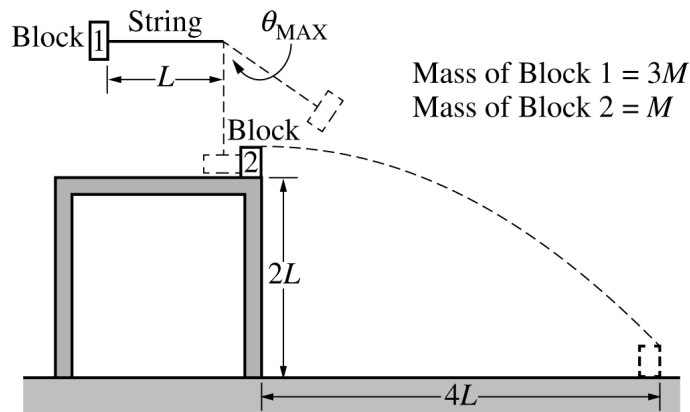




Note: Figure not drawn to scale.

2. A pendulum of length L consists of block 1 of mass $3M$ attached to the end of a string. Block 1 is released from rest with the string horizontal, as shown above. At the bottom of its swing, block 1 collides with block 2 of mass M , which is initially at rest at the edge of a table of height $2L$. Block 1 never touches the table. As a result of the collision, block 2 is launched horizontally from the table, landing on the floor a distance $4L$ from the base of the table. After the collision, block 1 continues forward and swings up. At its highest point, the string makes an angle θ_{MAX} to the vertical. Air resistance and friction are negligible. Express all algebraic answers in terms of M , L , and physical constants, as appropriate.
 - (a) Determine the speed of block 1 at the bottom of its swing just before it makes contact with block 2.
 - (d) Calculate the time between the instant block 2 leaves the table and the instant it first contacts the floor.
 - (e) Calculate the speed of block 2 as it leaves the table.
 - (f) Calculate the speed of block 1 just after it collides with block 2.
 - (g) Calculate the angle θ_{MAX} that the string makes with the vertical, as shown in the original figure, when block 1 is at its highest point after the collision.