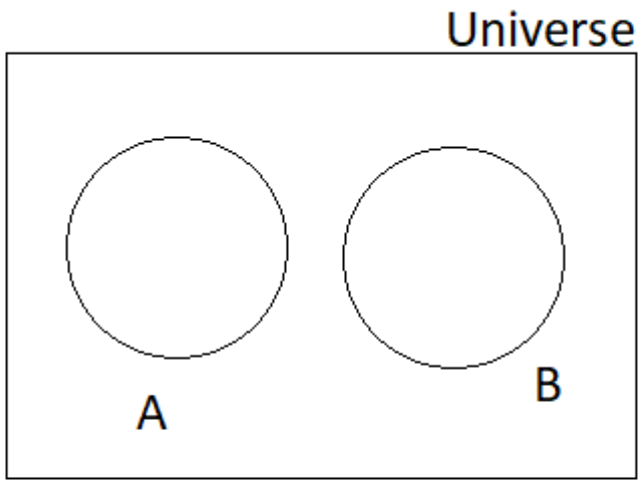
```
if A intersection B is empty set : A and B are mutually exclusive events
if A union B is Universal set : then A And B are mutually exhaustive events
```

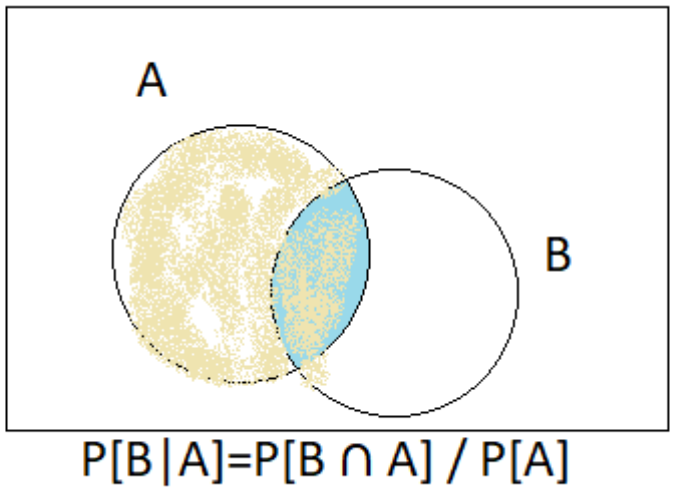


$$A \cap B = \{\ \}$$
$$A \cup B = \text{Universe}$$

```
P[A|B] = P[A ∩ B] / P[B]
       = P[B|A] * P[A]   / P[B]

P[A|B] = P[B|A] * P[A]   /
         (P[B|A] * P[A]   +   P[B|A'] * P[A'])
```

$$P[A|B] = \frac{P[B|A] * P[A]}{(P[B|A] * P[A] + P[B|A'] * P[A'])}$$



$$P[B|A] = P[B \cap A] / P[A]$$

In [ ]:

```

```

A family has 2 children. Given that at least one child is a girl, what is the probability that both are girls

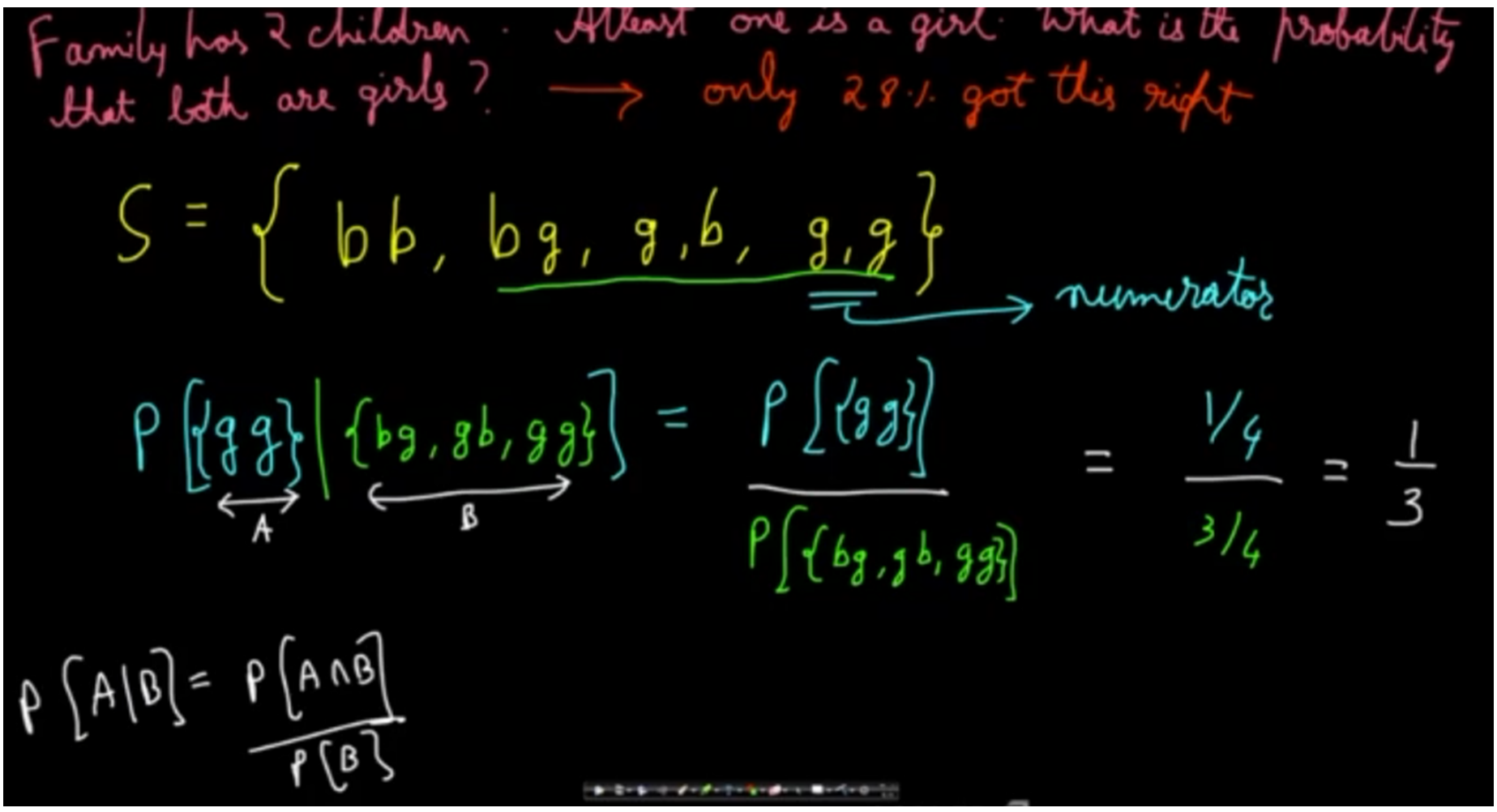
Click on an option to submit your answer

