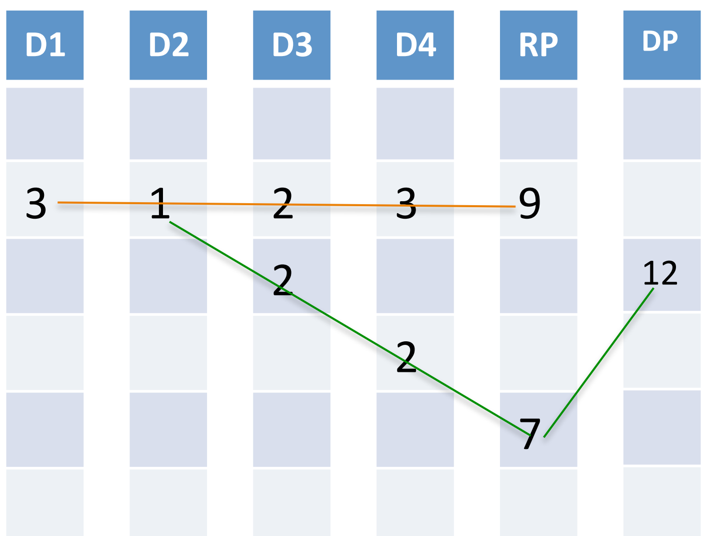
RAID 6 Example

Since RAID6 makes use of a two-parity scheme, it is also referred to as RAID-DP (for dual parity). It works by storing data in horizontal rows, calculating parity for data in the row and storing the parity on a separate disk. However, it also includes a second parity disk which stores diagonal parity across the disks in a RAID-DP group.

To simplify the illustration of its operation, we will compute the parity as the simple arithmetic sum of the data blocks in each row or along each diagonal. The following example is based on a system with 4 data disks, a horizontal or row parity disk and a diagonal parity disk.



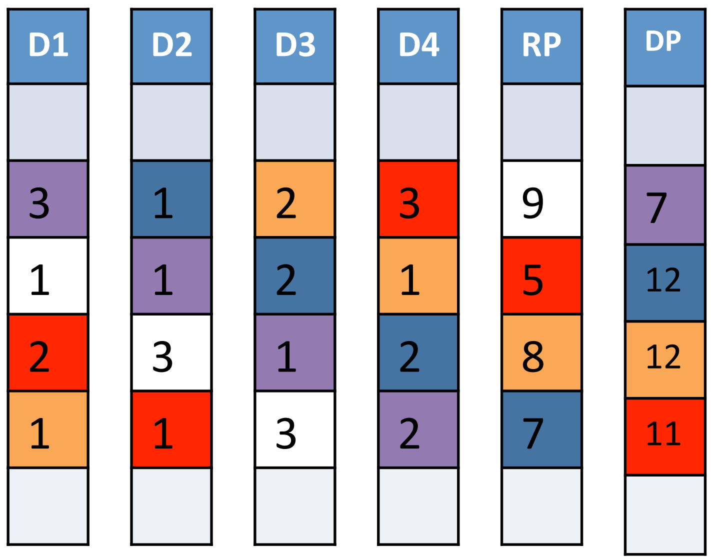
Row parity RP = 3+1+2+3 = 9
If D2 is lost, its data block can be computed as 9 - 3 - 2 - 3 = 1 the parity minus the sum of the remaining data blocks in the row.

