```
>> M6
input mass of cart 1 (g): 300
input mass of cart 2 (g): 60
input mass of cart 3 (g): 240
input velocity of cart 1 (m/s): 10
input velocity of cart 2 (m/s): 20
input velocity of cart 3 (m/s): 30
please specify an error threshold: .001
the carts will never collide the resultant velocity vector is [ 10 20 30 ]
>> M6
input mass of cart 1 (g): 999
input mass of cart 2 (g): 1
input mass of cart 3 (g): 999
input velocity of cart 1 (m/s): 0
input velocity of cart 2 (m/s): 1000
input velocity of cart 3 (m/s): 0
please specify an error threshold: .001
the first collision is ambiguous, please specify which cart collides with card 2 first: 1
carts 1 and 2 will collide
after collision number 0 the resultant velocity vector is [ 2 -998 0 ]
carts 2 and 3 will collide
after collision number 1 the resultant velocity vector is [ 2 9.960040e+02 -1.996000e+00↙
]
carts 1 and 2 will collide
after collision number 2 the resultant velocity vector is [ 3.988008e+00 -9.900160e+02↙
-1.996000e+00 ]
carts 2 and 3 will collide
after collision number 3 the resultant velocity vector is [ 3.988008e+00 9.840480e+02↙
-3.972040e+00 ]
carts 1 and 2 will collide
after collision number 4 the resultant velocity vector is [ 5.948128e+00 -9.741118e+02↙
-3.972040e+00 ]
carts 2 and 3 will collide
after collision number 5 the resultant velocity vector is [ 5.948128e+00 9.642275e+02↙
-5.912320e+00 ]
carts 1 and 2 will collide
after collision number 6 the resultant velocity vector is [ 7.864687e+00 -9.504146e+02↙
-5.912320e+00 ]
carts 2 and 3 will collide
after collision number 7 the resultant velocity vector is [ 7.864687e+00 9.367010e+02↙
-7.801324e+00 ]
carts 1 and 2 will collide
after collision number 8 the resultant velocity vector is [ 9.722359e+00 -9.191140e+02↙
-7.801324e+00 ]
carts 2 and 3 will collide
after collision number 9 the resultant velocity vector is [ 9.722359e+00 9.016887e+02↙
-9.623949e+00 ]
carts 1 and 2 will collide
after collision number 10 the resultant velocity vector is [ 1.150629e+01 -8.804600e+02↙
-9.623949e+00 ]
carts 2 and 3 will collide
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after collision number 11 the resultant velocity vector is [ 1.150629e+01 8.594705e+02↙
-1.136562e+01 ]
carts 1 and 2 will collide
after collision number 12 the resultant velocity vector is [ 1.320222e+01 -8.347619e+02↙
-1.136562e+01 ]
carts 2 and 3 will collide
after collision number 13 the resultant velocity vector is [ 1.320222e+01 8.103839e+02↙
-1.301241e+01 ]
carts 1 and 2 will collide
after collision number 14 the resultant velocity vector is [ 1.479658e+01 -7.823851e+02↙
-1.301241e+01 ]
carts 2 and 3 will collide
after collision number 15 the resultant velocity vector is [ 1.479658e+01 7.548215e+02↙
-1.455116e+01 ]
carts 1 and 2 will collide
after collision number 16 the resultant velocity vector is [ 1.627663e+01 -7.237483e+02↙
-1.455116e+01 ]
carts 2 and 3 will collide
after collision number 17 the resultant velocity vector is [ 1.627663e+01 6.932276e+02↙
-1.596955e+01 ]
carts 1 and 2 will collide
after collision number 18 the resultant velocity vector is [ 1.763054e+01 -6.593204e+02↙
-1.596955e+01 ]
carts 2 and 3 will collide
after collision number 19 the resultant velocity vector is [ 1.763054e+01 6.260946e+02↙
-1.725626e+01 ]
carts 1 and 2 will collide
after collision number 20 the resultant velocity vector is [ 1.884746e+01 -5.896166e+02↙
-1.725626e+01 ]
carts 2 and 3 will collide
after collision number 21 the resultant velocity vector is [ 1.884746e+01 5.539594e+02↙
-1.840098e+01 ]
carts 1 and 2 will collide
after collision number 22 the resultant velocity vector is [ 1.991769e+01 -5.151942e+02↙
-1.840098e+01 ]
carts 2 and 3 will collide
after collision number 23 the resultant velocity vector is [ 1.991769e+01 4.773987e+02↙
-1.939456e+01 ]
carts 1 and 2 will collide
after collision number 24 the resultant velocity vector is [ 2.083265e+01 -4.366484e+02↙
-1.939456e+01 ]
carts 2 and 3 will collide