A	1/2
B	2/3
C	1/4
D	1/3

```
sample space  : gg,by,gb,bb
           already given that one child is a girl
         so bb is not an element

            so , sample space is : gg,bg,gb
```

```
6
7           one is girl that is given ,
8           the probability of both are girl is :
9               1/ 3
```



In [ ]:
```
1
```

```
1 P[ 2 Girls | atleast 1 girl ]  = P[2 Girls ] ∩ P[ atleast 1 girl]/
2                                     P[atleast 1 girl]
3
4                                 = ( 1/4 ) / (3/4)
5                                 = 1/3
6
```

In [92]:
```
1  ( 1/4 ) / (3/4)
```

Out[92]: 0.3333333333333333

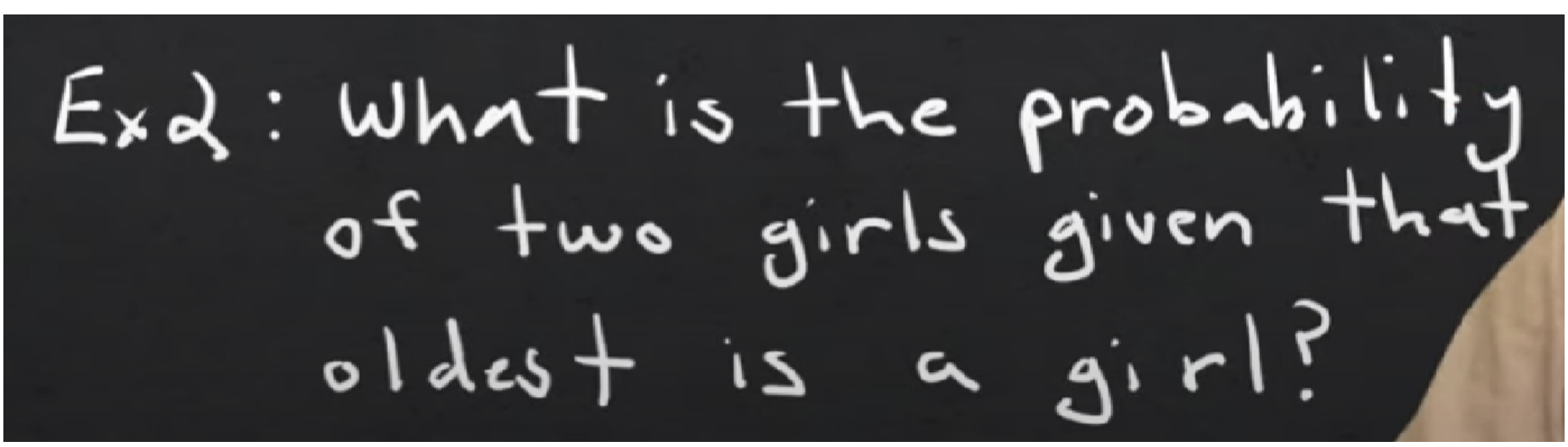
In [93]:
```
1 1/3
```

Out[93]: 0.3333333333333333

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```



In [ ]:
```
1 {gg,gb}
```

In [ ]:
```
1 1/2
```

```
1 P[2G|olderst_girl] = P[2G] ∩ P[OG] / P[OG]
2                    = 1/4           /  1/2
```

```
3                       = 1/2
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In MCQ with 4 options, let 0.8 be the probability that the student knows the answer, and 0.2 the probability of guessing. What is the conditional probability that the student knew the answer to a question given that it was answered correctly?

Click on an option to submit your answer

A	10/17
B	12/17
C	14/17
D	16/17

In [2]:
```
1 # D
```