DP = 1+2+2+7 = 12
(diagonal parity)

RAID 6 Example

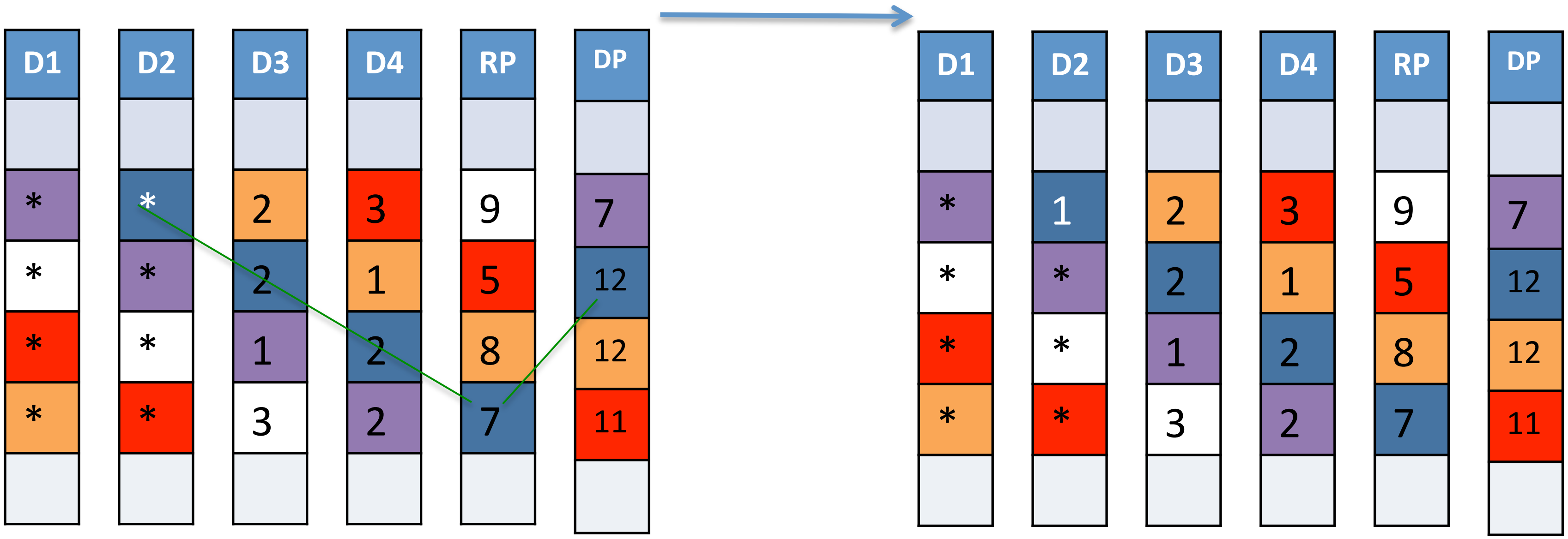
The diagram below shows the contents of all blocks on the disks and the color scheme indicates which blocks are within each diagonal.

Each diagonal parity stripe misses exactly one of the disks, but each diagonal stripe misses a different disk. This results in one diagonal stripe that doesn’t get parity generated for it and is not stored on the diagonal parity disk (the white or noncolored stripe in this example).



