Arabic Calendar Cube Design

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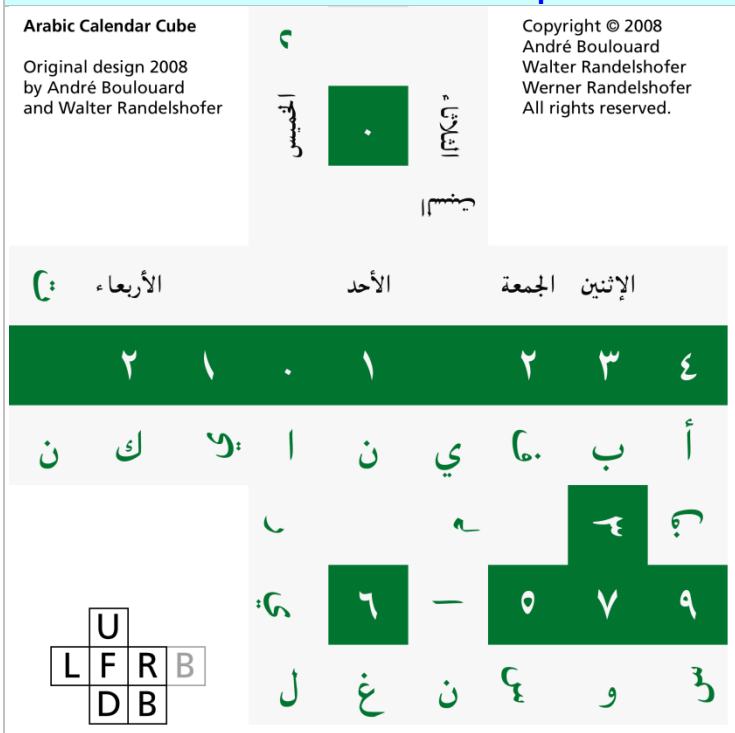
WebSites	http://www.mementoslangues.fr/	http://www.randelshofer.ch/

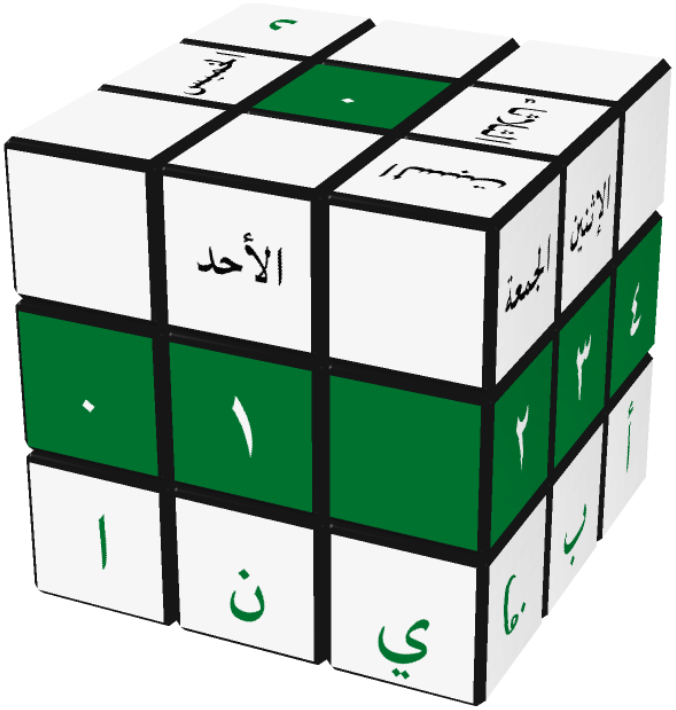
Introduction

An **Arabic Calendar Cube** is a 3x3x3 **Rubik's Cube** used as an **Arabic Calendar**. Calendars can be **Perpetual** (without any current year display) or **Yearly** (with current year display). They can also be *localized*, *customized* or *personalized* by laying down some user-defined information on *reserved* cubies.

Virtual Perpetual Arabic Calendar Cube – Western

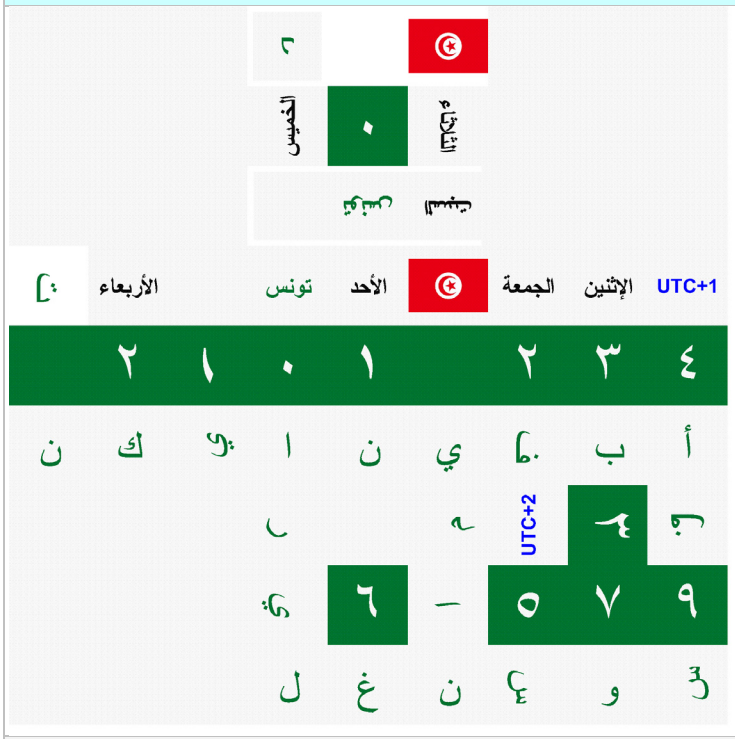


Arabic Calendar Cube Texture – Western



Arabic Calendar Cube – Western

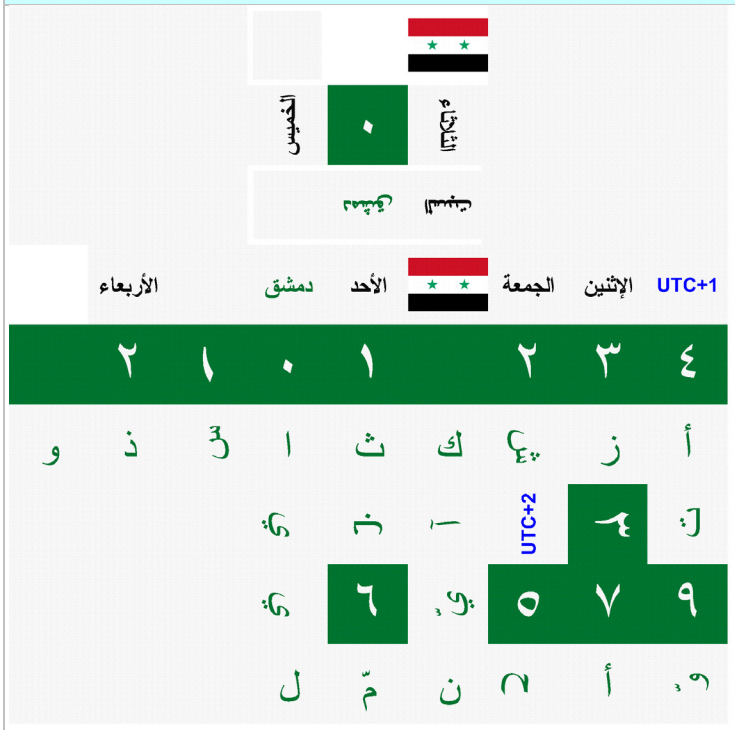
Localized Arabic Calendar Cube – Western (Tunis)



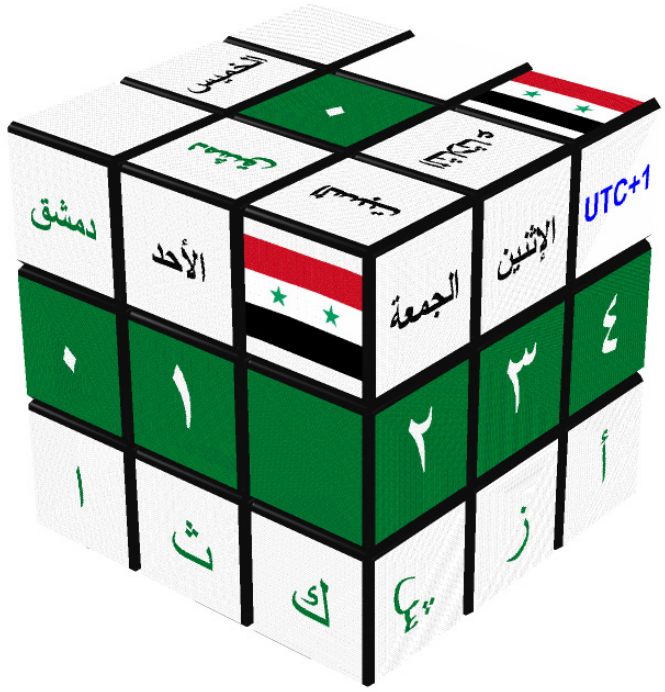
Localized Arabic Calendar Cube Texture – TUNIS

Localized Arabic Calendar Cube – TUNIS

Localized Arabic Calendar Cube – Syriac (Damascus)

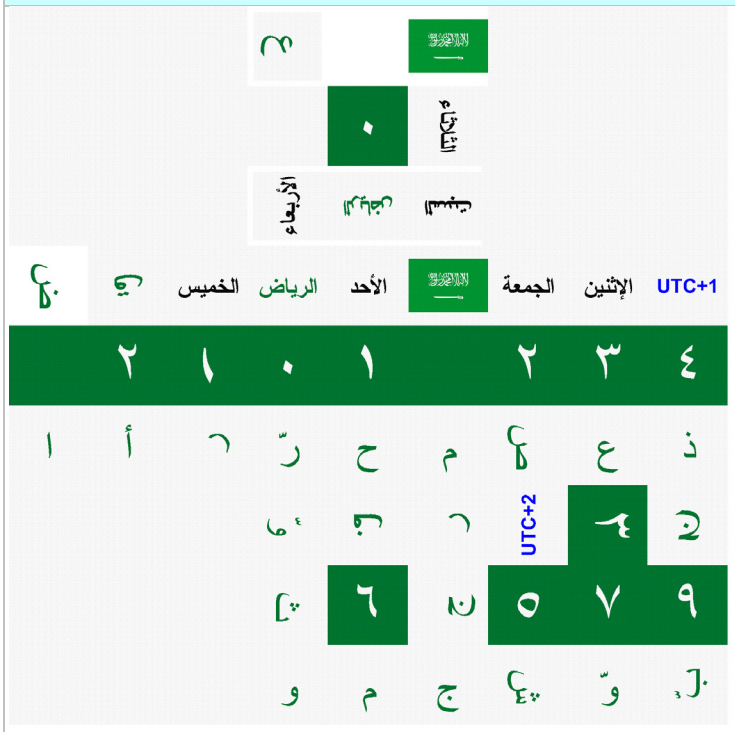


Localized Arabic Calendar Cube Texture – DAMASCUS



Localized Arabic Calendar Cube – DAMASCUS

Localized Arabic Calendar Cube – Hegirian (Riyadh)