after collision number 25 the resultant velocity vector is [ 2.083265e+01 3.970247e+02↙
-2.022907e+01 ]
carts 1 and 2 will collide
after collision number 26 the resultant velocity vector is [ 2.158503e+01 -3.546070e+02↙
-2.022907e+01 ]
carts 2 and 3 will collide
after collision number 27 the resultant velocity vector is [ 2.158503e+01 3.134802e+02↙
-2.089783e+01 ]
carts 1 and 2 will collide
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after collision number 28 the resultant velocity vector is [ 2.216882e+01 -2.697263e+02↙
-2.089783e+01 ]
carts 2 and 3 will collide
after collision number 29 the resultant velocity vector is [ 2.216882e+01 2.274330e+02↙
-2.139548e+01 ]
carts 1 and 2 will collide
after collision number 30 the resultant velocity vector is [ 2.257935e+01 -1.826848e+02↙
-2.139548e+01 ]
carts 2 and 3 will collide
after collision number 31 the resultant velocity vector is [ 2.257935e+01 1.395713e+02↙
-2.171806e+01 ]
carts 1 and 2 will collide
after collision number 32 the resultant velocity vector is [ 2.281334e+01 -9.417857e+01↙
-2.171806e+01 ]
carts 2 and 3 will collide
after collision number 33 the resultant velocity vector is [ 2.281334e+01 5.059753e+01↙
-2.186298e+01 ]
carts 1 and 2 will collide
after collision number 34 the resultant velocity vector is [ 2.286890e+01 -4.915289e+00↙
-2.186298e+01 ]
carts 2 and 3 will collide
after collision number 35 the resultant velocity vector is [ 2.286890e+01 -3.877678e+01↙
-2.182909e+01 ]
carts 1 and 2 will collide
after collision number 36 the resultant velocity vector is [ 2.274561e+01 8.439130e+01↙
-2.182909e+01 ]
carts 2 and 3 will collide
after collision number 37 the resultant velocity vector is [ 2.274561e+01 -1.278370e+02↙
-2.161665e+01 ]
carts 1 and 2 will collide
after collision number 38 the resultant velocity vector is [ 2.244445e+01 1.730271e+02↙
-2.161665e+01 ]
carts 2 and 3 will collide
after collision number 39 the resultant velocity vector is [ 2.244445e+01 -2.158711e+02↙
-2.122736e+01 ]
carts 1 and 2 will collide
after collision number 40 the resultant velocity vector is [ 2.196782e+01 2.602834e+02↙
-2.122736e+01 ]
carts 2 and 3 will collide
after collision number 41 the resultant velocity vector is [ 2.196782e+01 -3.021751e+02↙
-2.066434e+01 ]
carts 1 and 2 will collide
after collision number 42 the resultant velocity vector is [ 2.131953e+01 3.454624e+02↙
-2.066434e+01 ]
carts 2 and 3 will collide
after collision number 43 the resultant velocity vector is [ 2.131953e+01 -3.860588e+02↙
-1.993208e+01 ]
carts 1 and 2 will collide
after collision number 44 the resultant velocity vector is [ 2.050477e+01 4.278831e+02↙
-1.993208e+01 ]
carts 2 and 3 will collide
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after collision number 45 the resultant velocity vector is [ 2.050477e+01 -4.668517e+02↙
-1.903645e+01 ]
carts 1 and 2 will collide
after collision number 46 the resultant velocity vector is [ 1.953006e+01 5.068865e+02↙
-1.903645e+01 ]
carts 2 and 3 will collide
after collision number 47 the resultant velocity vector is [ 1.953006e+01 -5.439076e+02↙
-1.798461e+01 ]
carts 1 and 2 will collide
after collision number 48 the resultant velocity vector is [ 1.840319e+01 5.818408e+02↙
-1.798461e+01 ]
carts 2 and 3 will collide
after collision number 49 the resultant velocity vector is [ 1.840319e+01 -6.166104e+02↙
-1.678496e+01 ]
carts 1 and 2 will collide
after collision number 50 the resultant velocity vector is [ 1.713316e+01 6.521467e+02↙
-1.678496e+01 ]
carts 2 and 3 will collide
after collision number 51 the resultant velocity vector is [ 1.713316e+01 -6.843788e+02↙
-1.544709e+01 ]
carts 1 and 2 will collide
after collision number 52 the resultant velocity vector is [ 1.573013e+01 7.172421e+02↙
-1.544709e+01 ]
carts 2 and 3 will collide
after collision number 53 the resultant velocity vector is [ 1.573013e+01 -7.466709e+02↙
-1.398172e+01 ]
carts 1 and 2 will collide
after collision number 54 the resultant velocity vector is [ 1.420533e+01 7.766064e+02↙
