Quiz Debrief
Week 5
GRADE 12 APPLIED

Probability
Personal Finance

5 May 2022

MrF

GRADE 12 APPLIED
QUIZ – WEEK 5 (22-05-05)

30 MINS

Name:_____
Date: _____

Use the formulae in my (but preferably *your*) cheat sheet, and / or use open book.

The quiz is available, on request before 10:00, for those stuck at home. Solve, Scan, Send by 12:15

Round decimal and percent answers to nearest 0.01. All fractions are to be reduced.

Show organized work for best mark. A plain answer with no explanation is not sufficient. Showing *any reasonable work* is likely worth *some* marks.

If using an App, give *a hand-drawn 'screen shot'* of the App's entire display with your entries and the solution.

Each individual question is worth two marks unless otherwise indicated.

Do the bonuses, for this quiz you can exceed 100%

1. Carol has five different cute dolls. Her mom says she can bring any two of them with her on a car ride. Determine how many possible different selections of two dolls Carol can grab to throw in her knapsack.

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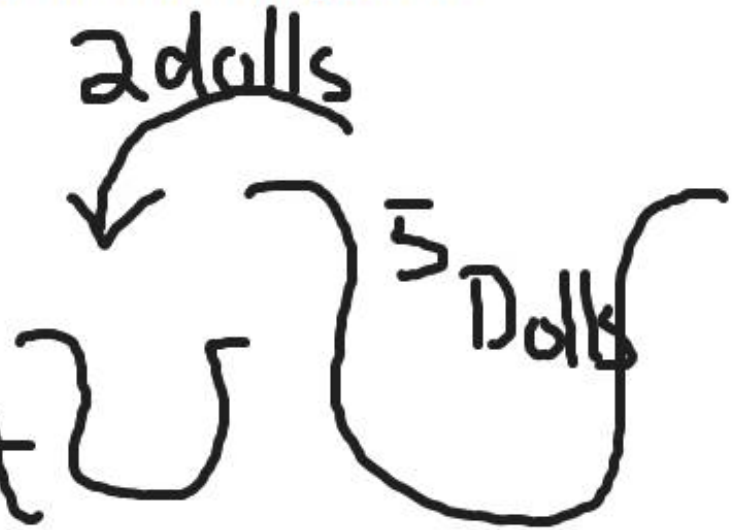
You know the definition?