Localized Arabic Calendar Cube Texture – RIYADH

Localized Arabic Calendar Cube – RIYADH

The 3 Main Types of Arabic Calendars

Western	Syriac	Muslim
Gregorian	Gregorian	Hegirian
Solar	Solar	Lunar
Western Countries	Middle- and Far-Eastern Countries	Eastern and Western Countries

Arabic Language – Useful Links

http://en.wikipedia.org/wiki/Arabic_alphabet	http://en.wikipedia.org/wiki/Arabic_language
http://en.wikipedia.org/wiki/Gregorian_calendar	http://en.wikipedia.org/wiki/Islamic_calendar

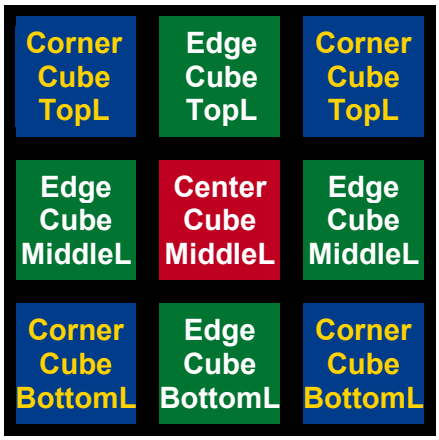
There are **Virtual Cubes** that can be *virtually* rotated and twisted on a computer screen and **Real Cubes** that can only be *physically* rotated and twisted by hand. A **Texture** is laid down on a Virtual Cube whereas real **Stickers** are stuck down on a Real Cube. An Arabic Calendar Cube is designed by placing arabic letters and *indian* numbers on a texture which is then laid down on a Virtual Cube (see http://www.randelshofer.ch/ for more details).

The date of the day can be displayed on a *selected* Cube Face by rotating and twisting some parts of the Cube. When this has been achieved, we say that the Cube has been *solved*.

Designing a Calendar Cube that *works* is definitely not a trivial task but **Design Rules** exist that should be applied for designing Calendar Cubes that will work for *any* day and month of a year. Because it is nearly impossible to test all configurations (remember thare there are 365 or 366 days per year), the placement of numbers and letters on a texture should be carefully checked at *the end* of the design process. This is carried out by applying a **Design Rules Check** (**DRC**) in the final design stage.

Terminology

In a 3x3x3 **Rubik's Cube**, there are 8 *Corner Cubes*, 12 *Edge Cubes*, 6 *Center Cubes* and 6 *Cube Faces*. There are also 4 Corner Cube faces, 4 Edge Cube faces and 1 Center Cube face *per Cube Face*, as shown below.



There are 1 face per Center Cube, 2 faces per Edge Cube and 3 faces per Corner Cube.

There are also 3 horizontal *Layers* called *Top*, *Middle* and *Bottom Layers*.

Cube Lexicon		
English	**Français**	**Deutsch**
Cube	Cube	Würfel
cubie, cube	cube, petit cube	Würfelteil, Teil des Würfels
face	face	Seite, Seitenfläche
front face	face avant	vordere Seite, vorne
back face	face arrière	hintere Seite, hinten
left face	face gauche	linke Seite, links
right face	face droite	rechte Seite, rechts
top face	face supérieure	obere Seite, oben
bottom face	face inférieure	untere Seite, unten
sticker	étiquette (autocollante), plaquette	Kleber, Farbkleber
tile	tuile, plaquette	Plättchen, Farbplättchen
center cube, center	cube central, centre	Mittelwürfel, Mittelstein, Mitte
edge cube, edge	cube-arête, arête	Kantenwürfel, Kantenstein, Kante
corner cube, corner	cube de coin, coin	Eckwürfel, Eckstein, Ecke
layer	couronne	Schicht, Scheibe
top layer	couronne supérieure	obere Schicht, obere Scheibe
middle layer	couronne intermédiaire	mittlere Schicht, mittlere Scheibe, Mittelschicht, Mittelscheibe
bottom layer	couronne inférieure	untere Schicht, untere Scheibe
orientation, direction	orientation	Orientierung
to solve	résoudre	lösen, zusammen drehen
to twist	pivoter	drehen
to rotate	tourner, effectuer une rotation	drehen
clockwise	dans le sens horaire	im Uhrzeigersinn
anticlockwise, counter-clockwise	dans le sens anti-horaire	im Gegenuhrzeigersinn

Arabic Calendar Cube Design – Western

Cube Layout

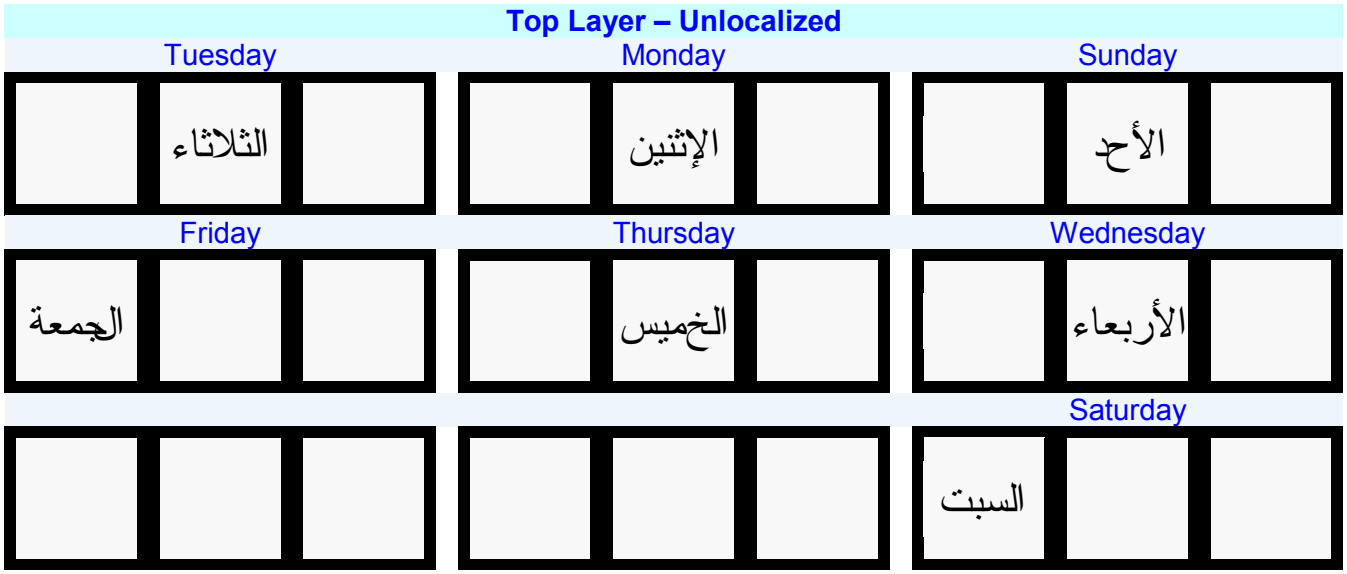
1- Weekday names are laid on a **T**op **L**ayer

2- Day numbers from 01 (٠١) up to 31 (٣١) are laid on a **M**iddle **L**ayer

3- The first 3 letters of each month name are laid on a **B**ottom **L**ayer, beginning from the right

Top Layer Layout

Top Layer – Unlocalized



1- 1 edge cube (Weekday names **T**op **C**enter): (الأحد, white)

2- 1 edge cube (Weekday names **T**op **C**enter): (الإثنين, الثلاثاء)

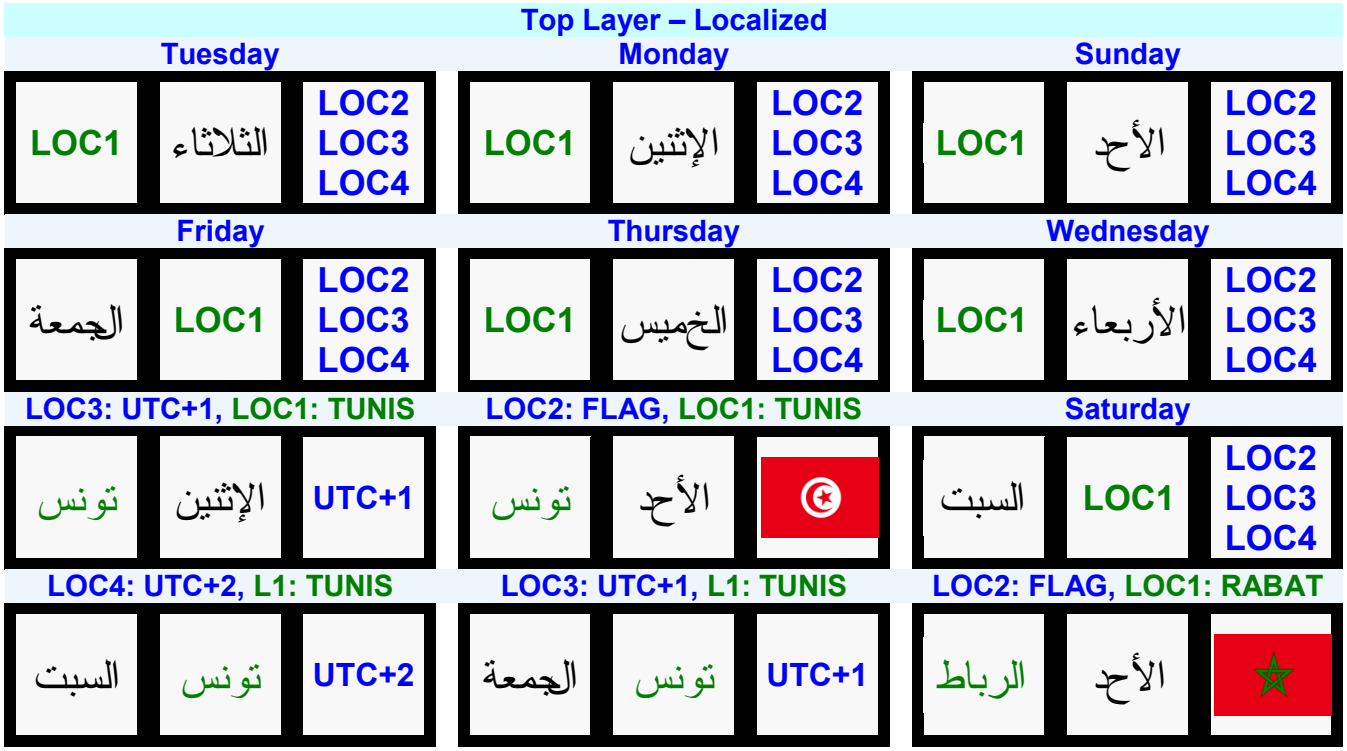
3- 1 edge cube (Weekday names **T**op **C**enter): (الأربعاء, الخميس)

4- 1 corner cube (Weekday names **T**op **L**eft): (السبت, الجمعة, white)

5- 1 white corner cube: (white, white, white)

So, now there are 9 (=12-3) edge and 6 (=8-2) corner cubes left that can be used for the 2 remaining layers.