RAID 6 Example

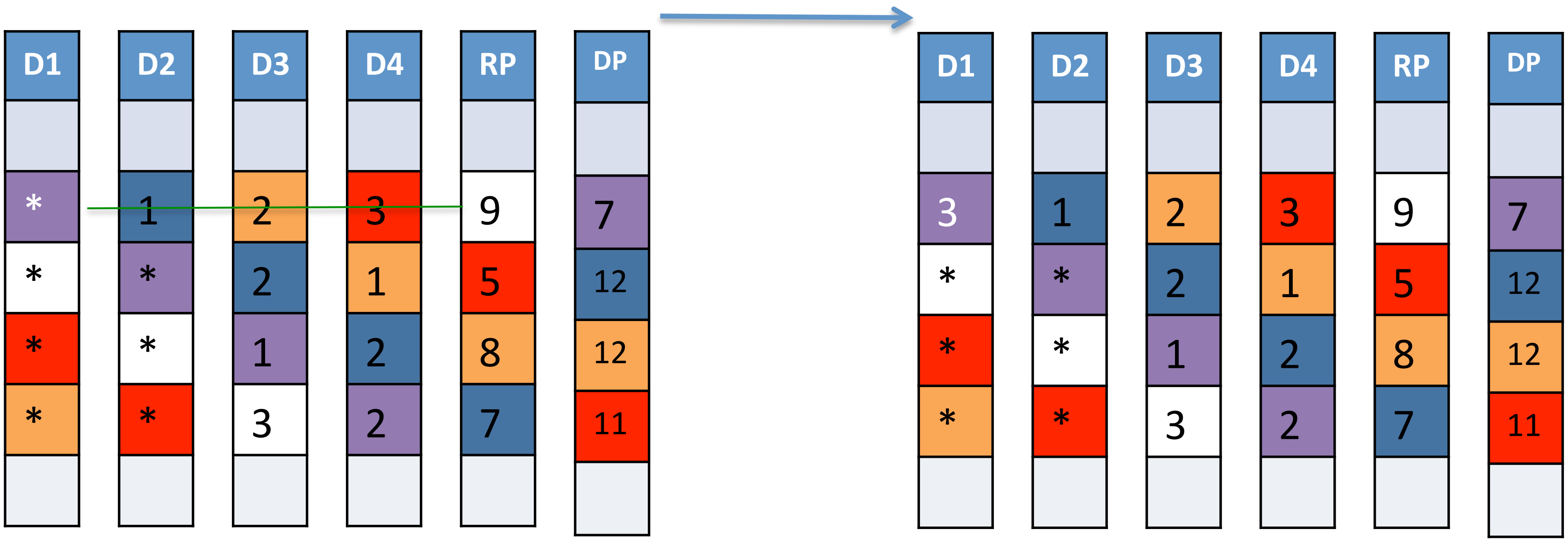
To see how missing blocks on two disks can be reconstructed, assume that both disk1 and disk2 are lost due to a head crash or some other event:



The first missing block on D2 is given by 12 – 7 – 2 – 2 = 1.

