P(H | d) = P(d | H) P(H) / P(d)

P(H)
Contestant has no information concerning where the nice prize is, so
P(nice prize is behind door 1) = 1 / 3
P(nice prize is behind door 2) = 1 / 3
P(nice prize is behind door 3) = 1 / 3

P(d | H)
Monty knows where the nice prize is, so
P(Monty has door 1 opened | nice prize is behind door 1) = 0
P(Monty has door 1 opened | nice prize is behind door 2) = 1
P(Monty has door 1 opened | nice prize is behind door 3) = 1 / 2
P(Monty has door 2 opened | nice prize is behind door 1) = 1
P(Monty has door 2 opened | nice prize is behind door 2) = 0
P(Monty has door 2 opened | nice prize is behind door 3) = 1 / 2
P(Monty has door 3 opened | any condition) = 0

P(d | H) P(d) = 0 (1 / 3)

P(H | d) = P(d | H) P(H) / P(d) = P(d | H) P(H) / (P(d | H) P(H) + P(d | ~H) P(~H))

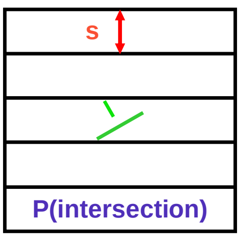
	nice prize is behind		
	door 1	door 2	door 3
Monty opens door 1	(0)(1/3)	(1)(1/3)	(1/2)(1/3)
Monty opens door 2	(1)(1/3)	(0)(1/3)	(1/2)(1/3)
Total	1/3	1/3	1/3

Note that the totals are consistent with the initial situation from the contestant's Informational perspective.

P(nice prize is behind door 3 | Monty opens door 1)
= P(nice prize is behind door 3 and Monty opens door 1) / P(Monty opens door 1)
= (1 / 6) / (0 + (1 / 3) + (1 / 6)) = 1 / 3

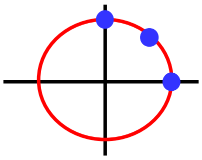
P(nice prize is behind door 2 | Monty opens door 1)
= P(nice prize is behind door 2 and Monty opens door 1) / P(Monty opens door 1)
= (1 / 3) / (0 + (1 / 3) + (1 / 6)) = 2 / 3

TRIGONOMETRY & STEREOLOGY



Buffon Needle Problem

TRIGONOMETRY



Sin[θ]

's=oh'

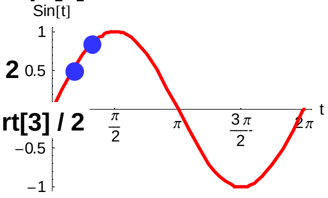
Sin[0] = 0

Sin[π / 4] = 1 / Sqrt[2]

Sin[π / 2] = 1

Sin[π / 6] = 1 / 2

Sin[π / 3] = Sqrt[3] / 2



θ	Sin[θ]	Cos[θ]
0	0	1
π / 6	1 / 2	Sqrt[3] / 2
π / 4	1 / Sqrt[2]	1 / Sqrt[2]
π / 3	Sqrt[3] / 2	1 / 2
π / 2	1	0

'CAST' rule

Tan[θ] = Sin[θ] / Cos[θ]

STEREOLOGY

studying 3D from lower dimensions

Delesse 1847

- geologist
- volume fraction = area fraction
  - $V_V = A_A$
  - is shape-independent
  - is distribution independent
  - is obtainable via unbiased, multiple samples

DELESSE PRINCIPLE

A_A

enumerate squares within a grid
cut and weigh hardcopy images

Rosiwal 1898

geologist
linear fraction

$A_A = L_L$

$V_V = A_A = L_L$

SCOTCH EGG

"a hard-boiled egg that is 'coated' with sausage, dipped into beaten egg, rolled in bread crumbs and deep-fried"

SCOTCH EGG_{YOLK}

cut into infinitely many extremely thin slices
summing the areas A_A must yield V_V

unit-thick slices (or unit-wide lines)
area within = volume within (or fraction)

imagine 1000 Scotch eggs in a deep fryer
take an unbiased planar section