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R Exercise 3
INFO 523

1. **Please generate the 3-D cuboids**

```
> apply(revenue_cube, c("year", "prod", "month"), FUN=function(x) sum(x,
na.rm=TRUE))
, , month = 1

     prod
year   Laptop Printer Tablet
  2012   2250     570  10080
  2013   2475    1140  19040

, , month = 2

     prod
year   Laptop Printer Tablet
  2012   2700     570   5600
  2013   1350    2280   8960

, , month = 3

     prod
year   Laptop Printer Tablet
  2012   4275    2280  20160
  2013   1125    3420   8960

, , month = 4

     prod
year   Laptop Printer Tablet
  2012   1350    1140  23520
  2013   2925    2850  13440

, , month = 5

     prod
year   Laptop Printer Tablet
  2012   1800    2280  17920
  2013   1575    2850  10080
```

, , month = 6

year	prod Laptop	Printer	Tablet
2012	2250	2850	21280
2013	2250	1710	11200

, , month = 7

year	prod Laptop	Printer	Tablet
2012	675	3990	12320
2013	1575	4560	10080

, , month = 8

year	prod Laptop	Printer	Tablet
2012	2250	1710	11200
2013	2475	1710	11200

, , month = 9

year	prod Laptop	Printer	Tablet
2012	2025	3990	14560
2013	1350	2850	13440

, , month = 10

year	prod Laptop	Printer	Tablet
2012	675	1140	15680
2013	1800	2850	20160

, , month = 11

year	prod Laptop	Printer	Tablet
2012	1125	6270	13440
2013	1350	1710	16800

, , month = 12

```
     prod
year   Laptop Printer Tablet
  2012   2250    3420  13440
  2013   3150    3990   6720

> apply(revenue_cube, c("year", "prod", "loc"), FUN=function(x) sum(x, na.rm=TRUE))
, , loc = CA

     prod
year   Laptop Printer Tablet
  2012   5175    5130  66080
  2013   8100   10260  51520

, , loc = NY

     prod
year   Laptop Printer Tablet
  2012   7650   13680  44800
  2013   6525    7980  49280

, , loc = ON

     prod
year   Laptop Printer Tablet
  2012   2925    1140  19040
  2013   3375    7980  16800

, , loc = QU

     prod
year   Laptop Printer Tablet
  2012   4050    6840  22400
  2013   2700    3990  15680

, , loc = WA

     prod
year   Laptop Printer Tablet
  2012   3825    3420  26880
  2013   2700    1710  16800

> apply(revenue_cube, c("year", "month", "loc"), FUN=function(x) sum(x, na.rm=TRUE))
```

```
, , loc = CA

      month
year     1    2    3    4    5    6    7    8    9    10   11   12
  2012 9410 2915 12795 3035 4480 6945 3485 5050 8635  6395 6740 6500
  2013 3610 3485  6070 5175 5625 1795 6965 7395 9310 11120 3485 5845

, , loc = NY

      month
year     1    2    3    4    5    6    7    8    9    10   11   12
  2012 1470 2590 7415 13340 7985 8210 4500 3710 3810  3260 5990 3850
  2013 8290 1915 3380  5155 3260 9655 4970 2020 3930 11995 6275 2940

, , loc = ON

      month
year     1    2    3    4    5    6   7    8    9   10   11   12
  2012  225  450 1345 2465 3585 2915   0 3260  795 1120 3360 3585
  2013 1345 3035  795 2810 2240 3260 450 2160 2830 1245 5620 2365

, , loc = QU

      month
year     1    2    3    4    5    6    7    8    9   10   11   12
  2012 1345 2915 1350 4480 2690 3360 4520 1795 1710 3360 3055 2710
  2013 7840  570 2810 2245 1140  225 3035 1345 1345  225    0 1590

, , loc = WA

      month
year     1    2    3    4    5    6    7    8    9   10   11   12
  2012  450    0 3810 2690 3260 4950 4480 1345 5625 3360 1690 2465
  2013 1570 3585  450 3830 2240  225  795 2465  225  225 4480 1120

> apply(revenue_cube, c("month", "prod", "loc"), FUN=function(x) sum(x, na.rm=TRUE))
, , loc = CA

     prod
month Laptop Printer Tablet
   1   1800    1140  10080
   2   1350     570   4480
   3   2025    2280  14560
```

```
   4     900    1710   5600
   5    1125    1140   7840
   6     900       0   7840
   7     900    1710   7840
   8     675     570  11200
   9    1125    1140  15680
   10    675    2280  14560
   11    675    1710   7840
   12   1125    1140  10080

, , loc = NY

     prod
month Laptop Printer Tablet
   1    1350     570   7840
   2    1125    1140   2240
   3     675    2280   7840
   4    1125     570  16800
   5    1125    2280   7840
   6    1575    2850  13440
   7     450    3420   5600
   8    1800     570   3360
   9     450     570   6720
   10    675    1140  13440
   11   1575    2850   7840
   12   2250    3420   1120

, , loc = ON

     prod
month Laptop Printer Tablet
   1     450       0   1120
   2     675     570   2240
   3     450     570   1120
   4     225     570   4480
   5     225       0   5600
   6    1125     570   4480
   7     450       0      0
   8     900    2280   2240
   9     225    2280   1120
   10    675     570   1120
   11      0    1140   7840
   12    900     570   4480
```

, , loc = QU

month	prod Laptop	Printer	Tablet
1	225	0	8960
2	675	570	2240
3	1350	570	2240
4	1125	0	5600
5	450	1140	2240
6	225	0	3360
7	225	2850	4480
8	900	0	2240
9	225	1710	1120
10	225	0	3360
11	225	1710	1120
12	900	2280	1120

, , loc = WA

month	prod Laptop	Printer	Tablet
1	900	0	1120
2	225	0	3360
3	900	0	3360
4	900	1140	4480
5	450	570	4480
6	675	1140	3360
7	225	570	4480
8	450	0	3360
9	1350	1140	3360
10	225	0	3360
11	0	570	5600
12	225	0	3360

2. **What is the 4-D cuboid or base cuboid in this case?**

In the example, the 4-D cuboid is [product, month, year, location]. I think month and year should be grouped into a hierarchical date/time dimension with month and year as attributes in this table.