1. Piece signatures in a nutshell

A good example for the signatures comes from the Master Skewb:
HC2[F3 C4 E3 X9][C4]

This signature tells the reader:

- **HC** the puzzle's axis system is a corner turning hexahedron,
- **2** each axis has two cuts per axis
- **[F3 C4 E3 X9]** the permutations of four piece types have to be solved
- **[C4]** for one piece type the orientations have to be solved too.

Lets break this down:
HC – "**H**exahedron – **C**orner turning" It denotes the axis system the puzzle uses. The other most common axis systems are:
HF – "**H**exahedron – **F**ace turning".
HE – "**H**exahedron – **E**dge turning"
DF – "**D**odecahedron – **F**ace turning"
DC – "**D**odecahedron – **C**orner turning"
DE – "**D**odecahedron – **E**dge turning"
There are more axis systems. Please refer to chapter 2. for more details.

HC2 The puzzle is a corner turning hexahedron with **two** cuts per through-going axis.
A 2x2x2 would belong in HF1.
A Pentultimate would belong in DF1.
A 4x4x4 would belong in HF3.
Please refer to chapter 2. for more details.

[F3 C4 E3 X9] The set of three pieces the puzzle consists of:
F3 - a **F**ace-piece of which **three** are affected by every turn.
C4 - a **C**orner-piece of which **four** are affected by every turn.
E3 - an **E**dge-piece of which **three** are affected by every turn.
X9 - an **X**-piece (between face and corner) of which **nine** are affected by every turn.
All these pieces are distinguishable and their permutations have to be solved.
See chapter 3. for what piece types are possible.

[C4] These types of pieces have to be oriented to solve the puzzle. It must be a subset of the former set. See chapter 4. for what piece types are possible.

This system goes a very long way but does not cover everything. See chapter 6. for the system's limits.

Piece type signatures

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Contents

2. Axis systems and number of cuts

2.1 The basic six

All non-shape-changing twistypuzzles based on 3D-geometry have to be based on one or more of these axis systems:

Name of axis system	number of axes	Equivalent systems	Example (deep-cut)
HF**x** = Face turning hexahedron	3	Corner turning octahedron Edge turning tetrahedron Corner turning rhombic dodecahedron (turning the corners of 4th order)	2x2x2
HC**x** = Corner turning hexahedron	4	Face turning octahedron Face-/Corner turning tetrahedron Corner turning rhombic dodecahedron (turning the corners of 3th order)	Skewb
HE**x** = Edge turning hexahedron	6	Edge turning octahedron Face turning rhombic dodecahedron	Little Chop
DF**x** = Face turning dodecahedron	6	Corner turning icosahedron Corner turning rhombic triacontahedron (turning the corners of 5th order)	Pentultimate
DC**x** = Corner turning dodecahedron	10	Face turning icosahedron Corner turning rhombic triacontahedron (turning the corners of 3th order)	Chopasaurus
DE**x** = Edge turning dodecahedron	15	Edge turning icosahedron Face turning rhombic triacontahedron	Big Chop

The **x** behind the abbreviation for the axis system denotes the **number of cuts per through-going axis**.

For this number **trivial tips** (if present) are ignored because they never affect the complexity of the puzzle's solution and it allows to reduce the number of cuts and thereby make the classification easier.

Although the axis systems are named after hexahedra and dodecahedra this has nothing to do with the shape of the puzzle which can be chosen almost arbitrarily. The words hexahedra and dodecahedra serve only as guiding posts for the axis systems.

2.2 Hybrids

Some of the "platonic" axis systems above can be combined to create a hybrid axis system. For example it is geometrically possible to create a cuboctahedron that is face turning on all fourteen faces, like 3x3x3 Rainbow Cube. It combines the axis systems of HF and HC. These combinations are only possible within a common geometry, meaning the three systems derived of the hexahedron can be combined or those of the dodecahedron but one can't combine the axis system of a hexahedron with that of a dodecahedron.

Name of axis system	number of axis	Example
HFxCy	3+4	Super Z
HFxEy	3+6	Copter 3x3x3
HCxEy	4+6	Shell Cube
HFxCyEz	3+4+6	Copter Extreme
DFxCy	6+10	Tuttminx
DFxEy	6+15	CopterMinx
DCxEy	10+15	Crescent Dodecahedron
DFxCyEz	6+10+15	DIRT V1.0

The **x** and **y** behind the abbreviation for the axis system denote the **number of cuts per through-going axis**. The number of cuts can differ between the components of the axis system. Examples:

Example	Axis system
Super Z	HF1C1
Super X	HF1C2
Skewb 3x3x3	HF2C1

2.3 Prisms

The last axis systems are based on prisms.

Let us start with the **pure prisms**: PIIxm, PIIIxm, PIVxm, PVxm, PVIxm, etc.

There is an endless row of axis system. The roman numeral gives the number of axes. The following arabic number (denoted with x) gives the number of cuts per axis. All the axis are placed in a single plane. The letter m denotes that the prism consists only of a single layer.

The Floppy Cube is an example of PII2m. The 1x2x2 is an example of PII1m.

The **layered prisms** come with one additional axis perpendicular to all the others. The obvious approach would be to add a third numeral denoting the number of cuts but the signatures works differently. Take these examples:

Floppy Prism	PV1m
Pentagonal Domino	PV1p
Pentagonal prism	PV1mp
Pentagonal prism (4+ layers)	PV1mp

The Floppy Prism has just one layer. Other prisms with more layers have been implemented up to six layers. Puzzles with four layers offer nothing new solvingwise since the puzzle can be treated as if the inner two layers formed a single one and then it can be solved like a prism with three layers.
All prisms with a middle layer (an odd number of layers) is denoted with **m** („middle“).
All prisms with at least one pair of layers are denoted with **p** („paired“).

Hybrid prisms are imaginable but were not necessary. As of this writing there are only three puzzles which might be classified as hybrid prisms:

- 2x3x3-X
- Bram's Brick
- Diagonal 2x3x3

As can be seen in these entries, they can be classified based on a non-hybrid axis system.

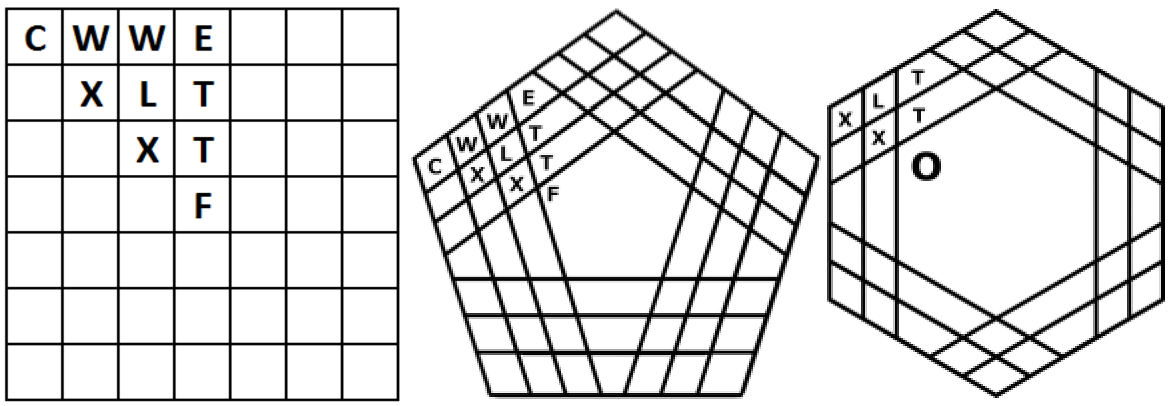
3. Pieces

After the axis system follows a set of piece types that have to be **solved**. Piece types that are physically present but hidden inside the puzzle or unstickered are not enumerated.

Every axis system creates its own set of possible piece types. For example C4 in HF1 is not the same piece type as C4 in HC1.

3.1 Standard pieces

Most pieces possible on twistypuzzles belong to one of eight conjugacy classes.
The number of pieces present on the puzzle can be derived directly from its conjugacy class although a clever shape modification might hide some of them. The number of orientations and the position in the puzzle are defined by their conjugacy class too.



	Hexahedron		Dodecahedron		Prism with n axes	
Name	number of pieces	possible orientations	number of pieces	possible orientations	number of pieces	possible orientations
c**O**re	1	24	1	60	1	2*n
Face	6	4	12	5	does not exist	
Corner	8	3	20	3	does not exist	
Edge	12	2	30	2	does not exist	
T-Piece	24	1	60	1	2*n	1
X-Piece	24	1	60	1	2*n	1
Wing	24	1	60	1	does not exist	
ob**L**ique	48	1	120	1	4*n	1

- Pieces can be split and look like different pieces. An easy example comes with the Crazy Dino Cube: The three green pieces are mechanically independent but will always moved together and collectively form a single piece of type C1.
- The axis system HC is a special case. The general naming scheme can be applied there too but the numbers for the possible orientations are different. Refer to 3.3 for more details.

Crazy Dino Cube
HC2[C1 E3][C1]

- The pieces T, X, W and L can not have a visible orientation because they have no internal rotational symmetry. Therefore they never appear in the second set of a signature.
- The pieces of type L always fall into two distinct sets (of size 24 or 60 or 2*n) between which pieces can never be exchanged because they have no symmetry at all.

Pieces of conjugacy class O (and the directly attached pieces like F1 in HF2) seem to be useless as they do not increase the solving challenge even if visible. But they also help in determining the global orientation of the puzzle which is discussed in chapter 5.

3.2 Distinguishing pieces of the same conjugacy class

On a 3x3x3 classifying the pieces as F, C and E would be sufficient to distinguish the piece types but in other axis systems there can be several different pieces from the same conjugacy class. Two puzzles from DF2 demonstrate this:

Megaminx
DF2[F1 C5 E5][C5 E5]

Master Pentultimate
DF2[F6 C10 E10 X25][C10 E10]

The Megaminx has an F-piece of which one sample is moved with every turn.
The Master Pentultimate has an F-piece of which six samples are moved with every turn.

To distinguish the pieces the number of pieces that are affected in any given turn. In the example above the pieces are named F1 (in the Megaminx) and F6 (in the Master Pentultimate).

This is the full list for DF2:

Piece	Type	# moved per turn	Remarks
O	Core	0	
F1	Face	1	Inner Faces; known from the Megaminx
F6	Face	6	Outer Faces; known from the Master Pentultimate
C5	Corner	5	Inner Corners; known from the Megaminx
C10	Corner	10	Outer Corners; known from the Master Pentultimate
E5	Edge	5	Inner Edges; known from the Megaminx
E10	Edge	10	Outer Edges; known from the Master Pentultimate
X25	X-Face	25	No orientation; known from the Master Pentultimate

There are two piece types each for F, C and E.
Refer to the appendix which enumerates all piece types for the six basic axis systems with one or two cuts per axis.

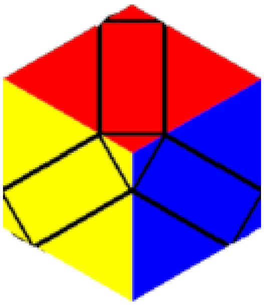
This system of conjugacy class and number of turned pieces is sufficient for piece types from axis systems with at most two cuts, except for DE2.
As can be seen in DE2 the naming scheme for the pieces does not always lead to unique names. So far nothing better has been found yet. With two cuts per axis this happens only in DE2. In axis systems of higher order it occurs too.

For puzzles of higher order (like DF4 or hybrids like HF2C2) this system can be used when two numbers are used.
For example DF4 supports F1.0 and F0.1. The former are the pentagons visible on the surface of the Gigaminx. The latter represents the (not implemented) face pieces between the outer faces and the (equally theoretical) core.
In general Fx.y denotes a face piece of which x samples are affected by a turn of an outer layer and of which y samples are affected by turn of a slice layer.
The Dino Rhombic Dodecahedron is the easiest puzzle in HF2C2 with just one piece type: X4.3. Four samples are affected by a face turn and three samples by a corner turn.

The signatures can be extended to axis systems with six cuts per axis or higher order hybrids. In those cases three or even more numbers are needed but the principle stays the same.

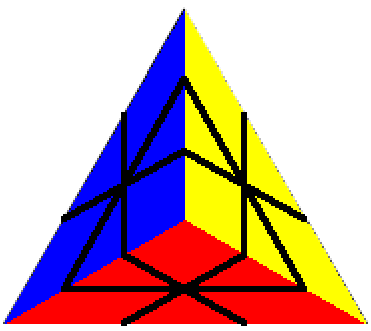
3.3 Halved piece types (based on HC)

Axis systems based on HC allow for a phenomenon that needs additional attention.