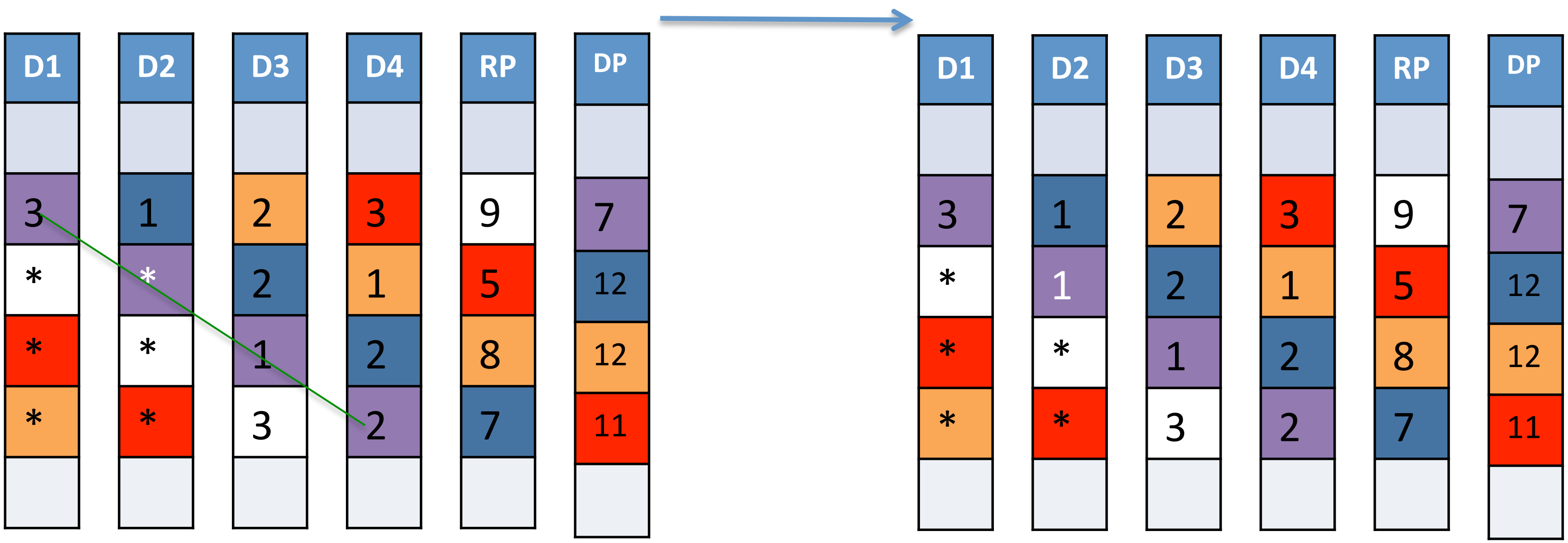
RAID 6 Example

Once the missing blue diagonal information has be reconstructed, the first missing block on D1 can be computed using the row parity as 9 – 3 – 2 – 1 = 3

