

B+2

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+

$$\begin{aligned} \text{17) } \underline{\text{A20:}} \quad \vec{P}_A &= \vec{P}_A' \Rightarrow \vec{P}_1 + \vec{P}_2 = \vec{P}_{\text{tot}} \Rightarrow \mathbf{P_1 - P_2 = P_{\text{tot}}} \Rightarrow \\ &\Rightarrow m_1 v_1 - m_2 v_2 = (m_1 + m_2) V \Rightarrow \\ &\Rightarrow 2 \cdot 100 - 8 \cdot 20 = (2+8) \cdot V \Rightarrow \\ &\Rightarrow 200 - 160 = 10 \cdot V \Rightarrow 40 = 10 \cdot V \Rightarrow \\ &\Rightarrow \boxed{V = 4 \text{ m/s}} \end{aligned}$$

$$\begin{aligned} \text{12) } Q &= |\Delta K| = |K_{\text{tot}} - (K_1 + K_2)| = K_1 + K_2 - K_{\text{tot}} = \frac{1}{2} m_1 v_1^2 + \frac{1}{2} m_2 v_2^2 - \frac{1}{2} (m_1 + m_2) V^2 = \\ &= \frac{1}{2} \cdot 2 \cdot 100^2 + \frac{1}{2} \cdot 8 \cdot 16^2 - \frac{1}{2} \cdot 10 \cdot 4^2 = \\ &= 10000 + 640 - 80 \Rightarrow \boxed{Q = 10320 \text{ Joule}} \end{aligned}$$

$$\text{13) } H = \frac{1}{2} g t_{\text{tot}}^2 \Rightarrow 20 = \frac{1}{2} \cdot 10 \cdot t_{\text{tot}}^2 \Rightarrow t_{\text{tot}}^2 = 4 \Rightarrow \boxed{t_{\text{tot}} = 2 \text{ sec}}$$

$$\text{14) } x = v_0 t \leadsto R = V \cdot t_{\text{tot}} = 4 \cdot 2 \Rightarrow \boxed{R = 8 \text{ m}}$$

H.W.: 11, 16, 23

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III

$$m = 300 \text{ g} = 0.3 \text{ kg}$$

$$m_1 = m_1 + m_2 \xrightarrow{m_2 = 2m_1} m_1 = m_1 + 2m_1 \Rightarrow m_1 = 3m_1 \Rightarrow m_1 = \frac{m}{3} = \frac{0.3}{3} \Rightarrow \boxed{m_1 = 0.1 \text{ kg}}$$

$$m_2 = 2m_1 = 2 \cdot 0.1 \Rightarrow \boxed{m_2 = 0.2 \text{ kg}}$$

$$\text{A1) } H = \frac{1}{2} g t_{\text{tot}}^2 \Rightarrow H = \frac{1}{2} \cdot 10 \cdot 3^2 \Rightarrow \boxed{H = 45 \text{ m}}$$

$$\begin{aligned} \text{A2) } \underline{\text{1+}} \quad \underline{\text{A20:}} \quad \vec{P}_A &= \vec{P}_A' \Rightarrow \vec{P}_{\text{tot}} = \vec{P}_1 + \vec{P}_2 \Rightarrow \mathbf{0 = P_1 - P_2} \Rightarrow P_2 = P_1 \Rightarrow m_2 v_2 = m_1 v_1 \Rightarrow \\ &\Rightarrow 2m_1 v_2 = m_1 v_1 \Rightarrow \boxed{2v_2 = v_1} \quad (1) \end{aligned}$$

$$\begin{aligned} \left. \begin{array}{l} S_1: \text{20 kg moving with } m_1 \\ S_2: \text{20 kg moving with } m_2 \end{array} \right\} D = S_1 + S_2 \Rightarrow D = v_1 t_{\text{tot}} + v_2 t_{\text{tot}} \Rightarrow 180 = v_1 \cdot 3 + v_2 \cdot 3 \Rightarrow \\ \Rightarrow 180 = 3(v_1 + v_2) \Rightarrow \boxed{v_1 + v_2 = 60} \quad (2) \end{aligned}$$

$$(1), (2): \quad \underbrace{v_1 + v_2 = 60}_{\uparrow} \Rightarrow 2v_2 + v_2 = 60 \Rightarrow 3v_2 = 60 \Rightarrow \boxed{v_2 = 20 \text{ m/s}}$$