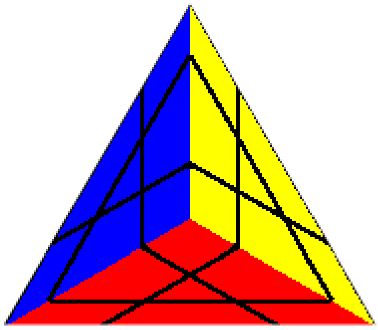
Offset Skewb
HC1[F3 C4][C4]

In most twistypuzzles the cuts either go through the core (aka: deepcut) or they have to be placed in pairs that are symmetric with respect around the core. Everything else would end with non-doctrinaire puzzles.
The axis system HC is the only one where you can place cuts not going through the centre or pairwise equidistantly from the centre. The offset Skewb demonstrates this. This puzzle does not have any difference in solving compared with the Skewb but you can see easily how corners are always split into two distinct sets and you see that faces can only be oriented by 180°. All offsets (distance between centre and cutting plane) have to be identical.



Pyraminx (without trivial tips)
HC1[F3 C4/][F3 C4/]

Although this seems awkward on hexahedra it looks natural on tetrahedra. The best-known example for a corner turning tetrahedron is the Pyraminx without trivial tips. We have two types of pieces which need to be solved: corners and

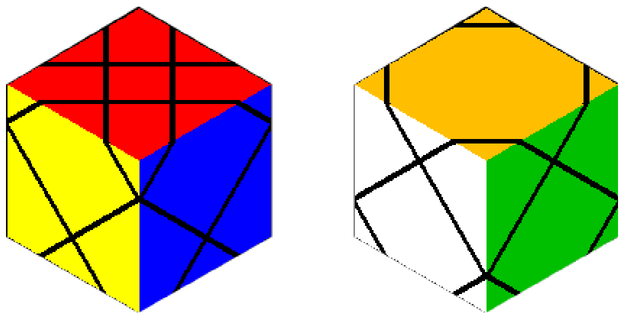


Halpern-Meier-Tetrahedron
HC1[F3 C4][F3 C4/]

edges. The edges of the Pyraminx represent F3 of HC1 which can only be turned by 180°. The corners are C4 of HC1 but only four of the original eight corners are visible. To reflect this, a halving factor is introduced into the signatures. This halving might be considered as a special case of piece partitioning (see 5.2 and 5.3) but it is only possible in HC.

This halving does not only occur in the piece types. It can also occur in the orientations alone. The Halpern-Meier-Tetrahedron gives an example. All four samples of C4 are present (the triangles and the tips) but only one half (the tips) have a visible orientation.

Offsetting works only when done in the tetrahedral scheme shown above. Other schemes to place cuts with an offset are impossible on HC (and all other axis systems) when a doctrinaire puzzle shall be achieved.



An example of HC with an impossible offset.

To the left we see another set of four cuts on HC1 placed with identical offsets in different directions compared with above.

Similar useless results would be gained when offsets are applied to other axis systems.

3.4 Halved piece types (based on P)

The phenomenon of the halved pieces can occur also in the prisms with odd number of axes.

The easiest thinkable puzzle is the triangular domino. Compare it with Rubik’s Ufo. Both have three axes which allow 180° turns. Rubik’s Ufo allows the single orthogonal axis to be turned in steps of 60°. On triangular domino that axis can be turned only in steps of 120°.

This restriction does not affect the set of pieces. The sets are identical for both puzzles except for the central triangle in the domino which is a Holding point piece with zero volume.

The same principle can be applied to all prisms with odd number of axes.

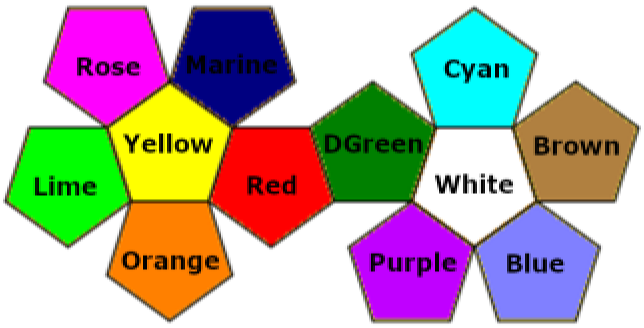
3.5 Holding point pieces (with zero volume)

Although the piece types presented in chapter 3.1 can cover many puzzles there are way more pieces for every axis system, one for every Holding Point. For the general concept please refer to the Twistypedia.

Take another look at DF2. It consists of six axes with three layers each. Lets assume you fix exactly one layer of each axis. Each set of layers describes a piece. Therefore the axis system supports 3^6=729 possible holding points although the list above covers only 185 sets.

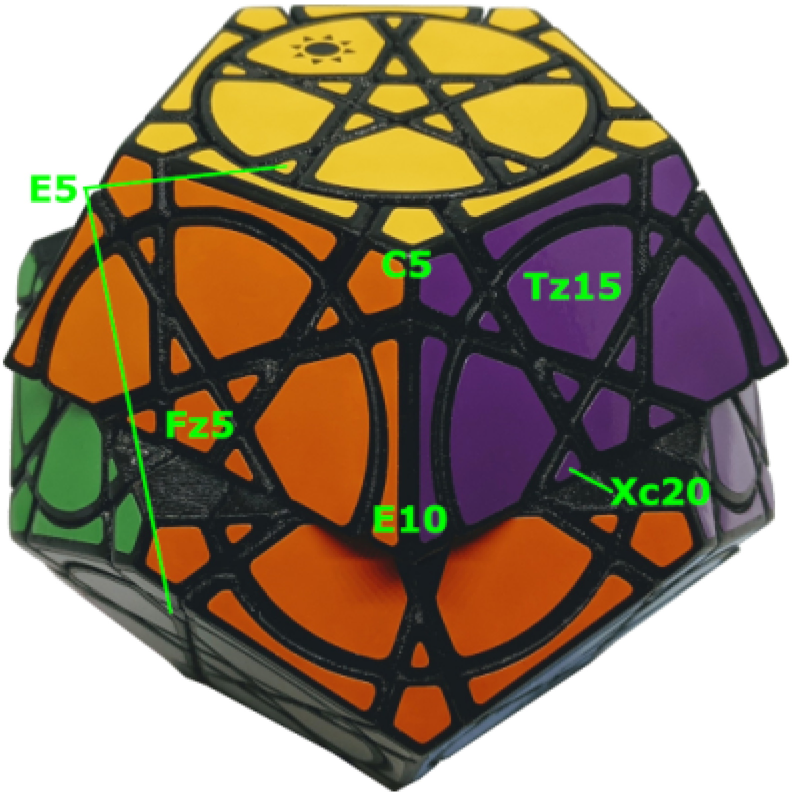
This is the complete list of different holding points.

Name		# pieces	Fixed layers
O	RVP	1	[]
F1	RVP	12	White
Ez5	ZHP	30	White Red
E5	RVP	30	White Brown
Cz5	ZHP	20	White Rose Red
Tz15	ZHP	60	White Brown Purple
Wz15	ZHP	60	White Blue Red
C5	RVP	20	White Brown Blue
Ez10	ZHP	30	White Blue Rose Red
Xc20	ZHP	60	White Purple Marine Red
Tz20	ZHP	60	White Brown Purple Marine
Xz20	ZHP	60	White Blue Purple Red
E10	RVP	30	White Brown Blue Purple
Fz5	ZHP	12	White Brown DGreen Rose Marine
Xz25	ZHP	60	White Brown Purple Lime Marine
Wz25	ZHP	60	White Blue Purple Lime Red
X25	RVP	60	White Brown Blue Purple DGreen
Fz6	ZHP	12	White Brown Purple Orange Lime Marine
Cz10	ZHP	20	White Blue Purple Cyan Lime Red
C10	RVP	20	White Brown Blue Purple Cyan Lime
F6	RVP	12	White Brown Blue Purple Cyan DGreen



The column „fixed layers“ gives one example of what layer have to fixed to make this piece stay unmoved. If a specific axis is not mentioned the slice of that axis stays fixed.

All piece types marked as ZHP do not occur in „normal“ puzzles because with equidistant plane cuts they would not have real volume.



Crazy Starminx
DF2[Fz5 C5 E5 E10 Tz15 Xc20][Fz5 C5 E5 E10]

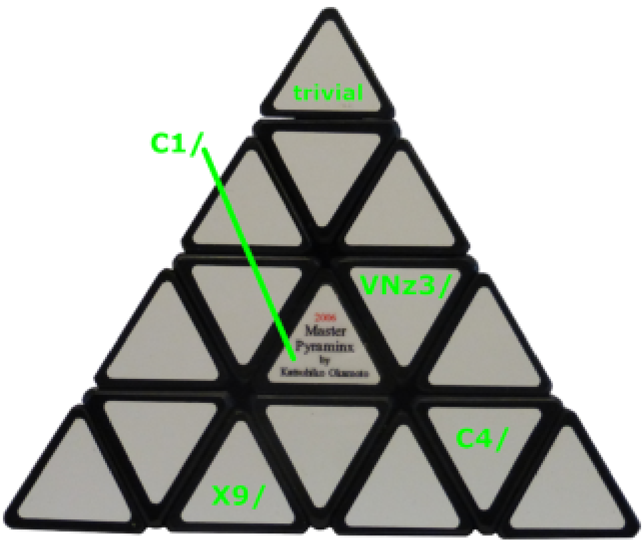
One still can make good use of them in puzzles that are „not normal“, e.g. in the Crazy Starminx.
It presents three piece types from the table in 3.2 but also three types represented by ZHPs.

For the purposes of classifying puzzles these pieces are denoted with an additional lower case letter between the conjugacy class and the number of pieces affected by turn. This letter is further used to distinguish piece types which otherwise would have the same name.

In the table above there are only the eight categories we have already seen. Expanding the available pieces to all HPs for all axis systems also exposes some additional categories. This will be dealt with in the next chapter.

3.6 Additional conjugacy classes of piece types

Although the eight standard categories of piece types cover most HPs there are some special additional categories.
The best accessible example can be found in the Master Pyraminx.
New is the VNz3 piece type which represents the middle of an edge. Its holding point can be defined as [URB, DLB]
One can create twelve signatures of this type (hence twelve pieces) of



Master Pyraminx
HC2[C1/ C4/ X9/ VNz3/][C4/]

which six (hence the slash) are present in the Master Pyraminx and of which three are affected in a single turn.

What distinguishes the VN from the other categories are the inherent symmetries. Like F it has two reflective symmetries along two edges (of an imagined cube) but it lacks the symmetry of a 90° rotation (among others). It therefore falls into a completely different conjugacy class.
We will deal with the additional categories of hexahedron, dodecahedron and prisms separately.

3.6.1 Hexahedron

Every conjugacy class of piece type that can be imagined is a subgroup of the cube's full symmetry group. Without going to deep into mathematics, the cube knows 98 different subgroups which fall in 33 different conjugacy classes. Some are represented by the standard piece types. Nine are new and also support HPs:

Name	# Pieces	# Orientations	# Orbits	Example
Pyram**I**n - Pyramid inside	2	12	1	From HC2: [ULF URB DLB DRF]
Hash**T**ag	6	4	1	From HE2: [UL UR DF DB]
te**R**n**B**lade	8	6	2	From HE2: [LF UB DR]
Ver**N**ier	12	2	1	From HC2: [ULF URB]
t**R**i**W**all	12	2	1	From HE2: [UL UR]
Prop**E**t - Propeller facet	12	2	1	From HCE2: [UL UR DF DB ULF URB DRF DLB]
ed**DY**	16	3	2	From HE2: [UL UF UR RB RF DF]
MIll	24	2	2	From HCE2: [ULF URB UF UB]
fa**NG**	24	2	2	From HE2: [UL RF]

Please note that two conjugacy classes (PE and MI) occur only in the hybrid axis systems. Therefore there are no easier examples.
To distinguish the nine new conjugacy classes from the standard ones they are abbreviated with two capital letters. These are followed by a lowercase letter (because it is always a ZHP) and the number of pieces affected by one turn.

3.6.2 Dodecahedron

The dodecahedron knows 164 different subgroups which fall in 22 different conjugacy classes. Seven of these are new and support HPs:

Name	# Pieces	# Orientations	# Orbits	Example
SNub (as in Snubminx)	10	12	2	From DC2: Yellow-Red-Marine Orange-Purple-Blue Rose-Lime-Brown DGreen-Cyan-White
ZIg	12	10	2	From DE2: Rose-Cyan Lime-Brown Orange-Blue Red-Purple Marine-Green
te**R**n**B**lade	20	6	2	From DE2: DGreen-Cyan Rose-Lime Orange-Purple
t**R**ipl**eU**	30	4	2	From DE2: Yellow-Marine Red-DGreen Lime-Blue Brown-White
ed**DY**	40	3	2	From DE2: Yellow-Orange Marine-Rose Red-DGreen
MIll	24	5	2	From DE2: Red-Marine Marine-Rose Rose-Lime Lime-Orange Orange-Red Red-Purple Marine-Green Rose-Cyan Lime-Brown Orange-Blue
fa**NG**	60	2	2	From DE2: Yellow-Marine Red-DGreen

3.6.3 Prisms

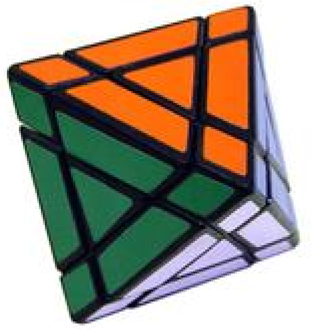
Prisms consist of an infinite series of axis systems so the piece types can't be enumerated completely but must be categorized further in three sets:

Name	# Pieces	# Orientations	# Orbits	Example (from PVI)
ROk Rotations	n	k	2	[A E Cn B2 F2 D2n] (example for RO3)
RXk Reflections type X	n/k	k	1	[A E Cn] (example for RX3)
RTk Reflections type T	n/k	k	1	[A B E F Cn Dn] (example for RT3)

n = number of axes

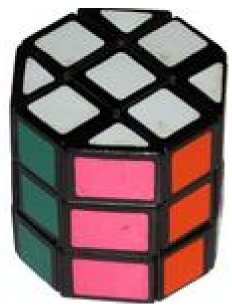
4. Orientable piece types

The second set in the signature enumerates the piece types that have to be oriented in addition to solving their permutations. This set always has to be a subset of the first one, even if it only the empty set. Piece types that are physically present but hidden inside the puzzle or unstickered are not enumerated in any set.



