

Chapter 1

Vectors

1.1 Vectors in Two and Three Dimensions

1. Here we just describe the points A , B or the points indicated.



2. Although more difficult for students to represent than on paper, the figures should look something like the following. Note that the origin is not at a corner of the frame. The vectors are the sides of the three vectors.



In positions 3 and 4, we supply more detail than is necessary to assist in reading when projections are being used.

3. $\text{a} = [2, 1, 1] + 1[-1, 0, 2] = [1, 1, 3]$, $\text{b} = [2, 1, 1] + 2[-1, 0, 2] = [0, 1, 5]$
 $\text{c} = [2, 1, 1] + 3[-1, 0, 2] = [-1, 1, 7]$, $\text{d} = [2, 1, 1] + 4[-1, 0, 2] = [-2, 1, 9]$
 $\text{e} = [2, 1, 1] + 5[-1, 0, 2] = [-3, 1, 11]$, $\text{f} = [2, 1, 1] + 6[-1, 0, 2] = [-4, 1, 13]$
 $\text{g} = [2, 1, 1] + 7[-1, 0, 2] = [-5, 1, 15]$, $\text{h} = [2, 1, 1] + 8[-1, 0, 2] = [-6, 1, 17]$
 $\text{i} = [2, 1, 1] + 9[-1, 0, 2] = [-7, 1, 19]$, $\text{j} = [2, 1, 1] + 10[-1, 0, 2] = [-8, 1, 21]$
 $\text{k} = [2, 1, 1] + 11[-1, 0, 2] = [-9, 1, 23]$, $\text{l} = [2, 1, 1] + 12[-1, 0, 2] = [-10, 1, 25]$
 $\text{m} = [2, 1, 1] + 13[-1, 0, 2] = [-11, 1, 27]$, $\text{n} = [2, 1, 1] + 14[-1, 0, 2] = [-12, 1, 29]$
 $\text{o} = [2, 1, 1] + 15[-1, 0, 2] = [-13, 1, 31]$, $\text{p} = [2, 1, 1] + 16[-1, 0, 2] = [-14, 1, 33]$
 $\text{q} = [2, 1, 1] + 17[-1, 0, 2] = [-15, 1, 35]$, $\text{r} = [2, 1, 1] + 18[-1, 0, 2] = [-16, 1, 37]$
 $\text{s} = [2, 1, 1] + 19[-1, 0, 2] = [-17, 1, 39]$, $\text{t} = [2, 1, 1] + 20[-1, 0, 2] = [-18, 1, 41]$
 $\text{u} = [2, 1, 1] + 21[-1, 0, 2] = [-19, 1, 43]$, $\text{v} = [2, 1, 1] + 22[-1, 0, 2] = [-20, 1, 45]$
 $\text{w} = [2, 1, 1] + 23[-1, 0, 2] = [-21, 1, 47]$, $\text{x} = [2, 1, 1] + 24[-1, 0, 2] = [-22, 1, 49]$
 $\text{y} = [2, 1, 1] + 25[-1, 0, 2] = [-23, 1, 51]$, $\text{z} = [2, 1, 1] + 26[-1, 0, 2] = [-24, 1, 53]$
 $\text{aa} = [2, 1, 1] + 27[-1, 0, 2] = [-25, 1, 55]$, $\text{ab} = [2, 1, 1] + 28[-1, 0, 2] = [-26, 1, 57]$
 $\text{ac} = [2, 1, 1] + 29[-1, 0, 2] = [-27, 1, 59]$, $\text{ad} = [2, 1, 1] + 30[-1, 0, 2] = [-28, 1, 61]$
 $\text{ae} = [2, 1, 1] + 31[-1, 0, 2] = [-29, 1, 63]$, $\text{af} = [2, 1, 1] + 32[-1, 0, 2] = [-30, 1, 65]$
 $\text{ag} = [2, 1, 1] + 33[-1, 0, 2] = [-31, 1, 67]$, $\text{ah} = [2, 1, 1] + 34[-1, 0, 2] = [-32, 1, 69]$
 $\text{ai} = [2, 1, 1] + 35[-1, 0, 2] = [-33, 1, 71]$, $\text{aj} = [2, 1, 1] + 36[-1, 0, 2] = [-34, 1, 73]$