Top Layer – Localized



1- 1 edge cube (Weekday names **T**op **C**enter): (الأحد, LOC1)

2- 1 edge cube (Weekday names **T**op **C**enter): (الإثنين, الثلاثاء)

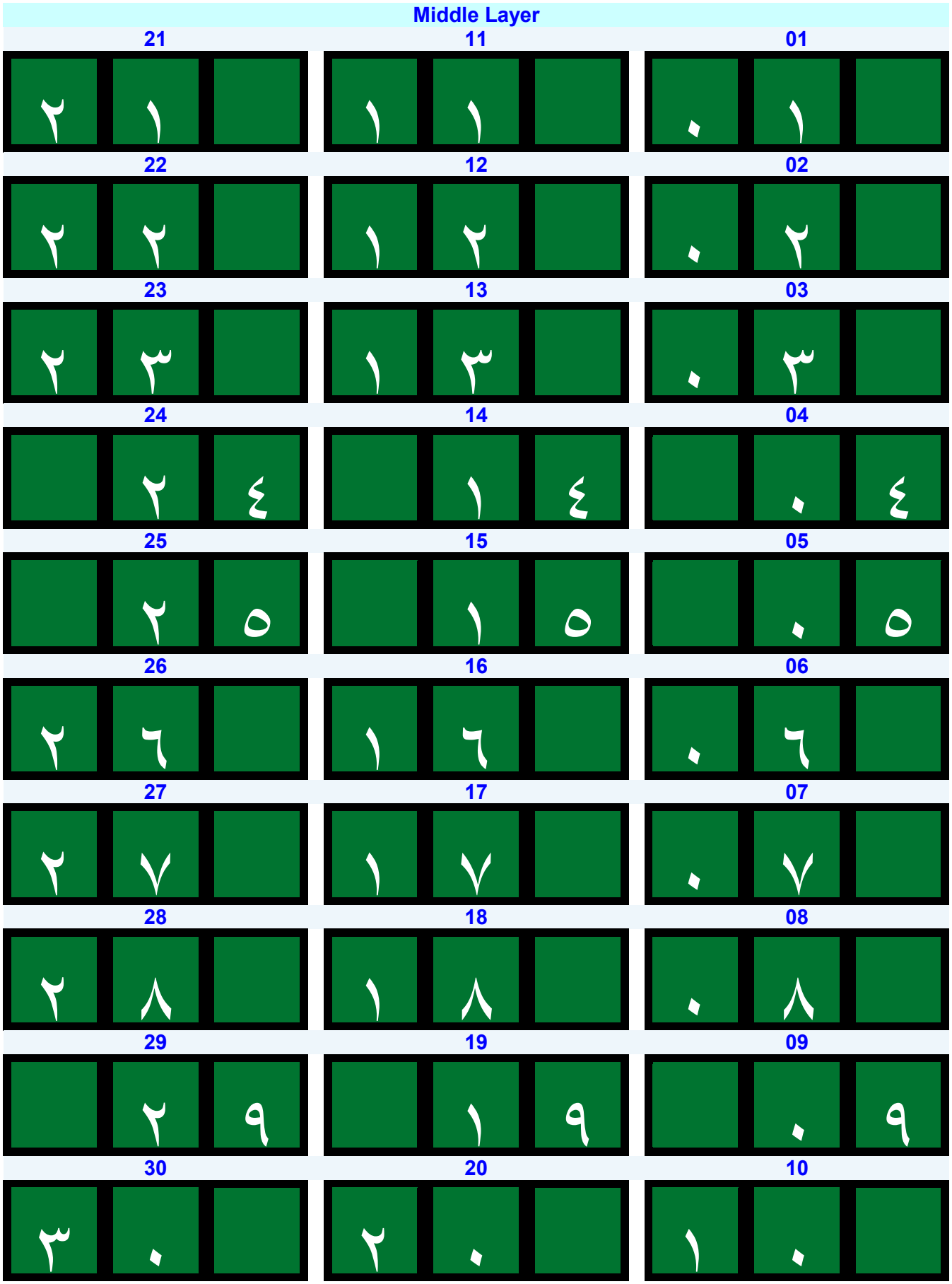
3- 1 edge cube (Weekday names **T**op **C**enter): (الأربعاء, الخميس)

4- 1 corner cube (Weekday names **T**op **L**eft, LOC2 **T**op **R**ight): (السبت, الجمعة, LOC2)

5- 1 corner cube (LOC1 **T**op **L**eft): (LOC1, white, white)
6- 1 corner cube (LOC2,3,4 **T**op **R**ight): (LOC2, LOC3, LOC4)

So, now there are 9 (=12-3) edge and 5 (=8-3) corner cubes left that can be used for the 2 remaining layers.

Middle Layer Layout



1- 6 center cubes (Numbers 0,1,2,3,6,7/8 **M**edium **C**enter): (٠ , ١ , ٢ , ٣ , ٦ , ٧/٨)

2- 2 edge cubes (Numbers 4,5,9 **M**edium **R**ight) : (٤ , ٥), (٩ , green)

3- 2 edge cubes (Numbers 0,1,2,3 **M**edium **L**eft) : (٠ **,** ١), (٢ **,** green), (٣ **,** white)

Bottom Layer Layout

Bottom Layer		
March	February	January
ر ا م	ر ب ف	ا ن ي
June	May	April
ن و ي	ي ا م	ر ب أ
September	August	July
ت ب س	س غ أ	ل و ي
December	November	October
س ي د	ف و ن	ت ك أ

1- 2 corner cubes (6 Letters *logically* grouped **B**ottom **R**ight):

(ي, ف, م), (*yâ'*, *fâ'*, *mîm*)

(أ, س, ن), (*alif hamza*, *sîn*, *nûn*)

2- 4 edge cubes (7 Letters *logically* grouped **B**ottom **C**enter):

(ن), *white*), (*nûn*, *white*)

(ب, ا), (*bâ'*, *alif)*

(و, غ), (*wâw*, *ġayn)*

(ك, ي), (*kâf*, *yâ')*

3- 1 corner cube (3 *mixed* Letters that are *never* used together): (ت, ف, د), (*tâ'*, *fâ'*, *dâl*)

Bottom **R**ight: (د), (*dâl*)

Bottom **L**eft: (ت, ف), (*tâ'*, *fâ'*)

4- 2 corner cubes (6 Letters *logically* grouped **B**ottom **L**eft):

(ا, ر, ي), (*alif*, *râ'*, *yâ'*)

(ن, ل, س), (*nûn*, *lâm*, *sîn)*

Arabic Calendar Cube Design – Syriac

Cube Layout

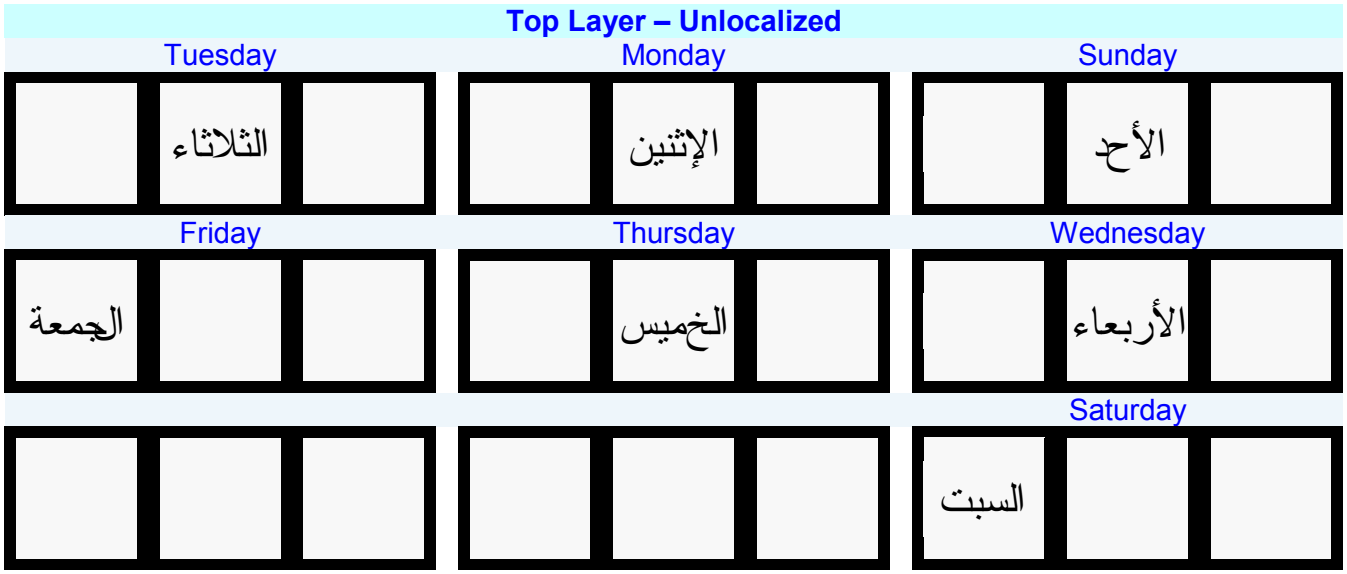
1- Weekday names are laid on a **T**op **L**ayer