Trajber's Octahedron

Just compare the plain 3x3x3 HF2[F1 C4 E4][C4 E4]
with Trajber's Octahedron HF2[F1 C4 E4][F1 E4]
The same piece types are present but in the 3x3x3 the corners have to be oriented, in Trajber's Octahedron the Face pieces.



It is possible that only some of the pieces of one type have a visible orientation. The earliest example are the octagonal prism. It solves like a 3x3x3 but four of the twelve edges have no visible orientation. For the purposes of the signatures this is ignored. If just one piece of the whole piece type needs to be oriented, that piece type will be enumerated in the second set. See also chapter 5.2.

It is possible to create sticker variants because of which permutations of certain piece types are irrelevant (e.g. because they are stickered identical) but need to be oriented. Since this scenario is extremely rare it will not be mentioned in the signatures. Even in this case the piece type is enumerated in both sets.

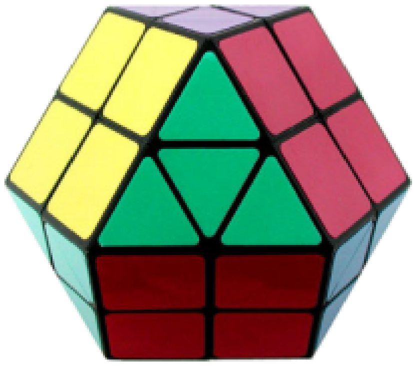
Orientable piece types can come only from conjugacy classes that have an internal rotational symmetry. This excludes all piece types from X, W, T and L which are the most common ones.
A special case occurs in HC. Edge pieces from these axis systems can't be oriented due to the restrictions of the axis systems. Therefore these piece types are always enumerated in the first set only even if an orientation seems to be visible.

5. Various topics

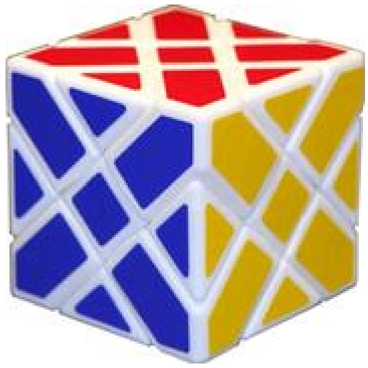
5.1 Global orientation and the two innermost pieces

For each of the six basic axis systems there are two pieces which contribution to the signatures is doubtful. Compare the Dino Cube with the Rainbow Cube.

Dino Cube
HC2[E3][]



Rainbow Cube
HC2[C1 E3][]



Compy Cube
HC2[O C1 E3][C1]

These different signatures suggest that on the Rainbow Cube the position of the pieces C1 need to be solved. That is not the case since the pieces C1 can not change their position relative to each other. There is still a difference between these puzzles because the Rainbow Cube has a visible global orientation unlike the Dino Cube. This explains why the Dino Cube has twelve solutions and the Rainbow Cube has only one. A similar effect would be achieved if the core of HC2 was visible, e.g. in the Compy Cube. Therefore the following puzzles are completely identical solvingwise and show a bit of redundancy in the signatures:

- HC2[O E3][]
- HC2[C1 E3][]
- HC2[O C1 E3][]

Global orientation has another effect which reaches beyond the number of different solutions: Compare the 3x3x3 HF2[F1 C4 E4][C4 E4] with the Void Cube HF2[C4 E4][C4 E4]. The signatures show us that the Void Cube has more than one solution since there is no piece from which the global orientation could be derived. Furthermore this allows the special parity problem of the void cube to occur.

Introducing the core and the second inner most piece type (both unpermutable) into the system introduces some redundancy but gives valuable information about the puzzle. Therefore both pieces are always enumerated in the signatures.

5.2 Sticker variants (partitions)

The signatures assume that permutations and orientations are possible or not but in reality there are intermediate possibilities.
An example is the Dual Arrow 3x3x3. Instead of twelve distinguishable edges this cube has two sets with six edges each (6+6). Instead of eight distinguishable corners this cube has two sets with two or six corners (2+6).

Dogic I

Dogic II

Other examples are the different versions of the Dogic:
In Dogic I the X-pieces are split into twelve sets of five pieces each (5+5+5+5+5+5+5+5+5+5+5+5).
In Dogic II the X-pieces are split into ten sets of six pieces each (6+6+6+6+6+6+6+6+6+6)

Mathematically spoken, for each permutable piece type a partition[1] can be given. For eight pieces there are 22 possible partitions. For 60 pieces the number grows to 966467 partitions.
Signatures reflecting these partitions could be added if there is need but such a system has not been formalized yet.
The same is true for orientations of pieces only. This was already discussed in 4.

5.3 Other partitions

There are some piece types that demonstrate more restrictions than indicated in 3.1 and 3.6.
Known so far are these:

Axis system	Piece type	Remarks
HC*	F*	All F-piece types in HC allow only 180°-rotations
HC*	*	All other piece types of HC are split into 2 sets.
HE2	X4	These are split into 4 sets.
DC2	X4	These are split into 6 sets.
HE2	RWz2	These are split into 3 sets.
HE2	NGz4	These are split into 8 sets (no puzzle yet)
HE2	RBz2	These are split into 8 sets (no puzzle yet)

The restrictions of HC2 were already mentioned in 3.3 and can be reflected in the signatures.
The others are not reflected yet in the signatures because they have never been used in an implemented puzzle. Maybe this changes in the future.

[1] https://en.wikipedia.org/wiki/Partition_(number_theory)

5.4 Cuboids

There are three possibilities to classify cuboids:

1. Always turning 90°:
   In these cases the puzzle is just a shape transformation of a puzzle HF.
2. Shape preserving square cuboid (e.g. 2x2x3)
   These puzzle can be classified as PII (a prism with two axes) with n perpendicular cuts.
3. Shape preserving non-square cuboids (e.g. 2x3x4)
   These can be classified as hybrid prisms or as bandaged prisms of higher order. Since cuboids almost classify themselves this gap is tolerated so far.

5.5 Bandaged and restricted variants

BiCube

3 Quads, 3 Stripes

Animal Cube

Latch Cube

Bandaged variants solve totally different but their axis systems and piece types are identical to their unbandaged cousins. Therefore they have the same signatures. Classic bandaged variants like the Bicube and the 3Q3S („3 Quads, 3 Stripes“) can be classified with additional signatures elements although these must be invented anew for each puzzle.

Beyond classical bandaged puzzles there are way more methods to restrict the turns of a given puzzle. Examples are the Animal Cube and the Latch Cube. These also share axis system and piece types with their original puzzles.

A generalized system to classify the restrictions on any given puzzles does not exist yet.

6. Puzzles that can’t be covered

Whether one can create a signature for a given puzzle depends solely on its axis system, whether it fits into those described in chapter 2.
The puzzles that can’t be covered are

1. 2D puzzles, e.g. all puzzles with intersecting circles.
2. Not created by cutting up a solid, e.g. Rubik’s Magic and Roundy.
3. Hybrid puzzles that combine the axis systems of hexahedron and dodecahedron, e.g. Arleminx.
4. Jumbling only geometries, e.g. the Clover Cube.
   This includes puzzles with coreless jumbling, e.g. Rocket Twist.
5. Puzzles with covered axis systems but with additional turning possibilities.
   e.g. the axis system of the Skyglobe is the same as HC1 but because it allows turns of 60° it contains non classifiable piece types.
6. Doctrinaire puzzles with completely new axis systems.
   e.g. Tetragram, Septic Twist have a doctrinaire but very limited axis system.
7. Mixup puzzles, e.g. Mixup Cube.
8. Puzzles which axes do not meet at one point, e.g. Bubbloid.
9. Puzzles with turns possible only in midturn, e.g. Krystian’s Cube.

Although this seems like a large number of exceptions the effect is limited. As of 14th June 2022 the museum contained 10000 entries which can be broken up like this:

<table>
<tr><td rowspan="4">Entries in the museum: 10000</td><td colspan="2">No puzzles (books, games, merchandise): 627</td></tr>
<tr><td colspan="2">No 3D puzzles with axis system: 1216</td></tr>
<tr><td rowspan="2">Puzzles with 3D solids cut up: 8157</td><td>With valid signatures: 7226</td></tr>
<tr><td>Not covered: 931</td></tr>
</table>

7. Appendix – Table of axis systems with two cuts per axes

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HC2

Index	Sides	Slices	Sides URF	Sides URB	Sides ULF	Sides DRF	Slices URF	Slices URB	Slices ULF	Slices DRF	Sides DLB	Sides DLF	Sides DRB	Sides ULB	Count	PerTurn		Piece
1	8	0	1	1	1	1	0	0	0	0	1	1	1	1	1	0	RVP	O
2	7	1	1	1	1	1	1	0	0	0	0	1	1	1	8	1	RVP	C1
3	6	2	1	0	1	1	1	1	0	0	0	1	1	1	12	3	ZHP	VNz3
4	6	2	1	1	1	1	1	1	0	0	0	0	1	1	12	3	RVP	E3
5	5	3	1	0	0	1	1	1	1	0	0	1	1	1	8	3	ZHP	Cz3
6	5	3	1	1	1	1	1	1	1	0	0	0	0	1	24	9	RVP	X9
7	4	4	1	0	0	0	1	1	1	1	0	1	1	1	2	1	ZHP	Plz1
8	4	4	1	1	1	0	1	1	1	1	0	0	0	1	6	3	RVP	F3
9	4	4	1	1	1	1	1	1	1	1	0	0	0	0	8	4	RVP	C4

HE2

Index	Sides	Slices	Sides: LB	LU	LD	LF	BU	BD	Slices: LBs	LUs	LDs	LFs	BUs	BDs	Sides: RF	RD	RU	RB	FD	FU	Count	perTurn		Piece
1	12	0	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	0	RVP	O
2	11	1	1	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	12	1	RVP	E1
3	10	2	1	1	1	1	1	1	0	1	1	0	0	0	1	0	0	1	1	1	12	2	ZHP	RWz2
4	10	2	1	0	1	1	1	1	1	1	0	0	0	0	0	1	1	1	1	1	24	4	ZHP	NGz4
5	10	2	1	1	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	24	4	RVP	X4
6	9	3	1	1	0	1	0	1	1	0	1	0	1	0	0	1	1	1	1	1	8	2	ZHP	RBz2
7	9	3	1	1	1	1	1	1	1	0	1	0	1	0	0	1	0	1	0	1	24	6	ZHP	NGz6
8	9	3	1	1	1	1	0	1	1	1	0	0	1	0	0	0	1	1	1	1	24	6	ZHP	Xz6
9	9	3	1	1	1	1	1	1	1	1	0	0	1	0	0	0	1	1	0	1	8	2	RVP	C2
10	9	3	1	0	0	1	1	1	1	1	1	0	0	0	0	1	1	1	1	1	24	6	ZHP	Tz6
11	9	3	1	1	0	1	1	1	1	1	1	0	0	0	0	0	1	1	1	1	48	12	ZHP	Lz12
12	9	3	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	24	6	RVP	T6
13	8	4	1	0	1	1	1	1	1	1	1	0	1	0	0	1	0	1	0	1	48	16	ZHP	Ln16
14	8	4	1	1	0	1	0	1	1	1	1	0	1	0	0	0	1	1	1	1	48	16	ZHP	Lx16
15	8	4	1	1	1	1	0	1	1	1	1	0	1	0	0	0	0	1	1	1	48	16	ZHP	Lt16
16	8	4	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0	1	0	1	48	16	RVP	L16
17	8	4	1	0	0	1	1	1	1	1	1	1	0	0	0	1	1	0	1	1	6	2	ZHP	HTz2
18	8	4	1	1	0	0	1	1	1	1	1	1	0	0	0	0	1	1	1	1	12	4	ZHP	Ez4
19	8	4	1	1	1	0	1	1	1	1	1	1	0	0	0	0	0	1	1	1	24	8	ZHP	Tz8
20	8	4	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	1	1	6	2	RVP	F2
21	7	5	1	0	0	1	1	1	1	1	1	1	1	0	0	1	1	0	0	1	24	10	ZHP	NGz10
22	7	5	1	0	1	0	1	1	1	1	1	1	1	0	0	1	0	1	0	1	24	10	ZHP	Tz10
23	7	5	1	1	0	0	0	1	1	1	1	1	1	0	0	0	1	1	1	1	12	5	ZHP	Ez5
24	7	5	1	1	0	0	1	1	1	1	1	1	1	0	0	0	1	1	0	1	12	5	RVP	E5
25	7	5	1	1	1	0	0	1	1	1	1	1	1	0	0	0	0	1	1	1	48	20	ZHP	Ln20
26	7	5	1	1	1	0	1	1	1	1	1	1	1	0	0	0	0	1	0	1	48	20	ZHP	Lt20
27	7	5	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	1	24	10	RVP	X10
28	6	6	1	1	1	0	0	0	1	1	1	1	1	1	0	0	0	1	1	1	24	12	ZHP	Tz12
29	6	6	1	1	1	0	1	0	1	1	1	1	1	1	0	0	0	1	0	1	16	8	ZHP	DYz8
30	6	6	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	24	12	RVP	T12

DF2

The colour scheme used here is taken from the Pyraminx Chrystals sold by Mefferts.