```
1  P[student knows the answer] = 0.8                P[K] = 0.8
2  P[~ student knows the ans ] = 0.2   (guessing )  P[G] = 0.2
3
4  P[correct ans]
5  P[ans is wrong]
6
7
8  P[knows ans| ans correctly] =  ? (Question )
9
10 P[K|C] = P[C|K]*P[K] / P[C|K]*P[K]  + P[C|K']*P[K']
11        = P[C|K]*P[K] / P[C|K]*P[K]  + P[C|G]*P[G]
12
13    P[C|K]  probability of correct ans given he knows the ans = 1
14    P[k] is 0.8
15    P[C|G] probability of correct ans guessing out of 4 questions = 1/4
16    P[G] = 0.2
17
18        = (1*0.8)  / ((1*(0.8)) +  ((1/4)*0.2))
19
20
21
22
```

In [3]:
```
1 (1*0.8)  / ((1*(0.8)) +  ((1/4)*0.2))
```

Out[3]:
```
0.9411764705882353
```

In [4]:
```
1 16/17
```

Out[4]:
```
0.9411764705882353
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1 # A ∩ B
2 # A ∪ B
3 # A ⊂ B
```

P(E) = 0.6

What can we say about P(E|F) when E and F are mutually exclusive

Click on an option to submit your answer

A	P(E|F) = 0.6
B	P(E|F) >= 0.6
C	P(E|F) <=0.6
D	P(E|F) = 0

```
1 P[E|F] = P[E ∩ F]/P[F]
2
3 here, E and F are mututally exclusive . that means :
4 E ∩ F = {}
5 P[E ∩ F] = 0
6
7 P[E|F] = 0/P[F]
8        = 0
9
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

Let P(E) = 0.6

What can we say about P(E|F) when E is a subset of F

Click on an option to submit your answer

A	P(E|F) = 0.6
B	P(E|F) >= 0.6
C	P(E|F) <= 0.6
D	P(E|F) = 0

```
E is a subset of F :

P[E ∩ F] = P[E]




P[E|F] = P[E ∩ F]/P[F]
       = P[E]/P[F]
       =  0.6/P[F]

      P[E]/ P[E]   >= P[E]
ans is option B



P[E] = 0.6

P[E|F] = P[E]/P[F]

left say : P[E|F]== 0.5
           0.5= 0.6 / P[F]
           so , P[F] becomes >1 , which is not possible


           thats why P[E|F] should be >= 0.6


```

In [ ]:
```

```

In [ ]:
```

```

In [ ]:
```

```

In [ ]:
```

```

In [ ]:
```

```

In [ ]:
```

```

In [ ]:
```

```

In [ ]:
```

```

Let P(E) = 0.6

What can we say about P(E|F) when F is a subset of E

Click on an option to submit your answer

A	P(E|F) = 1
B	P(E|F) >= 0.6
C	P(E|F) <= 0.6
D	P(E|F) = 0

In [ ]:
```
F is a subset of E :
     means F ∩ E = F

  P[E|F] = P[E ∩ F]/P[F]
         = P[F] / P[F]
         = 1

  option A is the ans
```

In [ ]:
```

```

In [ ]:
```

```

In [ ]:
```

```

In [ ]:
```

```

In [ ]:
```

```

In [ ]:
```

```

In [ ]:
```

```

A gambler has in his pocket a fair coin and a two-headed coin. He selects one of the coins at random, and when he flips it, it shows heads. What is the probability that it is the fair coin?

Click on an option to submit your answer

A	1/2
B	1/3
C	1/5
D	1

```
Fair coin      Biased coin
(HT)           (HH)

P[F] = 1/2     P[B] = 1/2

P[F|H] = ? (Question )

```

```

P[F|H]  =  P[H|F]*P[F]  /  P[H|F]*P[F] + P[H|B]*P[B]
        =  1/2 * 1/2    /    1/2 * 1/2 +     1 * 1/2

   P[H|F]  probability of heads given the coin is fair  is 50%
   P[F] probability offair coin is 1/2
   P[H|B] :  probility of heads given the biased coin :
            as biased coin has both sides heads   , probability of heads is 1
   P[B] = P[F]  due to randomness P[B] is 1/2  and P[F] is 1/2
```

In [5]:
```
((1/2) * (1/2))    / (   ((1/2) * (1/2)) +   (  1 * (1/2)   )  )
```

Out[5]: 0.3333333333333333

In [6]:
```
1/3 # ans is option B
```

Out[6]: 0.3333333333333333

In [ ]:
```

```

In [ ]:
```

```

In [ ]:
```

```

In [ ]:
```

```

In [ ]:
```

```

In [ ]:
```

```

`

A gambler has in his pocket a fair coin and a two-headed coin. He selects one of the coins at random, and he flips it twice. It shows heads both the times. What is the probability that it is the fair coin?

Click on an option to submit your answer

A	1/2
B	1/3
C	1/5
D	1

```
Fair coin      Biased coin


P[F] = 1/2     P[B] = 1/2

P[F|HH] = ? (Question )



P[F|HH]  =  P[HH|F]*P[F]  /  P[HH|F]*P[F] + P[HH|B]*P[B]
        =  1/4 * 1/2    /    1/4 * 1/2 +     1 * 1/2

   P[HH|F]  probability of two heads(two flips) given the coin is fair  is 25% (1/2 * 1/2)
   P[F] probability offair coin is 1/2
   P[HH|B] :  probility of both heads given the biased coin :
            as biased coin has both sides heads   , probability of two heads is 1
   P[B] = P[F]  due to randomness P[B] is 1/2  and P[F] is 1/2
```

In [7]:
```
((1/4) * (1/2))    / (   ((1/4) * (1/2)) +   (  1 * (1/2)   )  )
```

Out[7]: 0.2

In [8]:
```
1/5  # ans is Option C
```

Out[8]: 0.2

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

A gambler has in his pocket a fair coin and a two-headed coin. He selects one of the coins at random, and he flips it three times. He gets {HHT}. What is the probability that it is the fair coin?

