D.

 Find:

1. the correct spring compression X, such that the particle enters the hole at E.
2. State any necessary conditions relating d and p.