2- Day numbers from 01 (٠١) up to 31 (٣١) are laid on a **M**iddle **L**ayer

3- The first 3 letters of each month name are laid on a **B**ottom **L**ayer, beginning from the right

Top Layer Layout

Top Layer – Unlocalized



1- 1 edge cube (Weekday names **T**op **C**enter): (الأحد, white)

2- 1 edge cube (Weekday names **T**op **C**enter): (الإثنين, الثلاثاء)

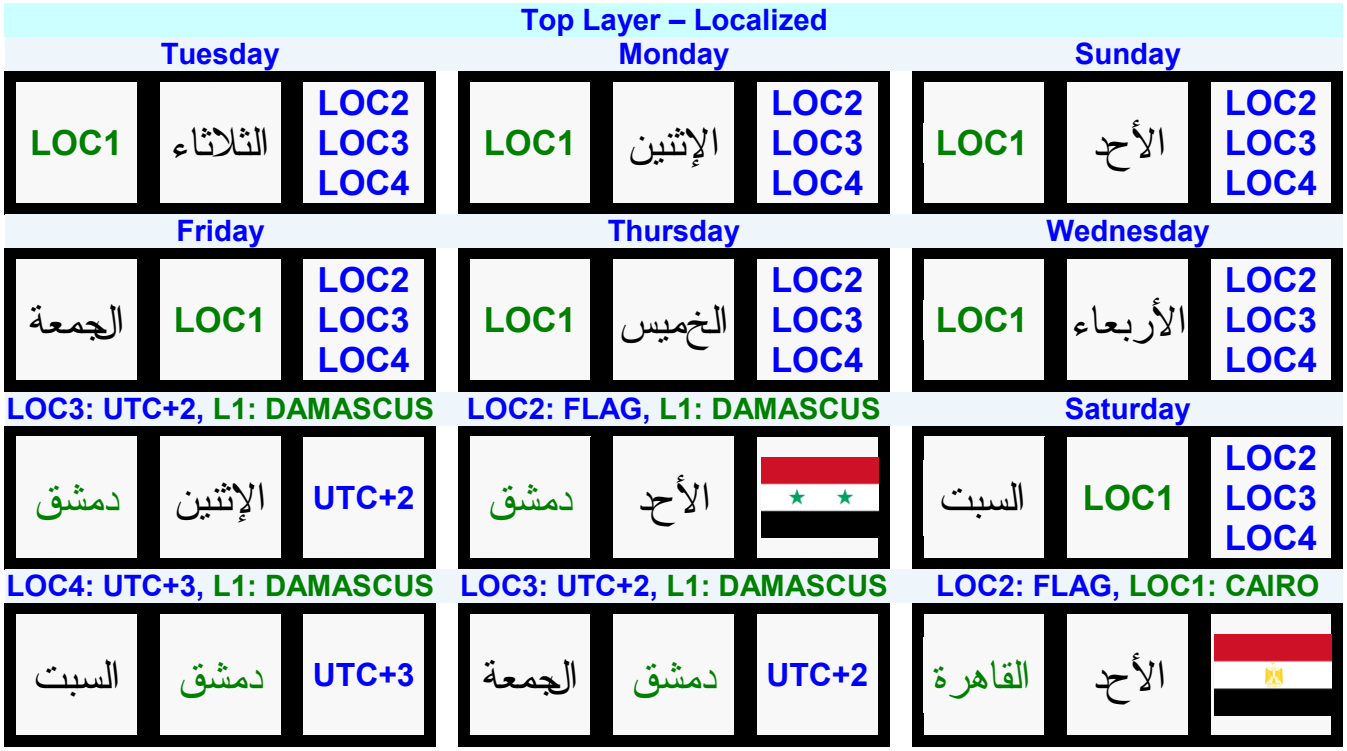
3- 1 edge cube (Weekday names **T**op **C**enter): (الأربعاء, الخميس)

4- 1 corner cube (Weekday names **T**op **L**eft): (السبت, الجمعة, white)

5- 1 white corner cube: (white, white, white)

So, now there are 9 (=12-3) edge and 6 (=8-2) corner cubes left that can be used for the 2 remaining layers.

Top Layer – Localized



1- 1 edge cube (Weekday names **T**op **C**enter): (الأحد, LOC1)

2- 1 edge cube (Weekday names **T**op **C**enter): (الإثنين, الثلاثاء)

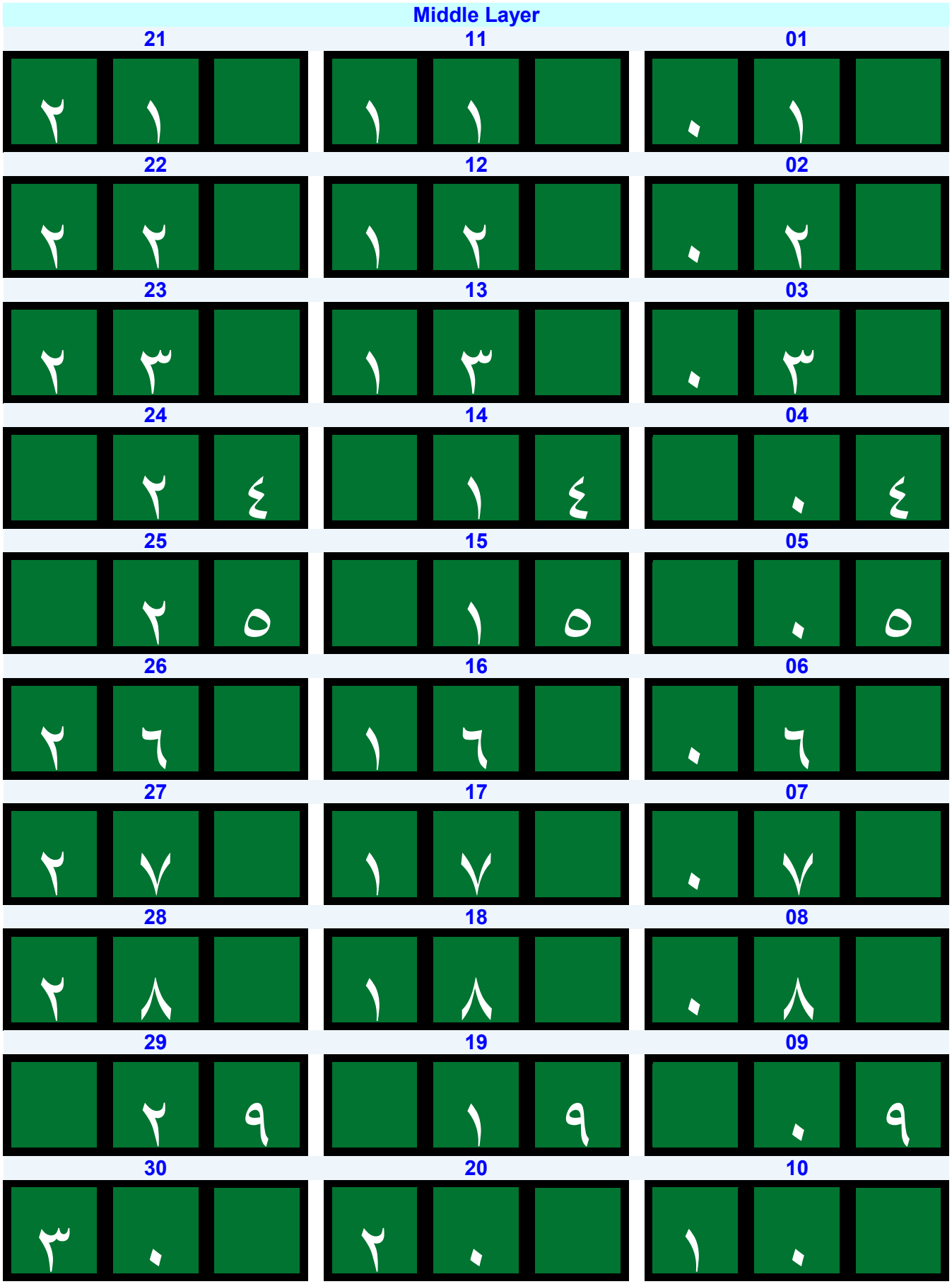
3- 1 edge cube (Weekday names **T**op **C**enter): (الأربعاء, الخميس)

4- 1 corner cube (Weekday names **T**op **L**eft, LOC2 **T**op **R**ight): (السبت, الجمعة, LOC2)

5- 1 corner cube (LOC1 **T**op **L**eft): (LOC1, white, white)
6- 1 corner cube (LOC2,3,4 **T**op **R**ight): (LOC2, LOC3, LOC4)

So, now there are 9 (=12-3) edge and 5 (=8-3) corner cubes left that can be used for the 2 remaining layers.

Middle Layer Layout



1- 6 center cubes (Numbers 0,1,2,3,6,7/8 **M**edium **C**enter): (٠ , ١ , ٢ , ٣ , ٦ , ٧/٨)

2- 2 edge cubes (Numbers 4,5,9 **M**edium **R**ight) : (٤ , ٥), (٩ , green)

3- 2 edge cubes (Numbers 0,1,2,3 **M**edium **L**eft) : (٠ , ١), (٢ , green), (٣ , white)

Bottom Layer Layout

Bottom Layer		
March	**February**	**January**
ا ذ آ	ا ب ش	ا ث ك
June	**May**	**April**
ي ز ح	ا يّ أ	س ي ن
September	**August**	**July**
ل ي أ	ب آ	و مّ ت
December	**November**	**October**
وّ أ ك	ا ث ت	وّ أ ت

1- 3 corner cubes (7 Letters *logically* grouped **B**ottom **R**ight):

(ك, ش, آ), (*kâf*, *šîn*, *alif madda*)

(أ, ح, ت), (*alif hamza*, *ḥâ'*, *tâ'*)

(ت, ,), (*tâ'*, *white*, *white*)

2- 4 edge cubes (6 Letters *logically* grouped **B**ottom **C**enter):

(ث, ب), (*tâ'*, *bâ'*)

(ذ, ي), (*dâl*, *yâ'*)

(يّ, ز), (*yâ' chadda*, *zây*)

(مّ, أ), (*mîm chadda*, *alif*)

3- 2 corner cubes (6 Letters *logically* grouped **B**ottom **L**eft):

(ا, س, ي), (*alif*, *sîn*, *yâ'*)

(و, ل, وّ), (*wâw*, *lâm*, *wâw chadda*)

