Assignment 1, Part A: Billboard

(20%, due 5:00pm Wednesday, September 13th)

Overview

This is the first part of a two-part assignment. This part is worth 20% of your final grade for IFB104. Part B will be worth a further 5%. Part B is intended as a last-minute extension to the assignment, thereby testing the maintainability of your code, and the instructions for completing it will not be released until Week 8. Whether or not you complete Part B you will submit only one file, and receive only one assessment, for the whole 25% assignment.

Motivation

One of the most basic functions of any IT system is to process a given data set to produce some form of human-readable output. This assignment requires you to produce a visual image by following instructions stored in a list. It tests your abilities to:

- Process lists of data values;
- Design a solution to a computational problem;
- Display information in a visual form; and
- Produce maintainable, reusable code.

Goal

Advertising billboards are a familiar, if annoying, feature of the urban landscape. Today many such billboards are electronic, although there are still plenty of traditional ones consisting of several rectangular sheets of paper pasted onto a wooden backing board.



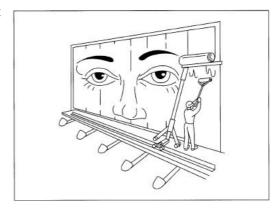


In this assignment you are required to develop a Python 3 program which processes data stored in a list to display a specific arrangement of sheets on a billboard. Each sheet must be a distinct part of a single overall image. Just like a hapless worker pasting up sheets on a real billboard, your "virtual" sheets can be placed in the wrong location and may even be pasted upside down.



To complete this assignment you will need to use basic Python features and the Turtle graphics module. You must also design four billboard sheets which, when pasted in the correct locations and orientations, align to produce a single picture. The picture must be non-trivial, and must span all four sheets, but otherwise you have a free choice of what to draw, e.g.,

- an advertisement for a commerical product (real or fictional),
- a public service announcement,
- a political advertisement,
- corporate or sporting logos,
- a portrait of an individual (real or fictional),
- a landscape painting, or
- any other picture you like!



Most importantly, you are not limited to the types of images normally found on billboards. Any recognisable image will do!

To "paste" the individual sheets as specified in the given data sets, you must develop your code so that each sheet can be drawn in any of four different locations on the drawing canvas and in either of two different orientations. You should give thought to how to do this efficiently before you start drawing your image using Turtle graphics. Simply drawing an image at fixed coordinates on the canvas will not allow you to relocate and reorient it later on.



Resources provided

A template Python 3 program, billboard.py, is provided with these instructions. When run it creates a drawing canvas and displays a simple background image on which you will draw your billboard sheets. The image drawn by the initial template appears as follows.



The billboard's backing is divided into four locations for pasting up sheets. Each sheet must be a rectangle measuring 200×500 pixels. The centrepoint of each location has been marked to help you position your images as you develop your program. Your sheets must fit precisely into the four locations indicated.

The provided template file also contains several data sets, in the form of lists, which specify how you must arrange the sheets when drawing them. These instruction lists each contain two types of data:

- An initial value, either 'O' or 'X', whose purpose will be revealed only in the second part of the assignment. You should ignore it while developing your solution to Part A.
- Instructions saying how to paste up each individual sheet. Each such instruction is itself a list containing three values:
 - o The name of the sheet to be pasted up, from 'Sheet A' to 'Sheet D'.
 - o The location on the billboard's backing where the sheet is to be pasted, from 'Location 1' to 'Location 4'.
 - o The orientation of the sheet, either 'Upright' or 'Upside down'.

There are thus many ways of pasting up the sheets, but to display the billboard image correctly Sheets A to D must be pasted upright in Locations 1 to 4, respectively. Any other arrangement will display the image incorrectly. Not all of the data sets mention all four sheets. If there is no instruction for a particular sheet then it should not be drawn at all.

