

**STEP/Inequalities Q4 (20/6/23)**

Which is larger:  $\frac{\sqrt{7}}{2}$  or  $\frac{1+\sqrt{6}}{3}$  (without using a calculator)?

## Solution

Considering the difference of squares:

$$\frac{7}{4} - \frac{(1+2\sqrt{6}+6)}{9} = \frac{63-28-8\sqrt{6}}{36} > \frac{35-8(3)}{36} > 0 ; \text{ so } \frac{\sqrt{7}}{2} \text{ is larger}$$

[Another approach is to investigate  $\frac{\left(\frac{7}{4}\right)}{\left(\frac{7+2\sqrt{6}}{9}\right)} = \frac{63(7-2\sqrt{6})}{4(49-24)} =$

$\frac{63(7-2\sqrt{6})}{100}$ , but it isn't as easy to show that this expression is greater than 1]