Arabic Calendar Cube Design – Hegirian

Cube Layout

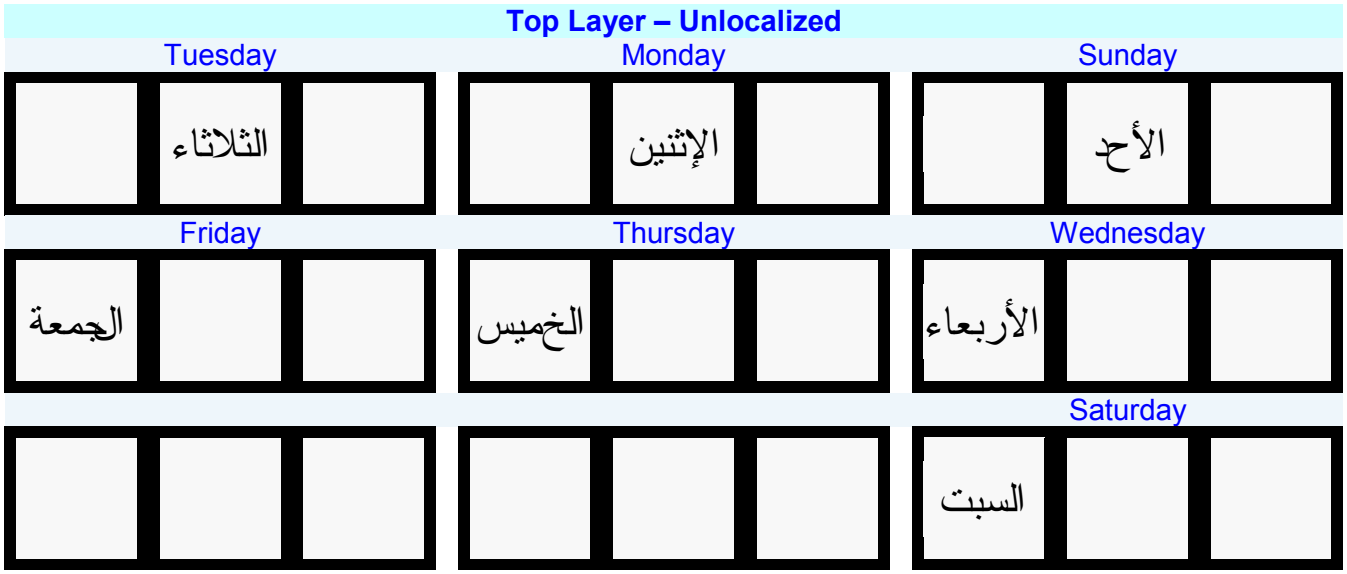
1- Weekday names are laid on a **T**op **L**ayer

2- Day numbers from 01 (٠١) up to 31 (٣١) are laid on a **M**iddle **L**ayer

3- The first 3 letters of each month name are laid on a **B**ottom **L**ayer, beginning from the right

Top Layer Layout

Top Layer – Unlocalized



1- 1 edge cube (Weekday names **T**op **C**enter): (الأحد, white)

2- 1 edge cube (Weekday names **T**op **C**enter): (الإثنين, الثلاثاء)

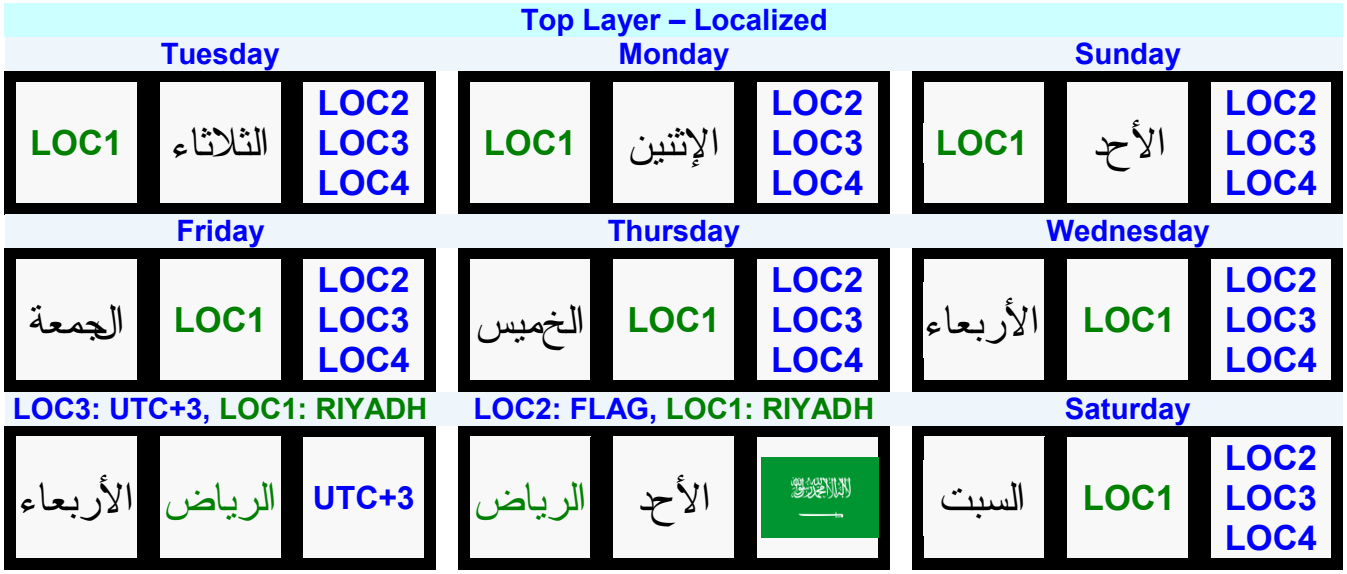
3- 1 corner cube (Weekday names **T**op **L**eft): (الخميس, الأربعاء, white)

4- 1 corner cube (Weekday names **T**op **L**eft): (السبت, الجمعة, white)

5- 1 white corner cube: (white, white, white)

So, now there are 10 (=12-2) edge and 5 (=8-3) corner cubes left that can be used for the 2 remaining layers.

Top Layer – Localized



1- 1 edge cube (Weekday names **T**op **C**enter): (الأحد, LOC1)

2- 1 edge cube (Weekday names **T**op **C**enter): (الإثنين, الثلاثاء)

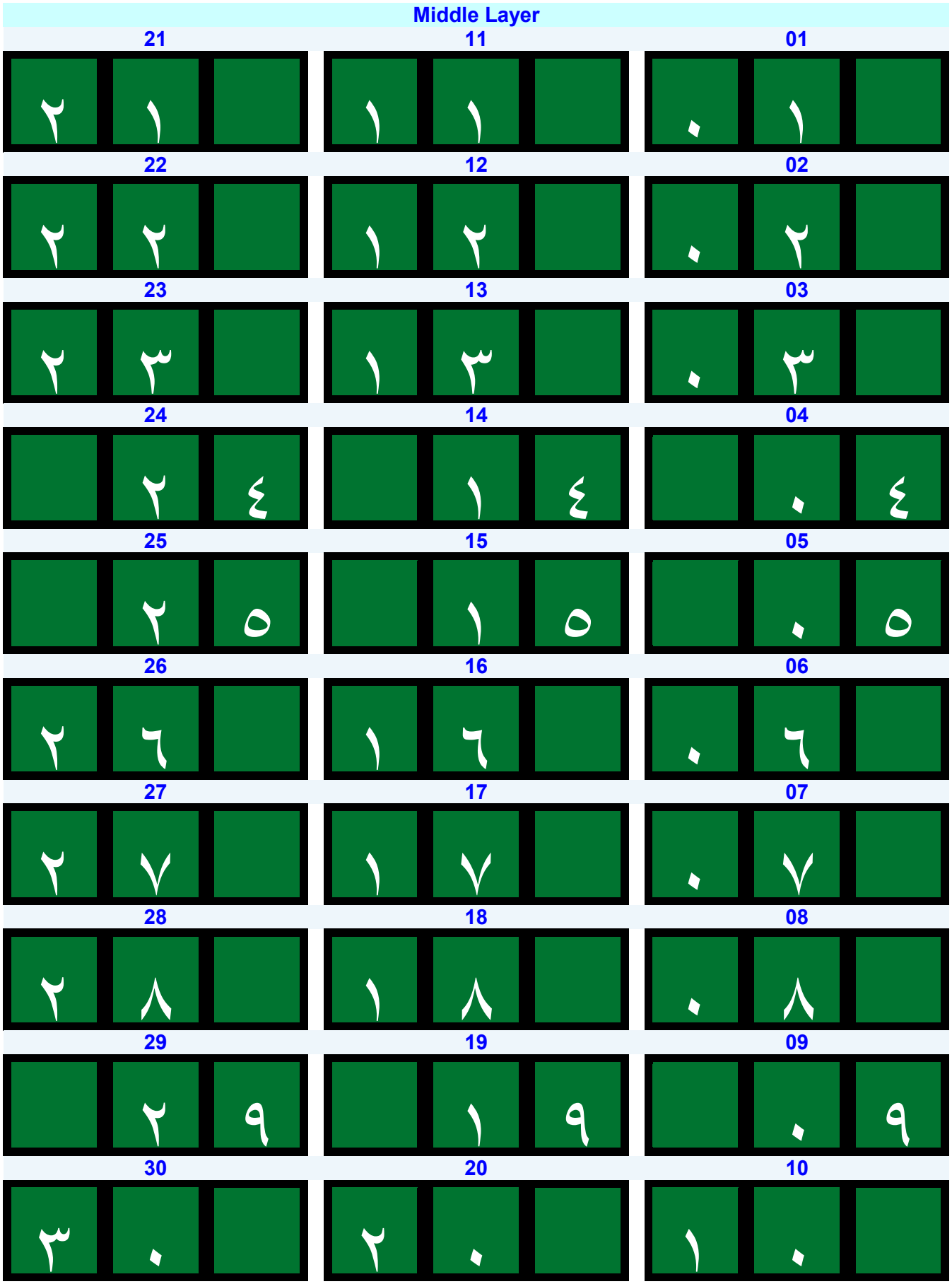
3- 1 corner cube (Weekday names **T**op **L**eft): (الخميس, الأربعاء, LOC1)

4- 1 corner cube (Weekday names **T**op **L**eft, LOC2 **T**op **R**ight): (السبت, الجمعة, LOC2 **T**op **R**ight)

5- 1 corner cube (LOC2,3,4 **T**op **R**ight): (LOC2, LOC3, LOC4)

So, now there are 10 (=12-2) edge and 5 (=8-3) corner cubes left that can be used for the 2 remaining layers.