Combination

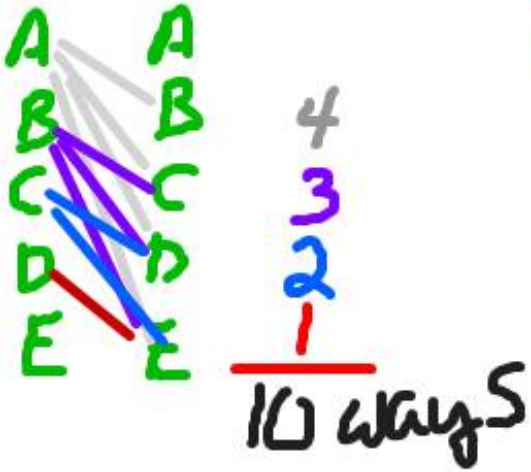
un-ordered

arrangement

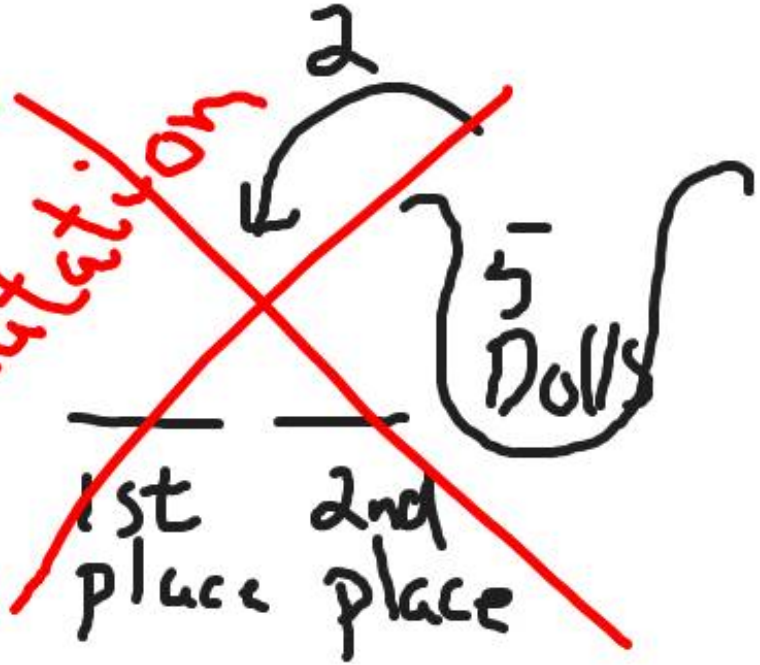


$_5C_2 = 10$

10 ways to select her dolls in a group



Permutation



2. The teacher has a class of 9 students. How many different ways can he line up (in some order):

a. all the students at the door, → $_9P_9$ or $9!$

b. three of the students at the door;

a) F.C.P

$9 \cdot 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$ ← Choices

then →

or $9!$ or $_9P_9$; nPr(9,9)

$9!$

$= 362880$

nPr(9,9)

$= 362880$

362,880 ways to line up * in order *

2. The teacher has a class of 9 students. How many different ways can he line up (in some order):

a. all the students at the door, → 362,880

b. three of the students at the door;

b) 9 · 8 · 7 = 504 choices F.C.P

$_9P_3 \equiv {}_nP_r(9,3) =$

objects ↑ arrange ↑ 3 in some order

nPr(9,3) = 504

9 nPr 3 504

So those first two questions took 30 seconds each!

Especially quick with a decent cheat sheet!

You need to produce your own cheat sheet for the course

MY! GRADE 12 APPLIED COURSE REFERENCE NOTES *(copy them if you ...)*

UNITS A & E- PROBABILITY, PERMUTATIONS & COMBINATIONS

Fundamental Counting Principle (FCP): 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**…*Eg*: number of license plates we can make 26*26*26*10*10*10. **Watch** if *repetitions* are allowed or not.

Permutations: *Order does matter*! 1st, 2nd, 3rd in a race of 12 runners. 12*11*10 possible choices. Or $_{12}P_3$.

Counting Non-Distinguishable Objects: **4 Red** balls, **2 Green** Balls. Number of *distinguishable* ways to arrange the 6 balls with 4 red and 2 green balls is $\frac{6!}{4!2!}$. Just like arranging YES and Nos. If only two different objects then = Combo.

Combinations. Arrangements of objects where ***order does not matter***. Selecting committees of people (no special positions or rewards), Lotto 6/49, etc.

Eg: how many ways can a committee of three people be formed from 12 people. $12C_3 = \frac{12!}{(12-3)!3!} = 220$

$Prob(A) = P(A) = \frac{\#\ of\ Favoured\ Outcomes}{\#\ of\ Total\ Possible\ Outcomes}$; eg: **Prob(Draw a King) = 4/52**. //**Sample space**: the list of all possible outcomes. Use a tree or table. // **Outcome**: the result of one trial of an experiment (eg: flipping one coin has only H or T outcome)// **Event**: A set of outcomes. **Eg**: rolling two dice, an event might be the set of outcomes where doubles were rolled.

Complement. The probability of an event happening is "***1 – the probability it won't happen***". **Complement** of event A is $\overline{A}$. So $P(\bar{A}) = 1 - P(A)$. **At least once Probs**: Prob(**A's ≥ 1 time**) $= 1 - P(no\ A's)$

ODDS. Odds in favour = favourable:not favourable; *eg*. wins : losses. Odds Against = not favourable : favourable

Formulas: **Factorial**: **6! = 6*5*4*3*2*1**; **Permutation**: $_nP_r = \frac{n!}{(n-r)!}$; **Combination**: $_nC_r = \frac{n!}{(n-r)!r!}$

Multiplying Probabilities: For successive events. *Keyword*: **AND**. Often one probability is *dependent* on the first. Often indicates whether something is drawn and with replacement or not.

