ADVANCE(p, v, m, dt): $\mathbb{R}^2_{5,3}, \mathbb{R}^2_{5,3}, \mathbb{R}^1_5, \mathbb{R} \to \mathbb{R}^3$

$$accs_{i,j} \mid 0 \leq i \leq 4 \wedge 0 \leq j \leq 4 = \begin{cases} \dfrac{(p_j - p_i) \cdot m_j}{\rho(p_i, p_j)^3} & j < i \\ 0 & otherwise \end{cases}$$

$$accs_{i,j} \mid j > i = -accs_{j,i}$$

$$a_{i,j} = \sum_k accs_{i,k,j}$$

$$v = v + a \cdot dt$$

$$p = p + v \cdot dt$$

return (p, v)

ENERGY(p, v, m): $\mathbb{R}^2_{5,3}, \mathbb{R}^2_{5,3}, \mathbb{R}^1_5 \to \mathbb{R}$

$$e \in \mathbb{R}$$

$$e = \sum_{i=0}^{4} \frac{m_i \cdot \sum_j v_j^2}{2}$$

$$e = e - \sum_{i=0,j=0}^{i<5,j<5} \begin{cases} \dfrac{m_i \cdot m_j}{\rho(p_i - p_j)} & i < j \\ 0 & \text{otherwise} \end{cases}$$

return (e)

OFFSET_MOMENTUM(v, m): $\mathbb{R}^2_{5,3}, \mathbb{R}^1_5 \to \mathbb{R}^2_{5,3}$

$$v_{0,j} \mid 0 \leq j \leq 2 = \frac{-\sum_i v_{i,j} \cdot m_i}{4 \cdot \pi^2}$$

return (v)

$\textsc{main}(\,): \;\to \mathbb{Z}$

$p \in \mathbb{R}^2_{5,3}, v \in \mathbb{R}^2_{5,3}, m \in \mathbb{R}^2_5$

$$p = \begin{pmatrix} 0 & 0 & 0 \\ 4.84143144246472090e+00 & -1.16032004402742839e+00 & -1.03622044471123109e-01 \\ 8.34336671824457987e+00 & 4.12479856412430479e+00 & -4.03523417114321381e-01 \\ 1.28943695621391310e+01 & -1.51111514016986312e+01 & -2.23307578892655734e-01 \\ 1.53796971148509165e+01 & -2.59193146099879641e+01 & 1.79258772950371181e-01 \end{pmatrix}$$

$$v = 365.24 \cdot \begin{pmatrix} 0 & 0 & 0 \\ 4.84143144246472090e+00 & -1.16032004402742839e+00 & -1.03622044471123109e- \\ 8.34336671824457987e+00 & 4.12479856412430479e+00 & -4.03523417114321381e- \\ 1.28943695621391310e+01 & -1.51111514016986312e+01 & -2.23307578892655734e- \\ 1.53796971148509165e+01 & -2.59193146099879641e+01 & 1.79258772950371181e- \end{pmatrix}$$

$$m = 4.0 \cdot \pi^2 \cdot \begin{pmatrix} 1 \\ 9.5479384224326609e-04 \\ 2.8588598066613812e-04 \\ 4.3662440433515629e-05 \\ 5.1513890046611451e-05 \end{pmatrix}$$

$v = \textsc{offset\_momentum}(v, m)$

print $(\textsc{energy}(p, v, m))$

$p^{[0]}, v^{[0]} = p, v$

$p^{[i]}, v^{[i]} = \textsc{advance}(p^{[i-1]}, v^{[i-1]}, m, 0.01)$

$p, v = \textbf{filter}(p^{[i]}, v^{[i]} \mid i = n)$

print $(\textsc{energy}(p, v, m))$

return (0)