 $\text{ak} = [2, 1, 1] + 37[-1, 0, 2] = [-35, 1, 75]$, $\text{al} = [2, 1, 1] + 38[-1, 0, 2] = [-36, 1, 77]$
 $\text{am} = [2, 1, 1] + 39[-1, 0, 2] = [-37, 1, 79]$, $\text{an} = [2, 1, 1] + 40[-1, 0, 2] = [-38, 1, 81]$
 $\text{ao} = [2, 1, 1] + 41[-1, 0, 2] = [-39, 1, 83]$, $\text{ap} = [2, 1, 1] + 42[-1, 0, 2] = [-40, 1, 85]$
 $\text{aq} = [2, 1, 1] + 43[-1, 0, 2] = [-41, 1, 87]$, $\text{ar} = [2, 1, 1] + 44[-1, 0, 2] = [-42, 1, 89]$
 $\text{as} = [2, 1, 1] + 45[-1, 0, 2] = [-43, 1, 91]$, $\text{at} = [2, 1, 1] + 46[-1, 0, 2] = [-44, 1, 93]$
 $\text{au} = [2, 1, 1] + 47[-1, 0, 2] = [-45, 1, 95]$, $\text{av} = [2, 1, 1] + 48[-1, 0, 2] = [-46, 1, 97]$
 $\text{aw} = [2, 1, 1] + 49[-1, 0, 2] = [-47, 1, 99]$, $\text{ax} = [2, 1, 1] + 50[-1, 0, 2] = [-48, 1, 101]$
 $\text{ay} = [2, 1, 1] + 51[-1, 0, 2] = [-49, 1, 103]$, $\text{az} = [2, 1, 1] + 52[-1, 0, 2] = [-50, 1, 105]$
 $\text{ba} = [2, 1, 1] + 53[-1, 0, 2] = [-51, 1, 107]$, $\text{bb} = [2, 1, 1] + 54[-1, 0, 2] = [-52, 1, 109]$
 $\text{bc} = [2, 1, 1] + 55[-1, 0, 2] = [-53, 1, 111]$, $\text{bd} = [2, 1, 1] + 56[-1, 0, 2] = [-54, 1, 113]$
 $\text{be} = [2, 1, 1] + 57[-1, 0, 2] = [-55, 1, 115]$, $\text{bf} = [2, 1, 1] + 58[-1, 0, 2] = [-56, 1, 117]$
 $\text{bg} = [2, 1, 1] + 59[-1, 0, 2] = [-57, 1, 119]$, $\text{bh} = [2, 1, 1] + 60[-1, 0, 2] = [-58, 1, 121]$
 $\text{bi} = [2, 1, 1] + 61[-1, 0, 2] = [-59, 1, 123]$, $\text{bj} = [2, 1, 1] + 62[-1, 0, 2] = [-60, 1, 125]$
 $\text{bk} = [2, 1, 1] + 63[-1, 0, 2] = [-61, 1, 127]$, $\text{bl} = [2, 1, 1] + 64[-1, 0, 2] = [-62, 1, 129]$
 $\text{bm} = [2, 1, 1] + 65[-1, 0, 2] = [-63, 1, 131]$, $\text{bn} = [2, 1, 1] + 66[-1, 0, 2] = [-64, 1, 133]$
 $\text{bo} = [2, 1, 1] + 67[-1, 0, 2] = [-65, 1, 135]$, $\text{bp} = [2, 1, 1] + 68[-1, 0, 2] = [-66, 1, 137]$
 $\text{bq} = [2, 1, 1] + 69[-1, 0, 2] = [-67, 1, 139]$, $\text{br} = [2, 1, 1] + 70[-1, 0, 2] = [-68, 1, 141]$
 $\text{bs} = [2, 1, 1] + 71[-1, 0, 2] = [-69, 1, 143]$, $\text{bt} = [2, 1, 1] + 72[-1, 0, 2] = [-70, 1, 145]$
 $\text{bu} = [2, 1, 1] + 73[-1, 0, 2] = [-71, 1, 147]$, $\text{bv} = [2, 1, 1] + 74[-1, 0, 2] = [-72, 1, 149]$
 $\text{bw} = [2, 1, 1] + 75[-1, 0, 2] = [-73, 1, 151]$, $\text{bx} = [2, 1, 1] + 76[-1, 0, 2] = [-74, 1, 153]$
 $\text{by} = [2, 1, 1] + 77[-1, 0, 2] = [-75, 1, 155]$, $\text{bz} = [2, 1, 1] + 78[-1, 0, 2] = [-76, 1, 157]$