Click on an option to submit your answer

A	1/2
B	1/3
C	1/5
D	1

```
Fair coin      Biased coin


P[F] = 1/2     P[B] = 1/2

P[F|HHT] = ? (Question )



P[F|HHT]  =  P[HHT|F]*P[F]  /  P[HHT|F]*P[F] + P[HHT|B]*P[B]
          =      1/8 * 1/2  /    1/8 * 1/2   + 0 * 1/2
          =      1/16       /    1/16
          =   1


        probability of  tails in a two headed coin P[HHT|B] = 0


          Option D = 1 is the ans
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

Type *Markdown* and LaTeX: α^2

In [ ]:
```
1
```

```
1
```

```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

Q3. Color blind

Unsolved

Stuck somewhere?

Ask for help from a TA and get it resolved.

Get help from TA.

Suppose 5 percent of men and 0.25 percent of the women are color-blind. A random color-blind person is chosen. What is the probability of this person being male? Assume there are equal number of men and women overall.

```
1 p[CB|M] = 0.05
2 p[CB|F] = 0.0025
```

```
1 P[M|CB]  =  ?
2
3 M|CB  =  (CB|M * M )  /  ( (CB|M * M ) +  (CB|F * F))
```

In [15]:
```
1         0.05 * 0.5    / (  (0.05*0.5) +  (0.0025*0.5)  )
```

Out[15]: 0.9523809523809523

In [ ]:
```
1
```

Q4. Three coins

Solved

Stuck somewhere?

Ask for help from a TA and get it resolved.

Get help from TA.

There are three coins in a box. One is a two-headed coin, another is a fair coin, and the third is a biased coin that comes up heads 75 percent of the time. When one of the three coins is selected at random and flipped, it shows heads. What is the probability that it was the two-headed coin?

Choose the correct answer from below:

- 1/9
- 2/9
- 1/3
- **4/9**

In [ ]:
```
1
```

In [ ]:
```
TOTAL 3 COINS :

    p[2headed] = 1/3
    P[fair] = 1/3
    P[biased] = 1/3


    P[H|biased] = 0.75
    P[H|2headed] = 1
    P[H|fiar] = 1/2

    P[2headed|H] = P[H|2headed] * P[2headed] /
         (P[H|2headed] * P[2headed]) + (P[H|2headed'] * P[2headed'])
```

In [63]:
```
1 * (1/3)
```

Out[63]: 0.3333333333333333

In [66]:
```
(( 0.75 + (1/2))/2 ) * (1-(1/3))
```

Out[66]: 0.41666666666666674

In [67]:
```
(1 * (1/3)) +  (( 0.75 + (1/2))/2 ) * (1-(1/3))
```

Out[67]: 0.75

In [69]:
```
(1 * (1/3) ) / ((1 * (1/3)) +  (( 0.75 + (1/2))/2 ) * (1-(1/3)))
```

Out[69]: 0.4444444444444444

In [73]:
```
4/9
```

Out[73]: 0.4444444444444444

In [ ]:
```

```

In [ ]:
```

```

In [ ]:
```

```

In [ ]:
```

```

In [ ]:
```

```

In [ ]:
```

```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

Q5. Ten coins Solved

Stuck somewhere?
Ask for help from a TA and get it resolved.
Get help from TA.

There are ten coins numbered from 1 to 10, where the probability of the heads is i/10, i=1,2,...,10. One of the coins is randomly selected and flipped, it shows heads. What is the conditional probability that it was the 5^{th} coin?

Choose the correct answer from below:

- 5/11
- **1/11** ✓
- 5/10
- 1/10

In [ ]:
```
1 P[C5|H]  = ?
2 P[]
3
4
5
6 P[C5|H]  =                          P[H|C5] * P[C5]/
7                     P[H|C5] * P[C5]    +   P[H|C5'] * P[C5']
8
9
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [58]:
```
1 (0.1+0.2+0.3+0.4+0.6+0.7+0.8+0.9+1)/9
```

Out[58]: 0.5555555555555556

In [59]:
```
1 1-(1/10)
```

Out[59]: 0.9

In [60]:
```
1 (5/10)*(1/10)
```

Out[60]: 0.05

In [61]:
```
1 (5/10)*(1/10) + (0.555*0.9)
```

Out[61]: 0.5495000000000001

In [62]:
```
1 0.05/0.549500
```

Out[62]: 0.09099181073703368

In [74]:
```
1 1/11
```

Out[74]: 0.09090909090909091

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

Q6. Two Urns

Solved

Stuck somewhere?

Ask for help from a TA and get it resolved.

Get help from TA.

Urn 1 has five white and seven black balls. Urn 2 has three white and twele black balls. We flip a fair coin. If the outcome is heads, then a ball from urn 1 is selected, while if the outcome is tails, then a ball from urn 2 is selected. Suppose that a white ball is selected. What is the probability that the coin landed tails?

Choose the correct answer from below:

- [x] 12/37
- [ ] 25/37
- [ ] 20/37
- [ ] 5/37

```
Urn1              Urn2
5 white balls      3 white balls
7 black balls      12 black balls

Heads             Tails


if heads : ball from Urn1 is selected
if tails : ball from Urn2 is selected

probability of tails given white ball is selected :
P[T|W] = ?