Middle Layer Layout



1- 6 center cubes (Numbers 0,1,2,3,6,7/8 **M**edium **C**enter): (٠ , ١ , ٢ , ٣ , ٦ , ٧/٨)

2- 2 edge cubes (Numbers 4,5,9 **M**edium **R**ight) : (٤ , ٥), (٩ , green)

3- 2 edge cubes (Numbers 0,1,2,3 **M**edium **L**eft) : (٠ , ١), (٢ , green), (٣ , white)

Bottom Layer Layout

Bottom Layer		
March	February	January
وّ أ ر	ر ف س	رّ ح م
June	May	April
ا ث ج	و أ ج	ا ث ر
September	August	July
ض م ر	ب ع ش	ب ج ر
December	November	October
ع ق ذ	جّ ح ذ	ل وّ ش

1- 2 corner cubes (6 Letters *logically* grouped **B**ottom **R**ight):

(م, ص, ر), (*mîm*, *ṣâd*, *râ'*)

(ج, ش, ذ), (*jîm*, *šîn*, *d̲âl*)

2- 5 edge cubes (9 Letters *logically* grouped **B**ottom **C**enter):

(ح, ف), (*ḥâ'*, *fâ'*)

(أ, ث), (*alif hamza*, *t̲â'*)

(ج, ع), (*jîm*, *ɛayn*)

(م, وّ), (*mîm*, *wâw chadda*)

(ق, *white*), (*qâf*, *white*)

3- 3 corner cubes (9 Letters *logically* grouped **B**ottom **L**eft):

(رّ, ر, وّ), (*râ' chadda*, *râ'*, *wâw chadda*)

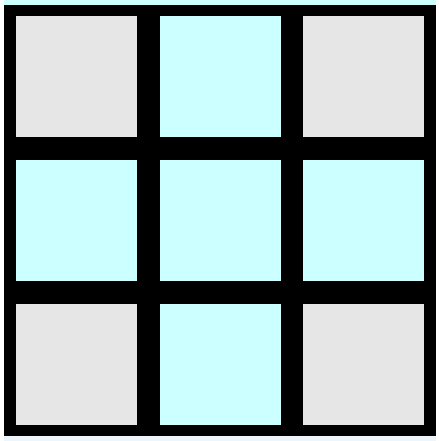
(ا, و, ب), (*alif*, *wâw*, *bâ'*)

(ض, ج, ع), (*ḍâd*, *jîm*, *ɛayn*)

Solving an Arabic Calendar Cube Step by Step

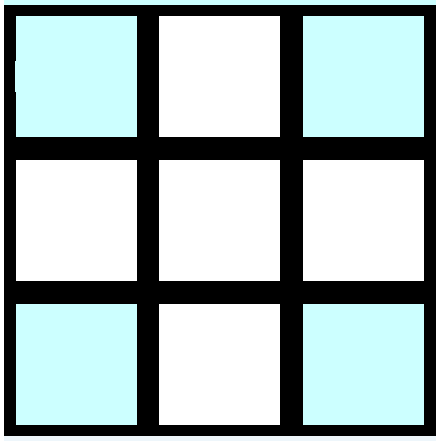
In this example, a step by step solving process is applied to an Arabic Calendar Cube described before. Note that the same process applies equally to other Arabic Calendar Cubes as well and remember that we only need to solve a *single* Face for the date of the day. The cube will be solved for Sunday, the 1rst of January and will be *localized* in **Tunis**, winter time (**UTC+1**).

Solve the Cross First



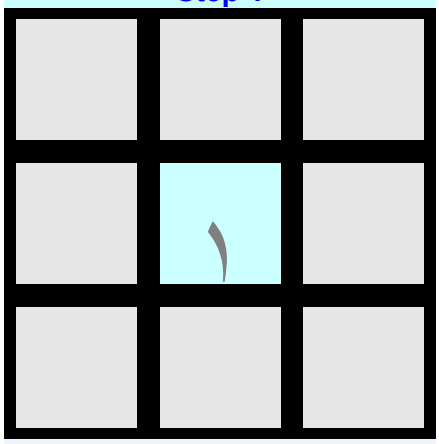
Standard Rubik's Cube Solving

Then Solve the Corner Cubes



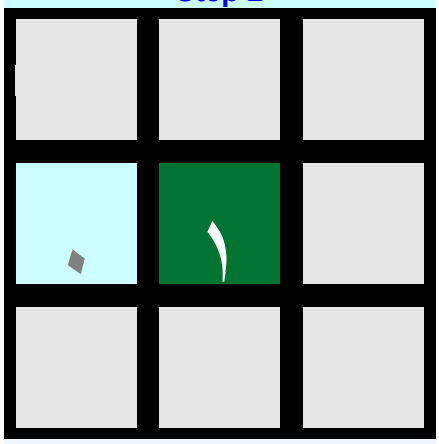
Standard Rubik's Cube Solving

Step 1



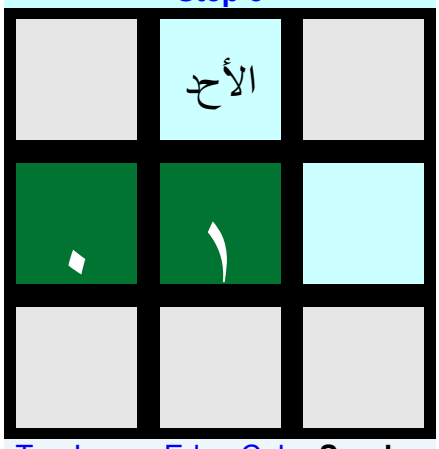
Center Cube 1 on Front Face

Step 2



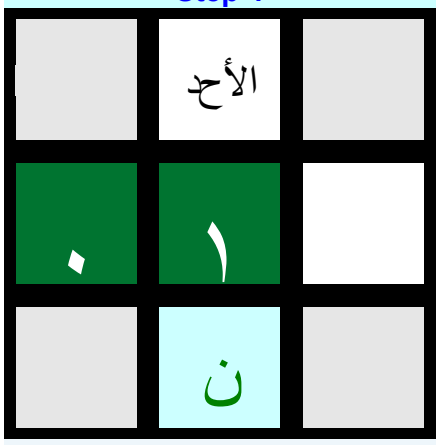
Middle Layer: Edge Cube 0

Step 3



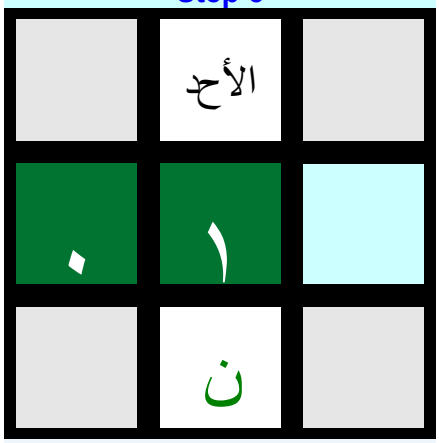
Top Layer: Edge Cube **Sunday**

Step 4



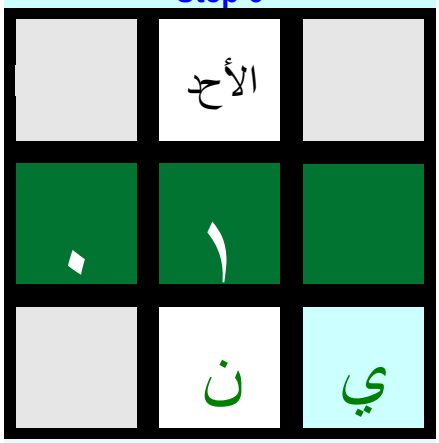
Bottom Layer: Edge Cube ***nûn***

Step 5



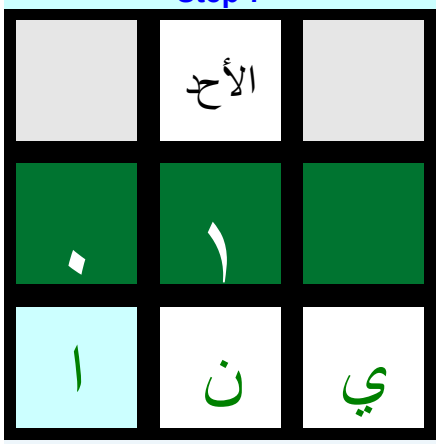
Middle Layer: Edge Cube ***green***

Step 6



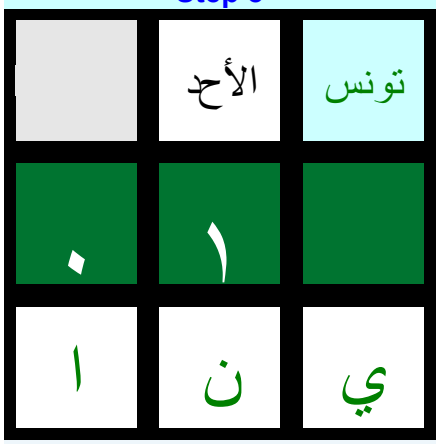
Bottom Layer: Corner ***yâ'***

Step 7



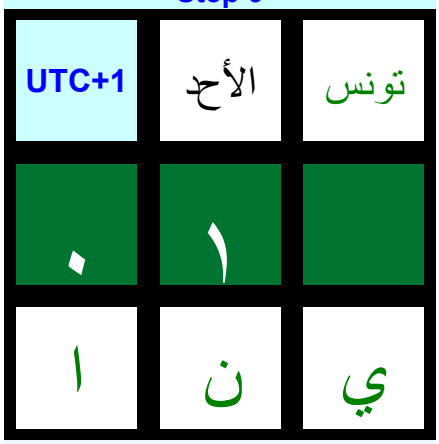
Bottom Layer: Corner ***alif***

Step 8



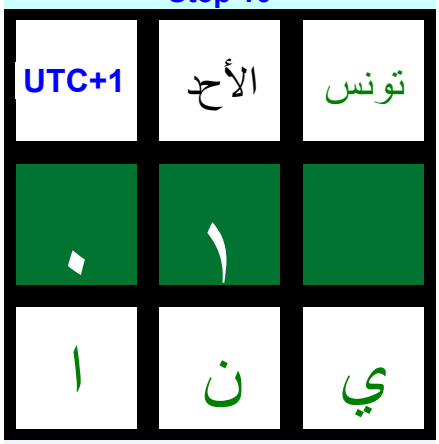
Top Layer: Corner Cube ***Tûnis***

Step 9



Top Layer: Corner Cube **UTC+1**

Step 10



That's it !