 $\text{ca} = [2, 1, 1] + 79[-1, 0, 2] = [-77, 1, 159]$, $\text{cb} = [2, 1, 1] + 80[-1, 0, 2] = [-78, 1, 161]$
 $\text{cc} = [2, 1, 1] + 81[-1, 0, 2] = [-79, 1, 163]$, $\text{cd} = [2, 1, 1] + 82[-1, 0, 2] = [-80, 1, 165]$
 $\text{ce} = [2, 1, 1] + 83[-1, 0, 2] = [-81, 1, 167]$, $\text{cf} = [2, 1, 1] + 84[-1, 0, 2] = [-82, 1, 169]$
 $\text{cg} = [2, 1, 1] + 85[-1, 0, 2] = [-83, 1, 171]$, $\text{ch} = [2, 1, 1] + 86[-1, 0, 2] = [-84, 1, 173]$
 $\text{ci} = [2, 1, 1] + 87[-1, 0, 2] = [-85, 1, 175]$, $\text{cj} = [2, 1, 1] + 88[-1, 0, 2] = [-86, 1, 177]$
 $\text{ck} = [2, 1, 1] + 89[-1, 0, 2] = [-87, 1, 179]$, $\text{cl} = [2, 1, 1] + 90[-1, 0, 2] = [-88, 1, 181]$
 $\text{cm} = [2, 1, 1] + 91[-1, 0, 2] = [-89, 1, 183]$, $\text{cn} = [2, 1, 1] + 92[-1, 0, 2] = [-90, 1, 185]$
 $\text{co} = [2, 1, 1] + 93[-1, 0, 2] = [-91, 1, 187]$, $\text{cp} = [2, 1, 1] + 94[-1, 0, 2] = [-92, 1, 189]$
 $\text{cq} = [2, 1, 1] + 95[-1, 0, 2] = [-93, 1, 191]$, $\text{cr} = [2, 1, 1] + 96[-1, 0, 2] = [-94, 1, 193]$
 $\text{cs} = [2, 1, 1] + 97[-1, 0, 2] = [-95, 1, 195]$, $\text{ct} = [2, 1, 1] + 98[-1, 0, 2] = [-96, 1, 197]$
 $\text{cu} = [2, 1, 1] + 99[-1, 0, 2] = [-97, 1, 199]$, $\text{cv} = [2, 1, 1] + 100[-1, 0, 2] = [-98, 1, 201]$
 $\text{cw} = [2, 1, 1] + 101[-1, 0, 2] = [-99, 1, 203]$, $\text{cx} = [2, 1, 1] + 102[-1, 0, 2] = [-100, 1, 205]$
 $\text{cy} = [2, 1, 1] + 103[-1, 0, 2] = [-101, 1, 207]$, $\text{cz} = [2, 1, 1] + 104[-1, 0, 2] = [-102, 1, 209]$
 $\text{da} = [2, 1, 1] + 105[-1, 0, 2] = [-103, 1, 211]$, $\text{db} = [2, 1, 1] + 106[-1, 0, 2] = [-104, 1, 213]$
 $\text{dc} = [2, 1, 1] + 107[-1, 0, 2] = [-105, 1, 215]$, $\text{dd} = [2, 1, 1] + 108[-1, 0, 2] = [-106, 1, 217]$
 $\text{de} = [2, 1, 1] + 109[-1, 0, 2] = [-107, 1, 219]$, $\text{df} = [2, 1, 1] + 110[-1, 0, 2] = [-108, 1, 221]$
 $\text{dg} = [2, 1, 1] + 111[-1, 0, 2] = [-109, 1, 223]$, $\text{dh} = [2, 1, 1] + 112[-1, 0, 2] = [-110, 1, 225]$
 $\text{di} = [2, 1, 1] + 113[-1, 0, 2] = [-111, 1, 227]$, $\text{dj} = [2, 1, 1] + 114[-1, 0, 2] = [-112, 1, 229]$
 $\text{dk} = [2, 1, 1] + 115[-1, 0, 2] = [-113, 1, 231]$, $\text{dl} = [2, 1, 1] + 116[-1, 0, 2] = [-114, 1, 233]$
 $\text{dm} = [2, 1, 1] + 117[-1, 0, 2] = [-115, 1, 235]$, $\text{dn} = [2, 1, 1] + 118[-1, 0, 2] = [-116, 1, 237]$
 $\text{do} = [2, 1, 1] + 119[-1, 0, 2] = [-117, 1, 239]$, $\text{dp} = [2, 1, 1] + 120[-1, 0, 2] = [-118, 1, 241]$