Index	Sides	Slices	Sides						Slices						Sides						Count	PerTurn		Piece
			Yellow	Red	Marine	Rose	Lime	Orange	Yellow	Red	Marine	Rose	Lime	Orange	White	Brown	Blue	Purple	DGreen	Cyan				
1	12	0	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	0	RVP	O
2	11	1	1	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	12	1	RVP	F1
3	10	2	1	0	1	1	1	1	1	1	0	0	0	0	0	1	1	1	1	1	30	5	ZHP	Ez5
4	10	2	1	1	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	30	5	RVP	E5
5	9	3	1	0	1	0	1	1	1	1	0	1	0	0	0	1	1	1	1	1	20	5	ZHP	Cz5
6	9	3	1	1	1	1	1	1	1	1	0	1	0	0	0	0	1	0	1	1	60	15	ZHP	Tz15
7	9	3	1	0	1	1	1	1	1	1	1	0	0	0	0	1	0	1	1	1	60	15	ZHP	Wz15
8	9	3	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	20	5	RVP	C5
9	8	4	1	0	1	0	1	1	1	1	1	1	0	0	0	1	0	1	1	1	30	10	ZHP	Ez10
10	8	4	1	0	0	1	1	1	1	1	1	1	0	0	0	1	1	0	1	1	60	20	ZHP	Xc20
11	8	4	1	1	0	1	1	1	1	1	1	1	0	0	0	0	1	0	1	1	60	20	ZHP	Tz20
12	8	4	1	0	1	1	1	1	1	1	1	1	0	0	0	1	0	0	1	1	60	20	ZHP	Xz20
13	8	4	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	1	1	30	10	RVP	E10
14	7	5	1	1	0	0	1	1	1	1	1	1	1	0	0	0	1	1	0	1	12	5	ZHP	Fz5
15	7	5	1	1	0	1	0	1	1	1	1	1	1	0	0	0	1	0	1	1	60	25	ZHP	Xz25
16	7	5	1	0	1	1	0	1	1	1	1	1	1	0	0	1	0	0	1	1	60	25	ZHP	Wz25
17	7	5	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	1	60	25	RVP	X25
18	6	6	1	1	0	1	0	0	1	1	1	1	1	1	0	0	1	0	1	1	12	6	ZHP	Fz6
19	6	6	1	0	1	1	0	1	1	1	1	1	1	1	0	1	0	0	1	0	20	10	ZHP	Cz10
20	6	6	1	1	1	1	0	1	1	1	1	1	1	1	0	0	0	0	1	0	20	10	RVP	C10
21	6	6	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	12	6	RVP	F6

DC2

The colour scheme used here is taken from the Pyraminx Chrystals sold by Mefferts.

Index	Sides	Slices	Sides										Slices										Sides										Count	Per Turn		Piece
			Yellow Marine Red	Yellow Rose Marine	Yellow Lime Rose	Yellow Orange Lime	Yellow Red Orange	Red Marine DGreen	Marine Rose Cyan	Rose Lime Brown	Lime Orange Blue	Orange Red Purple	Yellow Marine Red	Yellow Rose Marine	Yellow Lime Rose	Yellow Orange Lime	Yellow Red Orange	Red Marine DGreen	Marine Rose Cyan	Rose Lime Brown	Lime Orange Blue	Orange Red Purple	Brown Blue White	Blue Purple White	Purple DGreen White	DGreen Cyan White	Cyan Brown White	Lime Blue Brown	Orange Purple Blue	Red DGreen Purple	Marine Cyan DGreen	Rose Brown Cyan				
1	20	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	0	RVP	O
2	19	1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	1	1	1	1	1	1	1	1	1	1	20	1	RVP	C1
3	18	2	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	0	1	1	30	3	RVP	E3
4	18	2	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	30	3	ZHP	
5	18	2	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	1	1	0	1	1	1	1	1	1	1	0	1	1	60	6	ZHP	
6	18	2	1	1	1	1	1	1	1	0	0	1	0	0	0	0	0	0	0	1	1	0	1	1	1	1	1	1	1	1	1	1	60	6	ZHP	Xa6
7	17	3	1	1	1	0	1	1	1	1	1	1	0	0	0	1	0	1	1	0	0	0	1	1	1	1	1	0	0	1	1	1	20	3	ZHP	
8	17	3	1	1	1	0	1	0	0	1	1	1	0	0	0	1	0	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1	60	9	ZHP	
9	17	3	1	1	1	0	1	0	1	1	1	1	0	0	0	1	0	1	0	0	0	1	1	1	1	1	1	1	1	1	1	0	40	6	ZHP	
10	17	3	1	1	1	0	1	0	1	1	1	0	0	0	0	1	0	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	120	18	ZHP	
11	17	3	1	1	1	0	1	1	1	0	1	1	0	0	0	1	0	0	0	1	1	0	1	1	1	1	1	1	1	1	0	1	120	18	ZHP	
12	17	3	1	1	1	0	1	1	1	1	0	1	0	0	0	1	0	0	0	1	1	0	1	1	1	1	1	1	1	0	1	1	60	9	ZHP	
13	17	3	1	1	1	0	1	1	1	0	0	1	0	0	0	1	0	0	0	1	1	0	1	1	1	1	1	1	1	1	1	1	60	9	ZHP	
14	17	3	1	1	1	1	1	0	1	1	1	1	0	0	0	0	0	1	0	1	1	0	1	1	1	1	1	1	1	0	0	1	60	9	RVP	X9
15	17	3	1	1	1	1	1	0	1	1	0	1	0	0	0	0	0	1	0	1	1	0	1	1	1	1	1	1	1	0	1	1	120	18	ZHP	
16	17	3	1	1	1	1	1	0	1	0	0	1	0	0	0	0	0	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1	60	9	ZHP	
17	17	3	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	0	1	60	9	ZHP	
18	17	3	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	1	1	120	18	ZHP	
19	17	3	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	60	9	ZHP	
20	16	4	0	1	1	1	1	1	1	0	1	1	1	0	0	1	0	0	1	1	0	0	1	1	1	0	1	1	0	1	1	1	10	2	ZHP	
21	16	4	0	1	1	0	1	1	0	1	1	1	1	0	0	1	0	0	1	1	0	0	1	1	1	1	1	1	1	0	1	1	40	8	ZHP	
22	16	4	0	1	1	0	1	1	0	0	1	1	1	0	0	1	0	0	1	1	0	0	1	1	1	1	1	1	1	1	1	1	30	6	ZHP	
23	16	4	1	1	1	0	1	1	1	1	1	1	0	0	0	1	0	1	1	0	1	0	1	1	1	1	1	0	0	1	0	1	20	4	ZHP	
24	16	4	1	1	1	0	1	1	1	1	0	1	0	0	0	1	0	1	1	0	1	0	1	1	1	1	1	0	0	1	1	1	20	4	RVP	C4
25	16	4	1	1	1	0	1	0	0	1	1	1	0	0	0	1	0	1	1	0	1	0	1	1	1	1	1	1	1	1	0	1	60	12	ZHP	
26	16	4	1	1	1	0	1	0	0	1	0	1	0	0	0	1	0	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1	60	12	ZHP	

27	16	4	1	1	1	0	1	1	1	1	1	1	0	0	0	1	0	1	1	1	0	0	1	1	1	1	1	0	0	0	1	1	120	24	ZHP	
28	16	4	1	1	1	0	1	1	1	0	1	1	0	0	0	1	0	1	1	1	0	0	1	1	1	1	1	0	0	1	1	1	120	24	ZHP	
29	16	4	1	1	1	0	1	0	1	1	1	1	0	0	0	1	0	1	1	1	0	0	1	1	1	1	1	1	0	0	1	1	120	24	ZHP	
30	16	4	1	1	1	0	1	0	1	0	1	1	0	0	0	1	0	1	1	1	0	0	1	1	1	1	1	1	0	1	1	1	120	24	ZHP	
31	16	4	1	1	1	0	1	1	0	1	1	1	0	0	0	1	0	1	1	1	0	0	1	1	1	1	1	0	1	0	1	1	120	24	ZHP	
32	16	4	1	1	1	0	1	1	0	0	1	1	0	0	0	1	0	1	1	1	0	0	1	1	1	1	1	0	1	1	1	1	120	24	ZHP	
33	16	4	1	1	1	0	1	0	0	1	1	1	0	0	0	1	0	1	1	1	0	0	1	1	1	1	1	1	1	0	1	1	120	24	ZHP	
34	16	4	1	1	1	0	1	0	0	0	1	1	0	0	0	1	0	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	120	24	ZHP	
35	16	4	1	1	1	0	1	1	1	1	1	1	0	0	0	1	0	1	0	1	0	1	1	1	1	1	1	0	1	0	1	0	120	24	ZHP	
36	16	4	1	1	1	0	1	1	1	0	1	1	0	0	0	1	0	1	0	1	0	1	1	1	1	1	1	0	1	1	1	0	120	24	ZHP	
37	16	4	1	1	1	0	1	1	1	1	1	0	0	0	0	1	0	1	0	1	0	1	1	1	1	1	1	0	1	0	1	1	120	24	ZHP	
38	16	4	1	1	1	0	1	1	1	0	1	0	0	0	0	1	0	1	0	1	0	1	1	1	1	1	1	0	1	1	1	1	120	24	ZHP	
39	16	4	1	1	1	0	1	0	1	1	1	1	0	0	0	1	0	1	0	1	0	1	1	1	1	1	1	1	1	0	1	0	120	24	ZHP	
40	16	4	1	1	1	0	1	0	1	0	1	1	0	0	0	1	0	1	0	1	0	1	1	1	1	1	1	1	1	1	1	0	120	24	ZHP	
41	16	4	1	1	1	0	1	0	1	1	1	0	0	0	0	1	0	1	0	1	0	1	1	1	1	1	1	1	1	0	1	1	120	24	ZHP	
42	16	4	1	1	1	0	1	0	1	0	1	0	0	0	0	1	0	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1	120	24	ZHP	
43	16	4	1	1	1	0	1	1	1	1	1	1	0	0	0	1	0	1	0	1	1	0	1	1	1	1	1	0	1	0	0	1	60	12	ZHP	
44	16	4	1	1	1	0	1	1	1	0	0	1	0	0	0	1	0	1	0	1	1	0	1	1	1	1	1	0	1	1	1	1	60	12	RVP	T12
45	16	4	1	1	1	0	1	0	1	1	1	1	0	0	0	1	0	1	0	1	1	0	1	1	1	1	1	1	1	0	0	1	120	24	ZHP	
46	16	4	1	1	1	0	1	0	1	0	1	1	0	0	0	1	0	1	0	1	1	0	1	1	1	1	1	1	1	1	0	1	60	12	ZHP	
47	16	4	1	1	1	0	1	0	1	1	0	1	0	0	0	1	0	1	0	1	1	0	1	1	1	1	1	1	1	0	1	1	60	12	ZHP	
48	16	4	1	1	1	0	1	0	1	0	0	1	0	0	0	1	0	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1	120	24	ZHP	
49	16	4	1	1	1	0	1	1	1	1	0	1	0	0	0	1	0	0	0	1	1	1	1	1	1	1	1	1	1	0	1	0	30	6	ZHP	
50	16	4	1	1	1	0	1	1	1	1	1	0	0	0	0	1	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	1	60	12	ZHP	
51	16	4	1	1	1	0	1	1	1	0	1	0	0	0	0	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	0	1	60	12	ZHP	
52	16	4	1	1	1	0	1	1	1	1	0	0	0	0	0	1	0	0	0	1	1	1	1	1	1	1	1	1	1	0	1	1	60	12	ZHP	
53	16	4	1	1	1	0	1	1	1	0	0	0	0	0	0	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	30	6	ZHP	
54	16	4	1	1	1	1	1	0	1	0	1	1	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	0	0	60	12	ZHP	
55	16	4	1	1	1	1	1	0	1	1	0	1	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	0	60	12	ZHP	
56	16	4	1	1	1	1	1	0	1	1	1	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	0	0	1	60	12	ZHP	
57	16	4	1	1	1	1	1	0	1	0	1	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	0	1	120	24	ZHP	
58	16	4	1	1	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	120	24	ZHP	
59	16	4	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	60	12	ZHP	
60	15	5	0	1	1	1	1	1	1	0	0	1	1	0	0	1	0	0	1	1	1	0	1	1	1	0	1	1	0	1	1	1	120	30	ZHP	
61	15	5	0	1	1	1	1	1	0	1	1	1	1	0	0	1	0	0	1	1	1	0	1	1	1	0	1	1	1	0	0	1	60	15	ZHP	
62	15	5	0	1	1	1	1	1	0	1	0	1	1	0	0	1	0	0	1	1	1	0	1	1	1	0	1	1	1	0	1	1	60	15	ZHP	
63	15	5	0	1	1	0	1	1	1	1	1	1	1	0	0	1	0	0	1	1	1	0	1	1	1	1	1	1	0	0	0	1	60	15	ZHP	
64	15	5	0	1	1	0	1	1	1	0	1	1	1	0	0	1	0	0	1	1	1	0	1	1	1	1	1	1	0	1	0	1	120	30	ZHP	