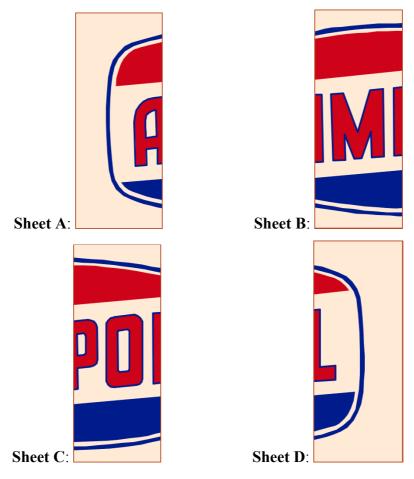


The template file also contains a dummy function definition, paste_up. Your task is to complete this function definition so that when called with a data set as its argument it draws the sheets at the locations and in the orientations specified. The function must work for any of the given data sets or any other similar data sets in the same format.

Illustrative example

Here we present a sample solution to illustrate the requirement. (You should *not* copy our example! Develop your own idea! Be imaginative!)

Firstly you will need to design each of the four distinct rolled paper "sheets" that collectively form your image. In our case we have created the following four sheets, as shown below in their upright orientations.



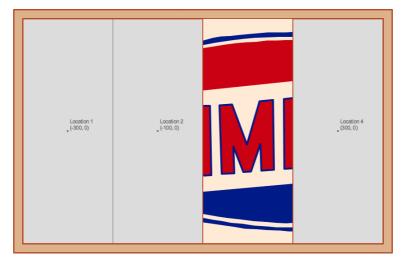
Each of the four sheets must contain a non-trivial image clearly distinct from all the others, regardless of their orientation, i.e., no sheet can be identical to another when turned upside down. Also, the images must be asymmetric so that it's easy to tell which way up the sheet has been pasted. When arranged correctly the four sheets must align precisely to produce a single composite picture.

Although it's difficult to specify the artistic requirements for this assignment, given the wide range of images that could be drawn, it's expected the assembled picture will involve several different shapes and colours and must be immediately recognisable. Simple geometric shapes would not be considered sufficiently challenging. Similarly, four unrelated images, one per sheet, would be unacceptable.



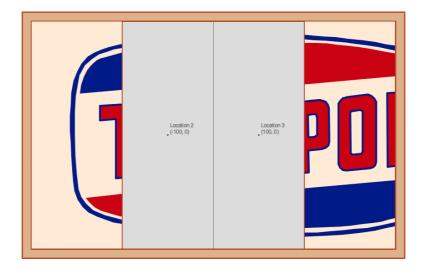
In the Python template file there are several data sets in the form of lists, each describing a particular way of pasting up one or more sheets. For instance, one of the simplest such lists is the one at index 12 in our data set, which is as follows:

This list tells us that we are required to paste Sheet B in Location 3 in its upright orientation. When our paste_up function is called with this list as the argument it produces the billboard displayed below.



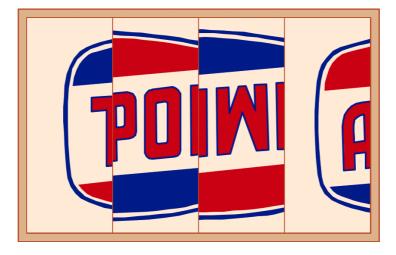
Another such data set is the one at index 36, as follows.

In this case Sheet D is to be pasted in Location 1, but upside down, and Sheet C is pasted in Location 4, in its correct orientation, which produces the following billboard.



Other data sets require all four sheets to be pasted up. For instance, the data set at index 47 specifies that four sheets must be displayed, but two are upside down as shown overleaf.

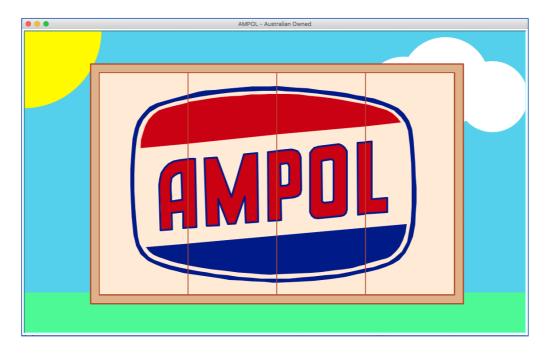
```
['O', ['Sheet C', 'Location 2', 'Upright'],
        ['Sheet B', 'Location 3', 'Upside down'],
        ['Sheet D', 'Location 1', 'Upside down'],
        ['Sheet A', 'Location 4', 'Upright']]
```