P[T|W]  = P[W|T]* P[T]/
      P[W|T]* P[T] + P[W|T']* P[T']

        = P[W|T]* P[T]/
      P[W|T]* P[T] + P[W|H]* P[H]

  P[W|T]  white balls given tails : 3 / (3+12) = 3/15
  P[W|H]  white ball given not tail : 5 / (5+7) = 5/ 12


P[T|W]=             P[W|T]* P[T]/
              P[W|T]* P[T] + P[W|H]* P[H]


```

In [79]:
```
(3/15)*(1/2)
```

Out[79]: 0.1

In [80]:
```
(3/15)*(1/2) + ((5/12)*0.5)
```

Out[80]: 0.30833333333333335

In [81]:
```
0.1/0.308333
```

Out[81]: 0.3243246749455945

In [78]:
```
12/37
```

Out[78]: 0.32432432432432434

In [ ]:
```

```

In [ ]:
```

```

In [ ]:
```
1
```

airline case of overbooking :

```
# airline case of overbooking :

50 seats are aavilbale in aircraft
52 tickets has been sold
5% of people dont show up

Q: P[all who show up gets the seat] = ?

```

```
probability  of all 52 people show up :
    P[all of people who bought ticket shows up]


    p[one person show up] = 1- P[person dont shw up]
                          = 1- 5%
                          = 0.95


    P[all of people who bought ticket shows up] = (0.95)**52


    P[51 people show up] = C(52,1) * ((0.95)**51) * (0.05)
                                    51 show-up       1 dont show up


    so , probability of 50 people show up so they all have seat is :

        = 1 - P[52 people show up] - P[51 people showup]
        = 1 - (0.95**52) - (52 * (0.95**51)*0.05)
```

In [82]:
```
1 - (0.95**52) - (52 * (0.95**51)*0.05)
```

Out[82]: 0.7405030708792849

```
all who show up will have 74% chances to get seat
```

In [ ]:
```
1
```

In [90]:
```
import math
```

```
                = nCx p**x (1-p)**n-x
P[52 show-up]  = C(52,0) * ((0.05)**0) * ((1-0.05)**(52-0))

n = 52
x = 0
```

In [85]:
```
(math.comb(52,0)) * ((0.05)**0) * ((1-0.05)**(52-0))  # P[52 show up]
```

Out[85]: 0.06944284018723361

```
P[51 show-up]  = C(52,1) * ((0.05)**1) * ((1-0.05)**(52-1))
               =   nCx   *   p**x      *     (1-p)**n-x
    n = 52
    x = 1
```

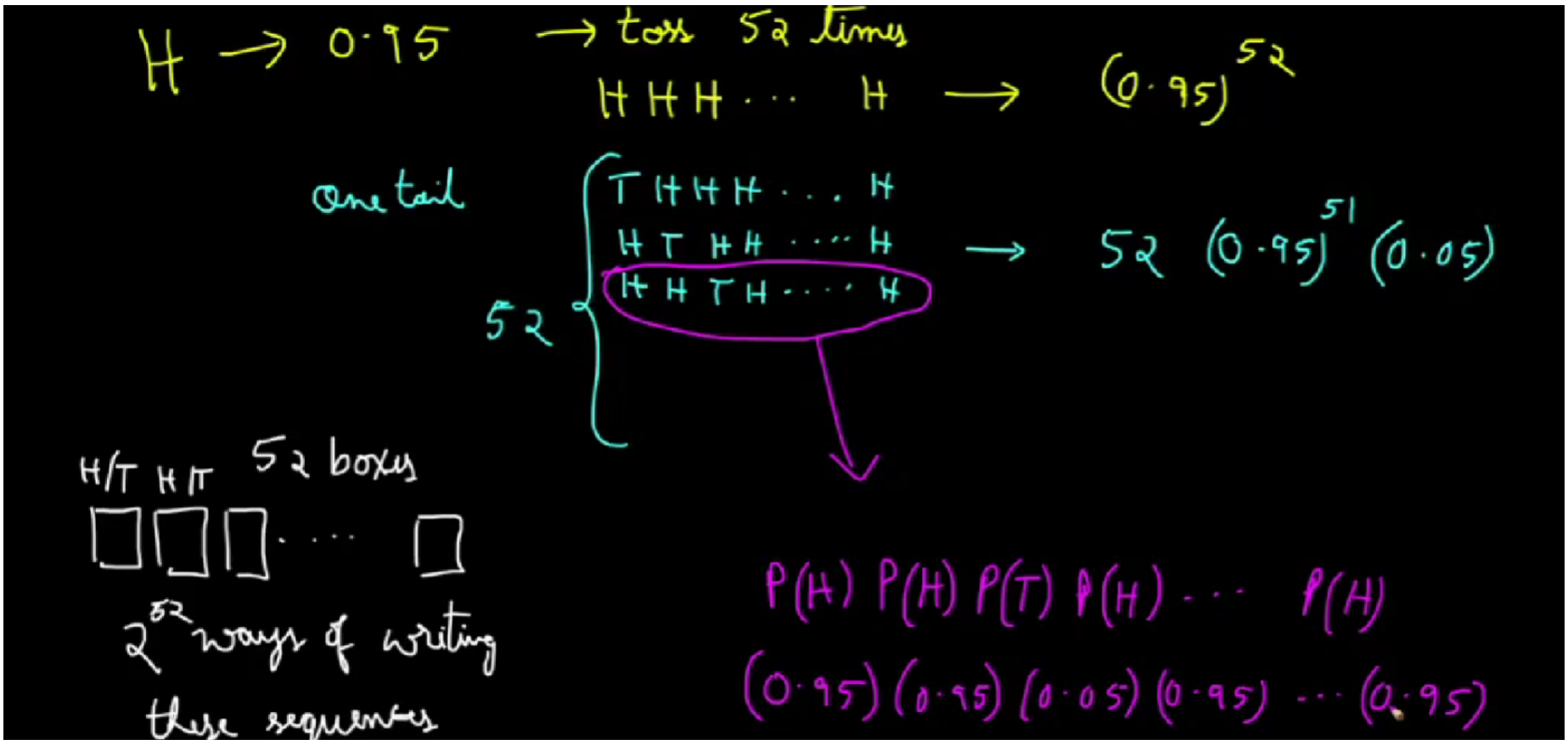
In [88]:
```
math.comb(52,1) * ((0.05)**1) * ((1-0.05)**(52-1)) # P[51 show up]
```

Out[88]: 0.1900540889334815

In [91]:
```
(1- 0.06944284018723361-0.1900540889334815)*100
```

Out[91]: 74.05030708792849

