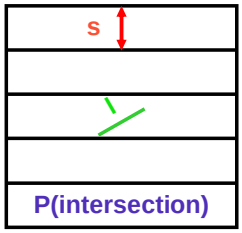
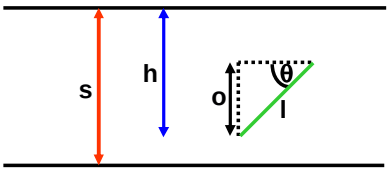
TRIGONOMETRY & STEREOLOGY



Buffon Needle Problem



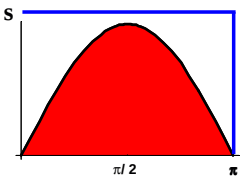
$o = l \, \text{Sin}[\theta] \qquad 0 \le \theta \le \pi \qquad 0 \le h \le s$

intersection if $h \le l \, \text{Sin}[\theta]$

area $= l \, \text{Integrate}[\text{Sin}[\theta], \{\theta, 0, \pi\}]$

$= l \, (-\text{Cos}[\pi] + \text{Cos}[0]) = 2\,l$

total area $= \pi\, s$



P(intersection) $= 2\,l \,/\, (\pi\, s)$

PERIMETER

Scotch egg transected with unit-wide lines

each ‘effective’ transect intersects yolk at two points

accumulate entire perimeter with repetition

place egg within grid with spacing z

$p = n_{\cap} z$

SURFACE DENSITY

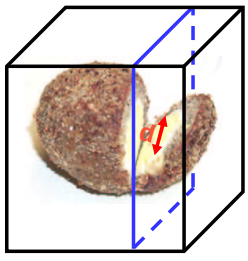
quantifies surface area within volume

$V = A t$

$S = p t$

$S_V = p / A$

STEREOLOGY & CELLS



P(section passes through yolk)

NUMERICAL DENSITY

quantifies objects within volume

***e.g.*, Scotch egg in a deep fryer**
- **unit-thick slices**
- **w slices, d including yolk**
- **P(yolk sectioned) = d / w**
- **if box contained n Scotch eggs,**
  - **then in one section**
  - **$N = n\ d / w$**
  - **$N_A = N_V\ d$ (Wicksell 1925)**

$N_V = N_A / D$, D = typical diameter

$D = 6\ (V / S)$

can be calculated from V_V and S_V:

recall that $S_V = p / A = n_{\cap}\ z / A$

and $V_V = A_A$ = squares * (area) / A
$A_A = n_{\bullet}\ z^2 / (4\ A)$;

thus, $V / S = n_{\bullet}\ z / (4\ n_{\cap})$