The final two data sets require all four sheets to be drawn, in their correct locations and orientations. The very last data set provided, at index 52, produces the correct billboard layout.

```
['O', ['Sheet A', 'Location 1', 'Upright'],
        ['Sheet B', 'Location 2', 'Upright'],
        ['Sheet C', 'Location 3', 'Upright'],
        ['Sheet D', 'Location 4', 'Upright']]
```

This data set pastes all four sheets upright and in locations that correctly complete the image, as shown below, finally revealing that our billboard displays the old AMPOL logo (see Appendix 2). We have also given the drawing canvas a title, describing the billboard.





Requirements and marking guide

To complete this part of the assignment you are required to extend the provided bill-board.py Python file by completing function paste_up so that it can draw sheets at the locations and orientations specified by a data set provided as its single parameter. Your code must work for all the supplied data sets in the template file and any other data set in the same format.

Your submitted solution will consist of a single Python 3 file, and must satisfy the following criteria. Percentage marks available are as shown.

- 1. **Drawing four distinct billboard sheets (4%)**. Your program must be able to draw four distinct sheets, each containing part of a single overall picture. Each sheet must be a 200 × 500 pixel rectangle and must be of a reasonable degree of complexity, involving multiple shapes and colours. The entire rectangle must be filled in with colour. Each sheet must be clearly distinct so that the viewer can tell which one has been drawn. It must be easy for the viewer to distinguish each sheet from its neighbours when they are side-by-side, either through the use of a visible margin or by contrasting background colours. Each sheet must be clearly different from all the others, regardless of their orientation, and the image on each sheet must be asymmetric so that it is easy to tell whether it is being displayed upright or upside down.
- 2. Creating a single picture in four parts (3%). When pasted up correctly, as per the final two data sets provided, the separate parts of the image must align perfectly to produce a single, clearly recognisable, non-trivial picture. The title of the drawing canvas must describe the picture drawn. (NB: If your solution is incapable of drawing all four sheets in their correct arrangement we cannot assess this criterion and must award zero for it.)
- 3. Relocating sheets (4%). Your code must be capable of drawing each of the four sheets at any of the four marked locations. The sheets must fit precisely into each of the locations marked on the billboard's backing, with the entire area being filled and no parts of the drawing protruding. The sheets must be sufficiently different that it is easy to distinguish which one is being drawn in each location. The images on the sheets must preserve their integrity no matter where they are drawn. Your solution for relocating the sheets must work for all of the provided data sets and any other data sets in the same format. You cannot "hardwire" your code for specific data sets and you may not change the data sets provided.
- 4. Orienting sheets (5%). Your code must be capable of drawing each of the four sheets in either of the two possible orientations, upright or upside down. The images on each sheet must be sufficiently asymmetric that it is easy to tell one orientation from the other. The images on the sheets must preserve their integrity no matter how they are oriented. Your solution for reorienting the sheets must work for all of the provided data sets and any other data sets in the same format. You cannot "hardwire" your code for specific data sets and you may not change the data sets provided.
- 5. Code quality and presentation (4%). Your program code, for both Parts A and B of the assignment, must be presented in a professional manner. See the coding guidelines in the *IFB104 Code Presentation Guide* (on Blackboard under *Assessment*) for suggestions on how to achieve this. In particular, given the obscure and repetitive nature of



the code needed to draw complex images using Turtle graphics, each significant code segment must be clearly commented to say what it does, e.g., "Draw letter 'M", "Draw red oval", etc.

6. Extra feature (5%). Part B of this assignment will require you to make a 'last-minute extension' to your solution. The instructions for Part B will not be released until just before the final deadline for Assignment 1.

You must complete the assignment using basic Turtle graphics and maths functions only. You may not import any additional modules or files into your program other than those already included in the given billboard.py template. In particular, you may not import any image files for use in creating your picture.

Finally, you are *not* required to copy the example shown in this document and you do *not* need to draw something that would be found on a "real" billboard. Instead you are strongly encouraged to be creative and to choose a picture that interests you personally. Surprise us!

Artistic merit - The Hall of Fame!