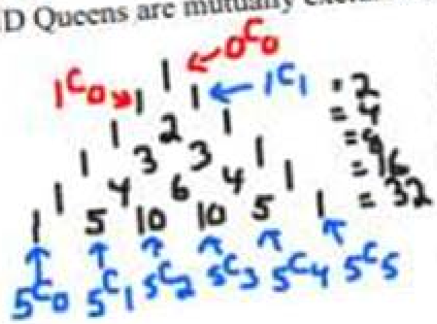
Independent example: Let **A** be event of being hit by bus. Let **B** be event of winning lottery. Both are independent events. Say P(A) = 0.01, and P(B) = 0.01. Prob of getting hit by a bus and winning the lottery = Prob(A AND B)= P(A)*P(B)=0.01*0.01=0.0001. Dependent example. Standard deck of cards. Probability of drawing a King **then** a Queen without replacing the first card. Let: K_1= event of drawing King first draw; Q_2 = event of drawing Queen second. **P(K_1 *and then* Q_2) = P(K_1)*P(Q_2 | K_1)**$=\frac{4}{52} * \frac{4}{51} = \frac{4}{663} = 0.60\%$

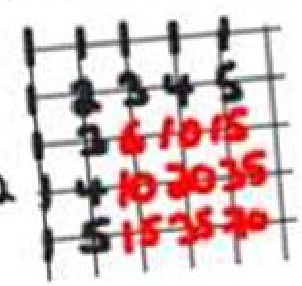
Adding Probabilities. For compound events, multiple events. *Keyword*: **OR**

Eg: Let **K = Set of all Kings**. Let **S = Set of all spades**.

Prob (**K OR S**) = P(K) + P(S) – Prob (**K AND S**). $= \frac{4}{52} + \frac{13}{52} - \frac{1}{52} = \frac{16}{52} = \frac{4}{13} = 30.7\%$ We are subtracting out the common card to set K **AND** set S; that is the **K♠** so we *don't double count* it. Mutually exclusive Events. The two events or sets that share no common outcomes! ie: Kings AND Queens are mutually exclusive. *****OR = Add : AND = Multiply *****

Pathways. As per usual PASCAL triangle method, or use the secret combination! $_nC_r$ where **n** is the total number of steps, **r** is *either* the downs or the rights. Doesn't matter what you count (downs or rights)! Just like selecting non-distinguishable objects.





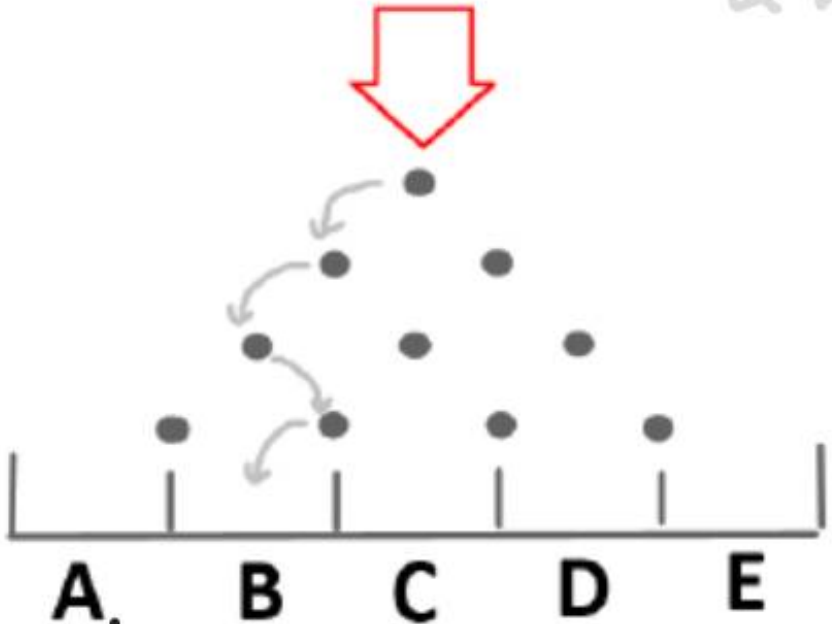
My cheat seems to show everything! How is yours looking?