```
all who show up will have 74% chances to get seat
```



In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

A and B toss a coin alternatively till one of them gets a heads. The probability of heads is "p". Game starts with A tossing first. What is the probability that A wins the game?

59 users have participated

A	1/2	12%
B	p	15%
C	p(1-p)	51%
✓ D	p/(2-p)	22%

```
definind sample space :
    till get heads , A and B keep tossing alternatively .

    S = { H, TH, TTH ,TTTH ,TTTTH , TTTTTH , ........ }

    since A starts the tossing :

    S = { H, TH, TTH ,TTTH ,TTTTH , TTTTTH , TTTTTTH........ }
          A      ABA        ABABA            ABABABA ....

            in above cases A wins (Q)

       P[first event] = H : 1/2 :  p                                          p
       P[3rd event] = TTH : 1/8 :  (1-p)(1-p)*p                          (1-p)**2  * p
       P[5th event]       :     :  (1-p)(1-p)(1-p)(1-p) * p              (1-p)**4  * p
       P[7th event]             :  (1-p)(1-p)(1-p)(1-p)(1-p)(1-p)*p      (1-p)**6  * p
       .
       .
       .
       .
P[A wins] = P    +    (1-p)^2  * p    +  (1-p)^4  * p     +   (1-p)^6  * p  +  .....

lets say (1-p)^2 = r

P[A wins] = p + rp + r^2p + r^3p +.....



sum of above GP :
```

```
30
31 P[A wins] = P / 1-r
32            = p / (1-((1-p)^2))
33              = 1 / (2-p)
34
35
36              Option 4 : is given wrong
37
38              ans is : 1/(2-p)
```

In [ ]:
```
1 --
```

Type *Markdown* and LaTeX: α^2

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

Q1. Three guns

Solved

Stuck somewhere?

Ask for help from a TA and get it resolved.

Get help from TA.

One shot is fired from each of the three guns. E1, E2, E3 denote the events that the target is hit by the first, second and third gun respectively. If P(E1) = 0·5, P(E2) = 0·6 and P(E3) = 0·8 and. E1, E2, E3 are independent events, find the probability that

(i) exactly one hit is registered

(ii) at least two hits are registered.

Choose the correct answer from below:

- 0.32 ,0.70
- 0.26 ,0.51
- 0.32 , 0.51
- **0·26, 0·70** ✓

In [ ]:
```
1
```

```
1 1: Exactly one hit is registered:
2
3  Gun 1 hits but Gun 2 and Gun 3 not hits     E1  E2'  E3'
4  Gun 2 hits but Gun 1 and Gun 3 not hits     E1' E2   E3'
5  Gun 3 hits but Gun 1 and Gun 2 not hits     E1' E2'  E3
6
7 P[E1] = 0.5 , P[E1'] = 0.5
8 P[E2] = 0.6 , P[E2'] = 0.4
9 P[E3] = 0.8 , P[E3'] = 0.2
10
11 [E1]  [E2']  [E3'] +  [E1'] [E2] [E3'] + [E1'] [E2'] [E3]
12 0.5 * 0.4 * 0.2    +   0.5* 0.6 * 0.2  + 0.5*0.4*0.8
13
```

In [94]:
```
1 (0.5 * 0.4 * 0.2 )   +  ( 0.5* 0.6 * 0.2)  + (0.5*0.4*0.8)
```

Out[94]: 0.26

In [ ]:
```
1
```

```
1 2 : At least two hits are registered:
2
3 Any two guns hits the target     E1 E2 E3'+ E1 E2' E3+ E1' E2 E3
4 All three guns hits the target   E1 E2 E3
5
6
7  [E1] [E2] [E3']+ [E1] [E2'] [E3]+ [E1'] [E2] [E3] + [E1] [E2] [E3]
```

```
(0.5*0.6*0.2)  + (0.5*0.4*0.8)  + (0.5*0.6*0.8) + (0.5*0.8*0.6)
```

In [95]:
```
(0.5*0.6*0.2)  + (0.5*0.4*0.8)  + (0.5*0.6*0.8) + (0.5*0.8*0.6)
```

Out[95]: 0.7

In [ ]:

In [ ]:

Q2. tell the truth

Solved

Stuck somewhere?

Ask for help from a TA and get it resolved.

Get help from TA.

The probabilities that “A” and “B” will tell the truth are 2/3 and 4/5 respectively. What is the probability that

i) they agree with each other

ii) they contradict each other while giving a witness in the court.

Choose the correct

- 0.6,0.4
- 0.5,0.7
- 0.8,0.6
- 0.7,0.5

In [ ]:
```
    A      B
T  2/3    4/5
F 1-2/3 1-4/5
```

```
P[ do not agree each other ] =

A intersect B' + B intersects A'
```

In [97]:
```
((2/3 )*(1-4/5)) + ((4/5)*(1-2/3))

