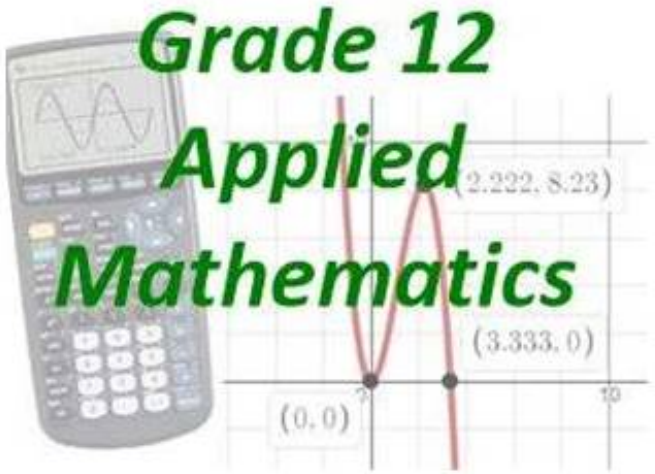


Grade 12
Applied
Mathematics

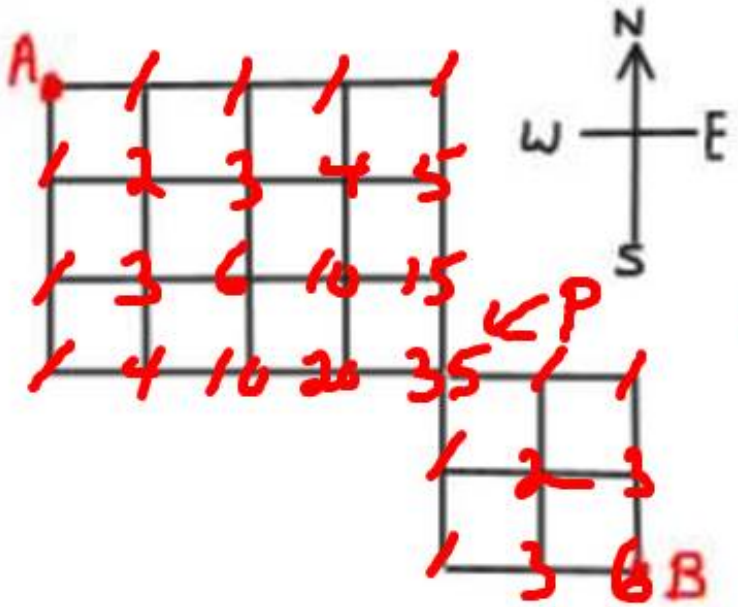
Quiz Debrief
Week 2

2022-04-14

Probability,
Permutations,
Combinations

MrF

Given the grid below, how many pathways are possible going from A to B if moves must be either East or South. Select the best answer



- 210 pathways
- 11 pathways ? seems awfully low
- 35 pathways
- nCr(7,23) pathways makes no Sense!

USE Pascal Triangle method

A→P 35 ways

P→B 6 ways

F.C.P. If one event can occur in 'a' ways, a second event in 'b' ways, a third event in 'c' ways, and so on, then the number of ways that all events can occur one after the other is the product a*b*c. .

∴ Paths from A→B = 35·6 = 210 ways

OR!!

A→P 7 letters moves 4 E East 3 S South

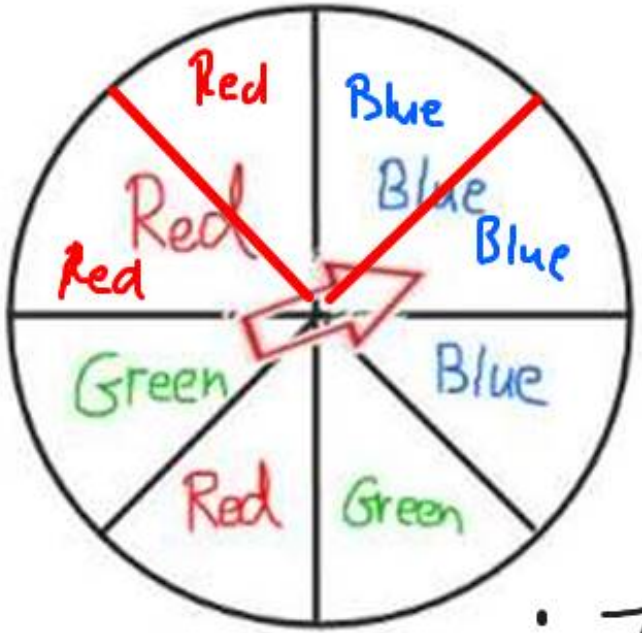
# of distinguishable arrangements $= \frac{7!}{(4!3!)} = 35$