$$v_1 = 2v_2 = 2 \cdot 20 \Rightarrow \boxed{v_1 = 40 \text{ m/s}}$$

A3) 6c xpro $t = 2 \text{ sec}$ 7c 10c 6c 7c 8c 9c 10c 11c 12c 13c 14c 15c 16c 17c 18c 19c 20c 21c 22c 23c 24c 25c 26c 27c 28c 29c 30c 31c 32c 33c 34c 35c 36c 37c 38c 39c 40c 41c 42c 43c 44c 45c 46c 47c 48c 49c 50c 51c 52c 53c 54c 55c 56c 57c 58c 59c 60c 61c 62c 63c 64c 65c 66c 67c 68c 69c 70c 71c 72c 73c 74c 75c 76c 77c 78c 79c 80c 81c 82c 83c 84c 85c 86c 87c 88c 89c 90c 91c 92c 93c 94c 95c 96c 97c 98c 99c 100c 101c 102c 103c 104c 105c 106c 107c 108c 109c 110c 111c 112c 113c 114c 115c 116c 117c 118c 119c 120c 121c 122c 123c 124c 125c 126c 127c 128c 129c 130c 131c 132c 133c 134c 135c 136c 137c 138c 139c 140c 141c 142c 143c 144c 145c 146c 147c 148c 149c 150c 151c 152c 153c 154c 155c 156c 157c 158c 159c 160c 161c 162c 163c 164c 165c 166c 167c 168c 169c 170c 171c 172c 173c 174c 175c 176c 177c 178c 179c 180c 181c 182c 183c 184c 185c 186c 187c 188c 189c 190c 191c 192c 193c 194c 195c 196c 197c 198c 199c 200c 201c 202c 203c 204c 205c 206c 207c 208c 209c 210c 211c 212c 213c 214c 215c 216c 217c 218c 219c 220c 221c 222c 223c 224c 225c 226c 227c 228c 229c 230c 231c 232c 233c 234c 235c 236c 237c 238c 239c 240c 241c 242c 243c 244c 245c 246c 247c 248c 249c 250c 251c 252c 253c 254c 255c 256c 257c 258c 259c 260c 261c 262c 263c 264c 265c 266c 267c 268c 269c 270c 271c 272c 273c 274c 275c 276c 277c 278c 279c 280c 281c 282c 283c 284c 285c 286c 287c 288c 289c 290c 291c 292c 293c 294c 295c 296c 297c 298c 299c 300c 301c 302c 303c 304c 305c 306c 307c 308c 309c 310c 311c 312c 313c 314c 315c 316c 317c 318c 319c 320c 321c 322c 323c 324c 325c 326c 327c 328c 329c 330c 331c 332c 333c 334c 335c 336c 337c 338c 339c 340c 341c 342c 343c 344c 345c 346c 347c 348c 349c 350c 351c 352c 353c 354c 355c 356c 357c 358c 359c 360c 361c 362c 363c 364c 365c 366c 367c 368c 369c 370c 371c 372c 373c 374c 375c 376c 377c 378c 379c 380c 381c 382c 383c 384c 385c 386c 387c 388c 389c 390c 391c 392c 393c 394c 395c 396c 397c 398c 399c 400c 401c 402c 403c 404c 405c 406c 407c 408c 409c 410c 411c 412c 413c 414c 415c 416c 417c 418c 419c 420c 421c 422c 423c 424c 425c 426c 427c 428c 429c 430c 431c 432c 433c 434c 435c 436c 437c 438c 439c 440c 441c 442c 443c 444c 445c 446c 447c 448c 449c 450c 451c 452c 453c 454c 455c 456c 457c 458c 459c 460c 461c 462c 463c 464c 465c 466c 467c 468c 469c 470c 471c 472c 473c 474c 475c 476c 477c 478c 479c 480c 481c 482c 483c 484c 485c 486c 487c 488c 489c 490c 491c 492c 493c 494c 495c 496c 497c 498c 499c 500c 501c 502c 503c 504c 505c 506c 507c 508c 509c 510c 511c 512c 513c 514c 515c 516c 517c 518c 519c 520c 521c 522c 523c 524c 525c 526c 527c 