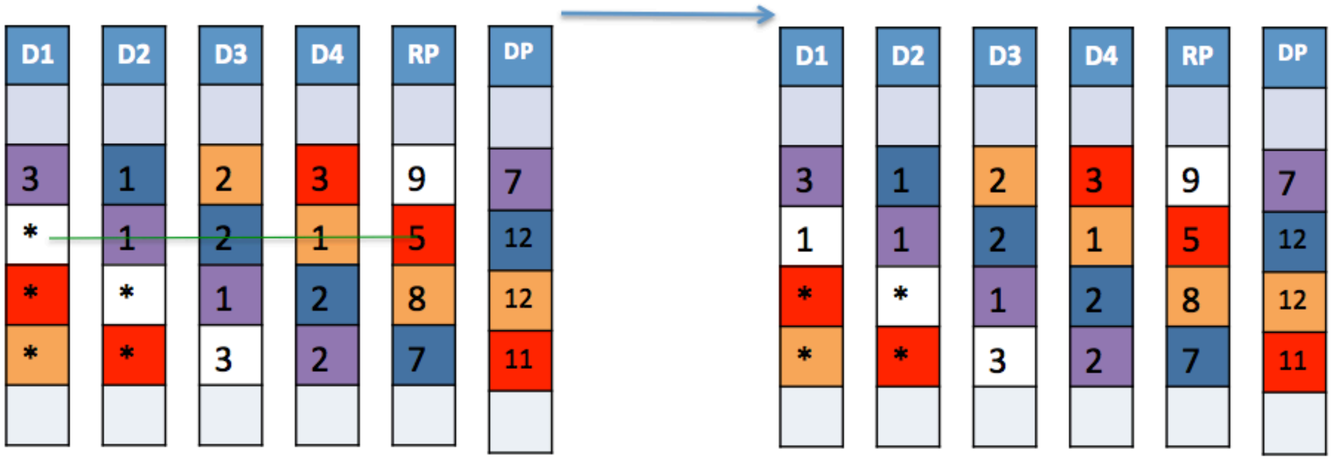


RAID 6 Example

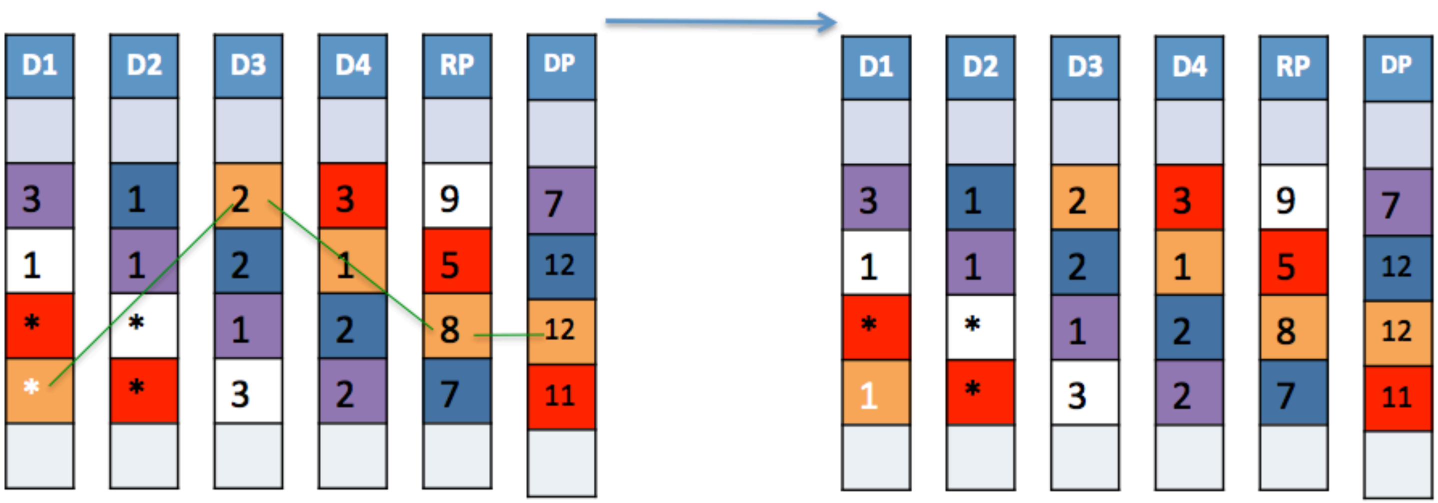
Now using the purple diagonal stripe we get 7 - 3 -1 - 2 = 1 for the second missing block on disk2.



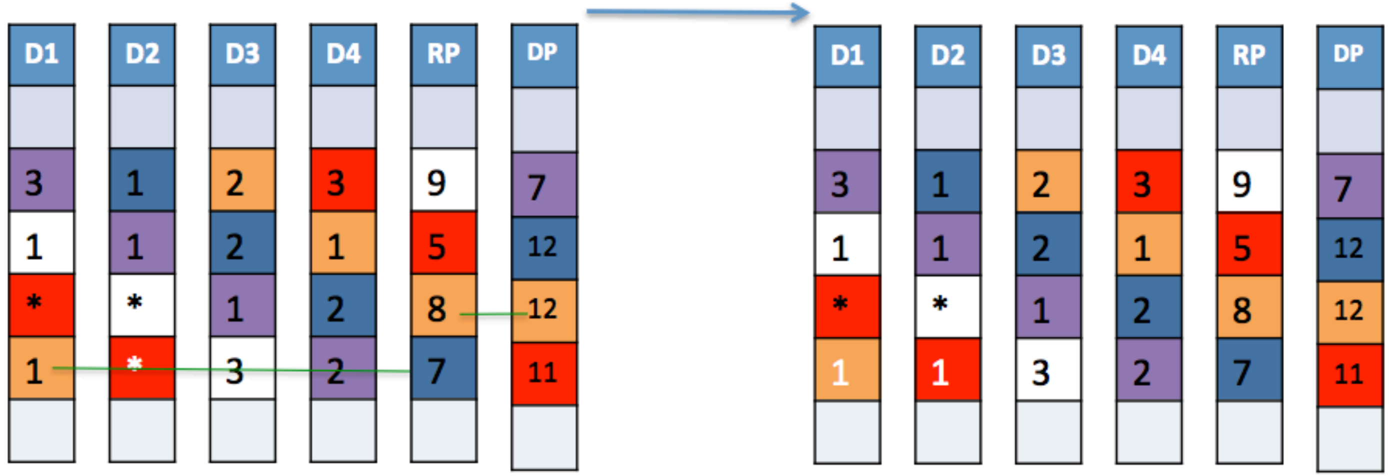
Next the second missing block on disk1 is given by 5 – 1 – 2 – 1 = 1 using row parity