P→B 4 letters moves 2 E East 2 S South

# of distinguishable arrangement $\frac{4!}{(2!2!)} = 6$

So A→B paths ⇒ 35·6 = 210

If you spin this fair spinner 40 times how many times should you EXPECT, on average, to get BLUE?



Need to have all sectors the same size to do theoretical calculation

$$\text{Prob of spinning blue} = \frac{\#\text{ of blue outcomes}}{\#\text{ total outcomes}}$$

$$P(\text{Blue}) = \frac{3}{8}$$

$$\therefore \text{Therefore: } \frac{3}{8}\ {}^{\text{blue}}_{\text{spins}} = \frac{x\ \text{blue}}{40\ \text{spins}}$$

Solve!

$$x = \frac{3 \cdot 40}{5} = 15$$

- two times
- 15 times
- 30 times
- maybe 8 or 9?
- idk

We can EXPECT, usually, on average, when we do 40 trials of this game to get 15 Blue!

We could get 40 blue in a row but don't expect it! It will average out to 15. If you played 100,000,000,000,000,000 times you likely spin all blue

The probability of a dog performing a trick successfully is 85%. Determine the Odds in Favour of the Dog successfully completing the trick

$$\text{Prob(success)} = \frac{85 \text{ successes}}{100 \text{ tries}} = \frac{85}{100} = \frac{17}{20}$$

- 0.85
- 17/20
- 17:3
- 8:5

ODDS IN FAVOUR ⇒ Successes : Failures

17 : 3

The Odds Against a volleyball team winning a game are 7:3. Determine the probability, as a reduced fraction, that they will win the game.

- 0.3
- 3/10
- 10%
- 3/7

ODDS AGAINST A WIN

LOSSES : WINS

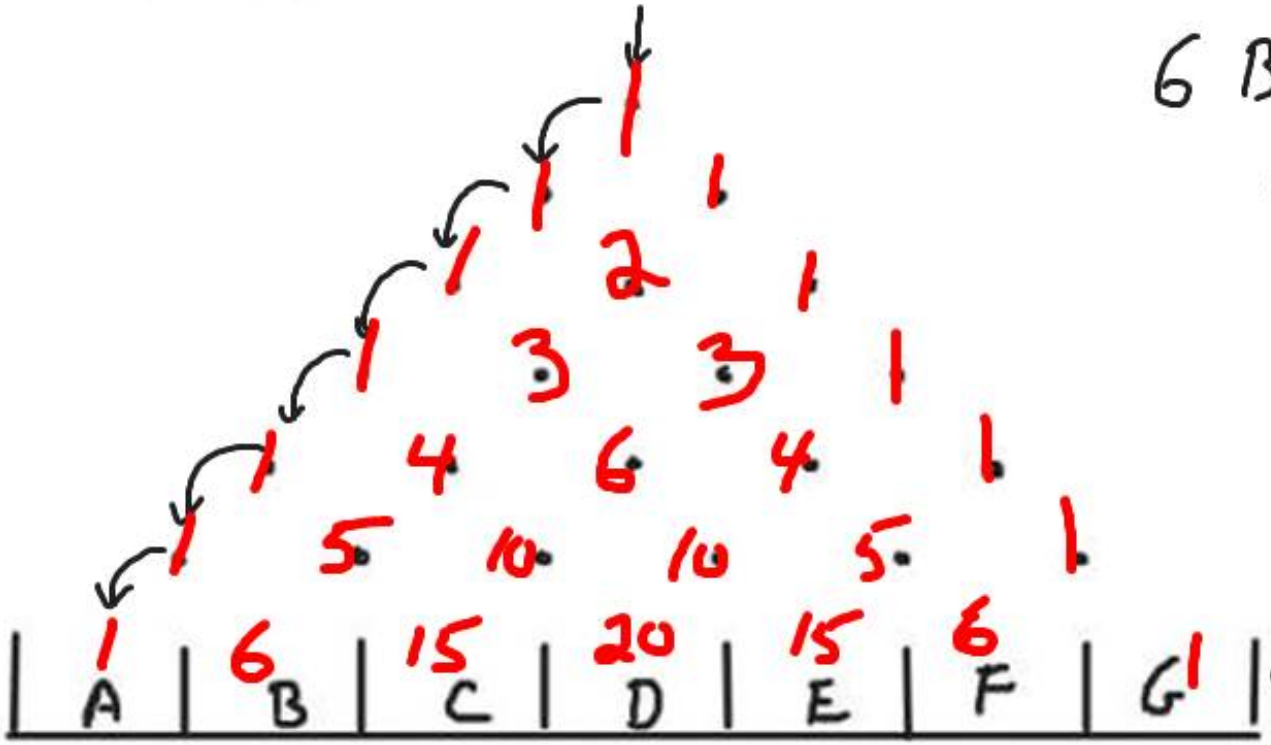
7 : 3 so 10 tries!