 $\text{dq} = [2, 1, 1] + 121[-1, 0, 2] = [-119, 1, 243]$, $\text{dr} = [2, 1, 1] + 122[-1, 0, 2] = [-120, 1, 245]$
 $\text{ds} = [2, 1, 1] + 123[-1, 0, 2] = [-121, 1, 247]$, $\text{dt} = [2, 1, 1] + 124[-1, 0, 2] = [-122, 1, 249]$
 $\text{du} = [2, 1, 1] + 125[-1, 0, 2] = [-123, 1, 251]$, $\text{dv} = [2, 1, 1] + 126[-1, 0, 2] = [-124, 1, 253]$
 $\text{dw} = [2, 1, 1] + 127[-1, 0, 2] = [-125, 1, 255]$, $\text{dx} = [2, 1, 1] + 128[-1, 0, 2] = [-126, 1, 257]$
 $\text{dy} = [2, 1, 1] + 129[-1, 0, 2] = [-127, 1, 259]$, $\text{dz} = [2, 1, 1] + 130[-1, 0, 2] = [-128, 1, 261]$
 $\text{ea} = [2, 1, 1] + 131[-1, 0, 2] = [-129, 1, 263]$, $\text{eb} = [2, 1, 1] + 132[-1, 0, 2] = [-130, 1, 265]$
 $\text{ec} = [2, 1, 1] + 133[-1, 0, 2] = [-131, 1, 267]$, $\text{ed} = [2, 1, 1] + 134[-1, 0, 2] = [-132, 1, 269]$
 $\text{ee} = [2, 1, 1] + 135[-1, 0, 2] = [-133, 1, 271]$, $\text{ef} = [2, 1, 1] + 136[-1, 0, 2] = [-134, 1, 273]$
 $\text{eg} = [2, 1, 1] + 137[-1, 0, 2] = [-135, 1, 275]$, $\text{eh} = [2, 1, 1] + 138[-1, 0, 2] = [-136, 1, 277]$
 $\text{ei} = [2, 1, 1] + 139[-1, 0, 2] = [-137, 1, 279]$, $\text{ej} = [2, 1, 1] + 140[-1, 0, 2] = [-138, 1, 281]$
 $\text{ek} = [2, 1, 1] + 141[-1, 0, 2] = [-139, 1, 283]$, $\text{el} = [2, 1, 1] + 142[-1, 0, 2] = [-140, 1, 285]$
 $\text{em} = [2, 1, 1] + 143[-1, 0, 2] = [-141, 1, 287]$, $\text{en} = [2, 1, 1] + 144[-1, 0, 2] = [-142, 1, 289]$
 $\text{eo} = [2, 1, 1] + 145[-1, 0, 2] = [-143, 1, 291]$, $\text{ep} = [2, 1, 1] + 146[-1, 0, 2] = [-144, 1, 293]$
 $\text{eq} = [2, 1, 1] + 147[-1, 0, 2] = [-145, 1, 295]$, $\text{er} = [2, 1, 1] + 148[-1, 0, 2] = [-146, 1, 297]$
 $\text{es} = [2, 1, 1] + 149[-1, 0, 2] = [-147, 1, 299]$, $\text{et} = [2, 1, 1] + 150[-1, 0, 2] = [-148, 1, 301]$
 $\text{eu} = [2, 1, 1] + 151[-1, 0, 2] = [-149, 1, 303]$, $\text{ev} = [2, 1, 1] + 152[-1, 0, 2] = [-150, 1, 305]$
 $\text{ew} = [2, 1, 1] + 153[-1, 0, 2] = [-151, 1, 307]$, $\text{ex} = [2, 1, 1] + 154[-1, 0, 2] = [-152, 1, 309]$
 $\text{ey} = [2, 1, 1] + 155[-1, 0, 2] = [-153, 1, 311]$, $\text{ez} = [2, 1, 1] + 156[-1, 0, 2] = [-154, 1, 313]$
 $\text{fa} = [2, 1, 1] + 157[-1, 0, 2] = [-155, 1, 315]$, $\text{fb} = [2, 1, 1] + 158[-1, 0, 2] = [-156, 1, 317]$
 $\text{fc} = [2, 1, 1] + 159[-1, 0, 2] = [-157, 1, 319]$, $\text{fd} = [2, 1, 1] + 160[-1, 0, 2] = [-158, 1, 321]$
