ŒKeLU1œoecl

PROBABILITY

Probability is the numerical Inappuuôt) cr net. of the required outcome ha ratzc the of possJDIù out tb is stated as a fraction cemL) of required out conuo to thL

PIObL5dZy of an event = No. of required OLLtC2ff&o

ND Of [DOSSLbLc OLLt ccauo

Probability of a cer Of a ccntdz)01Ly 1 and of an impossibility pÉDbcLbUIcy

There fore probam-u;y C Z

ie $0 \leq P(A) \leq 1$

The Scompu Spau % ccssòs coun, UD a Head (H) and talc (T) ,

ample SjDtcCLo ef the following :-

cc) -Eosscng 2 COM) S

Suna tlaL Sczmpœ Spau (L Ccul IS Hf T

2 CL) IJ)S

Q nd CCI-h

SC

e fore thL Sam-p(L YOSSung Q J)

Probability

=

T 1-1

a) thL of heca p (Head)3

b) Probability of getting 2 heads

$$P(2 \text{ heads}) = \frac{2}{4} = \frac{1}{2}$$

(ii) tossing 3 coins

Consider the sample space of the 2 coins and for the third coin.

	3rd coin H	T
Two coins		
HH	HHH	HHT
HT	HTH	HTT
TH	THH	THT
TT	TTH	TTT

Therefore the sample space of tossing 3 coins is

HHH	HHT
HTH	HTT
THH	THT
TTH	TTT

Find

a) Probability of 2 heads and a tail

$$P(2 \text{ Heads and a tail}) = \frac{3}{8}$$

(iii) Sample space of tossing a coin and throwing a die

A die has 6 faces ~~labled~~ labeled 1, 2, 3, 4, 5, 6

∴ Sample space of a die is 1 2 3 4 5 6

If we combine the sample space of a coin and that

Ha

We hcwe 12 possibilities

∴ PIOba-bCLIÂJ and a Prime number

ww. 6e geven asp (T and (L
prcrnz narrtber) = 3

L) Fund* Probability 0f gecung Lt Heud and a Square
n-u-mbe-r •

P H md CouaR n.mber) = 2
IQ

b) P f0bcubVuJSy (33f geJZu-MY L Heud onc[dc/ jQ-wnQ-be-f
= P (Hond Odd) = 3

w) SpLCL Of thsou.•jng Q dtce

('%nsCc1Lf tJu So-mP L spacus eacln dé and combine bhem .
2 3 + 5
9 ᒪ .

2 ─ 2 し

っツ3 3 2 3 3 34 3 ら 3 乙 十 2 4. 午午

45

5 ら 2 ら 3 5 + 5 ら 56

い G 2 C 午 6 5 26

number of p 0 &ゞしいんしつあ 3 乙

a) F のげい at th

0)と矼山れ 0 子プ n 山 1 昉び 5、、on on 孖比-住

Prime number

p 0 しあ p。し。,、めび) = 15 わ一

3 乙 成

~~P(sum is an odd~~ the sum is an odd number

P(sum し。0 記(わし) 00

3乙

PC 虹 。 呼 6) 00

6

Types of Pr Probabcl-ù-e —tuJO typeo

There are two of probablLUg namuuy :

i) Experimental probc probCLbuUlU

ii) Cfunret»cax proba

Ex p rimental Pro bob Lity

fhL0 CD thê pro bo-bcLLCy banca on experûnmta-b N-corL)

i. e Nur-neròcnLOf th_L IDCvoU LO Pèzt-jCL rococd-o

ChL ut are

For example h is interested fü-LcÉcn@J tu.

I st bcfn an d chu recond Of ChiLcLne-n in

belou) hur am

MoUfruuc 'S Sésuç o 6

t her , S

broEfru-r

,S cco 5

,S broth-2-r 6

Hot l e u-c 7

Iotac

œ) FencL the experi al probabÜ1153 thaL Chu FFS C

is female

Born
ïòt0-L n c 96_ 36

P (fics t born J)) 36

3
5

b) t foc eventwûL¹-y hou') 10 chûlclsen J rncuy are
most liuub-J to be boys , p
(gewng (1 boy) 24- = 2
numberos boys = 2 x

NOTE If tf1L pro bcubUA3 even-cA P(A) then
the pro babcLUô Ă n.DC happening will log P (Ai) .

Eg ž I î thL proboJÔiJ5y an exam
at is ŁhL probability Of' failing?
P(failing)

. 3

I HE ORE TIC AC PR CBA Bi Li T

IȚ-uÂ vo pro bćLbîJčLţj ôcuccL on the physica

CL gcoeh Țctu-ccccoa &Dśtlnt eg

A cord. pudice" OL rLncLrn grom pa-Ck 60 concis • IA]BoJ tha pmbouoUury thaz cc

There are

a IZ 1h8 P(picking cure 4 Kings in the park eg carda

therefore

r CJ AL L CLUS/ V E V E 10 TS

'Two evento excLLLScJé fr ecch-u- % dum

CM ('CCD UuL bcch ' rn-LCL.nS evuuCo hccve no inter

A Set Df voueCS and C et Of Prime numbers.