∴ Therefore

Prob(WIN) = 3/10 = 30%

= 0.3

A pinball machine is constructed as the figure below. Determine the PROBABILITY that a randomly falling ball will fall into Bin C. Pick best or closest answer.



6 Bounces
Left or right equally likely

Total ways to bottom = 64 way

$P(\text{Ball lands Bin C}) = \frac{\#\text{of paths to C}}{\text{Total \#of paths}}$

$= 15/64 = 0.234375$

$\cong 23\%$

- 15%
- 64
- ~23%
- 50/50

In a classroom of eight students, how many ways can the teacher line up three students in a row at the door.

- 3 ways
- 24 ways
- 3/8
- 336 ways

F.C.P choices → $\underline{8}_{\text{1st stud}} \cdot \underline{7}_{\text{2nd stud}} \cdot \underline{6}_{\text{3rd stud}} = 336$ ways to line up 3 student out of 8 in order at the door

? Doesn't make sense

OR: use the permutation function on your calculator | ${}_nP_r$ |

total # of different objects

you are going to select in some order

8 nPr 3
336

$\text{nPr}(8,3)$

$= 336$

Determine how many ways all the letters of word YELLOWQUILL can be distinguishably arranged. State the answer as a number below

$n = 11$ letters

If the letters were all different then

$11 \cdot 10 \cdot 9 \cdot 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$ ways to re-arrange

$= 39916800$ Thirty-nine million, nine-hundred sixteen thousand, eight hundred ways.

But there are 4 L's that could all be swap places

$4!$ (ie 24) ways

∴ The number of distinguishable arrangements

is $\frac{11!}{4!} =$ 11! 39916800 Ans/4! 1663200

1,663,200 ways to distinguishably re-arrange

BONUS. A baby randomly presses three buttons on her mom's phone which is set in the phone mode. Determine the probability the baby dials '911'

- 10%
- 9.11%
- 1/1000
- 3 ways

$$\text{Prob}(9 \text{ then } 1 \text{ then } 1) = \frac{\#\text{ways to make a "911"}}{\text{total \#ways to make \#}}$$

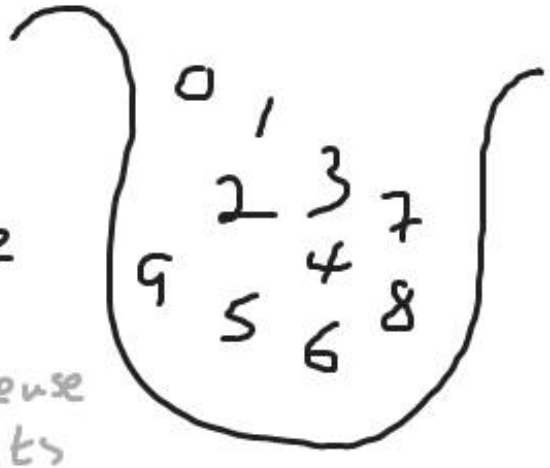
$$= \frac{1}{\uparrow} \cdot \frac{1}{\nwarrow} \cdot \frac{1}{\nearrow} = 1$$