#  A   *  B'     +    B  * A'
```

Out[97]: 0.4

```
P[agree each other] = A intersection B + A' intersection B'
```

In [99]:
```
((2/3)*(4/5))+((1-2/3)*(1-4/5))
```

Out[99]: 0.6

In [ ]:

Q3. Boy or girl paradox

Solved

Asked in: PP

Stuck somewhere?

Ask for help from a TA and get it resolved.

Get help from TA.

Supposedly a friend of yours has 2 children and at least one of them is a boy. What is the probability that the other is also a boy?

Choose the correct

- 1/2
- 1/3
- 2/5
- 2/3

In [ ]:

```
P[ 2 boy | atleast 1 boy ]  = P[2 boys ] ∩ P[ atleast 1 boy]/
                                    P[atleast 1 boy]

                            = ( 1/4 ) / (3/4)
                            = 1/3

```

A family has 2 children. Given that at least one child is a girl, what is the probability that both are girls

Click on an option to submit your answer

- A 1/2
- B 2/3
- C 1/4
- D 1/3

```
sample space  : gg,by,gb,bb
           already given that one child is a girl
         so bb is not an element

            so , sample space is : gg,bg,gb

            one is girl that is given ,
            the probability of both are girl is :
                1/ 3
```

In [ ]:

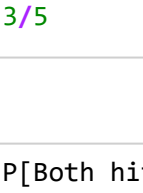
In [ ]:

In [ ]:

In [ ]:
```
1
```

Q4. Target Hitting

Solved



Stuck somewhere?

Ask for help from a TA and get it resolved.

Get help from TA.

The probability of one person hitting a target is 3/ 5. The probability of another person not hitting the target is 2/3. If each of them fires once at the target, find the probability that:

i) both of them hit it

ii) at least one of them hit the target.

Choose the correct answer from below:

- [x] 0.2,0.73
- [ ] 0.39,0.26
- [ ] 0.2,0.26
- [ ] 0.13,0.80

```
1
2
3
4
```

```
      Hit      Not Hit
P1    3/5      1-3/5
P2    1-2/3    2/3
```

In [100]:
```
1 3/5
```

Out[100]: 0.6

```
1 P[Both hit] = P[P1|H]*P[P2|H]
2               (3/5)  * (1-2/3)
```

In [107]:
```
1 (3/5)  * (1-(2/3))
```

Out[107]: 0.2

```
1 P[atleast one hit] = P[both|hit] +  P[p1| hit]    + P[P2 |hit]
2                    = 0.2         + ((3/5)*(2/3)) +  ((1-2/3)*(1-3/5))
```

In [111]:
```
1  0.2         + ((3/5)*(2/3)) +  ((1-2/3)*(1-3/5))
```

Out[111]: 0.7333333333333334

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

Two men hit at a target with probabilities 1/2 and 1/3 respectively. What is the probability that exactly one of them hits the target?

Concept:

$P(\bar{A}) = 1 - P(A)$

Calculation:

Here, let probability of a man hitting target P(A) = 1/2 and

Probability of another man hitting target P(B) = 1/3

So, probability of a man not hitting target = $P(\bar{A}) = 1 - 1/2 = 1/2$ and

Probability of another man not hitting target = $P(\bar{B}) = 1 - 1/3 = 2/3$

Now, required probability = $P(A)P(\bar{B}) + P(B)P(\bar{A})$

$\Rightarrow \left(\frac{1}{2}\right)\left(\frac{2}{3}\right) + \left(\frac{1}{3}\right)\left(\frac{1}{2}\right)$

$\Rightarrow \frac{2}{6} + \frac{1}{6}$

$\Rightarrow \frac{1}{2}$

```
In [ ]: 1
```

```
In [ ]: 1
```

```
In [ ]: 1
```

Q5. White Marble Probability

Solved

Stuck somewhere?

Ask for help from a TA and get it resolved.

Get help from TA.

There are 6 marbles in a bag and only one of them is white. You are allowed to draw a marble from the bag 100 times. After drawing a marble, it is placed back in the bag. What is the probability of drawing the white marble at least once?

Choose the correct answer from below:

- ○ 5/6
- ○ (5/6)^100
- ● 1 - (5/6)^100
- ○ Insufficient Information

```
In [ ]: 1 P[not white marble] = 5/6
```

```
In [ ]: 1 P[not white marble 100 times] = (5/6)^100
```

```
In [ ]: 1 P[white marble 100 times] = 1- ((5/6)^100)
```

```
In [31]: 1 1- ((5/6)**100)
```

```
Out[31]: 0.9999999879253265
```

```
In [ ]: 1
```

```
In [ ]: 1
```

Q15. Becoming managers

Solved

Stuck somewhere?

Ask for help from a TA and get it resolved.

Get help from TA.

The probability of Ashok, Priya, Naveen becoming managers is 4/9, 2/9, and 1/3 respectively. The probability that the Bonus scheme will be introduced if Ashok, Priya, and Naveen become Managers is 3/10,1/ 2, and 4/5 respectively.

i. What is the probability that a Bonus scheme will be introduced?

ii. If the bonus scheme has been introduced what is the probability that the manager appointed is Ashok.

Choose the correct answer from below:

- 0.45, 0.28
- 0.48 , 0.19
- **0.51 , 0.26**
- 0.54 ,0.13

In [ ]:
```
  i       x        y        z
        ashok     priya     Naveen              i = (x,y,z)

P(i)     4/9       2/9      1/3

P(B|i)  3/10      1/2       4/5



P[Bonus] = P[B] =  P[x]*P[B|x]  +  P[y]*P[B|y]  +  P[z]P[B|z]
                 ((4/9)*(3/10)) + ((2/9)*(1/2)) + ((1/3) *( 4/5))

```

In [23]:
```
((4/9)*(3/10)) + ((2/9)*(1/2)) + ((1/3) *( 4/5))
```

Out[23]: 0.5111111111111111

In [ ]:
```
P[Ashok become manager | bonus introduced ]