LAWS OF PROBABILITY

1·AddLtDDOJ LOD of pro bLbUDé

ThD StoL, thai a evÜbCS A and (3

etuun p (AU B)

But if the events are mutually ve ,

P(AUB) = P(A) + P(B).

NB P(AUB) means Probability of A g

Example. oecun.hg.

A number is chosen at random fr

å from 2 - 20. Find the probabili n-cuytbers paobct-buüL3

a factor of 18 or a multiple clou Ch)-ncum-be«

6

SCLcn-ptL f2, 4, 6, 8, 10, 12, 14, 16, 18, 20}

Bute $(F_{18} \cap M_5) =$

$\therefore P(F_{18} \cup M_5)$

to

5

10

2. Given that A represents ... 5 and a number
nambers I to ... probability that
chosen at random from) Find the

The sample si q, 1, ..., 10, 11, 12,

2, 4, 6, 8 ... 12, 14

5, 10, 15 }

$M_2 \cap M_5$

$P(M_2 \cup M_5) = P(M_2) + P(M_5) - P(M_2 \cap M_5)$

15 16 15

q

3

Exercise

I ' What is the paba-bvuag thLC a number
OL rancLom fam a of flŕst 15 rwu-n-berc wer ÐrL nu-
mbvr d-ăcśCbCL 9 ?

.ru-zm-be.ś 3, on o-oged rancCcm m CL No
o-nru+K+0form CLOCJCC digit number.
repeated in t thî formed.
ruĂmloQM

(i) Ă)ô-tL duoon Cann-p CL ţ pccc-L Find thL prDbabc).LY Clu- Du-

n')-bu formed

3.A box ConLaa-r; s red) ond
probability of picking blazl (toaLb , The
white ball is 1/6. (J. red looJJ 0/5 an d 6h03 è} a is pro bû-bi-LU.é
pickin gj acblack b CT lofL-LC

INDEPENDENT EVENTS

Two events A and B a are uncLqoandL:ü5
outcome of A is not rela a to the ou tn-e—
Therefore if independent ïtC0--
probability üudJ occurring 0) out ccm-
of their in c Cf. A Ond 13 arc) th-c of A and B th-c pro
i duaL pœbŒbuLl-t.C

ie PCA n g) P (A) PCB)
NB P CA n Ê) mzc-ns Po ba- A cuncl Û
bLLCg of occuscog
This Jo nuuLtCpŒca tcohb law of probabtu;y .

Example

A HCL is and in is dos sed - What is

ChL bovl'DJù-by Of cc h-LO-CI Œna NQ. g .

From etQ-L revis. we had

DIC 4

2

3

I-f 5 H6

T5 TC

p (H n No, 3)=

Now multiplication pro ba-bcL.cs

and I D (3) =

Ega, A be C.onLcun C s 3 bCæek bcuL0 6-nd Q uJhüÅL ,

A ban ccuceo from .bhL b and IJIQJJ) rcplæccl ancC thL bcc" is Who-

b [Dr-c60-bJJ5d chat 09

d) Boch BOILS bCaol(

P(B ∩ B)

5 5 =q

Both boJUD cohLJ3 p(wm•)= P(

5 5

tho .. p

codBlack)

cub A

p OSS p n gor P(B∩W)

B) · +p (B n v0)

P(W) x P(B) + P(B) x P(W)

5 5 5 5

Now (I thE

replacement , Q bCLlLD pcc(kLOI Fm tłu. 6a4 withoutB) =pCg) x

P(O)

5

balls ie I Lue tfu baJL the i . t tJnz dona p. t

in I - IF he Łuc ± back

ŁhL bag , tftL Dym-be« e-lf €CO/YUo tłu. bcug flŕSC

and the total number of pick , th-z p (B) ó

4 . ~~So the P(B)~~ So after the rbCv0 Q/

P(W∩W)

..p (wn g) + P C Bn inu)

P(B) x P(W)

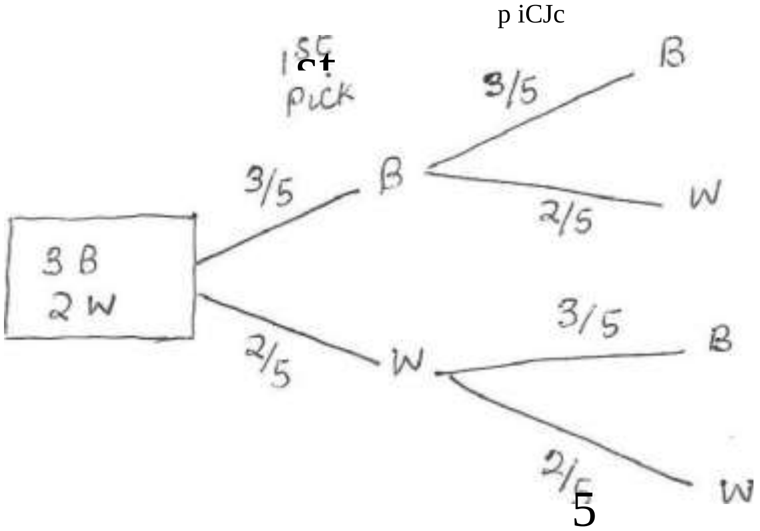
20

lAfe can fu-)d ttu;e pa, bcUoUDD ct tree diagram

I f &peovc

(J) th 1±-40 IDD

p iCJc



5

on t rex Lag r O-m) thx fins C u_nåz cue pcdl< uE cehu ()ec-la b(æck baz or 6 a-L . C n tu Second pick ,If btw , will a-goan cehJL

we (Dtcled C black eácc either pick a black ball the first time white ball the first time, ban or T, white b cu