65	15	5	0	1	1	0	1	1	1	1	0	1	1	0	0	1	0	0	1	1	1	0	1	1	1	1	1	1	0	0	1	1	60	15	ZHP	
66	15	5	0	1	1	0	1	1	1	0	0	1	1	0	0	1	0	0	1	1	1	0	1	1	1	1	1	1	0	1	1	1	120	30	ZHP	
67	15	5	0	1	1	0	1	1	0	1	1	1	1	0	0	1	0	0	1	1	1	0	1	1	1	1	1	1	1	0	0	1	120	30	ZHP	
68	15	5	0	1	1	0	1	1	0	1	0	1	1	0	0	1	0	0	1	1	1	0	1	1	1	1	1	1	1	0	1	1	120	30	ZHP	
69	15	5	0	1	1	0	1	1	0	0	0	1	1	0	0	1	0	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	120	30	ZHP	
70	15	5	1	1	1	1	0	1	0	1	1	1	0	0	0	1	1	1	1	1	0	0	1	1	1	0	1	0	1	0	1	1	120	30	ZHP	
71	15	5	1	1	1	1	0	1	0	0	1	1	0	0	0	1	1	1	1	1	0	0	1	1	1	0	1	0	1	1	1	1	120	30	ZHP	
72	15	5	1	1	1	1	0	0	0	1	1	1	0	0	0	1	1	1	1	1	0	0	1	1	1	0	1	1	1	0	1	1	120	30	ZHP	
73	15	5	1	1	1	1	0	0	0	0	1	1	0	0	0	1	1	1	1	1	0	0	1	1	1	0	1	1	1	1	1	1	120	30	ZHP	
74	15	5	1	1	1	0	0	1	1	1	1	1	0	0	0	1	1	1	1	1	0	0	1	1	1	1	1	0	0	0	1	1	60	15	ZHP	
75	15	5	1	1	1	0	0	0	1	1	1	1	0	0	0	1	1	1	1	1	0	0	1	1	1	1	1	1	0	0	1	1	120	30	ZHP	
76	15	5	1	1	1	0	0	0	1	0	1	1	0	0	0	1	1	1	1	1	0	0	1	1	1	1	1	1	0	1	1	1	60	15	ZHP	
77	15	5	1	1	1	0	0	1	0	1	1	1	0	0	0	1	1	1	1	1	0	0	1	1	1	1	1	0	1	0	1	1	60	15	ZHP	
78	15	5	1	1	1	0	0	0	0	1	1	1	0	0	0	1	1	1	1	1	0	0	1	1	1	1	1	1	1	0	1	1	120	30	ZHP	
79	15	5	1	1	1	0	0	0	0	0	1	1	0	0	0	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	60	15	ZHP	
80	15	5	1	1	1	0	0	1	1	1	1	1	0	0	0	1	1	0	1	0	1	1	1	1	1	1	1	1	0	1	0	0	60	15	ZHP	
81	15	5	1	1	1	0	0	1	1	1	0	0	0	0	0	1	1	0	1	0	1	1	1	1	1	1	1	1	0	1	1	1	12	3	RVP	F3
82	15	5	1	1	1	0	0	1	0	1	1	0	0	0	0	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	60	15	ZHP	
83	15	5	1	1	1	0	0	1	0	1	0	0	0	0	0	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	60	15	ZHP	
84	15	5	1	1	1	1	0	1	1	1	1	1	0	0	0	1	1	0	1	1	1	0	1	1	1	0	1	1	0	0	0	1	60	15	ZHP	
85	15	5	1	1	1	1	0	1	1	0	1	1	0	0	0	1	1	0	1	1	1	0	1	1	1	0	1	1	0	1	0	1	60	15	ZHP	
86	15	5	1	1	1	1	0	1	0	0	0	1	0	0	0	1	1	0	1	1	1	0	1	1	1	0	1	1	1	1	1	1	120	30	ZHP	
87	15	5	1	1	1	0	0	1	1	1	1	1	0	0	0	1	1	0	1	1	1	0	1	1	1	1	1	1	0	0	0	1	120	30	ZHP	
88	15	5	1	1	1	0	0	1	1	0	1	1	0	0	0	1	1	0	1	1	1	0	1	1	1	1	1	1	0	1	0	1	120	30	ZHP	
89	15	5	1	1	1	0	0	1	1	1	0	1	0	0	0	1	1	0	1	1	1	0	1	1	1	1	1	1	0	0	1	1	60	15	ZHP	
90	15	5	1	1	1	0	0	1	1	0	0	1	0	0	0	1	1	0	1	1	1	0	1	1	1	1	1	1	0	1	1	1	60	15	ZHP	
91	15	5	1	1	1	0	0	1	0	0	1	1	0	0	0	1	1	0	1	1	1	0	1	1	1	1	1	1	1	1	0	1	120	30	ZHP	
92	15	5	1	1	1	0	0	1	0	1	0	1	0	0	0	1	1	0	1	1	1	0	1	1	1	1	1	1	1	0	1	1	120	30	ZHP	
93	15	5	1	1	1	0	0	1	0	0	0	1	0	0	0	1	1	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	120	30	ZHP	
94	15	5	1	1	1	0	1	1	1	1	1	1	0	0	0	1	0	1	1	1	0	1	1	1	1	1	1	0	0	0	1	0	60	15	ZHP	
95	15	5	1	1	1	0	1	1	1	1	1	0	0	0	0	1	0	1	1	1	0	1	1	1	1	1	1	0	0	0	1	1	120	30	ZHP	
96	15	5	1	1	1	0	1	1	1	0	1	0	0	0	0	1	0	1	1	1	0	1	1	1	1	1	1	0	0	1	1	1	60	15	ZHP	
97	15	5	1	1	1	0	1	1	0	1	1	1	0	0	0	1	0	1	1	1	0	1	1	1	1	1	1	0	1	0	1	0	120	30	ZHP	
98	15	5	1	1	1	0	1	1	0	0	1	1	0	0	0	1	0	1	1	1	0	1	1	1	1	1	1	0	1	1	1	0	120	30	ZHP	
99	15	5	1	1	1	0	1	1	0	1	1	0	0	0	0	1	0	1	1	1	0	1	1	1	1	1	1	0	1	0	1	1	120	30	ZHP	
100	15	5	1	1	1	0	1	1	0	0	1	0	0	0	0	1	0	1	1	1	0	1	1	1	1	1	1	0	1	1	1	1	120	30	ZHP	
101	15	5	1	1	1	0	1	0	0	1	1	1	0	0	0	1	0	1	1	1	0	1	1	1	1	1	1	1	1	0	1	0	60	15	ZHP	
102	15	5	1	1	1	0	1	0	0	1	1	0	0	0	0	1	0	1	1	1	0	1	1	1	1	1	1	1	1	0	1	1	120	30	ZHP	

103	15	5	1	1	1	0	1	0	0	0	1	0	0	0	0	1	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	60	15	ZHP	
104	15	5	1	1	1	0	1	1	1	1	1	1	0	0	0	1	0	1	1	1	1	0	1	1	1	1	1	0	0	0	0	1	120	30	ZHP	
105	15	5	1	1	1	0	1	1	1	0	1	1	0	0	0	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	1	120	30	ZHP	
106	15	5	1	1	1	0	1	1	1	1	0	1	0	0	0	1	0	1	1	1	1	0	1	1	1	1	1	0	0	0	1	1	120	30	ZHP	
107	15	5	1	1	1	0	1	1	1	0	0	1	0	0	0	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	1	1	120	30	RVP	L30
108	15	5	1	1	1	0	1	0	1	1	1	1	0	0	0	1	0	1	1	1	1	0	1	1	1	1	1	1	0	0	0	1	120	30	ZHP	
109	15	5	1	1	1	0	1	0	1	0	1	1	0	0	0	1	0	1	1	1	1	0	1	1	1	1	1	1	0	1	0	1	120	30	ZHP	
110	15	5	1	1	1	0	1	0	1	1	0	1	0	0	0	1	0	1	1	1	1	0	1	1	1	1	1	1	0	0	1	1	120	30	ZHP	
111	15	5	1	1	1	0	1	0	1	0	0	1	0	0	0	1	0	1	1	1	1	0	1	1	1	1	1	1	0	1	1	1	120	30	ZHP	
112	15	5	1	1	1	0	1	1	0	1	1	1	0	0	0	1	0	1	1	1	1	0	1	1	1	1	1	0	1	0	0	1	120	30	ZHP	
113	15	5	1	1	1	0	1	1	0	0	1	1	0	0	0	1	0	1	1	1	1	0	1	1	1	1	1	0	1	1	0	1	120	30	ZHP	
114	15	5	1	1	1	0	1	1	0	1	0	1	0	0	0	1	0	1	1	1	1	0	1	1	1	1	1	0	1	0	1	1	120	30	ZHP	
115	15	5	1	1	1	0	1	1	0	0	0	1	0	0	0	1	0	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	120	30	ZHP	
116	15	5	1	1	1	0	1	0	0	1	1	1	0	0	0	1	0	1	1	1	1	0	1	1	1	1	1	1	1	0	0	1	120	30	ZHP	
117	15	5	1	1	1	0	1	0	0	0	1	1	0	0	0	1	0	1	1	1	1	0	1	1	1	1	1	1	1	1	0	1	120	30	ZHP	
118	15	5	1	1	1	0	1	0	0	1	0	1	0	0	0	1	0	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	120	30	ZHP	
119	15	5	1	1	1	0	1	0	0	0	0	1	0	0	0	1	0	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	120	30	ZHP	
120	15	5	1	1	1	0	1	1	1	1	1	1	0	0	0	1	0	1	0	1	1	1	1	1	1	1	1	0	1	0	0	0	120	30	ZHP	
121	15	5	1	1	1	0	1	1	1	0	1	1	0	0	0	1	0	1	0	1	1	1	1	1	1	1	1	0	1	1	0	0	120	30	ZHP	
122	15	5	1	1	1	0	1	1	1	1	0	1	0	0	0	1	0	1	0	1	1	1	1	1	1	1	1	0	1	0	1	0	120	30	ZHP	
123	15	5	1	1	1	0	1	1	1	0	0	1	0	0	0	1	0	1	0	1	1	1	1	1	1	1	1	0	1	1	1	0	120	30	ZHP	
124	15	5	1	1	1	0	1	1	1	1	1	0	0	0	0	1	0	1	0	1	1	1	1	1	1	1	1	0	1	0	0	1	120	30	ZHP	
125	15	5	1	1	1	0	1	1	1	0	1	0	0	0	0	1	0	1	0	1	1	1	1	1	1	1	1	0	1	1	0	1	120	30	ZHP	
126	15	5	1	1	1	0	1	1	1	1	0	0	0	0	0	1	0	1	0	1	1	1	1	1	1	1	1	0	1	0	1	1	120	30	ZHP	
127	15	5	1	1	1	0	1	1	1	0	0	0	0	0	0	1	0	1	0	1	1	1	1	1	1	1	1	0	1	1	1	1	120	30	ZHP	
128	15	5	1	1	1	0	1	0	1	1	1	1	0	0	0	1	0	1	0	1	1	1	1	1	1	1	1	1	1	0	0	0	120	30	ZHP	
129	15	5	1	1	1	0	1	0	1	0	1	1	0	0	0	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1	0	0	120	30	ZHP	
130	15	5	1	1	1	0	1	0	1	1	0	1	0	0	0	1	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	0	120	30	ZHP	
131	15	5	1	1	1	0	1	0	1	0	0	1	0	0	0	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0	120	30	ZHP	
132	15	5	1	1	1	0	1	0	1	1	1	0	0	0	0	1	0	1	0	1	1	1	1	1	1	1	1	1	1	0	0	1	120	30	ZHP	
133	15	5	1	1	1	0	1	0	1	0	1	0	0	0	0	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1	0	1	120	30	ZHP	
134	15	5	1	1	1	0	1	0	1	1	0	0	0	0	0	1	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	120	30	ZHP	
135	15	5	1	1	1	0	1	0	1	0	0	0	0	0	0	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	120	30	ZHP	
136	15	5	1	1	1	1	1	0	0	1	0	1	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	60	15	ZHP	
137	15	5	1	1	1	1	1	0	0	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	60	15	ZHP	
138	15	5	1	1	1	1	1	0	0	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	60	15	ZHP	
139	15	5	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	12	3	ZHP	
140	14	6	1	0	1	1	0	0	1	0	1	1	0	1	0	1	1	1	1	1	0	0	1	1	1	0	1	1	0	1	1	1	40	12	ZHP	