 $\text{fe} = [2, 1, 1] + 161[-1, 0, 2] = [-159, 1, 323]$, $\text{ff} = [2, 1, 1] + 162[-1, 0, 2] = [-160, 1, 325]$
 $\text{fg} = [2, 1, 1] + 163[-1, 0, 2] = [-161, 1, 327]$, $\text{fh} = [2, 1, 1] + 164[-1, 0, 2] = [-162, 1, 329]$
 $\text{fi} = [2, 1, 1] + 165[-1, 0, 2] = [-163, 1, 331]$, $\text{fj} = [2, 1, 1] + 166[-1, 0, 2] = [-164, 1, 333]$
 $\text{fk} = [2, 1, 1] + 167[-1, 0, 2] = [-165, 1, 335]$, $\text{fl} = [2, 1, 1] + 168[-1, 0, 2] = [-166, 1, 337]$
 $\text{fm} = [2, 1, 1] + 169[-1, 0, 2] = [-167, 1, 339]$, $\text{fn} = [2, 1, 1] + 170[-1, 0, 2] = [-168, 1, 341]$
 $\text{fo} = [2, 1, 1] + 171[-1, 0, 2] = [-169, 1, 343]$, $\text{fp} = [2, 1, 1] + 172[-1, 0, 2] = [-170, 1, 345]$
 $\text{fq} = [2, 1, 1] + 173[-1, 0, 2] = [-171, 1, 347]$, $\text{fr} = [2, 1, 1] + 174[-1, 0, 2] = [-172, 1, 349]$
 $\text{fs} = [2, 1, 1] + 175[-1, 0, 2] = [-173, 1, 351]$, $\text{ft} = [2, 1, 1] + 176[-1, 0, 2] = [-174, 1, 353]$
 $\text{fu} = [2, 1, 1] + 177[-1, 0, 2] = [-175, 1, 355]$, $\text{fv} = [2, 1, 1] + 178[-1, 0, 2] = [-176, 1, 357]$
 $\text{fw} = [2, 1, 1] + 179[-1, 0, 2] = [-177, 1, 359]$, $\text{fx} = [2, 1, 1] + 180[-1, 0, 2] = [-178, 1, 361]$
 $\text{fy} = [2, 1, 1] + 181[-1, 0, 2] = [-179, 1, 363]$, $\text{fz} = [2, 1, 1] + 182[-1, 0, 2] = [-180, 1, 365]$
 $\text{ga} = [2, 1, 1] + 183[-1, 0, 2] = [-181, 1, 367]$, $\text{gb} = [2, 1, 1] + 184[-1, 0, 2] = [-182, 1, 369]$
 $\text{gc} = [2, 1, 1] + 185[-1, 0, 2] = [-183, 1, 371]$, $\text{gd} = [2, 1, 1] + 186[-1, 0, 2] = [-184, 1, 373]$
 $\text{ge} = [2, 1, 1] + 187[-1, 0, 2] = [-185, 1, 375]$, $\text{gf} = [2, 1, 1] + 188[-1, 0, 2] = [-186, 1, 377]$
 $\text{gg} = [2, 1, 1] + 189[-1, 0, 2] = [-187, 1, 379]$, $\text{gh} = [2, 1, 1] + 190[-1, 0, 2] = [-188, 1, 381]$
 $\text{gi} = [2, 1, 1] + 191[-1, 0, 2] = [-189, 1, 383]$, $\text{gj} = [2, 1, 1] + 192[-1, 0, 2] = [-190, 1, 385]$
 $\text{gk} = [2, 1, 1] + 193[-1, 0, 2] = [-191, 1, 387]$, $\text{gl} = [2, 1, 1] + 194[-1, 0, 2] = [-192, 1, 389]$
 $\text{gm} = [2, 1, 1] + 195[-1, 0, 2] = [-193, 1, 391]$, $\text{gn} = [2, 1, 1] + 196[-1, 0, 2] = [-194, 1, 393]$
 $\text{go} = [2, 1, 1] + 197[-1, 0, 2] = [-195, 1, 395]$, $\text{gp} = [2, 1, 1] + 198[-1, 0, 2] = [-196, 1, 397]$
 $\text{gq} = [2, 1, 1] + 199[-1, 0, 2] = [-197, 1, 399]$, $\text{gr} = [2, 1, 1] + 200[-1, 0, 2] = [-198, 1, 401]$
 $\text{gs} = [2, 1, 1] + 201[-1, 0, 2] = [-199, 1, 403]$, $\text{gt} = [2, 1, 1] + 202[-1, 0, 2] = [-200, 1, 405]$