528c 529c 530c 531c 532c 533c 534c 535c 536c 537c 538c 539c 540c 541c 542c 543c 544c 545c 546c 547c 548c 549c 550c 551c 552c 553c 554c 555c 556c 557c 558c 559c 560c 561c 562c 563c 564c 565c 566c 567c 568c 569c 570c 571c 572c 573c 574c 575c 576c 577c 578c 579c 580c 581c 582c 583c 584c 585c 586c 587c 588c 589c 590c 591c 592c 593c 594c 595c 596c 597c 598c 599c 600c 601c 602c 603c 604c 605c 606c 607c 608c 609c 610c 611c 612c 613c 614c 615c 616c 617c 618c 619c 620c 621c 622c 623c 624c 625c 626c 627c 628c 629c 630c 631c 632c 633c 634c 635c 636c 637c 638c 639c 640c 641c 642c 643c 644c 645c 646c 647c 648c 649c 650c 651c 652c 653c 654c 655c 656c 657c 658c 659c 660c 661c 662c 663c 664c 665c 666c 667c 668c 669c 670c 671c 672c 673c 674c 675c 676c 677c 678c 679c 680c 681c 682c 683c 684c 685c 686c 687c 688c 689c 690c 691c 692c 693c 694c 695c 696c 697c 698c 699c 700c 701c 702c 703c 704c 705c 706c 707c 708c 709c 710c 711c 712c 713c 714c 715c 716c 717c 718c 719c 720c 721c 722c 723c 724c 725c 726c 727c 728c 729c 730c 731c 732c 733c 734c 735c 736c 737c 738c 739c 740c 741c 742c 743c 744c 745c 746c 747c 748c 749c 750c 751c 752c 753c 754c 755c 756c 757c 758c 759c 760c 761c 762c 763c 764c 765c 766c 767c 768c 769c 770c 771c 772c 773c 774c 775c 776c 777c 778c 779c 780c 781c 782c 783c 784c 785c 786c 787c 788c 789c 790c 791c 792c 793c 794c 795c 796c 797c 798c 799c 800c 801c 802c 803c 804c 805c 806c 807c 808c 809c 810c 811c 812c 813c 814c 815c 816c 817c 818c 819c 820c 821c 822c 823c 824c 825c 826c 827c 828c 829c 830c 831c 832c 833c 834c 835c 836c 837c 838c 839c 840c 841c 842c 843c 844c 845c 846c 847c 848c 849c 850c 851c 852c 853c 854c 855c 856c 857c 858c 859c 860c 861c 862c 863c 864c 865c 866c 867c 868c 869c 870c 871c 872c 873c 874c 875c 876c 877c 878c 879c 880c 881c 882c 883c 884c 885c 886c 887c 888c 889c 890c 891c 892c 893c 894c 895c 896c 897c 898c 899c 900c 901c 902c 903c 904c 905c 906c 907c 908c 909c 910c 911c 912c 913c 914c 915c 916c 917c 918c 919c 920c 921c 922c 923c 924c 925c 926c 927c 928c 929c 930c 931c 932c 933c 934c 935c 936c 937c 938c 939c 940c 941c 942c 943c 944c 945c 946c 947c 948c 949c 950c 951c 952c 953c 954c 955c 956c 957c 958c 959c 960c 961c 962c 963c 964c 965c 966c 967c 968c 969c 970c 971c 972c 973c 974c 975c 976c 977c 978c 979c 980c 981c 982c 983c 984c 985c 986c 987c 988c 989c 990c 991c 992c 993c 994c 995c 996c 997c 998c 999c 1000c 1001c 1002c 1003c 1004c 1005c 1006c 1007c 1008c 1009c 1010c 1011c 1012c 1013c 1014c 1015c 1016c 1017c 1018c 1019c 1020c 1021c 1022c 1023c 1024c 1025c 1026c 1027c 1028c 1029c 1030c 1031c 1032c 1033c 1034c 1035c 1036c 1037c 1038c 1039c 1040c 1041c 1042c 1043c 