You will not be assessed on the artistic merit of your solution, only the ability to create a recognisable picture in four parts. However, a "Hall of Fame" containing the solutions considered the most artistic or ambitious by the assignment markers will be created on Blackboard. (Sadly, additional marks will not be awarded to the winners, only kudos.)

Development hints

- This can be a time-consuming task, so you are strongly encouraged to design your bill-board sheets carefully before developing any program code.
- The hardest part of this assignment is the need to allow the sheets to be drawn in different locations and orientations. You therefore need to devise a way of drawing each sheet so that you can either (a) make all drawing moves *relative* to the starting position and orientation (using Turtle's forward, left and right commands), or (b) calculate *absolute* target positions for each drawing move in terms of a given starting position and orientation (using Turtle's goto command). Stick with one of these two approaches. Mixing these two styles of drawing will make the task harder.
- If you are unable to complete the whole assignment, just submit whatever parts you can get working. You will receive partial marks for incomplete solutions. Try to ensure that your program code runs when you submit it, even if it is incomplete.
- To help you debug your code we have provided several data sets, numbered 2 to 33, which draw just one sheet at a time. You can use these to help refine the code for each sheet separately.
- Part B of this assignment will require you to change your solution slightly in a short space of time. You are therefore encouraged to keep code maintainability in mind while developing your solution to Part A. Make sure your code is neat and well-commented so that you will find it easy to modify when the instructions for Part B are released.

Deliverable

You must develop your solution by completing and submitting the provided Python 3 file billboard.py as follows.

- 1. Complete the "statement" at the beginning of the Python file to confirm that this is your own individual work by inserting your name and student number in the places indicated. We will assume that submissions without a completed statement are <u>not</u> your own work!
- 2. Complete your solution by developing Python code to replace the dummy paste_up function. You must complete your solution using only the modules already imported by the provided template. You may *not* use or import any other modules to complete this program. In particular, you may *not* import any image files into your solution.
- 3. Submit *a single Python file* containing your solution for marking. Do *not* submit an archive (e.g., in 'zip' or 'rar' formats) containing several files. Only a single file will be accepted, so you cannot accompany your solution with other files or pre-defined images. Do not submit any other files! Submit only a single Python 3 file!

Apart from working correctly your program code must be well-presented and easy to understand, thanks to (sparse) commenting that explains the *purpose* of significant code segments and *helpful* choices of variable and function names. *Professional presentation* of your code will be taken into account when marking this assignment.

If you are unable to solve the whole problem, submit whatever parts you can get working. You will receive *partial marks for incomplete solutions*.

Plagiarism

This is an individual assessment item. All files submitted will be subjected to software plagiarism analysis using the MoSS system (http://theory.stanford.edu/~aiken/moss/). Serious violations of the university's policies regarding plagiarism will be forwarded to the Science and Engineering Faculty's Academic Misconduct Committee for trial.

How to submit your solution

A link will be available on Blackboard under *Assessment* for uploading your solution file before the deadline (5:00pm Wednesday, September 13th). You can *submit as many drafts of your solution as you like*. You are strongly encouraged to *submit draft solutions* before the deadline as insurance against computer or network problems near the deadline. Students who encounter problems uploading their Python files to Blackboard should contact the *IT Helpdesk* (ithelpdesk@qut.edu.au; 3138 4000) for assistance and advice.