Arabic Months and Days

Arabic Gregorian Solar Calendar (Used in Most Arabic Countries)								
Months of the Year			Connected Letters			Isolated Letters		
English	With Vowels	Without Vowels	3rd	2nd	1st	3rd	2nd	1st
January	يَنَاير	يناير	ـا	ـنـ	يـ	ا	ن	ي
February	فِبْرَاير	فبراير	ـر	ـبـ	فـ	ر	ب	ف
March	مَارْس	مارس	ـر	ـا	مـ	ر	ا	م
April	أَبْرِيل	أبريل	ـر	ـبـ	أ	ر	ب	أ
May	مَايُو	مايو	ـيـ	ـا	مـ	ي	ا	م
June	يُونِيُو	يونيو	ـنـ	ـو	يـ	ن	و	ي
July	يُولِيُو	يوليو	ـلـ	ـو	يـ	ل	و	ي
August	أُغُسْطُس	أغسطس	ـسـ	ـغـ	أ	س	غ	أ
September	سِبْتَمْبَر	سبتمبر	ـتـ	ـبـ	سـ	ت	ب	س
October	أُكْتُوبَر	أكتوبر	ـتـ	ـكـ	أ	ت	ك	أ
November	نُوفَمْبَر	نوفمبر	ـفـ	ـو	نـ	ف	و	ن
December	دِيسَمْبَر	ديسمبر	ـسـ	ـيـ	د	س	ي	د

8 letters on left-hand corner cubes	ف ت س ل ن ي ر ا
7 letters on edge cubes	ي ك غ و ا ب ن
7 letters on right-hand corner cubes	د ن س أ م ف ي

Days of the Week					
English	With Vowels	Without Vowels	English	With Vowels	Without Vowels
*Sunday	يَوْمَ ٱلأَحَد	** يوم الأحد	Thursday	يَوْمَ ٱلْخَمِيس	يوم الخميس
Monday	يَوْمَ ٱلإِثْنَيْن	يوم الإثنين	Friday	يَوْمَ ٱلْجُمْعَة	يوم الجمعة
Tuesday	يَوْمَ ٱلثُّلاثَاء	يوم الثلاثاء	Saturday	يَوْمَ ٱلسَّبْت	يوم السبت
Wednesday	يَوْمَ ٱلأَرْبِعَاء	يوم الأربعاء	* Arabic weeks begin on Sundays		
			** يوم (=day) not used in simplified forms		

Arabic Syriac Solar Calendar (Used in Middle-East)								
Months of the Year			Connected Letters			Isolated Letters		
English	With Vowels	Without Vowels	3rd	2nd	1st	3rd	2nd	1st
January	كَانُونَ ٱلثَّانِي	كانون الثاني				ا	ث	ك
February	شُبَاط	شباط				ا	ب	ش
March	آذَار	آذار				ا	ذ	آ
April	نِيسَان	نيسان				س	ي	ن
May	أَيَّار	أيّار				ا	يّ	أ
June	حُزَيْرَان	حزيران				ي	ز	ح
July	تَمُّوز	تمّوز				و	مّ	ت
August	آب	آب					ب	آ
September	أَيْلُول	أيلول				ل	ي	أ
October	تِشْرِينَ ٱلأَوَّل	تشرين الأوّل				وّ	أ	ت
November	تِشْرِينَ ٱلثَّانِي	تشرين الثاني				ا	ث	ت
December	كَانُونَ ٱلأَوَّل	كانون الأوّل				وّ	أ	ك

6 letters on left-hand corner cubes	وّ ل و ي س ا
8 letters on edge cubes	أ مّ ز يّ ي ذ ب ث
7 letters on right-hand corner cubes	ت ح أ ن آ ش ك

Days of the Week					
English	With Vowels	Without Vowels	English	With Vowels	Without Vowels
*Sunday	يَوْمَ ٱلأَحَد	** يوم الأحد	Thursday	يَوْمَ ٱلْخَمِيس	يوم الخميس
Monday	يَوْمَ ٱلإِثْنَيْن	يوم الإثنين	Friday	يَوْمَ ٱلْجُمْعَة	يوم الجمعة
Tuesday	يَوْمَ ٱلثُّلاثَاء	يوم الثلاثاء	Saturday	يَوْمَ ٱلسَّبْت	يوم السبت
Wednesday	يَوْمَ ٱلأَرْبِعَاء	يوم الأربعاء	* Arabic weeks begin on Sundays		
			** يوم (=day) not used in simplified forms		

Arabic Hegirian Lunar Calendar (Used by Muslims)								
Months of the Year			Connected Letters			Isolated Letters		
English	With Vowels	Without Vowels	3rd	2nd	1st	3rd	2nd	1st
January	مُحَرَّم	محرّم				رّ	ح	م
February	صَفَر	صفر				ر	ف	ص
March	رَبِيعَ ٱلأَوَّل	ربيع الأوّل				وّ	أ	ر
April	رَبِيعَ ٱلثَّانِي	ربيع الثاني				ا	ث	ر
May	جُمَادَى ٱلأُولَى	جمادى الأولى				و	أ	ج
June	جُمَادَى ٱلثَّانِيَة	جمادى الثانية				ا	ث	ج
July	رَجَب	رجب				ب	ج	ر
August	شَعْبَان	شعبان				ب	ع	ش
September	رَمَضَان	رمضان				ض	م	ر
October	شَوَّال	شوّال				ا	وّ	ش
November	ذُو ٱلحِجَّة	ذو الحجّة				جّ	ح	ذ
December	ذُو ٱلقَعْدَة	ذو القعدة				ع	ق	ذ

9 letters on left-hand corner cubes	ع جّ ض ب و ا وّ ر رّ
9 letters on edge cubes	ق وّ م ع ج ث أ ف ح
6 letters on right-hand corner cubes	ذ ش ج ر ص م

Days of the Week					
English	With Vowels	Without Vowels	English	With Vowels	Without Vowels
*Sunday	يَوْمَ ٱلأَحَد	يوم الأحد**	Thursday	يَوْمَ ٱلْخَمِيس	يوم الخميس
Monday	يَوْمَ ٱلإِثْنَيْن	يوم الإثنين	Friday	يَوْمَ ٱلْجُمْعَة	يوم الجمعة
Tuesday	يَوْمَ ٱلثُّلاثَاء	يوم الثلاثاء	Saturday	يَوْمَ ٱلسَّبْت	يوم السبت
Wednesday	يَوْمَ ٱلأَرْبِعَاء	يوم الأربعاء	* Arabic weeks begin on Sundays		
			** يوم (=day) not used in simplified forms		

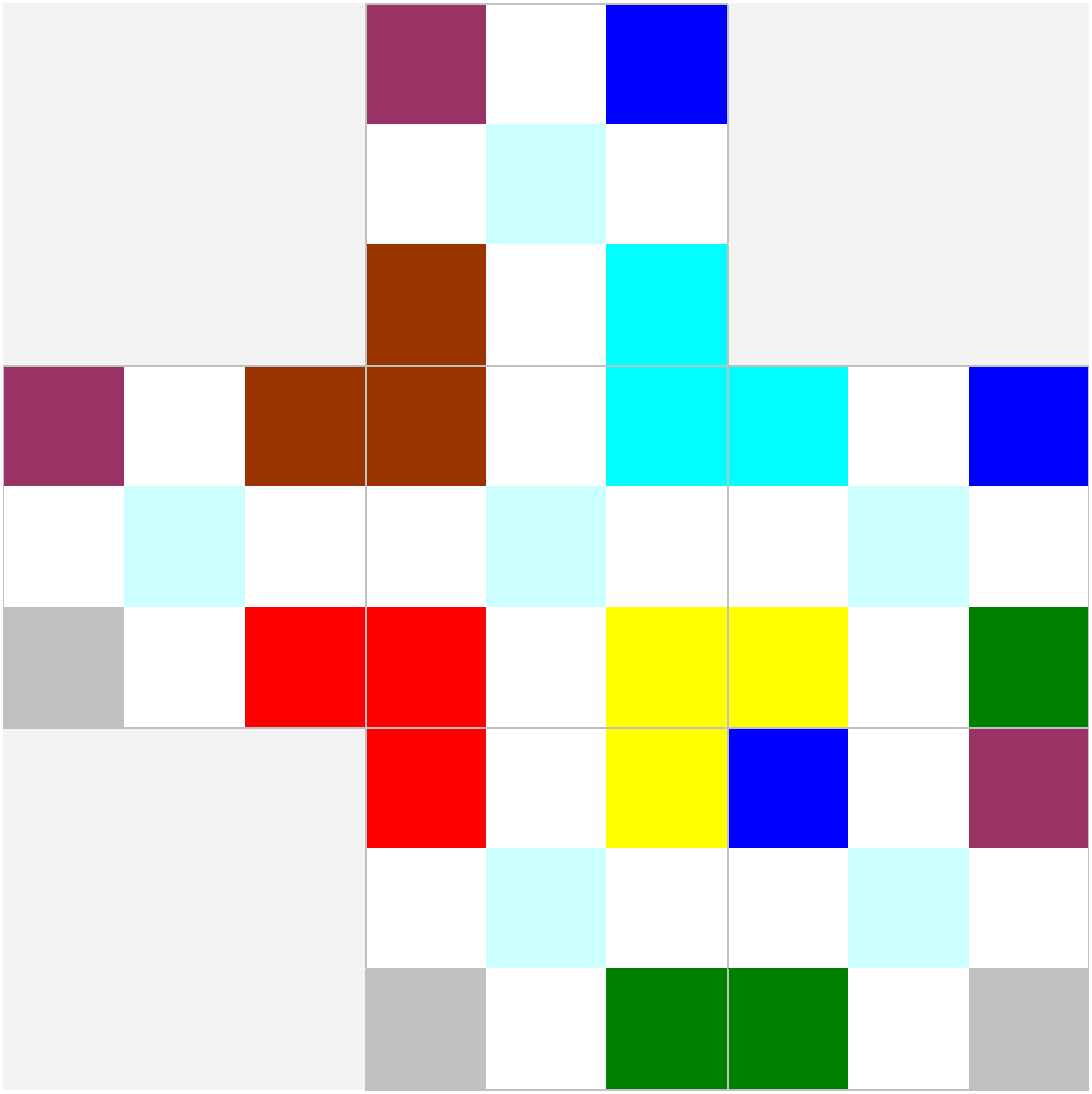
Arabic Alphabet and Letters Pronunciation Table									
ء	*hamza*	ا	*alif*	د	*dâl*	ض	*ḍâd*	ك	*kâf*
أ	*alif hamza*	ب	*bâ'*	ذ	*ḏâl*	ط	*tˍâ'*	ل	*lâm*
آ	*alif madda*	ت	*tâ'*	ر	*râ'*	ظ	*ẓâ'*	م	*mîm*
جّ	*jîm chadda*	ث	*ṯâ'*	ز	*zây*	ع	*ɛayn*	ن	*nûn*
رّ	*râ' chadda*	ج	*jîm*	س	*sîn*	غ	*ġayn*	ه	*hâ'*
وّ	*wâw chadda*	ح	*ḥâ'*	ش	*šîn*	ف	*fâ'*	و	*wâw*
يّ	*yâ' chadda*	خ	*ḫâ'*	ص	*ṣâd*	ق	*qâf*	ي	*yâ'*
Arabic Numerals									
0	1	2	3	4	5	6	7	8	9
٠	١	٢	٣	٤	٥	٦	٧	٨	٩

Print out this page and fill in the blank faces with *your* data. Then try to design your *own* Cube.