 $\text{gu} = [2, 1, 1] + 203[-1, 0, 2] = [-201, 1, 407]$, $\text{gv} = [2, 1, 1] + 204[-1, 0, 2] = [-202, 1, 409]$
 $\text{gw} = [2, 1, 1] + 205[-1, 0, 2] = [-203, 1, 411]$, $\text{gx} = [2, 1, 1] + 206[-1, 0, 2] = [-204, 1, 413]$
 $\text{gy} = [2, 1, 1] + 207[-1, 0, 2] = [-205, 1, 415]$, $\text{gz} = [2, 1, 1] + 208[-1, 0, 2] = [-206, 1, 417]$
 $\text{ha} = [2, 1, 1] + 209[-1, 0, 2] = [-207, 1, 419]$, $\text{hb} = [2, 1, 1] + 210[-1, 0, 2] = [-208, 1, 421]$
 $\text{hc} = [2, 1, 1] + 211[-1, 0, 2] = [-209, 1, 423]$, $\text{hd} = [2, 1, 1] + 212[-1, 0, 2] = [-210, 1, 425]$
 $\text{he} = [2, 1, 1] + 213[-1, 0, 2] = [-211, 1, 427]$, $\text{hf} = [2, 1, 1] + 214[-1, 0, 2] = [-212, 1, 429]$
 $\text{hg} = [2, 1, 1] + 215[-1, 0, 2] = [-213, 1, 431]$, $\text{hh} = [2, 1, 1] + 216[-1, 0, 2] = [-214, 1, 433]$
 $\text{hi} = [2, 1, 1] + 217[-1, 0, 2] = [-215, 1, 435]$, $\text{hj} = [2, 1, 1] + 218[-1, 0, 2] = [-216, 1, 437]$
 $\text{hk} = [2, 1, 1] + 219[-1, 0, 2] = [-217, 1, 439]$, $\text{hl} = [2, 1, 1] + 220[-1, 0, 2] = [-218, 1, 441]$
 $\text{hm} = [2, 1, 1] + 221[-1, 0, 2] = [-219, 1, 443]$, $\text{hn} = [2, 1, 1] + 222[-1, 0, 2] = [-220, 1, 445]$
 $\text{ho} = [2, 1, 1] + 223[-1, 0, 2] = [-221, 1, 447]$, $\text{hp} = [2, 1, 1] + 224[-1, 0, 2] = [-222, 1, 449]$
 $\text{hq} = [2, 1, 1] + 225[-1, 0, 2] = [-223, 1, 451]$, $\text{hr} = [2, 1, 1] + 226[-1, 0, 2] = [-224, 1, 453]$
 $\text{hs} = [2, 1, 1] + 227[-1, 0, 2] = [-225, 1, 455]$, $\text{ht} = [2, 1, 1] + 228[-1, 0, 2] = [-226, 1, 457]$
 $\text{hu} = [2, 1, 1] + 229[-1, 0, 2] = [-227, 1, 459]$, $\text{hv} = [2, 1, 1] + 230[-1, 0, 2] = [-228, 1, 461]$
 $\text{hw} = [2, 1, 1] + 231[-1, 0, 2] = [-229, 1, 463]$, $\text{hx} = [2, 1, 1] + 232[-1, 0, 2] = [-230, 1, 465]$
 $\text{hy} = [2, 1, 1] + 233[-1, 0, 2] = [-231, 1, 467]$, $\text{hz} = [2, 1, 1] + 234[-1, 0, 2] = [-232, 1, 469]$
 $\text{ia} = [2, 1, 1] + 235[-1, 0, 2] = [-233, 1, 471]$, $\text{ib} = [2, 1, 1] + 236[-1, 0, 2] = [-234, 1, 473]$
 $\text{ic} = [2, 1, 1] + 237[-1, 0, 2] = [-235, 1, 475]$, $\text{id} = [2, 1, 1] + 238[-1, 0, 2] = [-236, 1, 477]$
 $\text{ie} = [2, 1, 1] + 239[-1, 0, 2] = [-237, 1, 479]$, $\text{if} = [2, 1, 1] + 240[-1, 0, 2] = [-238, 1, 481]$
 $\text{ig} = [2, 1, 1] + 241[-1, 0, 2] = [-239, 1, 483]$, $\text{ih} = [2, 1, 1]$

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