Appendix 1: Some standard Turtle graphics colours you can use

IndianRed	CD	5C	50	205	92	92
LightCoral	F0	80	80	240	128	128
Salmon	FA	80	72	250	128	114
DarkSalmon	E9	96	7A	233	150	122
LightSalmon	FF	A0	7A	255	160	122
Crimson	DC	14	3C	220	20	60
Red	FF	00	00	255	0	0
FireBrick	В2	22	22	178	34	34
DarkRed	8B	00	00	139	0	0
Pink colors						
Pink	FF	C0	СВ	255	192	203
LightPink	FF	В6	C1	255	182	193
HotPink	FF	69	В4	255	105	180
DeepPink	FF	14	93	255	20	147
MediumVioletRed	C7		85	199		133
PaleVioletRed	DB	70	93	219	112	147
Orange colors						
LightSalmon	FF	A0	7A	255	160	122
Coral	FF	7F	50	255	127	80
Tomato	FF	63	47	255	99	71
OrangeRed	FF	45	00	255	69	0
DarkOrange	FF	8C	00	255	140	0
Orange	FF		00	255		
Yellow colors						
Gold	FF	D7	00	255	215	0
Yellow	FF		00	255		0
LightYellow	FF		EO	255		224
LemonChiffon	FF		CD	255		205
LightGoldenrodYellow		FA	D2	250		210
PapayaWhip	FF		D5	255		213
Moccasin	FF	E4	B5	255		181
PeachPuff	FF		В9	255	218	185
PaleGoldenrod	EE		AA	238		170
Khaki	F0		8C		230	140
DarkKhaki	BD	В7	6B	189	183	107
Purple colors						
Lavender					230	
Thistle	D8	BF	D8		191	216
Plum	DD	A0	DD	221	160	221
Violet	EE	82	EE	238	130	238
Orchid	DA	70	D6	218	112	214
Fuchsia	FF	00	FF	255	0	255
Magenta	FF	00	FF	255	0	255
MediumOrchid	ва	55	D3	186	85	211
BlueViolet	8A	2B	E2	138	43	226
DarkViolet	94	00	D3	148	0	211
DarkOrchid	99	32	CC	153	50	204
DarkMagenta	8B	00	8B	139	0	139
Purple	80	00	80	128	0	128
Indigo	4B	00	82	75	0	130
SlateBlue	бΑ	5A	CD	106	90	205
			-			
DarkSlateBlue	48			72		