-1.398172e+01 ]
carts 2 and 3 will collide
after collision number 55 the resultant velocity vector is [ 1.420533e+01 -8.029886e+02↙
-1.240054e+01 ]
carts 1 and 2 will collide
after collision number 56 the resultant velocity vector is [ 1.257094e+01 8.297649e+02↙
-1.240054e+01 ]
carts 2 and 3 will collide
after collision number 57 the resultant velocity vector is [ 1.257094e+01 -8.528816e+02↙
-1.071621e+01 ]
carts 1 and 2 will collide
after collision number 58 the resultant velocity vector is [ 1.084004e+01 8.762926e+02↙
-1.071621e+01 ]
carts 2 and 3 will collide
after collision number 59 the resultant velocity vector is [ 1.084004e+01 -8.959510e+02↙
-8.942191e+00 ]
carts 1 and 2 will collide
after collision number 60 the resultant velocity vector is [ 9.026458e+00 9.158175e+02↙
-8.942191e+00 ]
carts 2 and 3 will collide
after collision number 61 the resultant velocity vector is [ 9.026458e+00 -9.318524e+02↙
-7.092672e+00 ]
carts 1 and 2 will collide
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after collision number 62 the resultant velocity vector is [ 7.144700e+00 9.480235e+02↙
-7.092672e+00 ]
carts 2 and 3 will collide
after collision number 63 the resultant velocity vector is [ 7.144700e+00 -9.602986e+02↙
-5.182439e+00 ]
carts 1 and 2 will collide
after collision number 64 the resultant velocity vector is [ 5.209813e+00 9.726532e+02↙
-5.182439e+00 ]
carts 2 and 3 will collide
after collision number 65 the resultant velocity vector is [ 5.209813e+00 -9.810624e+02↙
-3.226768e+00 ]
carts 1 and 2 will collide
after collision number 66 the resultant velocity vector is [ 3.237269e+00 9.895094e+02↙
-3.226768e+00 ]
carts 2 and 3 will collide
after collision number 67 the resultant velocity vector is [ 3.237269e+00 -9.939775e+02↙
-1.241295e+00 ]
carts 1 and 2 will collide
after collision number 68 the resultant velocity vector is [ 1.242839e+00 9.984576e+02↙
-1.241295e+00 ]
carts 2 and 3 will collide
after collision number 69 the resultant velocity vector is [ 1.242839e+00 -9.989408e+02↙
7.581024e-01 ]
carts 1 and 2 will collide
after collision number 70 the resultant velocity vector is [ -7.575279e-01 9.994261e+02↙
7.581024e-01 ]
carts 2 and 3 will collide
after collision number 71 the resultant velocity vector is [ -7.575279e-01 -9.959126e+02↙
2.755438e+00 ]
carts 1 and 2 will collide
after collision number 72 the resultant velocity vector is [ -2.747838e+00 9.924072e+02↙
2.755438e+00 ]
carts 2 and 3 will collide
after collision number 73 the resultant velocity vector is [ -2.747838e+00 -9.849170e+02↙
4.734742e+00 ]
carts 1 and 2 will collide
after collision number 74 the resultant velocity vector is [ -4.712176e+00 9.774570e+02↙
4.734742e+00 ]
carts 2 and 3 will collide
after collision number 75 the resultant velocity vector is [ -4.712176e+00 -9.660421e+02↙
6.680187e+00 ]
carts 1 and 2 will collide
after collision number 76 the resultant velocity vector is [ -6.634836e+00 9.546951e+02↙
6.680187e+00 ]
carts 2 and 3 will collide
after collision number 77 the resultant velocity vector is [ -6.634836e+00 -9.394387e+02↙
8.576216e+00 ]
carts 1 and 2 will collide
after collision number 78 the resultant velocity vector is [ -8.500444e+00 9.243034e+02↙
8.576216e+00 ]
carts 2 and 3 will collide
```

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after collision number 79 the resultant velocity vector is [ -8.500444e+00 -9.053195e+02↙
1.040767e+01 ]
carts 1 and 2 will collide
after collision number 80 the resultant velocity vector is [ -1.029408e+01 8.865250e+02↙
1.040767e+01 ]
carts 2 and 3 will collide
after collision number 81 the resultant velocity vector is [ -1.029408e+01 -8.639574e+02↙
1.215991e+01 ]
carts 1 and 2 will collide
after collision number 82 the resultant velocity vector is [ -1.200141e+01 8.416619e+02↙
1.215991e+01 ]
carts 2 and 3 will collide
after collision number 83 the resultant velocity vector is [ -1.200141e+01 -8.156831e+02↙
1.381891e+01 ]