P[x|B]  = P[B|x] * P[x]
            /  P[B]
        = ((3/10)*(4/9))/(0.5111111111111111)
```

In [24]:
```
((3/10)*(4/9))/(0.5111111111111111)
```

Out[24]: 0.2608695652173913

In [ ]:

In [ ]:

In [ ]:

In [ ]:

Q6. Will it Rain? Solved

Stuck somewhere?
Ask for help from a TA and get it resolved.
Get help from TA.

Consider the situation where there are two cities, city1 and city2. The cities are close enough that they are generally affected by the same weather, yet they are far enough apart that they do not get identical weather.

We can consider discrete weather classifications for these cities on a given day, such as sunny, cloudy, and rainy. When it is sunny in city1, it is usually sunny in city2, but not always. As such, there is a dependency between the weather in the two cities.

The table below summarizes the probability of each discrete weather for the two cities, with city1 defined across the top (x-axis) and city2 defined along the side (y-axis).

	Sunny	Cloudy	Rainy
Sunny	6/20	1/20	1/20
Cloudy	1/20	5/20	2/20
Rainy	0/20	1/20	3/20

Using the table find the probability of city1 having sunny weather.

Choose the correct answer from below:

- [x] 0.35
- [ ] 0.2
- [ ] 0.15
- [ ] 0.7

Submit

```
P[ city1=sunny | city2=sunny ]    6/20
P[ city1=sunny | city2=cloudy ]   1/20
P[ city1=sunny | city2=rainy ]    0/20

P[c1=s|c2=s]  + P[c1=s|c2=c] +  P[c1=s|c2=r]
6/20          +   1/20       + 0/20
```

In [30]:
```
7/20
```

Out[30]: 0.35

In [ ]:

In [ ]:

In [ ]:

In [ ]:

Q14. Dangerous fire Solved

Stuck somewhere?
Ask for help from a TA and get it resolved.
Get help from TA.

If dangerous fires are rare (3%) but smoke is fairly common (15%) due to barbecues, and 85% of dangerous fires make smoke then what is the probability of dangerous fire when there is Smoke.

Choose the correct answer from below:

- [ ] 0.11
- [ ] 0.09
- [x] 0.17
- [ ] 0.90

In [ ]:
```
1
```

```
P[dangerous fire] = 0.03
P[smoky fire]    =  0.15

P[Smokey|dangerous ] = 0.85


P[dangerous fire| Smokey fire] =

P[sm|df]*P[df]   /  P[sm]

(0.85 * 0.03) / 0.15
```

In [37]:
```
(0.85 * 0.03) / 0.15
```

Out[37]: 0.16999999999999998

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

Q13. HHT or HTT? Solved

Asked in:

Stuck somewhere?

Ask for help from a TA and get it resolved.

Get help from TA.

You flip a coin until either Head Heads Tails or Heads Tail Tails shows up. What's more likely to appear 1st?

Choose the correct answer from below:

- (●) HHT
- ( ) HTT
- ( ) insufficient information
- ( ) None of the above

In [ ]:
```
1
```

```
Let A be the event that HTT comes before HHT.
P{A} = P{A|H}P{H} + P{A|T}P{T} = .5P{A|H} + .5P{A|T}
P{A|T} = P{A} therefore, P{A|H} = P{A|T}

P{A|H} = P{A|HH}P{H} + P{A|HT}P{T} = (0)(.5) + P{A|HT}(.5)
Therefore, 2P{A|H} = P{A|HT}

P{A|HT} = P{A|HTT}P{T} + P{A|HTH}P{H} = (1)(.5) + P{A|H}(.5)
2P{A|H} = .5 + P{A|H}(.5)
P{A|H} = 1/3 and P{A|H} = P{A}, therefore, P{A} = 1/3

So, HHT is more likely to appear first and it appears first 2/3 of the time.
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

Q8. Probability 09 Solved

Stuck somewhere?

Ask for help from a TA and get it resolved.

Get help from TA.

Company A produces 10% defective products, Company B produces 20% defective products and C produces 5% defective products. If choosing a company is an equally likely event, then find the probability that the product chosen is defective.

Choose the correct answer from below:

- 0.22
- **0.12** ✓
- 0.11
- 0.21

```
defective P[D]

= (E1 * D|E1) + (E2 * D|E2) + (E3 * D|E3)
=  1/3 * 0.1  +  1/3 * 0.2  + 1/3 * 0.05
```

In [43]:
```
(1/3 * 0.1)  +  (1/3 * 0.2)  + (1/3 * 0.05)
```

Out[43]: 0.11666666666666667

In [ ]:

In [ ]:

In [ ]:

In [ ]:

In [ ]:

Q9. Probabilty 10 Solved

Stuck somewhere?

Ask for help from a TA and get it resolved.

Get help from TA.

The probability that person A completes all the tasks assigned is 50% and that of person B is 20%. Find the probability that all the tasks are completed.

Choose the correct answer from below:

- 0.15
- 0.25
- **0.35** ✓
- 0.45

```
p[task complete]

P[TC] = P[A]*P[TC|A] + P[B]*P[TC|B]
      = ((1/2) * (50/100)) + ((1/2) * (20/100) )
```

In [44]:
```
1 ((1/2) * (50/100)) + ((1/2) * (20/100) )
```

Out[44]: 0.35

In [ ]:
```
1
```

In [ ]:
```
1
```