Green colors						
GreenYellow	AD	FF	2F	173		47
Chartreuse	7F	FF	00	127	255	0
LawnGreen	7C	FC	00	124	252	0
Lime	00	FF	00	0	255	0
LimeGreen	32	CD	32	50	205	50
PaleGreen	98	FB	98	152	251	152
LightGreen	90	EE	90	144	238	144
MediumSpringGreen	00	FA	9A	0	250	154
SpringGreen	00	FF	7F	0	255	127
MediumSeaGreen	3C	В3	71	60	179	113
SeaGreen	2E	8B	57	46	139	87
ForestGreen	22	8B	22	34	139	34
Green	00	80	00	0	128	0
DarkGreen	00	64	00	0	100	0
YellowGreen	9A	CD	32	154	205	50
OliveDrab	6B	8E	23	107	142	35
Olive	80	80	00	128	128	0
DarkOliveGreen	55	6B	2F	85	107	47
MediumAquamarine	66	CD	AA	102	205	170
DarkSeaGreen	8F	ВС	8F	143	188	143
LightSeaGreen	20	В2	AA	32	178	170
DarkCyan	00	8B	8B	0	139	139
Teal	00	80	80	0	128	128
Blue/Cyan cold	rs					
Aqua	00	FF	FF	0	255	255
Aqua Cyan	00 00	FF FF	FF FF	0	255 255	255 255
Cyan	00	FF	FF	0	255	255
<mark>Cyan</mark> LightCyan	00 E0	FF FF	FF FF	0 224	255 255	255 255
Cyan LightCyan PaleTurquoise	00 E0 AF	FF FF EE	FF FF EE	0 224 175	255 255 238	255 255 238
Cyan LightCyan PaleTurquoise Aquamarine	00 E0 AF 7F	FF FF EE FF	FF FF EE D4	0 224 175 127	255 255 238 255	255 255 238 212
Cyan LightCyan PaleTurquoise Aquamarine Turquoise	00 E0 AF 7F 40	FF FF EE FF E0	FF FF EE D4 D0	0 224 175 127 64	255 255 238 255 224	255 255 238 212 208
Cyan LightCyan PaleTurquoise Aquamarine Turquoise MediumTurquoise	00 E0 AF 7F 40	FF FF EE FF E0	FF FF EE D4 D0 CC	0 224 175 127 64 72 0	255 255 238 255 224 209	255 255 238 212 208 204
Cyan LightCyan PaleTurquoise Aquamarine Turquoise MediumTurquoise DarkTurquoise	00 E0 AF 7F 40 48	FF FF EE FF E0 D1	FF FF EE D4 D0 CC	0 224 175 127 64 72	255 255 238 255 224 209 206	255 255 238 212 208 204 209
Cyan LightCyan PaleTurquoise Aquamarine Turquoise MediumTurquoise DarkTurquoise CadetBlue	00 E0 AF 7F 40 48 00	FF FF EE FF E0 D1 CE	FF FF D4 D0 CC D1 A0	0 224 175 127 64 72 0	255 255 238 255 224 209 206	255 255 238 212 208 204 209
Cyan LightCyan PaleTurquoise Aquamarine Turquoise MediumTurquoise DarkTurquoise CadetBlue SteelBlue	00 E0 AF 7F 40 48 00 5F	FF FF EE FF E0 D1 CE 9E	FF FF EE D4 D0 CC D1 A0 B4	0 224 175 127 64 72 0 95 70 176	255 255 238 255 224 209 206 158	255 255 238 212 208 204 209 160
Cyan LightCyan PaleTurquoise Aquamarine Turquoise MediumTurquoise DarkTurquoise CadetBlue SteelBlue LightSteelBlue	00 E0 AF 7F 40 48 00 5F 46 B0	FF FF EE FF E0 D1 CE 9E 82 C4	FF FF EE D4 D0 CC D1 A0 B4 DE	0 224 175 127 64 72 0 95 70	255 255 238 255 224 209 206 158 130	255 255 238 212 208 204 209 160 180
Cyan LightCyan PaleTurquoise Aquamarine Turquoise MediumTurquoise DarkTurquoise CadetBlue SteelBlue LightSteelBlue PowderBlue	00 E0 AF 7F 40 48 00 5F 46 B0	FF FF EE FF E0 D1 CE 9E C4 E0	FF FF EE D4 D0 CC D1 A0 B4 DE E6	0 224 175 127 64 72 0 95 70 176	255 255 238 255 224 209 206 158 130 196 224	255 255 238 212 208 204 209 160 180 222 230
Cyan LightCyan PaleTurquoise Aquamarine Turquoise MediumTurquoise DarkTurquoise CadetBlue SteelBlue LightSteelBlue LightBlue LightBlue	00 E0 AF 7F 40 48 00 5F 46 B0 B0	FF FF EE FF E0 D1 CE 9E 82 C4 E0 D8	FF FF EE D4 D0 CC D1 A0 B4 E6 E6	0 2224 175 127 64 72 0 95 70 176 176	255 255 238 255 224 209 206 158 130 196 224 216	255 255 238 212 208 204 209 160 180 222 230 230
Cyan LightCyan PaleTurquoise Aquamarine Turquoise MediumTurquoise DarkTurquoise CadetBlue SteelBlue LightSteelBlue LightBlue SkyBlue	00 AF 7F 40 48 00 5F 46 B0 B0 AD	FF FF EE FF EO D1 CE 9E 82 C4 EO D8	FF FF EE D4 D0 CC D1 A0 B4 DE E6 E6 EB	0 224 175 127 64 72 0 95 70 176 176 173	255 255 238 255 224 209 206 158 130 196 224 216 206	255 255 238 212 208 204 209 160 180 222 230 230 235 250
Cyan LightCyan PaleTurquoise Aquamarine Turquoise MediumTurquoise DarkTurquoise CadetBlue SteelBlue LightSteelBlue LightBlue LightBlue LightSkyBlue LightSkyBlue	000 AF 7F 400 48 000 5F 46 B0 B0 AD 87	FF FF EE FF E0 D1 CE 82 C4 E0 D8 CE CE	FF FF FF EE D4 D0 CC D1 A0 B4 DE E6 E6 E8 FA FF	0 224 175 127 64 72 0 95 70 176 173 135	255 255 238 255 224 209 206 158 130 196 224 216 206	255 255 238 212 208 204 209 160 180 222 230 235 250 255