141	14	6	1	0	1	1	0	1	0	1	1	1	0	1	0	1	1	1	1	1	0	0	1	1	1	0	1	0	1	0	1	1	60	18	ZHP	
142	14	6	1	0	1	0	0	0	1	0	1	1	0	1	0	1	1	1	1	1	0	0	1	1	1	1	1	1	0	1	1	1	60	18	ZHP	
143	14	6	1	0	1	0	0	1	0	1	1	1	0	1	0	1	1	1	1	1	0	0	1	1	1	1	1	0	1	0	1	1	60	18	ZHP	
144	14	6	1	0	1	0	0	0	0	1	1	1	0	1	0	1	1	1	1	1	0	0	1	1	1	1	1	1	1	0	1	1	40	12	ZHP	
145	14	6	1	0	1	0	0	0	0	0	1	1	0	1	0	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	60	18	ZHP	
146	14	6	0	1	1	1	1	0	1	0	1	1	1	0	0	1	0	1	1	1	1	0	1	1	1	0	1	1	0	1	0	1	60	18	ZHP	
147	14	6	0	1	1	1	1	0	1	0	0	1	1	0	0	1	0	1	1	1	1	0	1	1	1	0	1	1	0	1	1	1	60	18	ZHP	
148	14	6	0	1	1	1	1	1	0	1	0	1	1	0	0	1	0	1	1	1	1	0	1	1	1	0	1	0	1	0	1	1	30	9	ZHP	
149	14	6	0	1	1	1	1	0	0	1	1	1	1	0	0	1	0	1	1	1	1	0	1	1	1	0	1	1	1	0	0	1	30	9	RVP	E9
150	14	6	0	1	1	1	1	0	0	1	0	1	1	0	0	1	0	1	1	1	1	0	1	1	1	0	1	1	1	0	1	1	60	18	ZHP	
151	14	6	0	1	1	0	1	1	1	1	1	1	1	0	0	1	0	1	1	1	1	0	1	1	1	1	1	0	0	0	0	1	30	9	ZHP	
152	14	6	0	1	1	0	1	0	1	1	1	1	1	0	0	1	0	1	1	1	1	0	1	1	1	1	1	1	0	0	0	1	60	18	ZHP	
153	14	6	0	1	1	0	1	0	1	1	0	1	1	0	0	1	0	1	1	1	1	0	1	1	1	1	1	1	0	0	1	1	30	9	ZHP	
154	14	6	0	1	1	0	1	1	0	1	1	1	1	0	0	1	0	1	1	1	1	0	1	1	1	1	1	0	1	0	0	1	120	36	ZHP	
155	14	6	0	1	1	0	1	1	0	1	0	1	1	0	0	1	0	1	1	1	1	0	1	1	1	1	1	0	1	0	1	1	120	36	ZHP	
156	14	6	0	1	1	0	1	0	0	1	1	1	1	0	0	1	0	1	1	1	1	0	1	1	1	1	1	1	1	0	0	1	120	36	ZHP	
157	14	6	0	1	1	0	1	0	0	0	1	1	1	0	0	1	0	1	1	1	1	0	1	1	1	1	1	1	1	1	0	1	60	18	ZHP	
158	14	6	0	1	1	0	1	0	0	1	0	1	1	0	0	1	0	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	120	36	ZHP	
159	14	6	0	1	1	0	1	0	0	0	0	1	1	0	0	1	0	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	60	18	ZHP	
160	14	6	0	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0	1	1	1	1	1	1	1	0	1	1	0	0	0	0	120	36	ZHP	
161	14	6	0	1	1	1	1	1	1	0	1	1	1	0	0	1	0	0	1	1	1	1	1	1	1	0	1	1	0	1	0	0	120	36	ZHP	
162	14	6	0	1	1	1	1	1	1	1	0	1	1	0	0	1	0	0	1	1	1	1	1	1	1	0	1	1	0	0	1	0	120	36	ZHP	
163	14	6	0	1	1	1	1	1	1	0	0	1	1	0	0	1	0	0	1	1	1	1	1	1	1	0	1	1	0	1	1	0	120	36	ZHP	
164	14	6	0	1	1	1	1	1	1	1	1	0	1	0	0	1	0	0	1	1	1	1	1	1	1	0	1	1	0	0	0	1	120	36	ZHP	
165	14	6	0	1	1	1	1	1	1	0	1	0	1	0	0	1	0	0	1	1	1	1	1	1	1	0	1	1	0	1	0	1	120	36	ZHP	
166	14	6	0	1	1	1	1	1	1	1	0	0	1	0	0	1	0	0	1	1	1	1	1	1	1	0	1	1	0	0	1	1	120	36	ZHP	
167	14	6	0	1	1	1	1	1	1	0	0	0	1	0	0	1	0	0	1	1	1	1	1	1	1	0	1	1	0	1	1	1	120	36	ZHP	
168	14	6	0	1	1	1	1	1	0	1	1	1	1	0	0	1	0	0	1	1	1	1	1	1	1	0	1	1	1	0	0	0	120	36	ZHP	
169	14	6	0	1	1	1	1	1	0	0	1	1	1	0	0	1	0	0	1	1	1	1	1	1	1	0	1	1	1	1	0	0	120	36	ZHP	
170	14	6	0	1	1	1	1	1	0	1	0	1	1	0	0	1	0	0	1	1	1	1	1	1	1	0	1	1	1	0	1	0	120	36	ZHP	
171	14	6	0	1	1	1	1	1	0	0	0	1	1	0	0	1	0	0	1	1	1	1	1	1	1	0	1	1	1	1	1	0	120	36	ZHP	
172	14	6	0	1	1	1	1	1	0	1	1	0	1	0	0	1	0	0	1	1	1	1	1	1	1	0	1	1	1	0	0	1	120	36	ZHP	
173	14	6	0	1	1	1	1	1	0	0	1	0	1	0	0	1	0	0	1	1	1	1	1	1	1	0	1	1	1	1	0	1	120	36	ZHP	
174	14	6	0	1	1	1	1	1	0	1	0	0	1	0	0	1	0	0	1	1	1	1	1	1	1	0	1	1	1	0	1	1	120	36	ZHP	
175	14	6	0	1	1	1	1	1	0	0	0	0	1	0	0	1	0	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	120	36	ZHP	
176	14	6	0	1	1	0	1	1	1	1	1	1	1	0	0	1	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	120	36	ZHP	
177	14	6	0	1	1	0	1	1	1	0	1	1	1	0	0	1	0	0	1	1	1	1	1	1	1	1	1	1	0	1	0	0	120	36	ZHP	
178	14	6	0	1	1	0	1	1	1	1	0	1	1	0	0	1	0	0	1	1	1	1	1	1	1	1	1	1	0	0	1	0	120	36	ZHP	

179	14	6	0	1	1	0	1	1	1	0	0	1	1	0	0	1	0	0	1	1	1	1	1	1	1	1	1	1	0	1	1	0	120	36	ZHP
180	14	6	0	1	1	0	1	1	1	1	1	0	1	0	0	1	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	1	120	36	ZHP
181	14	6	0	1	1	0	1	1	1	0	1	0	1	0	0	1	0	0	1	1	1	1	1	1	1	1	1	1	0	1	0	1	120	36	ZHP
182	14	6	0	1	1	0	1	1	1	1	0	0	1	0	0	1	0	0	1	1	1	1	1	1	1	1	1	1	0	0	1	1	120	36	ZHP
183	14	6	0	1	1	0	1	1	1	0	0	0	1	0	0	1	0	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	120	36	ZHP
184	14	6	0	1	1	0	1	1	0	1	1	1	1	0	0	1	0	0	1	1	1	1	1	1	1	1	1	1	1	0	0	0	120	36	ZHP
185	14	6	0	1	1	0	1	1	0	0	1	1	1	0	0	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	120	36	ZHP
186	14	6	0	1	1	0	1	1	0	1	0	1	1	0	0	1	0	0	1	1	1	1	1	1	1	1	1	1	1	0	1	0	120	36	ZHP
187	14	6	0	1	1	0	1	1	0	0	0	1	1	0	0	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	120	36	ZHP
188	14	6	0	1	1	0	1	1	0	1	1	0	1	0	0	1	0	0	1	1	1	1	1	1	1	1	1	1	1	0	0	1	120	36	ZHP
189	14	6	0	1	1	0	1	1	0	0	1	0	1	0	0	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	120	36	ZHP
190	14	6	0	1	1	0	1	1	0	1	0	0	1	0	0	1	0	0	1	1	1	1	1	1	1	1	1	1	1	0	1	1	120	36	ZHP
191	14	6	0	1	1	0	1	1	0	0	0	0	1	0	0	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	120	36	ZHP
192	14	6	1	1	1	1	0	1	1	1	1	1	0	0	0	1	1	1	1	1	1	0	1	1	1	0	1	0	0	0	0	1	120	36	ZHP
193	14	6	1	1	1	1	0	1	1	0	1	1	0	0	0	1	1	1	1	1	1	0	1	1	1	0	1	0	0	1	0	1	120	36	ZHP
194	14	6	1	1	1	1	0	1	1	1	0	1	0	0	0	1	1	1	1	1	1	0	1	1	1	0	1	0	0	0	1	1	120	36	ZHP
195	14	6	1	1	1	1	0	1	1	0	0	1	0	0	0	1	1	1	1	1	1	0	1	1	1	0	1	0	0	1	1	1	120	36	ZHP
196	14	6	1	1	1	1	0	0	1	1	1	1	0	0	0	1	1	1	1	1	1	0	1	1	1	0	1	1	0	0	0	1	120	36	ZHP
197	14	6	1	1	1	1	0	0	1	0	1	1	0	0	0	1	1	1	1	1	1	0	1	1	1	0	1	1	0	1	0	1	120	36	ZHP
198	14	6	1	1	1	1	0	0	1	1	0	1	0	0	0	1	1	1	1	1	1	0	1	1	1	0	1	1	0	0	1	1	120	36	ZHP
199	14	6	1	1	1	1	0	0	1	0	0	1	0	0	0	1	1	1	1	1	1	0	1	1	1	0	1	1	0	1	1	1	120	36	ZHP
200	14	6	1	1	1	1	0	1	0	1	1	1	0	0	0	1	1	1	1	1	1	0	1	1	1	0	1	0	1	0	0	1	120	36	ZHP
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202	14	6	1	1	1	1	0	1	0	1	0	1	0	0	0	1	1	1	1	1	1	0	1	1	1	0	1	0	1	0	1	1	120	36	ZHP
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204	14	6	1	1	1	1	0	0	0	1	1	1	0	0	0	1	1	1	1	1	1	0	1	1	1	0	1	1	1	0	0	1	120	36	ZHP
205	14	6	1	1	1	1	0	0	0	0	1	1	0	0	0	1	1	1	1	1	1	0	1	1	1	0	1	1	1	1	0	1	120	36	ZHP
206	14	6	1	1	1	1	0	0	0	1	0	1	0	0	0	1	1	1	1	1	1	0	1	1	1	0	1	1	1	0	1	1	120	36	ZHP
207	14	6	1	1	1	1	0	0	0	0	0	1	0	0	0	1	1	1	1	1	1	0	1	1	1	0	1	1	1	1	1	1	120	36	ZHP
208	14	6	1	1	1	0	0	1	1	1	1	1	0	0	0	1	1	1	1	1	1	0	1	1	1	1	1	0	0	0	0	1	120	36	ZHP
209	14	6	1	1	1	0	0	1	1	0	1	1	0	0	0	1	1	1	1	1	1	0	1	1	1	1	1	0	0	1	0	1	120	36	ZHP
210	14	6	1	1	1	0	0	1	1	1	0	1	0	0	0	1	1	1	1	1	1	0	1	1	1	1	1	0	0	0	1	1	120	36	ZHP
211	14	6	1	1	1	0	0	1	1	0	0	1	0	0	0	1	1	1	1	1	1	0	1	1	1	1	1	0	0	1	1	1	120	36	ZHP
212	14	6	1	1	1	0	0	0	1	1	1	1	0	0	0	1	1	1	1	1	1	0	1	1	1	1	1	1	0	0	0	1	120	36	ZHP
213	14	6	1	1	1	0	0	0	1	0	1	1	0	0	0	1	1	1	1	1	1	0	1	1	1	1	1	1	0	1	0	1	120	36	ZHP
214	14	6	1	1	1	0	0	0	1	1	0	1	0	0	0	1	1	1	1	1	1	0	1	1	1	1	1	1	0	0	1	1	120	36	ZHP
215	14	6	1	1	1	0	0	0	1	0	0	1	0	0	0	1	1	1	1	1	1	0	1	1	1	1	1	1	0	1	1	1	120	36	ZHP
216	14	6	1	1	1	0	0	1	0	1	1	1	0	0	0	1	1	1	1	1	1	0	1	1	1	1	1	0	1	0	0	1	120	36	ZHP