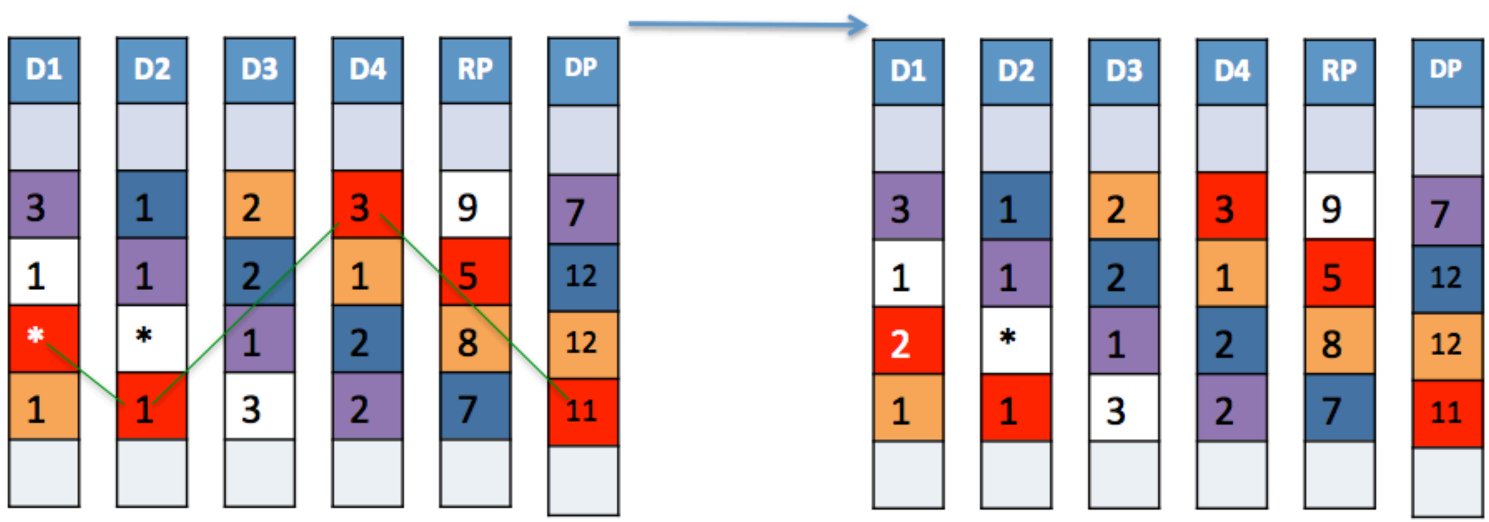
Using the orange diagonal strips gives 12 – 8 – 1 – 2 = 1 for the fourth missing block on D1.