Cyan LightCyan PaleTurquoise Aquamarine Turquoise MediumTurquoise DarkTurquoise CadetBlue SteelBlue LightSteelBlue LightBlue SkyBlue LightSkyBlue DeepSkyBlue	000 E0 AF 7F 400 48 000 5F 46 B00 B00 AD 87 87 000 1E	FFF FFF E0 D1 CE 82 C4 E0 D8 CE CE BF	FF	0 224 175 127 64 72 0 95 70 176 173 135 0 30	255 238 255 224 209 206 158 130 196 224 216 206 206 191	255 255 238 212 208 204 209 160 180 222 230 230 235 250
Cyan LightCyan PaleTurquoise Aquamarine Turquoise MediumTurquoise DarkTurquoise CadetBlue SteelBlue LightSteelBlue PowderBlue LightBlue SkyBlue LightSkyBlue DoeepSkyBlue DodgerBlue	000 E00 AF 7F 400 48 000 5F 46 B00 AD 87 87 000	FFF FFF E0 D1 CE 82 C4 E0 D8 CE CE BF	FF FF FF EE D4 D0 CC D1 A0 B4 DE E6 E6 E8 FA FF	0 224 175 127 64 72 0 95 70 176 173 135 135	255 238 255 224 209 206 158 130 196 224 216 206 206 191	255 255 238 212 208 204 209 160 180 222 230 235 250 255
Cyan LightCyan PaleTurquoise Aquamarine Turquoise MediumTurquoise DarkTurquoise CadetBlue LightSteelBlue PowderBlue LightBlue SkyBlue LightSkyBlue DeepSkyBlue DodgerBlue CornflowerBlue	000 E00 AF7F400 488000 5F466 B00 B00 AD08787 000 1E6447B	FF FF EE FF E0 D1 CE BF P0 90 68 69	FF FF FF EE E	0 224 175 127 64 72 0 95 70 176 173 135 0 30 100 123	255 238 255 224 209 206 158 130 196 224 216 206 206 191 144	255 255 238 212 208 204 209 160 180 222 230 235 255 255 237 238 225
Cyan LightCyan PaleTurquoise Aquamarine Turquoise MediumTurquoise DarkTurquoise CadetBlue LightSteelBlue PowderBlue LightBlue SkyBlue LightSkyBlue DeepSkyBlue DodgerBlue CornflowerBlue MediumSlateBlue	000 E0 AF 7F 400 488 000 5F 466 B00 B00 AD 87 000 1E 644 7B	FF FF FF EE FF E0 D1 CE S2 C4 E0 CE BF 90 68 69 00	FF FF EE D4 D0 CC D1 A0 B4 E6 E6 E8 FA FF FF ED	0 224 175 64 72 0 95 70 176 173 135 0 30	255 255 238 255 224 209 206 158 130 196 224 216 206 206 191 144 149	255 255 238 212 208 204 209 160 180 222 230 235 255 255 237 238 225 205
Cyan LightCyan PaleTurquoise Aquamarine Turquoise MediumTurquoise DarkTurquoise CadetBlue SteelBlue LightSteelBlue PowderBlue LightBlue SkyBlue LightSkyBlue DeepSkyBlue DodgerBlue CornflowerBlue MediumSiateBlue RoyalBlue	000 E00 AF7F400 488000 5F466 B00 B00 AD08787 000 1E6447B	FF FF EE FF E0 D1 CE BF P0 90 68 69	FF FF FF EE E	0 224 175 127 64 72 0 95 70 176 173 135 0 30 100 123	255 255 238 255 224 209 206 158 130 196 224 216 206 206 191 144 149 104	255 255 238 212 208 204 209 160 180 222 230 235 255 255 237 238 225
Cyan LightCyan PaleTurquoise Aquamarine Turquoise MediumTurquoise DarkTurquoise CadetBlue SteelBlue LightSteelBlue PowderBlue LightBlue SkyBlue LightSkyBlue DeepSkyBlue DodgerBlue CornflowerBlue MediumSlateBlue RoyalBlue MediumBlue	000 E00 AF7F400 4800 5F46 B00 B00 AD00 8700 1E64 7B41	FF FF FF EE FF E0 D1 SE E0 E0 EF E0 E0 EF E0	FF	0 224 175 127 64 72 0 95 176 176 173 135 0 30 100 123 65	255 238 255 224 209 206 158 130 196 224 216 206 206 191 144 149 104	255 255 238 212 208 204 209 160 180 222 230 235 255 255 237 238 225 205
Cyan LightCyan PaleTurquoise Aquamarine Turquoise MediumTurquoise DarkTurquoise CadetBlue SteelBlue LightSteelBlue PowderBlue LightBlue SkyBlue LightSkyBlue DeepSkyBlue DodgerBlue CornflowerBlue MediumSlateBlue RoyalBlue MediumBlue MediumBlue DarkBlue	000 E00 AF 7F 400 5F 466 B00 AD 87 000 1E 64 7B 41 000	FF FF FF EE O D1 O D1 O O O O O O O O O O O O O O O	FF FF EE D4 D0 CC D1 A0 B4 E6 E6 E6 FA FF ED EE E1 CD	0 224 175 127 64 72 0 95 70 176 173 135 135 0 100 123 65	255 238 255 224 209 206 158 130 196 224 216 206 206 191 144 149 104 105 0	255 238 212 208 204 209 160 180 222 230 235 250 255 255 225 237 238 225 205 139

