```matlab
1 % *** Aidan Chin ***
2 % *** 9/15/23 ***
3 % ECE 202 MATLAB exercise M2
4
5 % *** citation: http://hyperphysics.phy-astr.gsu.edu/hbase/elacol2.html
6
7 % *** description: the goal of this code is to determine the mass of object
8 % 2 and final velocity of object 1 in elastic collision
9
10
11 clear   % clears the registers, which helps catch typos
12
13
14 % ----- givens -----
15
16 % Left cart is #1; right cart is #2
17
18 m1 = input("Input value for mass of car (g): " ); % mass for car 1 in g
19 v1i = input("Input value for intial velocity of car (cm/s): "); % initial velocity in ↙
cm/s
20 v2i = -v1i; % initial veloctiy in cm/s
21 v2f = 0; % final velocity in cm/s
22
23
24 % ----- calculation -----
25
26
27 m2 =  m1*(2*v1i - v2i - v2f) / (v2f - v2i) % mass for car 2 in g
28
29         % *** expression for m2 must depend on all 4 givens
30
31 M = m1 + m2; %total mass of the 2 cars in g
32
33 v1f = ((m1-m2)/M)*v1i + ((2*m2)/M)*v2i   % final velocity of cart 1, in cm/s
34
35         % *** expressions for v1f (below) and v2f are from M1 ***
36
37
38
39
40 % ----- check conservation of momentum and energy -----
41
42 checkP = (m1*v1i + m2*v2i) - (m1*v1f + m2*v2f)   % *** should be zero, checks ↙
concervation of momentum
43
44
45 % initial and final kinetic energies, in *** J/100000 ***
46
47 KEi = (.5*m1*v1i^2) + (.5*m2*v2i^2);
48 KEf = (.5*m1*v1f^2) + (.5*m2*v2f^2);
49
```

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50 checkKE = KEi - KEf   % *** should be zero, kinetic energy must be conserved
51
52
53 % ----- check that design is successful -----
54
55 check_v2f = v2f - (((2*m1)/M)*v1i + ((m2-m1)/M)*v2i)   % should be equal to v2f, ↙
difference should = 0
56
57 % *** Alternatively, compute v2f_new = ... using expression from M1
58
59 % *** this code is successful because the checks all came out as expected,
60 % and the values are logical.
```