1044c 1045c 1046c 1047c 1048c 1049c 1050c 1051c 1052c 1053c 1054c 1055c 1056c 1057c 1058c 1059c 1060c 1061c 1062c 1063c 1064c 1065c 1066c 1067c 1068c 1069c 1070c 1071c 1072c 1073c 1074c 1075c 1076c 1077c 1078c 1079c 1080c 1081c 1082c 1083c 1084c 1085c 1086c 1087c 1088c 1089c 1090c 1091c 1092c 1093c 1094c 1095c 1096c 1097c 1098c 1099c 1100c 1101c 1102c 1103c 1104c 1105c 1106c 1107c 1108c 1109c 1110c 1111c 1112c 1113c 1114c 1115c 1116c 1117c 1118c 1119c 1120c 1121c 1122c 1123c 1124c 1125c 1126c 1127c 1128c 1129c 1130c 1131c 1132c 1133c 1134c 1135c 1136c 1137c 1138c 1139c 1140c 1141c 1142c 1143c 1144c 1145c 1146c 1147c 1148c 1149c 1150c 1151c 1152c 1153c 1154c 1155c 1156c 1157c 1158c 1159c 1160c 1161c 1162c 1163c 1164c 1165c 1166c 1167c 1168c 1169c 1170c 1171c 1172c 1173c 1174c 1175c 1176c 1177c 1178c 1179c 1180c 1181c 1182c 1183c 1184c 1185c 1186c 1187c 1188c 1189c 1190c 1191c 1192c 1193c 1194c 1195c 1196c 1197c 1198c 1199c 1200c 1201c 1202c 1203c 1204c 1205c 1206c 1207c 1208c 1209c 1210c 1211c 1212c 1213c 1214c 1215c 1216c 1217c 1218c 1219c 1220c 1221c 1222c 1223c 1224c 1225c 1226c 1227c 1228c 1229c 1230c 1231c 1232c 1233c 1234c 1235c 1236c 1237c 1238c 1239c 1240c 1241c 1242c 1243c 1244c 1245c 1246c 1247c 1248c 1249c 1250c 1251c 1252c 1253c 1254c 1255c 1256c 1257c 1258c 1259c 1260c 1261c 1262c 1263c 1264c 1265c 1266c 1267c 1268c 1269c 1270c 1271c 1272c 1273c 1274c 1275c 1276c 1277c 1278c 1279c 1280c 1281c 1282c 1283c 1284c 1285c 1286c 1287c 1288c 1289c 1290c 1291c 1292c 1293c 1294c 1295c 1296c 1297c 1298c 1299c 1300c 1301c 1302c 1303c 1304c 1305c 1306c 1307c 1308c 1309c 1310c 1311c 1312c 1313c 1314c 1315c 1316c 1317c 1318c 1319c 1320c 1321c 1322c 1323c 1324c 1325c 1326c 1327c 1328c 1329c 1330c 1331c 1332c 1333c 1334c 1335c 1336c 1337c 1338c 1339c 1340c 1341c 1342c 1343c 1344c 1345c 1346c 1347c 1348c 1349c 1350c 1351c 1352c 1353c 1354c 1355c 1356c 1357c 1358c 1359c 1360c 1361c 1362c 1363c 1364c 1365c 1366c 1367c 1368c 1369c 1370c 1371c 1372c 1373c 1374c 1375c 1376c 1377c 1378c 1379c 1380c 1381c 1382c 1383c 1384c 1385c 1386c 1387c 1388c 1389c 1390c 1391c 1392c 1393c 1394c 1395c 1396c 1397c 1398c 1399c 1400c 1401c 1402c 1403c 1404c 1405c 1406c 1407c 1408c 1409c 1410c 1411c 1412c 1413c 1414c 1415c 1416c 1417c 1418c 1419c 1420c 1421c 1422c 1423c 1424c 1425c 1426c 1427c 1428c 1429c 1430c 1431c 1432c 1433c 1434c 1435c 1436c 1437c 1438c 1439c 1440c 1441c 1442c 1443c 1444c 1445c 1446c 1447c 1448c 1449c 1450c 1451c 1452c 1453c 1454c 1455c 1456c 1457c 1458c 1459c 1460c 1461c 1462c 1463c 1464c 1465c 1466c 1467c 1468c 1469c 1470c 1471c 1472c 1473c 1474c 1475c 1476c 1477c 1478c 1479c 1480c 