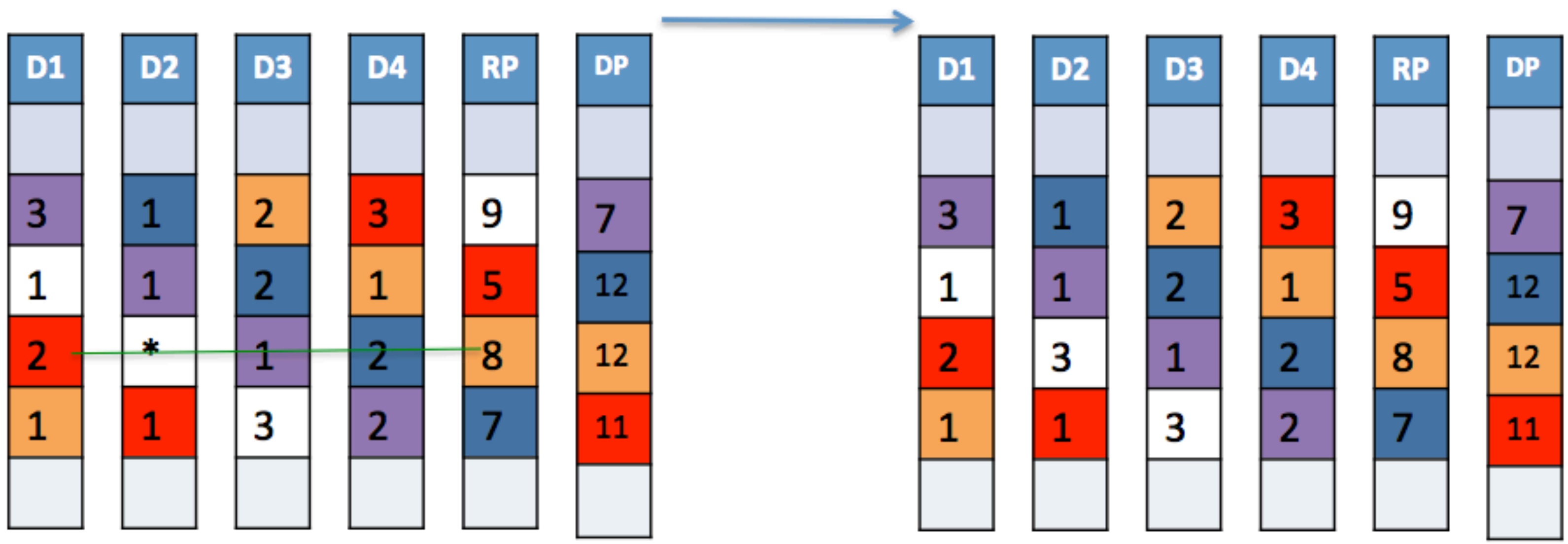
Next using row parity gives 7 – 2 – 3 – 1 = 1 for the missing block 4 on D2.



The red diagonal stripe gives 11 – 5 – 3 – 1 = 2 for the missing block 3 on D1.

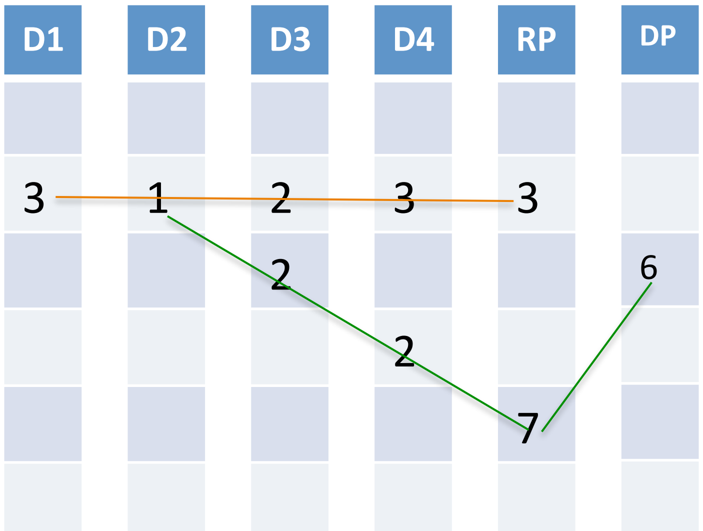


The final missing block on D2 is obtained using row parity as 8 – 2 – 1 – 2 = 3 to complete restoration of data blocks on the two missing disks.



Keep in mind that the XOR function would normally be used instead of addition. Addition was only used in this example to make it easier to follow.

The following example shows how the XOR (rather than addition and subtraction) is used to compute the horizontal or row parity and diagonal parity for the system. The symbol ^ is used to denote the XOR operator. XOR is used in computing parity and reconstructing missing blocks.



Row parity RP = 3^1^2^3 = 3
If D2 is lost, its data block can be computed as the XOR of the parity with the remaining data blocks in the row.
D2 = 3 ^ 2 ^ 3 ^ 3 = 1

DP = 1^2^2^7 = 6 (diagonal parity)