Brown color	s					
Cornsilk	FF	F8	DC	255	248	220
BlanchedAlmond	FF	EB	CD	255	235	205
Bisque	FF	E4	C4	255	228	196
NavajoWhite	FF	DE	AD	255	222	173
Wheat	F5	DE	ВЗ	245	222	179
BurlyWood	DE	В8	87	222	184	135
Tan	D2	В4	8C	210	180	140
RosyBrown	вс	8F	8F	188	143	143
SandyBrown	F4	A4	60	244	164	96
Goldenrod	DA	A5	20	218	165	32
DarkGoldenrod	В8	86	0B	184	134	11
Peru	CD	85	3F	205	133	63
Chocolate	D2	69	1E	210	105	30
SaddleBrown	8B	45	13	139	69	19
Sienna	A0 A5	52	2D 2A	160 165	82	45
Brown Maroon	A5 80	2A 00	2A 00	128	42	42
White color		00	00	120		·
White	FF	FF	FF	255	255	255
Snow	FF	FA	FA	255	250	250
Honeydew	FO	FF	FO	240	255	240
MintCream	F5	FF	FA	245	255	250
Azure	F0	FF	FF	240	255	255
AliceBlue	F0	F8	FF	240	248	255
GhostWhite	F8	F8	FF	248	248	255
WhiteSmoke	F5	F5	F5	245	245	245
Seashell	FF	F5	EE	255	245	238
Beige	F5	F5	DC	245	245	220
OldLace	FD	F5	E6	253	245	230
FloralWhite	FF	FA	F0	255	250	240
lvory	FF	FF	F0	255	255	240
AntiqueWhite	FA	EB	D7	250	235	215
Linen LavenderBlush	FA	F0 F0	E6 F5	250 255	240 240	230
MistyRose	FF	E4	E1	255	228	225
Grav colors	PP	ET	EI	255	220	225
Gainsboro	DC	DC	DC	220	220	220
LightGrey	D3	D3	D3	211	211	211
Silver	CO	CO	CO	192	192	192
DarkGray	A9	A9	A9	169	169	169
Gray	80	80	80	128	128	128
DimGray	69	69	69	105	105	105
						152
LightSlateGray	77			119		
	77 70	88	99	119	136	144
LightSlateGray						



Appendix 2: Irrelevant historical note

For our demonstration solution we draw the AMPOL logo as an example of something you might have seen on an advertising billboard while driving around Australia some years ago. But just what is AMPOL?

AMPOL, the <u>Australian Motorists Petrol</u> Company, was established in 1936 and at its peak operated service stations around the country. Its logo was widely seen everywhere, typically accompanied by the words "Australian Owned", "Buy Australian", or some other such patriotic message.



The company logo changed considerably over the years, but typically consisted of the name "AMPOL" with thick coloured stripes both above and below. The colours were usually red and blue on a white background. For our demo we've used the "classic" oval-shaped logo which was common in the late 1950s and early 1960s.



Sadly, like so many Australian companies, AMPOL was devoured by foreign interests in the early 1990s, in this case the American oil company Caltex. AMPOL signage on service stations is therefore rare these days, although you may run across surviving examples in isolated country towns.