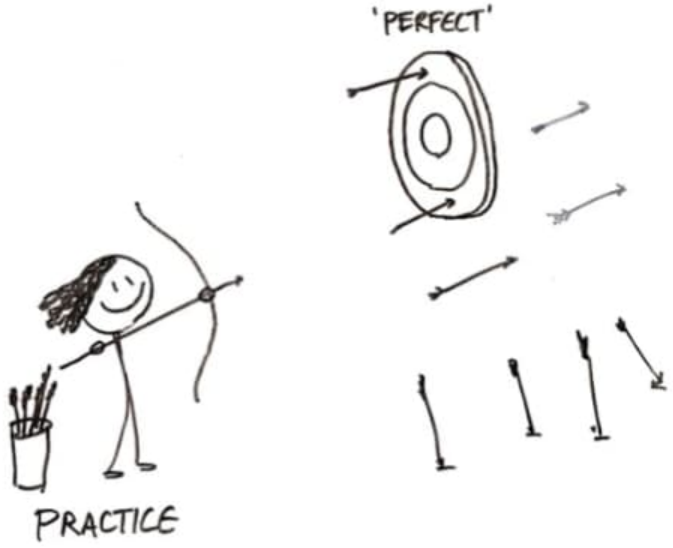
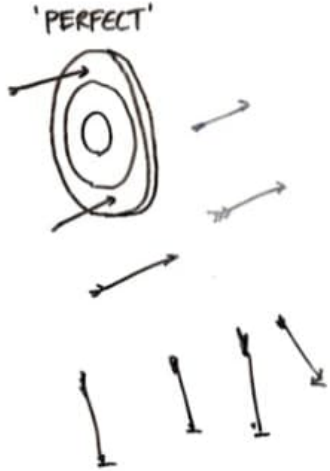
- Practice:

1. A box contains 3 blue marbles, 4 red, 6 green marbles and 2 yellow marbles. If two marbles are drawn at random, what is the probability that at least one is green?
2. A box contains 3 blue marbles, 4 red, 6 green marbles and 2 yellow marbles. If two marbles are picked at random, what is the probability that they are either blue or yellow?
3. A box contains 3 blue marbles, 4 red, 6 green marbles and 2 yellow marbles. If four marbles are picked at random, what is the probability that none is blue?
4. 10 books are placed at random in a shelf. The probability that a pair of books will always be together is?
5. What is the probability that a leap year has 53 Sundays and 52 Mondays?
6. Out of 20 consecutive integers, two are chosen at random. The probability that their sum is odd is?
7. A box contains 3 blue marbles, 4 red, 6 green marbles and 2 yellow marbles. If three marbles are drawn what is the probability that one is yellow and two are red?



- Practice:

8. Out of 10 persons working on a project, 4 are graduates. If 3 are selected, what is the probability that there is at least one graduate among them?
9. In a party there are 5 couples. Out of them 5 people are chosen at random. Find the probability that there are at the least two couples?
10. The probability of a lottery ticket being a prized ticket is 0.2. When 4 tickets are purchased, the probability of winning a prize on atleast one ticket is?
11. There are two boxes, one containing 39 red balls & the other containing 26 green balls. You are allowed to move the balls between the boxes so that when you choose a box random & a ball at random from the chosen box, the probability of getting a red ball is maximized. This maximum probability is
12. There are 6 red balls, 8 blue balls and 7 green balls in a bag. If 5 are drawn with replacement, what is the probability at least three are red?



2/7/25 M T W T F S S Probability (practice) Date:

1 Ans: T(no) = 3+4+6+2
= 15

Total marble = $15C_2 = \frac{15 \times 14}{2} = 105$ //

Not green marble = 3+4+2 = 9

(no. of marbles)

(no green) = $(9C_2) = 36$

$P(\text{no green}) = \frac{36}{105} = \frac{12}{35}$

Final = $1 - \frac{12}{35} = \frac{35-12}{35} = \frac{23}{35}$ //

2 Ans:- (blue or yellow) = 3+2 = 5

Total marbles = 15

P(Total marble) = $15C_2 = 105$

∴ 2 marbles → b(or)yellow

$= 5C_2$

probability = $\frac{\frac{5 \times 4}{2}}{105} = \frac{10}{105} = \frac{2}{21}$ //

3 Ans:- Blue marble = 3
Red marble = 4
Green marble = 6
Yellow marble = 2

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∴ Total marble = 3 + 4 + 6 + 2 = 15

∴ None blue marble = 15 − (3) (No. of blue ball)

= 12

4 marbles are drawn at random

∴ P(none is blue) = $\frac{12C_4}{15C_4}$

= $\frac{33}{91}$ //

Sol:- Total book arrangets = 10!

(where no. of books = 10)

∴ pair are treated as 1 entity: (Assume)

∴ We have 9 entity: (1 pair + 8 other books)

∴ Arrangets of these entities = 9!

∴ pair can be arranged in two ways: 2! ways

∴ Arrangets (possible) = 9! × 2!