OR If Picked

ick C UlO-cß avg ach .

e fore P Cßn B)= 3

=q

P(W∩W)

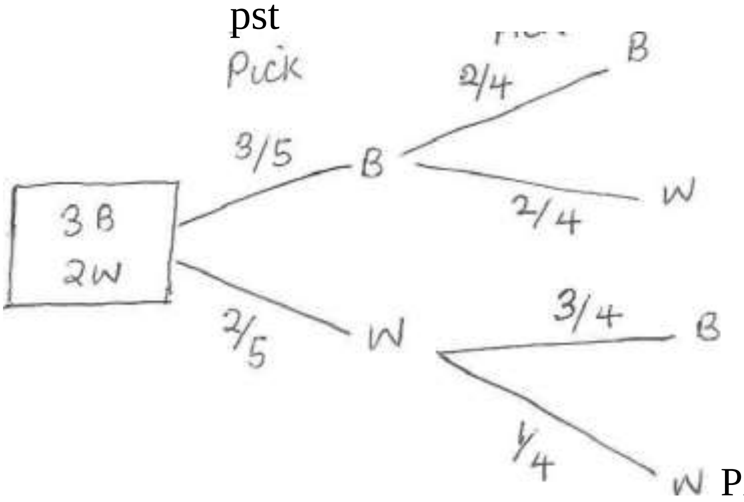
5 5

W) +pOJn Q)

d» Without replacement and

pst

Pick



Pick

The fifk t pedk LüthM [Duck baLC

or a LDbÜCc bcc i If we (ÅDI'IE put the bau uoLLCb(, tota-U Cf bcuUs cn Ccccna peck

e fore (i) P (g n 13) = 3

(ii) $P(W \cap W) = \frac{2}{5} \times \frac{1}{4}$

$= \frac{2}{20}$

Cil')) concl WhiL)

..20

.. 5

A box Con±cu-ns 5 bu. g bee(KS .
2 books pc(-lQzL ra_ncLom o liur
(L true digram fin CL

{het e) bcth books are g

reca (ii) botn books aye of cclou.üi) tu ôoolCS
axe ef dAJffÈ/Ent
C

2, A green 10" contain's 4 blue pens bag 5 red pens and g pens, random tilt
2 pens are picked at replacement. Using u)tthou-c Clscn'g a. tree diagram determine thL probability that f)iœbovbcuxg
(i) thL ns are of the same C
(ii) The penc cf pens cu-e Of diffèrent Cebu-ng.

RANDOM SELECTION

Four identical blue pens were put in a box. a pens were picked pcu•ed randomly without replacement.

Œ) POSscbLLby S puce

b) bo-b(ldg Ing tu Second bluu-L pen and thL E hird pen?

L) ln ttu'c covoe use label th-L pens blue peo BI) Ceund B a l/kle wo(ïK POSSIbï-L(g

as the first so on.
space as follows;
either pick the
Or the fourth
blue pen first,
Isnen

If we pu:Ak pen) ose couLdA ex-t(a•
p Q_-n or Chu bhund

OR If Second

thon fjfkL- efuFd e tho fout-tn pun Und So en
poccŒüJtg Spa-& wouLd th.2-n Look like belownd

st
Bi
pcbvs B 2

B_1		B_3	B_4
B_1B_1		B_1B_3	B_1B_4
B_2B_1		B_2B_3	B_2B_4
B_3B_1	133 È 2	B_3B_3	B_3B_4
B_4B_1		B_4B_3	B_4B_4

NB If we a we ose pcclxtng tru pens
we cannot rcptŒccnu.nL st bluepet) LW) cx
again. S LIJ Sc Bi Bi BBB 3 ccnd B_4B_4OR
posscèu.
There fore we have ja pcsstUUZcwo.

b) prob(LbLL/fg pzkjng Chl-v Lecond blue
pen UNCL third blJu-L pen-.

We have 2 possibilities; we could either pick SLCD0d blue pen first then the third blue pen or we could pick the third blue pen first then the second blue pen. That is B_2B_3 and B_3B_2

$\therefore$ ~~$P(B_2B_3)$~~

P(2nd blue pen and the 3rd blue pen) = 2

Chu

li

2

A bag coo,La-cSs 5 gan baLbD CaLLl-Œd (- 5 .
Two balls are picked Two 0" random
without replacement C &üu-r
Write down the poss
tu POSSIbLLCy CpLc-L.

Find probability th-c tju tJucC baLjv ond fifth green b0J-L .

(iii) INho-L CD pr-cbcòJJüy ha-vuhg t_lu- Of th-c nu-nmbers boLIn ruumber.