217	14	6	1	1	1	0	0	1	0	0	1	1	0	0	0	1	1	1	1	1	1	0	1	1	1	1	1	0	1	1	0	1	120	36	ZHP	
218	14	6	1	1	1	0	0	1	0	1	0	1	0	0	0	1	1	1	1	1	1	0	1	1	1	1	1	0	1	0	1	1	120	36	ZHP	
219	14	6	1	1	1	0	0	1	0	0	0	1	0	0	0	1	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	120	36	ZHP	
220	14	6	1	1	1	0	0	0	0	1	1	1	0	0	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	0	1	120	36	ZHP	
221	14	6	1	1	1	0	0	0	0	0	1	1	0	0	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0	1	120	36	ZHP	
222	14	6	1	1	1	0	0	0	0	1	0	1	0	0	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	120	36	ZHP	
223	14	6	1	1	1	0	0	0	0	0	0	1	0	0	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	120	36	ZHP	
224	14	6	1	1	1	1	0	1	1	1	1	1	0	0	0	1	1	0	1	1	1	1	1	1	1	0	1	1	0	0	0	0	60	18	ZHP	
225	14	6	1	1	1	1	0	1	1	0	1	1	0	0	0	1	1	0	1	1	1	1	1	1	1	0	1	1	0	1	0	0	60	18	ZHP	
226	14	6	1	1	1	1	0	1	1	1	1	0	0	0	0	1	1	0	1	1	1	1	1	1	1	0	1	1	0	0	0	1	60	18	ZHP	
227	14	6	1	1	1	1	0	1	1	0	1	0	0	0	0	1	1	0	1	1	1	1	1	1	1	0	1	1	0	1	0	1	60	18	ZHP	
228	14	6	1	1	1	1	0	1	0	1	0	0	0	0	0	1	1	0	1	1	1	1	1	1	1	0	1	1	1	0	1	1	120	36	ZHP	
229	14	6	1	1	1	1	0	1	0	0	0	0	0	0	0	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	120	36	ZHP	
230	14	6	1	1	1	0	0	1	1	1	1	1	0	0	0	1	1	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	120	36	ZHP	
231	14	6	1	1	1	0	0	1	1	0	1	1	0	0	0	1	1	0	1	1	1	1	1	1	1	1	1	1	0	1	0	0	120	36	ZHP	
232	14	6	1	1	1	0	0	1	1	1	0	1	0	0	0	1	1	0	1	1	1	1	1	1	1	1	1	1	0	0	1	0	60	18	ZHP	
233	14	6	1	1	1	0	0	1	1	0	0	1	0	0	0	1	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	0	60	18	ZHP	
234	14	6	1	1	1	0	0	1	1	1	1	0	0	0	0	1	1	0	1	1	1	1	1	1	1	1	1	1	0	0	0	1	120	36	ZHP	
235	14	6	1	1	1	0	0	1	1	0	1	0	0	0	0	1	1	0	1	1	1	1	1	1	1	1	1	1	0	1	0	1	120	36	ZHP	
236	14	6	1	1	1	0	0	1	1	1	0	0	0	0	0	1	1	0	1	1	1	1	1	1	1	1	1	1	0	0	1	1	60	18	RVP	X18
237	14	6	1	1	1	0	0	1	1	0	0	0	0	0	0	1	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	60	18	ZHP	
238	14	6	1	1	1	0	0	1	0	1	0	1	0	0	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	0	1	0	120	36	ZHP	
239	14	6	1	1	1	0	0	1	0	0	0	1	0	0	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	120	36	ZHP	
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243	14	6	1	1	1	0	0	1	0	0	0	0	0	0	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	120	36	ZHP	
244	14	6	1	1	1	1	0	1	1	0	1	0	0	0	0	1	1	1	0	1	1	1	1	1	1	0	1	0	1	1	0	1	20	6	ZHP	
245	14	6	1	1	1	1	0	0	1	0	0	0	0	0	0	1	1	1	0	1	1	1	1	1	1	0	1	1	1	1	1	1	60	18	ZHP	
246	14	6	1	1	1	0	0	1	1	1	1	1	0	0	0	1	1	1	0	1	1	1	1	1	1	1	1	0	1	0	0	0	60	18	ZHP	
247	14	6	1	1	1	0	0	1	1	1	1	0	0	0	0	1	1	1	0	1	1	1	1	1	1	1	1	0	1	0	0	1	60	18	ZHP	
248	14	6	1	1	1	0	0	0	1	0	1	1	0	0	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	0	0	20	6	ZHP	
249	14	6	1	1	1	0	0	0	1	1	0	1	0	0	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	0	1	0	120	36	ZHP	
250	14	6	1	1	1	0	0	0	1	1	1	0	0	0	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	0	0	1	60	18	ZHP	
251	14	6	1	1	1	0	0	0	1	0	1	0	0	0	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	0	1	120	36	ZHP	
252	14	6	1	1	1	0	0	0	1	1	0	0	0	0	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	60	18	ZHP	
253	14	6	1	1	1	0	0	0	1	0	0	0	0	0	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	60	18	ZHP	
254	14	6	1	1	1	0	1	1	1	1	1	1	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	60	18	ZHP	

255	14	6	1	1	1	0	1	1	1	1	0	1	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	60	18	ZHP
256	14	6	1	1	1	0	1	1	1	1	1	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	120	36	ZHP
257	14	6	1	1	1	0	1	1	1	0	1	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	0	0	1	0	1	60	18	ZHP
258	14	6	1	1	1	0	1	1	1	1	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	0	0	0	1	1	120	36	ZHP
259	14	6	1	1	1	0	1	1	1	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	60	18	ZHP
260	14	6	1	1	1	0	1	1	0	1	1	1	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	120	36	ZHP
261	14	6	1	1	1	0	1	1	0	0	1	1	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	120	36	ZHP
262	14	6	1	1	1	0	1	1	0	1	0	1	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	0	1	0	120	36	ZHP
263	14	6	1	1	1	0	1	1	0	0	0	1	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	0	120	36	ZHP
264	14	6	1	1	1	0	1	1	0	1	1	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	120	36	ZHP
265	14	6	1	1	1	0	1	1	0	0	1	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	120	36	ZHP
266	14	6	1	1	1	0	1	1	0	1	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	0	1	1	120	36	ZHP
267	14	6	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	120	36	ZHP
268	14	6	1	1	1	0	1	0	0	1	1	1	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	60	18	ZHP
269	14	6	1	1	1	0	1	0	0	1	0	1	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	60	18	ZHP
270	14	6	1	1	1	0	1	0	0	1	1	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	120	36	ZHP
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272	14	6	1	1	1	0	1	0	0	1	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	120	36	ZHP
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274	13	7	1	0	1	1	1	0	0	1	1	1	0	1	0	1	1	1	1	1	1	0	1	1	1	0	0	1	1	0	0	1	40	14	ZHP
275	13	7	1	0	1	1	1	0	0	1	0	1	0	1	0	1	1	1	1	1	1	0	1	1	1	0	0	1	1	0	1	1	40	14	ZHP
276	13	7	1	0	1	0	1	1	1	1	1	1	0	1	0	1	1	1	1	1	1	0	1	1	1	1	0	0	0	0	0	1	40	14	ZHP
277	13	7	1	0	1	0	1	1	1	1	0	1	0	1	0	1	1	1	1	1	1	0	1	1	1	1	0	0	0	0	1	1	40	14	ZHP
278	13	7	1	0	1	0	1	1	0	1	1	1	0	1	0	1	1	1	1	1	1	0	1	1	1	1	0	0	1	0	0	1	120	42	ZHP
279	13	7	1	0	1	0	1	1	0	1	0	1	0	1	0	1	1	1	1	1	1	0	1	1	1	1	0	0	1	0	1	1	120	42	ZHP
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282	13	7	1	0	1	1	0	0	1	0	1	1	0	1	0	1	1	1	1	1	1	0	1	1	1	0	1	1	0	1	0	1	120	42	ZHP
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293	13	7	1	0	1	0	0	1	0	1	0	1	0	1	0	1	1	1	1	1	1	0	1	1	1	1	1	0	1	0	1	1	120	42	ZHP
294	13	7	1	0	1	0	0	0	0	1	1	1	0	1	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	0	1	120	42	ZHP
295	13	7	1	0	1	0	0	0	0	0	1	1	0	1	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0	1	120	42	ZHP
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297	13	7	1	0	1	0	0	0	0	0	0	1	0	1	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	120	42	ZHP
298	13	7	1	0	1	1	1	1	1	1	0	0	0	1	0	1	1	1	0	1	1	1	1	1	1	0	0	0	1	0	1	1	20	7	ZHP
299	13	7	1	0	1	1	0	1	1	1	0	1	0	1	0	1	1	1	0	1	1	1	1	1	1	0	1	0	1	0	1	0	60	21	ZHP
300	13	7	1	0	1	1	0	1	1	0	1	0	0	1	0	1	1	1	0	1	1	1	1	1	1	0	1	0	1	1	0	1	40	14	ZHP
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302	13	7	1	0	1	1	0	1	1	0	0	0	0	1	0	1	1	1	0	1	1	1	1	1	1	0	1	0	1	1	1	1	120	42	ZHP
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305	13	7	1	0	1	0	0	1	1	1	1	1	0	1	0	1	1	1	0	1	1	1	1	1	1	1	1	0	1	0	0	0	60	21	ZHP
306	13	7	1	0	1	0	0	1	1	1	1	0	0	1	0	1	1	1	0	1	1	1	1	1	1	1	1	0	1	0	0	1	120	42	ZHP
307	13	7	1	0	1	0	0	1	1	1	0	0	0	1	0	1	1	1	0	1	1	1	1	1	1	1	1	0	1	0	1	1	60	21	ZHP
308	13	7	1	0	1	0	0	0	1	0	1	1	0	1	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	0	0	20	7	ZHP
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322	13	7	0	1	1	0	1	1	0	1	0	1	1	0	0	1	1	0	1	1	1	1	1	1	1	1	0	1	1	0	1	0	120	42	ZHP
323	13	7	0	1	1	0	1	1	0	0	0	0	1	0	0	1	1	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1	120	42	ZHP
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331	13	7	0	1	1	1	0	1	0	1	1	0	1	0	0	1	1	0	1	1	1	1	1	1	1	0	1	1	1	0	0	1	60	21	ZHP	
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368	13	7	0	1	1	0	1	0	1	1	1	1	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	120	42	ZHP	

369	13	7	0	1	1	0	1	0	1	1	0	1	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	60	21	ZHP
370	13	7	0	1	1	0	1	0	1	1	1	0	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	120	42	ZHP
371	13	7	0	1	1	0	1	0	1	1	0	0	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	60	21	ZHP
372	13	7	0	1	1	0	1	1	0	1	1	1	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	120	42	ZHP
373	13	7	0	1	1	0	1	1	0	0	1	1	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	60	21	ZHP
374	13	7	0	1	1	0	1	1	0	1	0	1	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	0	1	0	120	42	ZHP
375	13	7	0	1	1	0	1	1	0	1	1	0	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	120	42	ZHP
376	13	7	0	1	1	0	1	1	0	0	1	0	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	60	21	ZHP
377	13	7	0	1	1	0	1	1	0	1	0	0	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	0	1	1	120	42	ZHP
378	13	7	0	1	1	0	1	0	0	1	1	1	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	120	42	ZHP
379	13	7	0	1	1	0	1	0	0	0	1	1	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	120	42	ZHP
380	13	7	0	1	1	0	1	0	0	1	0	1	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	120	42	ZHP
381	13	7	0	1	1	0	1	0	0	0	0	1	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	60	21	ZHP
382	13	7	0	1	1	0	1	0	0	1	1	0	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	120	42	ZHP
383	13	7	0	1	1	0	1	0	0	0	1	0	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	120	42	ZHP
384	13	7	0	1	1	0	1	0	0	1	0	0	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	120	42	ZHP
385	13	7	0	1	1	0	1	0	0	0	0	0	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	60	21	ZHP
386	13	7	1	1	1	1	0	1	0	1	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1	0	1	0	1	0	0	0	120	42	ZHP
387	13	7	1	1	1	1	0	1	0	0	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1	0	1	0	1	1	0	0	120	42	ZHP
388	13	7	1	1	1	1	0	1	0	1	0	1	0	0	0	1	1	1	1	1	1	1	1	1	1	0	1	0	1	0	1	0	120	42	ZHP
389	13	7	1	1	1	1	0	1	0	0	0	1	0	0	0	1	1	1	1	1	1	1	1	1	1	0	1	0	1	1	1	0	120	42	ZHP
390	13	7	1	1	1	1	0	1	0	1	1	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	1	0	1	0	0	1	120	42	ZHP
391	13	7	1	1	1	1	0	1	0	0	1	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	1	0	1	1	0	1	120	42	ZHP
392	13	7	1	1	1	1	0	1	0	1	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	1	0	1	0	1	1	120	42	ZHP
393	13	7	1	1	1	1	0	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	1	0	1	1	1	1	120	42	ZHP
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395	13	7	1	1	1	1	0	0	0	0	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	0	120	42	ZHP
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397	13	7	1	1	1	1	0	0	0	0	0	1	0	0	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	0	120	42	ZHP
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399	13	7	1	1	1	1	0	0	0	0	1	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	120	42	ZHP
400	13	7	1	1	1	1	0	0	0	1	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	0	1	1	120	42	ZHP
401	13	7	1	1	1	1	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	120	42	ZHP
402	13	7	1	1	1	0	0	1	1	1	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	60	21	ZHP
403	13	7	1	1	1	0	0	1	1	1	1	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	120	42	ZHP
404	13	7	1	1	1	0	0	1	1	1	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	1	60	21	ZHP
405	13	7	1	1	1	0	0	0	1	1	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	120	42	ZHP
406	13	7	1	1	1	0	0	0	1	0	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	60	21	ZHP