carts 1 and 2 will collide
after collision number 84 the resultant velocity vector is [ -1.360877e+01 7.900729e+02↙
1.381891e+01 ]
carts 2 and 3 will collide
after collision number 85 the resultant velocity vector is [ -1.360877e+01 -7.608826e+02↙
1.537142e+01 ]
carts 1 and 2 will collide
after collision number 86 the resultant velocity vector is [ -1.510332e+01 7.321705e+02↙
1.537142e+01 ]
carts 2 and 3 will collide
after collision number 87 the resultant velocity vector is [ -1.510332e+01 -6.999941e+02↙
1.680502e+01 ]
carts 1 and 2 will collide
after collision number 88 the resultant velocity vector is [ -1.647310e+01 6.684177e+02↙
1.680502e+01 ]
carts 2 and 3 will collide
after collision number 89 the resultant velocity vector is [ -1.647310e+01 -6.335044e+02↙
1.810824e+01 ]
carts 1 and 2 will collide
after collision number 90 the resultant velocity vector is [ -1.770716e+01 5.993241e+02↙
1.810824e+01 ]
carts 2 and 3 will collide
after collision number 91 the resultant velocity vector is [ -1.770716e+01 -5.619452e+02↙
1.927067e+01 ]
carts 1 and 2 will collide
after collision number 92 the resultant velocity vector is [ -1.879564e+01 5.254424e+02↙
1.927067e+01 ]
carts 2 and 3 will collide
after collision number 93 the resultant velocity vector is [ -1.879564e+01 -4.858887e+02↙
2.028302e+01 ]
carts 1 and 2 will collide
after collision number 94 the resultant velocity vector is [ -1.972983e+01 4.473633e+02↙
2.028302e+01 ]
carts 2 and 3 will collide
after collision number 95 the resultant velocity vector is [ -1.972983e+01 -4.059431e+02↙
2.113718e+01 ]
carts 1 and 2 will collide
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after collision number 96 the resultant velocity vector is [ -2.050225e+01 3.657110e+02↙
2.113718e+01 ]
carts 2 and 3 will collide
after collision number 97 the resultant velocity vector is [ -2.050225e+01 -3.227475e+02↙
2.182632e+01 ]
carts 1 and 2 will collide
after collision number 98 the resultant velocity vector is [ -2.110674e+01 2.811385e+02↙
2.182632e+01 ]
carts 2 and 3 will collide
after collision number 99 the resultant velocity vector is [ -2.110674e+01 -2.369672e+02↙
2.234495e+01 ]
carts 1 and 2 will collide
after collision number 100 the resultant velocity vector is [ -2.153846e+01 1.943220e+02↙
2.234495e+01 ]
carts 2 and 3 will collide
after collision number 101 the resultant velocity vector is [ -2.153846e+01 -1.492882e+02↙
2.268890e+01 ]
carts 1 and 2 will collide
after collision number 102 the resultant velocity vector is [ -2.179396e+01 1.059557e+02↙
2.268890e+01 ]
carts 2 and 3 will collide
after collision number 103 the resultant velocity vector is [ -2.179396e+01 -6.041139e+01↙
2.285544e+01 ]
carts 1 and 2 will collide
after collision number 104 the resultant velocity vector is [ -2.187120e+01 1.674623e+01↙
2.285544e+01 ]
after all collisions the resultant velocity vector is [ -2.187120e+01 1.674623e+01↙
2.285544e+01 ]
There are no more collisions
>> M6
input mass of cart 1 (g): 300
input mass of cart 2 (g): 60
input mass of cart 3 (g): 240
input velocity of cart 1 (m/s): 10
input velocity of cart 2 (m/s): 20
input velocity of cart 3 (m/s): -30
please specify an error threshold: .000000000000000000000001
the first collision is ambiguous, please specify which cart collides with card 2 first: 1
carts 1 and 2 will collide
after collision number 0 the resultant velocity vector is [ 1.333333e+01 3.333333e+00 -30↙
]
carts 2 and 3 will collide
after collision number 1 the resultant velocity vector is [ 1.333333e+01 -50 -1.666667↙
e+01 ]
carts 1 and 2 will collide
after collision number 2 the resultant velocity vector is [ -7.777778e+00 5.555556e+01↙
-1.666667e+01 ]
threshold has been reached, terminating simulation
 Potential energy check: 4.547474e-13
 Kinetic energy check: -2.910383e-11
after all collisions the resultant velocity vector is [ -7.777778e+00 5.555556e+01↙
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-1.666667e+01 ]
There are no more collisions
>>
```