1481c 1482c 1483c 1484c 1485c 1486c 1487c 1488c 1489c 1490c 1491c 1492c 1493c 1494c 1495c 1496c 1497c 1498c 1499c 1500c 1501c 1502c 1503c 1504c 1505c 1506c 1507c 1508c 1509c 1510c 1511c 1512c 1513c 1514c 1515c 1516c 1517c 1518c 1519c 1520c 1521c 1522c 1523c 1524c 1525c 1526c 1527c 1528c 1529c 1530c 1531c 1532c 1533c 1534c 1535c 1536c 1537c 1538c 1539c 1540c 1541c 1542c 1543c 1544c 1545c 1546c 1547c 1548c 1549c 1550c 1551c 1552c 1553c 1554c 1555c 1556c 1557c 1558c 1559c 1560c 1561c 1562c 1563c 1564c 1565c 1566c 1567c 1568c 1569c 1570c 1571c 1572c 1573c 1574c 1575c 1576c 1577c 1578c 1579c 1580c 1581c 1582c 1583c 1584c 1585c 1586c 1587c 1588c 1589c 1590c 1591c 1592c 1593c 1594c 1595c 1596c 1597c 1598c 1599c 1600c 1601c 1602c 1603c 1604c 1605c 1606c 1607c 1608c 1609c 1610c 1611c 1612c 1613c 1614c 1615c 1616c 1617c 1618c 1619c 1620c 1621c 1622c 1623c 1624c 1625c 1626c 1627c 1628c 1629c 1630c 1631c 1632c 1633c 1634c 1635c 1636c 1637c 1638c 1639c 1640c 1641c 1642c 1643c 1644c 1645c 1646c 1647c 1648c 1649c 1650c 1651c 1652c 1653c 1654c 1655c 1656c 1657c 1658c 1659c 1660c 1661c 1662c 1663c 1664c 1665c 1666c 1667c 1668c 1669c 1670c 1671c 1672c 1673c 1674c 1675c 1676c 1677c 1678c 1679c 1680c 1681c 1682c 1683c 1684c 1685c 1686c 1687c 1688c 1689c 1690c 1691c 1692c 1693c 1694c 1695c 1696c 1697c 1698c 1699c 1700c 1701c 1702c 1703c 1704c 1705c 1706c 1707c 1708c 1709c 1710c 1711c 1712c 1713c 1714c 1715c 1716c 1717c 1718c 1719c 1720c 1721c 1722c 1723c 1724c 1725c 1726c 1727c 1728c 1729c 1730c 1731c 1732c 1733c 1734c 1735c 1736c 1737c 1738c 1739c 1740c 1741c 1742c 1743c 1744c 1745c 1746c 1747c 1748c 1749c 1750c 1751c 1752c 1753c 1754c 1755c 1756c 1757c 1758c 1759c 1760c 1761c 1762c 1763c 1764c 1765c 1766c 1767c 1768c 1769c 1770c 1771c 1772c 1773c 1774c 1775c 1776c 1777c 1778c 1779c 1780c 1781c 1782c 1783c 1784c 1785c 1786c 1787c 1788c 1789c 1790c 1791c 1792c 1793c 1794c 1795c 1796c 1797c 1798c 1799c 1800c 1801c 1802c 1803c 1804c 1805c 1806c 1807c 1808c 1809c 1810c 1811c 1812c 1813c 1814c 1815c 1816c 1817c 1818c 1819c 1820c 1821c 1822c 1823c 1824c 1825c 1826c 1827c 1828c 1829c 1830c 1831c 1832c 1833c 1834c 1835c 1836c 1837c 1838c 1839c 1840c 1841c 1842c 1843c 1844c 1845c 1846c 1847c 1848c 1849c 1850c 1851c 1852c 1853c 1854c 1855c 1856c 1857c 1858c 1859c 1860c 1861c 1862c 1863c 1864c 1865c 1866c 1867c 1868c 1869c 1870c 1871c 1872c 1873c 1874c 1875c 1876c 1877c 1878c 1879c 1880c 1881c 1882c 1883c 1884c 1885c 1886c 1887c 1888c 1889c 1890c 1891c 1892c 1893c 1894c 1895c 1896c 1897c 1898c 1899c 1900c 1901c 1902c 1903c 1904c 1905c 1906c 1907c 1908c 1909c 1910c 1911c 1912c 1913c 1914c 1915c 1916c 1917c