

# UNSW High Schools Programming Competition 2018

## Important Information for Finalists

### Introduction

Since 2009 one of the five finals tasks has involved image processing. Sometimes the graphics medium has been SVG and sometimes it's raster bitmaps. This year it's bitmaps again.

To maintain equity amongst teams using different languages and systems, we will maintain the fundamental rule of the competition that inputs and outputs are in text format. Consequently images will be supplied, and any new images must be generated, in plain PPM P3 (ASCII) format. For a description of the format, see <http://netpbm.sourceforge.net/doc/ppm.html> and [http://en.wikipedia.org/wiki/Portable\\_pixmap](http://en.wikipedia.org/wiki/Portable_pixmap).

### Data Format

The PPM format can be read and written by a program using normal text operations. To display an image on screen, you will need to have a suitable display program installed on the computer you bring to the finals. For Windows, the freeware **IrfanView** application is adequate, although if you save it writes overlong lines and always assumes 8-bit values; for Linux many viewers are suitable, such as **eog**, **geeqie** or **gthumb**. For Mac try **Totem** (freeware) or **Lynx**. An example of a small image in plain PPM format (the 24 pixel wide x 32 pixel high squashed Paypal icon shown at right) accompanies this document: make sure you can view this file and generate similarly structured ones at least. The first few lines are:



```
P3
# Paypal favicon, converted by IrfanView
24 32
255
254 237 139 254 237 139 254 237 139 203 200 131 59 93
109 16 62 103 16 62 103 16 62 103 16 62 103 16 62 103 16 62 103 16
```

Line 1: file type (P3 is plain PPM ASCII)  
Line 2: comment (# to end of line)  
Line 3: width and height in pixels  
Line 4: maximum value of each colourant ( $2^N-1$ )

Top-left pixel, yellow

Colourants in order red green blue  
red green blue red.... Maximum  
line length is 70 characters

12<sup>th</sup> pixel from top  
left, dark blue

### Processing algorithms

We're not going to give anything away, but you do *not* need any deep knowledge about image processing apart from the basic structure: each pixel is represented by a red, a green and a blue colourant (a value between 0 and some specified maximum), in that order, with pixels stored left to right and top to bottom. This year all you'll have to do is to process colourants using simple arithmetic, and generate images. *You may bring any pre-written procedures or additional software that you think may be useful.* The task may require you to present output in PPM text form and display images on the screen for assessment.

### Limits

No image will exceed 800 pixels in width or 600 pixels in height. The image geometry is given on the first four lines, as shown in the sample. All line endings are single ASCII line feeds. All files will have 8 bits per colourant.

### Questions

If you have any queries please email [progcomp@cse.unsw.edu.au](mailto:progcomp@cse.unsw.edu.au)

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