407	13	7	1	1	1	0	0	0	1	1	0	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	120	42	ZHP	
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434	12	8	1	0	1	1	1	1	0	1	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	1	1	60	24	ZHP	
435	12	8	1	0	1	1	1	0	0	1	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1	0	0	1	1	0	0	0	120	48	ZHP	
436	12	8	1	0	1	1	1	0	0	0	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	0	0	60	24	RVP	X24
437	12	8	1	0	1	1	1	0	0	1	0	1	0	1	0	1	1	1	1	1	1	1	1	1	1	0	0	1	1	0	1	0	120	48	ZHP	
438	12	8	1	0	1	1	1	0	0	1	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	0	0	1	1	0	0	1	120	48	ZHP	
439	12	8	1	0	1	1	1	0	0	0	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	0	1	120	48	ZHP	
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441	12	8	1	0	1	1	1	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	60	24	ZHP	
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444	12	8	1	0	1	1	0	1	1	1	0	1	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	1	0	120	48	ZHP	

445	12	8	1	0	1	1	0	1	1	0	0	1	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	1	0	120	48	ZHP
446	12	8	1	0	1	1	0	1	1	1	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0	1	120	48	ZHP
447	12	8	1	0	1	1	0	1	1	0	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	0	1	120	48	ZHP
448	12	8	1	0	1	1	0	1	1	1	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	1	1	120	48	ZHP
449	12	8	1	0	1	1	0	1	1	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	1	1	120	48	ZHP
450	12	8	1	0	1	1	0	0	1	1	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	120	48	ZHP
451	12	8	1	0	1	1	0	0	1	0	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	0	0	120	48	ZHP
452	12	8	1	0	1	1	0	0	1	1	0	1	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	1	0	120	48	ZHP
453	12	8	1	0	1	1	0	0	1	0	0	1	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	0	120	48	ZHP
454	12	8	1	0	1	1	0	0	1	1	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	1	120	48	ZHP
455	12	8	1	0	1	1	0	0	1	0	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	0	1	120	48	ZHP
456	12	8	1	0	1	1	0	0	1	1	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	1	1	120	48	ZHP
457	12	8	1	0	1	1	0	0	1	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	1	120	48	ZHP
458	12	8	1	0	1	1	0	1	0	1	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	0	1	0	0	0	120	48	ZHP
459	12	8	1	0	1	1	0	1	0	0	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	0	1	1	0	0	120	48	ZHP
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461	12	8	1	0	1	1	0	1	0	0	0	1	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	0	1	1	1	0	120	48	ZHP
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463	12	8	1	0	1	1	0	1	0	0	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	0	1	1	0	1	120	48	ZHP
464	12	8	1	0	1	1	0	1	0	1	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	0	1	0	1	1	120	48	ZHP
465	12	8	1	0	1	1	0	1	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	0	1	1	1	1	120	48	ZHP
466	12	8	1	0	1	1	0	0	0	1	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	0	0	0	120	48	ZHP
467	12	8	1	0	1	1	0	0	0	0	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	0	120	48	ZHP
468	12	8	1	0	1	1	0	0	0	1	0	1	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	0	1	0	120	48	ZHP
469	12	8	1	0	1	1	0	0	0	0	0	1	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	0	120	48	ZHP
470	12	8	1	0	1	1	0	0	0	1	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	0	0	1	120	48	ZHP
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472	12	8	1	0	1	1	0	0	0	1	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	0	1	1	120	48	ZHP
473	12	8	1	0	1	1	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	120	48	ZHP
474	12	8	1	0	1	0	0	1	1	1	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	60	24	ZHP
475	12	8	1	0	1	0	0	1	1	1	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	120	48	ZHP
476	12	8	1	0	1	0	0	1	1	1	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	1	60	24	ZHP
477	12	8	1	0	1	0	0	0	1	1	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	120	48	ZHP
478	12	8	1	0	1	0	0	0	1	0	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	60	24	ZHP
479	12	8	1	0	1	0	0	0	1	1	0	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	120	48	ZHP
480	12	8	1	0	1	0	0	0	1	1	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	120	48	ZHP
481	12	8	1	0	1	0	0	0	1	0	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1	120	48	ZHP
482	12	8	1	0	1	0	0	0	1	1	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	120	48	ZHP

483	12	8	1	0	1	0	0	0	1	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	60	24	ZHP
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493	12	8	1	0	1	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	60	24	ZHP
494	12	8	0	1	1	0	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	30	12	ZHP
495	12	8	0	1	1	0	1	0	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0	60	24	ZHP
496	12	8	0	1	1	0	1	0	1	1	0	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	0	30	12	ZHP
497	12	8	0	1	1	0	1	0	0	0	1	0	1	0	0	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	0	1	60	24	ZHP
498	12	8	0	1	1	0	1	0	0	0	0	0	1	0	0	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	60	24	ZHP
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500	12	8	0	1	1	1	0	1	1	1	0	1	1	0	0	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	1	0	120	48	ZHP
501	12	8	0	1	1	1	0	1	1	0	1	0	1	0	0	1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	0	1	60	24	ZHP
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506	12	8	0	1	1	1	0	0	1	0	1	0	1	0	0	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	0	1	120	48	ZHP
507	12	8	0	1	1	1	0	0	1	0	0	0	1	0	0	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	1	60	24	ZHP
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509	12	8	0	1	1	1	0	1	0	1	1	0	1	0	0	1	1	1	1	1	1	1	1	1	1	0	1	0	1	0	0	1	60	24	ZHP
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546	11	9	0	0	1	0	1	0	1	0	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1	0	1	120	54	ZHP	
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559	11	9	0	0	1	1	0	0	1	0	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	0	120	54	ZHP	
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583	11	9	0	0	1	0	0	0	0	0	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	60	27	ZHP	
584	11	9	0	0	1	0	0	0	0	1	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	120	54	ZHP	
585	11	9	0	0	1	0	0	0	0	0	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	120	54	ZHP	
586	11	9	0	0	1	0	0	0	0	1	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	120	54	RVP	L54
587	11	9	0	0	1	0	0	0	0	0	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	120	54	ZHP	
588	11	9	0	0	1	0	0	0	0	1	0	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	60	27	ZHP	
589	11	9	0	0	1	0	0	0	0	0	0	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	60	27	ZHP	
590	10	10	1	0	0	1	0	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	0	0	1	0	20	10	ZHP	
591	10	10	0	0	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	1	40	20	ZHP	
592	10	10	0	0	0	1	1	0	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	1	1	1	60	30	ZHP	
593	10	10	0	0	0	1	1	1	0	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	1	1	20	10	ZHP	
594	10	10	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	60	30	ZHP	
595	10	10	0	0	0	1	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	1	0	60	30	ZHP	
596	10	10	0	0	0	1	0	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	0	1	60	30	ZHP	

597	10	10	0	0	0	1	0	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	1	1	20	10	ZHP	
598	10	10	0	0	0	1	0	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1	0	1	0	60	30	ZHP	
599	10	10	0	0	0	1	0	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1	1	0	1	40	20	ZHP	
600	10	10	0	0	0	1	0	1	0	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1	0	1	1	120	60	ZHP	
601	10	10	0	0	0	1	0	1	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1	1	1	1	120	60	ZHP	
602	10	10	0	0	0	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	60	30	ZHP	
603	10	10	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	12	6	ZHP	
604	10	10	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	60	30	ZHP	
605	10	10	0	0	0	0	0	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	60	30	ZHP	
606	10	10	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	60	30	ZHP	
607	10	10	0	0	0	0	0	0	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	20	10	RVP	C10
608	10	10	0	0	0	0	0	0	0	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	60	30	RVP	T30
609	10	10	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	12	6	RVP	F6

DE2

The colour scheme used here is taken from the Pyraminx Chrystals sold by Mefferts.
The list of all HPs contains 120714 lines. Therefore only the RVPs are enumerated.

Index	Sides	Slices	Sides															Slices															Sides															Count	perTurn		Piece
			Yellow Red	Yellow Marine	Yellow Rose	Yellow Lime	Yellow Orange	Red Marine	Marine Rose	Rose Lime	Lime Orange	Orange Red	Red DGree	Marine Cyan	Rose Brown	Lime Blue	Orange Purple	Yellow Red	Yellow Marine	Yellow Rose	Yellow Lime	Yellow Orange	Red Marine	Marine Rose	Rose Lime	Lime Orange	Orange Red	Red DGree	Marine Cyan	Rose Brown	Lime Blue	Orange Purple	Brown White	Blue White	Purple White	Green White	Cyan White	Brown Blue	Blue Purple	Purple DGreen	DGreen Cyan	Cyan Brown	Lime Brown	Orange Blue	Red Purple	Marine DGreen	Rose Cyan				
1	30	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	RVP	O
2	29	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	30	1	RVP	E1
3	28	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	60	4	RVP	X4
4	27	3	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	20	2	RVP	C2
5	27	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	0	60	6	RVP	T6
6	26	4	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	1	1	1	1	1	1	1	1	0	1	1	1	1	0	120	16	RVP	L16
7	25	5	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	0	0	0	1	0	0	0	0	1	0	0	1	0	1	0	1	1	1	0	1	1	1	1	0	1	1	1	1	0	30	5	RVP	E5
8	26	4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	0	0	0	1	1	0	0	0	0	1	1	1	1	1	0	1	1	1	0	0	1	1	1	1	0	60	8	RVP	X8
9	25	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	12	2	RVP	F2
10	25	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	1	1	0	0	0	0	1	0	1	1	1	0	1	1	1	0	0	1	1	1	1	0	60	10	RVP	X10
11	24	6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1	1	1	1	1	120	24	RVP	L24
12	23	7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	1	1	1	1	60	14	RVP	X14
13	23	7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	1	1	1	1	0	1	1	1	60	14	RVP	W14
14	22	8	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	120	32	RVP	L32a
15	24	6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	60	12	RVP	X12
16	21	9	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	0	0	0	1	0	0	1	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	20	6	RVP	C6
17	23	7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	60	14	RVP	T14
18	22	8	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	60	16	RVP	X16
19	22	8	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1	1	1	120	32	RVP	L32b
20	21	9	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1	1	1	1	0	1	1	1	30	9	RVP	E9
21	21	9	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1	1	1	120	36	RVP	L36
22	20	10	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	1	1	1	0	1	1	1	60	20	RVP	X20
23	20	10	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1	1	1	120	40	RVP	L40a
24	21	9	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	60	18	RVP	T18
25	19	11	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	1	1	1	0	1	1	1	60	22	RVP	W22
26	20	10	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	12	4	RVP	F4
27	18	12	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	0	0	1	1	20	8	RVP	C8
28	20	10	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	1	1	120	40	RVP	L40b
29	19	11	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	1	0	1	0	1	1	1	60	22	RVP	T22
30	18	12	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	0	1	0	1	0	1	1	0	0	0	0	0	0	0	0	1	0	1	0	1	1	1	120	48	RVP	L48
31	17	13	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	0	1	1	1	0	1	1	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	30	13	RVP	E13
32	19	11	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	1	0	1	0	1	1	1	120	44	RVP	L44a
33	19	11	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	120	44	RVP	L44b
34	18	12	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	60	24	RVP	X24
35	18	12	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	60	24	RVP	T24

36	17	13	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	120	52	RVP	L52a
37	17	13	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	0	1	0	1	1	1	1	0	0	0	0	0	0	0	0	1	0	1	0	0	1	1	120	52	RVP	L52b
38	16	14	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	60	28	RVP	X28
39	16	14	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	60	28	RVP	T28
40	16	14	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	60	28	RVP	W28
41	15	15	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	120	60	RVP	L60