must be "9" only one "9"

must be "1" only one "1"

only one way to make a "911"

allowed to reuse the digits

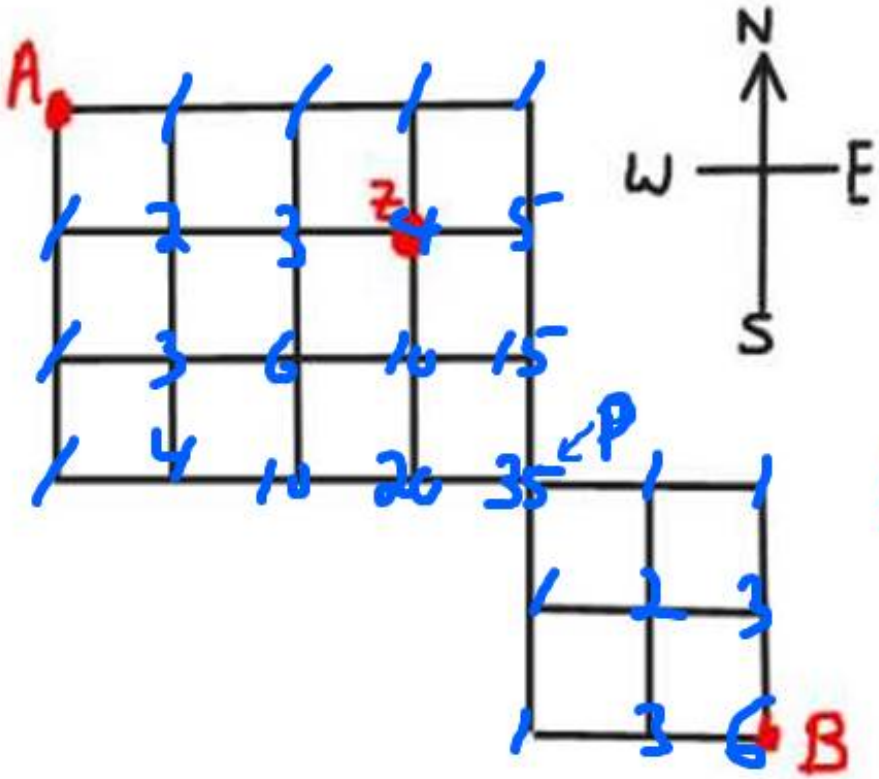


Total # of ways to make a 3-digit number (repeats allowed)

$$= \underline{10} \cdot \underline{10} \cdot \underline{10} = 1{,}000 \text{ ways}$$

$$\therefore P(\text{dialling 911}) = \frac{1}{1{,}000}$$

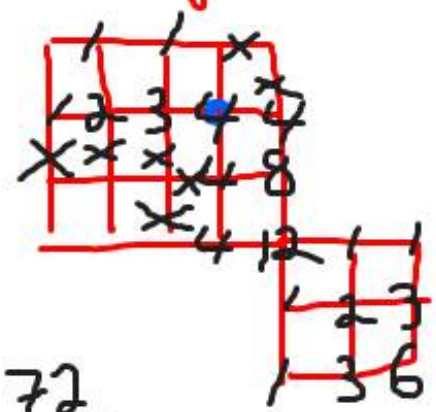
BONUS. If you move from A towards B randomly (East and South moves only), determine the probability that you will pass through point Z. Express response as a percent to nearest 0.01.



We had already determined there was 210 ways A to B for all paths

$35 \cdot 6 = 210$ or $\left(\frac{7!}{4!3!}\right) \cdot \frac{4!}{2!2!}$

(1) How many paths thru Z?



$12 \cdot 6 = 72$ paths thru Z

(2) $\therefore P(\text{Pass } Z) = \frac{72}{210}$

$= 12/35 \cong 34.29\%$

Wow! That was fun!

Load Clear !