∴ P(Pair of books are taken together) = $\frac{9! \times 2!}{10!}$

= $\frac{9 \times 8 \times 7! \times 2!}{10 \times 9 \times 8}$

= $\frac{2}{10} = \frac{1}{5}$ //

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5 Ans:- Leap year has 366 days.

⇒) 366 ÷ 7 = 52 weeks & 2 extra days

53 Sundays:-

possible pair: (Sun, Mon)
(Sat, Sun)
If extra day = Sunday

for 53 Sunday & 52 Mondays:-

Total possible pairs for extra days:

⇒) 7 choice for first day, 6 for second, order matters: 7 total combination (Mon-Tue, Tue-Wed, Sun-Mon)

⇒) out comes = 1

∴ P(occurrence) = 1/7 //

6 Ans:- Total integer = 20

here 2 are chosen at random from 20

∴ Total probability = $^{20}C_2$
(way to choose)

$= \frac{20 \times 19}{2} = 190$ //

∴ No. of ways to choose if Sum is odd

$= {}^{10}C_1 \times {}^{10}C_1$

$= 10 \times 10$

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1 $P(\text{Sunisada}) = \frac{10 \times 9}{19 \times 0} = \frac{10}{19}$ //

Ans:- blue marble = 3
Red marble = 4
Green marble = 6
Yellow marble = 2

Total marble = 15

Total ways to draw 3 marble = $15C_3$
$= 455$

∴ ways to choose 1 yellow & 2 red
$= 2C_1 \times 4C_2 = 2 \times 6 = 12$ //

∴ $P(\text{choose 1 yellow \& 2 red}) = \frac{12}{455}$ //

Ans:- Total ways = $C(10,3) = 10C_3$
$= \frac{10 \times 9 \times 8 \times 7!}{1 \times 2 \times 3 \times 7!}$
$= 120$ ways //

ways to select 0 graduates (3 are no graduates) $= 6C_3 = \frac{6^2 \times 5 \times 4 \times 3!}{1 \times 2 \times 3 \times 3!}$
$= 20$ //

P(at least one graduate) = 1 - P(no graduates) $= 1 - \left(\frac{20}{1 \times 6}\right) = \frac{5}{6}$ //

6

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9Ans:- We need to find:

$$P(\geq 2 \text{ couples}) = P(0 \text{ couples}) + P(1 \text{ couple})$$

$$\therefore P(0 \text{ couples}) = \frac{5C5 \times 2^5}{10C5} \quad \begin{matrix} \text{each couple} \\ \text{pick 1 person} \\ \text{5 of 5} \end{matrix}$$

$$= \frac{1 \times 32}{10 \times 9 \times 8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1}$$

$$= \frac{32}{252} //$$

$$P(1 \text{ couple}) = \frac{4C3 \times 2^3}{160} = 1 //$$

$$\therefore P(\text{at least 2 couples}) = 1 - \left(\frac{32+160}{252}\right)$$

$$= \frac{252 - 192}{252}$$

$$= 5/21 //$$

10Ans:- $P(\text{no prize}) = (1-0.2)^4 = (0.8)^4$

$$= 0.4096$$

$$P(\text{at least one prize}) = 1 - 0.4096$$

$$= 0.5904$$

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Ans: Initial:

Box A: 39 red

Box B: 26 green

• Move 1 red ball from A to B

∴ BOX A: 38 red

Box B: 1 red, 26 green (27)

P(choose A) = 0.5, P(red from A) = 38/38 = 1

P(Choose B) = 0.5, P(red from B) = 1/27

∴ T.P = 0.5 × 1 + 0.5 × (1/27) = 0.5 + 0.0185 = 0.5185 //

Ans: Let p = probability of red = 6/21 = 2/7

Let x ~ Binomial (n = 5, p = 2/7)

Find:- $P(x \geq 3) = 1 - P(x < 2)$

Formula:- $P(x = r) = {}^5C_r \times \left(\frac{2}{7}\right)^r \times \left(\frac{5}{7}\right)^{(5-r)}$

• $P(0) = {}^5C_0 \left(\frac{2}{7}\right)^0 \left(\frac{5}{7}\right)^5 = 1 \times \left(\frac{3125}{16807}\right)$

$P(1) = {}^5C_1 \left(\frac{2}{7}\right)^1 \left(\frac{5}{7}\right)^4 = 5 \times \frac{2}{7} \times \frac{625}{2401}$

$= 6250/16807$

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$P(2) = {}^5C_2 \times \left(\frac{2}{7}\right)^2 \left(\frac{5}{7}\right)^3 = 10 \times \frac{4}{49} \times \frac{125}{343}$

$\therefore P(x \leq 2) = \frac{(3125 + 6250 + 5000)}{16807}$

$= \frac{14375}{16807}$

$\therefore P(x > 3) = 1 - \left(\frac{14375}{16807}\right) = \frac{2432}{16807}$

$= 0.1447$ //