

# Drawing

## 1 Fonts

[plex]										\mr : <i>Ag</i>			
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\rm	Ag	Ag	<i>Ag</i>	<i>Ag</i>	<b>Ag</b>	<b>Ag</b>	<b>Ag</b>	Ag	Ag	Ag	Ag	<b>Ag</b>	<b>Ag</b>
\ss	Ag	Ag	<i>Ag</i>	<i>Ag</i>	<b>Ag</b>	<b>Ag</b>	<b>Ag</b>	Ag	Ag	Ag	Ag	<b>Ag</b>	<b>Ag</b>
\tt	Ag	Ag	<i>Ag</i>	<i>Ag</i>	<b>Ag</b>	<b>Ag</b>	<b>Ag</b>	Ag	Ag	Ag	Ag	<b>Ag</b>	<b>Ag</b>

[nimbus]										\mr : Ag			
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\rm	Ag	Ag	<i>Ag</i>	<i>Ag</i>	Ag	Ag	Ag	Ag	Ag	Ag	Ag	<b>Ag</b>	<b>Ag</b>
\ss	Ag	Ag	<i>Ag</i>	<i>Ag</i>	<b>Ag</b>	<b>Ag</b>	<b>Ag</b>	Ag	Ag	Ag	Ag	<b>Ag</b>	<b>Ag</b>
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[lato]										\mr : Ag			
	\tf	\sc	\sl	\it	\bf	\bs	\bi	\tfx	\tfxx	\tfa	\tfb	\tfc	\tfd
\rm	Ag	Ag	<i>Ag</i>	<i>Ag</i>	<b>Ag</b>	<b>Ag</b>	<b>Ag</b>	Ag	Ag	Ag	Ag	<b>Ag</b>	<b>Ag</b>
\ss	Ag	Ag	<i>Ag</i>	<i>Ag</i>	<b>Ag</b>	<b>Ag</b>	<b>Ag</b>	Ag	Ag	Ag	Ag	<b>Ag</b>	<b>Ag</b>
\tt	Ag	Ag	<i>Ag</i>	<i>Ag</i>	<b>Ag</b>	<b>Ag</b>	<b>Ag</b>	Ag	Ag	Ag	Ag	<b>Ag</b>	<b>Ag</b>

## 2 Drawing a Die

Suppose we want to draw a die



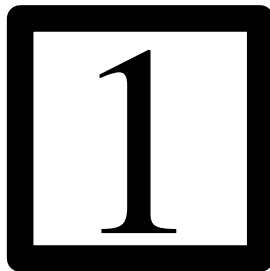
To do that, let us first define a macro which will draw a single face of the die: a square with number `s` on it.

```
def face (expr s) = image (begingroup
  pickup pencircle scaled 1pt;
  draw (0.5, 0.5) -- (0.5, 9.5) -- (9.5, 9.5) -- (9.5, 0.5) -- cycle;
  label (s, (5.75, 5.75)) scaled 0.85;
endgroup) scaled 10 enddef;
```

Now we can draw it using

```
draw face ("1");
```

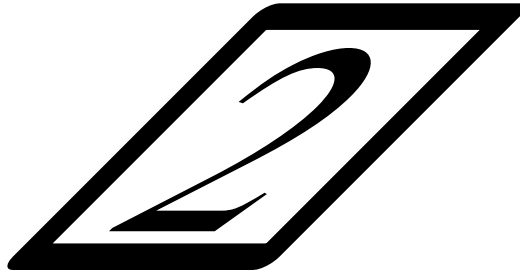
and get the picture:



Next, we need an upper face and a right face. To draw them, we will have to compose an affine transformation to skew them. This can be tricky since the only readily available primitive transformation for skewing is `slanted a` which transforms a point  $(x, y)$  into  $(x + ay, y)$ .

```
draw face ("1");
```

Here is our picture slanted 2:



To make it look realistic for the eye leve we will scale it along the y-axis

```
draw face ("2") yscaled 0.45 slanted 1;
```

This shoule yield us following picture



Now let's do the right side projection. We will x-scale it by the same factor, turn it -90 degrees slant it -1 and then turn it back up

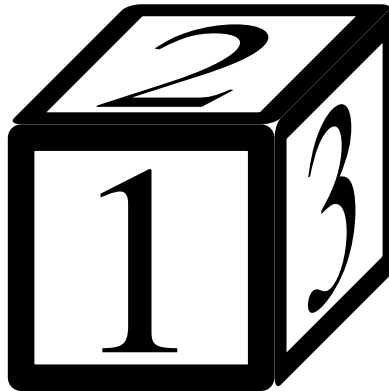
```
draw face ("3") xscaled 0.45 rotated -90 slanted -1 rotated 90;
```

This should yield us following picture



Now let's put it together by shifting top face by 100 on **y** and shifting right face by 100 on **x**

```
draw face ("1");
draw face ("2") yscaled 0.45 slanted 1 shifted (0,100);
draw face ("3") xscaled 0.45 rotated -90 slanted -1 rotated 90 shifted (100,0);
```



Now we can turn the die into a **picture**

Drawing it as image with transformation

```
picture die;
die := image(
  begingroup
  draw face ("1");
  draw face ("2") yscaled 0.45 slanted 1 shifted (0,100);
  draw face ("3") xscaled 0.45 rotated -90 slanted -1 rotated 90 shifted (100,0);
  endgroup
);
draw die rotated 45;
```