TL	TC	TR
ML	MC	MR
BL	BC	BR

Corner Cubes Final Check

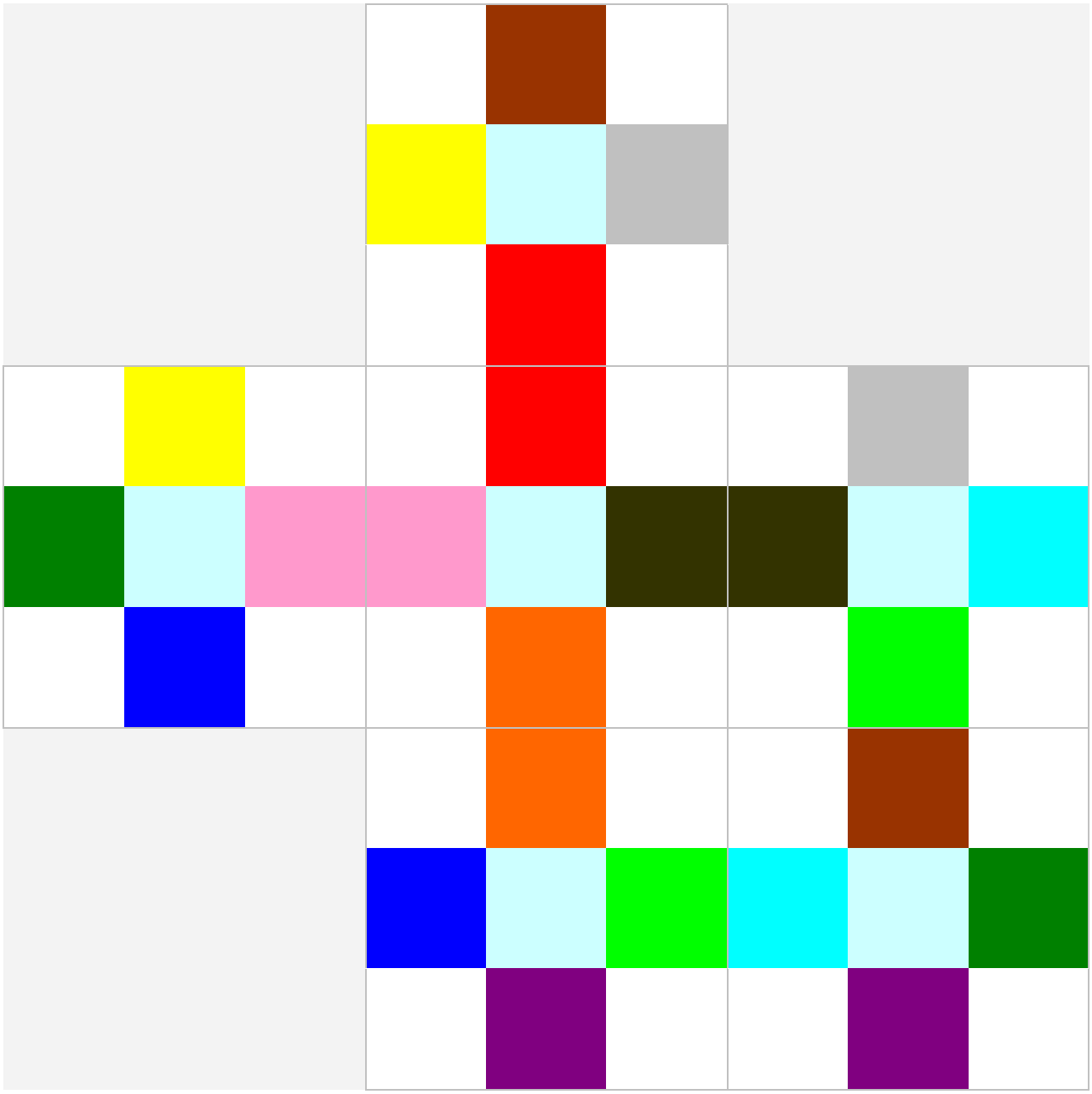
There are 8 Corner Cubes and 3 faces per Corner Cube. In the diagram below, each Corner Cube is displayed in 8 different colors and with the same color applied to each of its 3 faces. This diagram can be used as a convenient *visual aid* to check Design Rules (DRC).



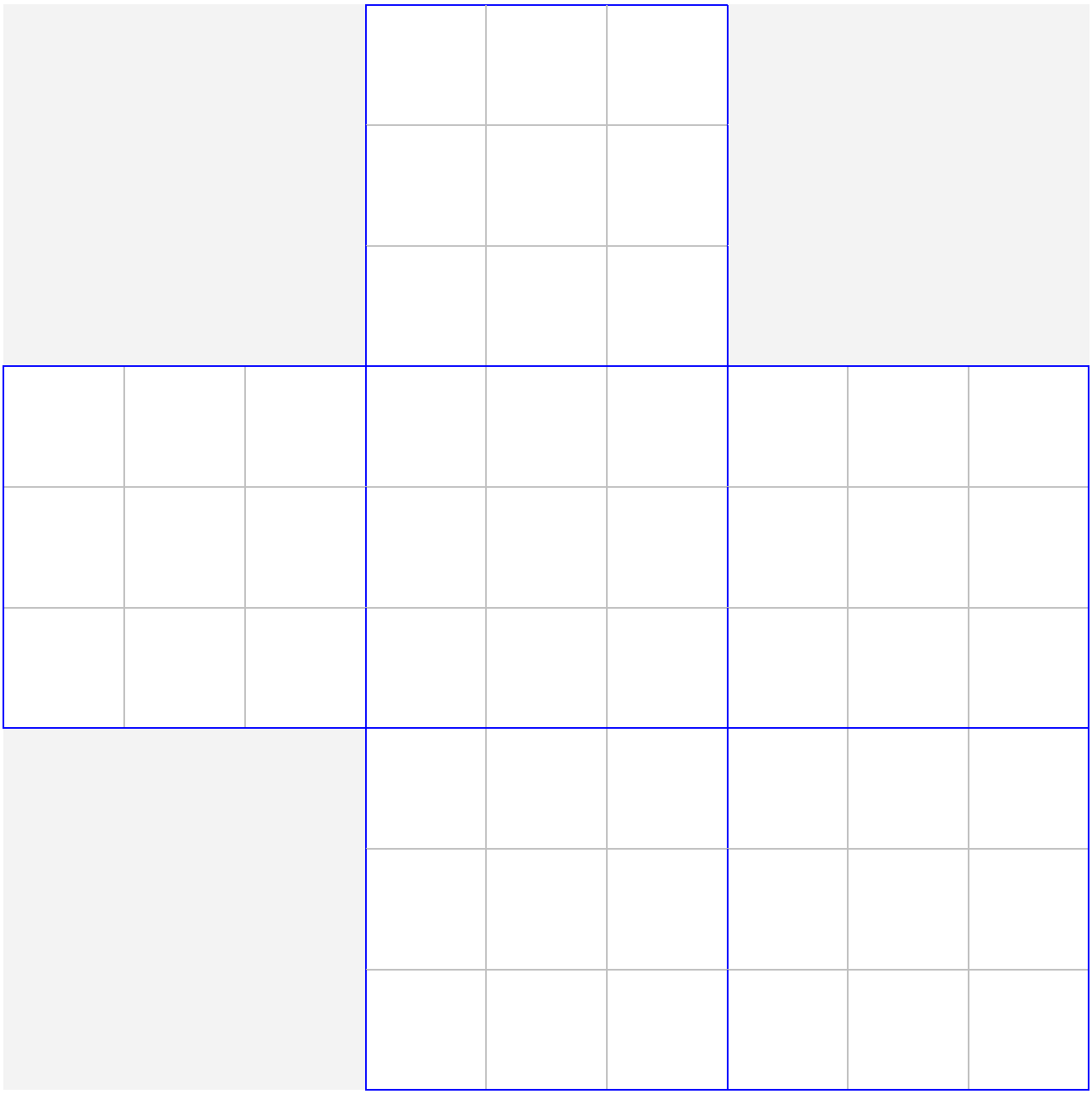
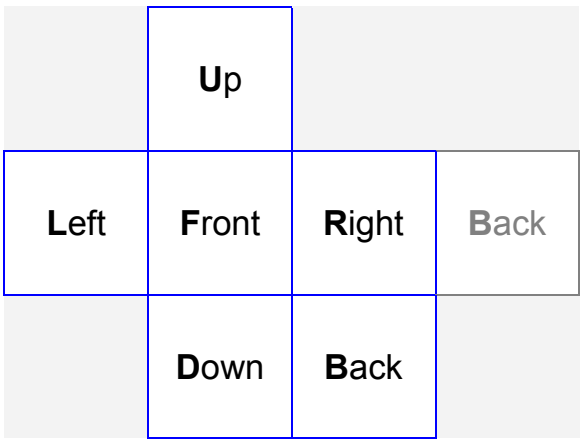
	Up		
Left	**F**ront	**R**ight	**B**ack
	Down	**B**ack	

Edge Cubes Final Check

There are 12 Edge Cubes and 2 faces per Edge Cube. In the diagram below, each Edge Cube is displayed in 12 different colors and with the same color applied to each of its 2 faces. This diagram can be used as a convenient *visual aid* to check Design Rules (DRC).



	Up		
Left	**F**ront	**R**ight	**B**ack
	Down	**B**ack	

Texture Template

This is a texture template that can be printed out and used for writing down numbers and letters by hand *prior to* texture design. All is needed are pencil, rubber…and time.