3. A ball randomly drops down hitting the pins.

2 mins!

a. determine how many ways it can get to Bin D ?

b. calculate the probability it lands in Bin D **or** Bin E.

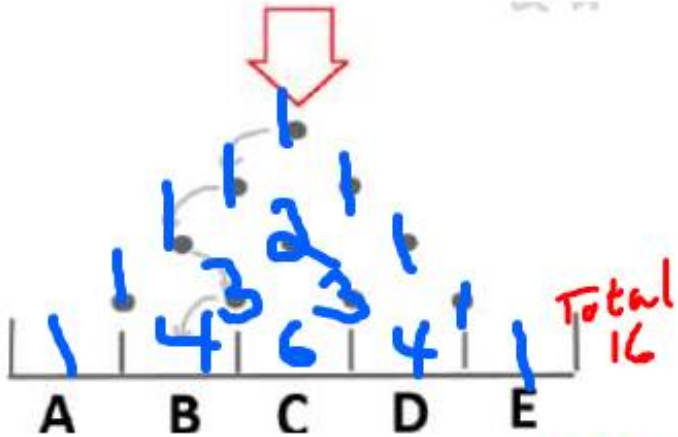


a) USE Pascal Triangle

4 Paths to Bin D

Distinguable Arrangements
4 moves, 3R, 1 Left

$\frac{4!}{3!1!} = 4$



b) $P(\text{Bin D or Bin E}) = \frac{4+1}{16} = \frac{5}{16}$

$= P(\text{Bin D}) + P(\text{Bin E})$

$= \frac{4}{16} + \frac{1}{16} = \frac{5}{16}$

4. **Compound Investment**. Chris puts $2,000 in an account that accumulates 4% interest, compounded quarterly. How much money does he have after three years?

[*Solve using formula only, check yourself with an App if you want*]

$$A = P \cdot \left(1 + \frac{r}{s}\right)^{n \cdot s}$$

$$A = 2{,}000 \cdot \left(1 + \frac{0.04}{4}\right)^{(3 \cdot 4)}$$

This one should take 2 mins

$= \$2{,}253.65$

$$2000 \cdot \left(1 + \frac{0.04}{4}\right)^{(3 \cdot 4)}$$

$= 2253.650060$

```
2000*(1+0.04/4)^
12
2253.65006
```

Check with App

-2,000	PV
0	PMT
2,253.65	FV
4	Rate
12	Periods

Quarterly

5. **Compound Investment**. David puts $21,000 in a high-interest savings account. The account has an interest rate of 7.2%, compounded annually. When he takes it out, he has $31,870.44. How long did he invest his money?

[*Use an App. Do hand-drawn screen shot of App solution*]

End **Beginning**

-21,000	PV
0	PMT
31,870.44	FV
7.2	Rate
6.0	Periods
Annually	

6 annual periods
i.e: years

Makes sense. Would double in 10 years. So 5 or 6 yrs sounds OK

Check? Test? Does 6 years work?

$21{,}000 \cdot (1+0.072)^6 = ?$

```
21000*(1+0.072)^
6
        31870.43615
```

Yes
6 works perfectly

7. **Problem Solve / Logic**. Five years ago, Jason was half his father's age. His dad is 41 years old now. How old is Jason **now**?

Logic.

Dad is 41 now, therefore dad was 36 five years ago. So five year's ago Jason was half of 36, so 18. So if Jason was 18 five years ago he must be 23 now.

Jason is 23 now

Logic, algebra, graphic, work backwards, graph ... guess and check?

At least 7 ways to figure this out!

7. **Problem Solve / Logic**. Five years ago, Jason was half his father's age. His dad is 41 years old now. How old is Jason **now**?

Guess and check?

Logic, algebra, graphic, work backwards, graph ... guess and check?

Jason now	Jason 5 years ago	Dad 5 years ago	Dad now	
X20?	15	30	35	X
X22?	17	34	39	X
23 ✓	18	36	41 ✓	

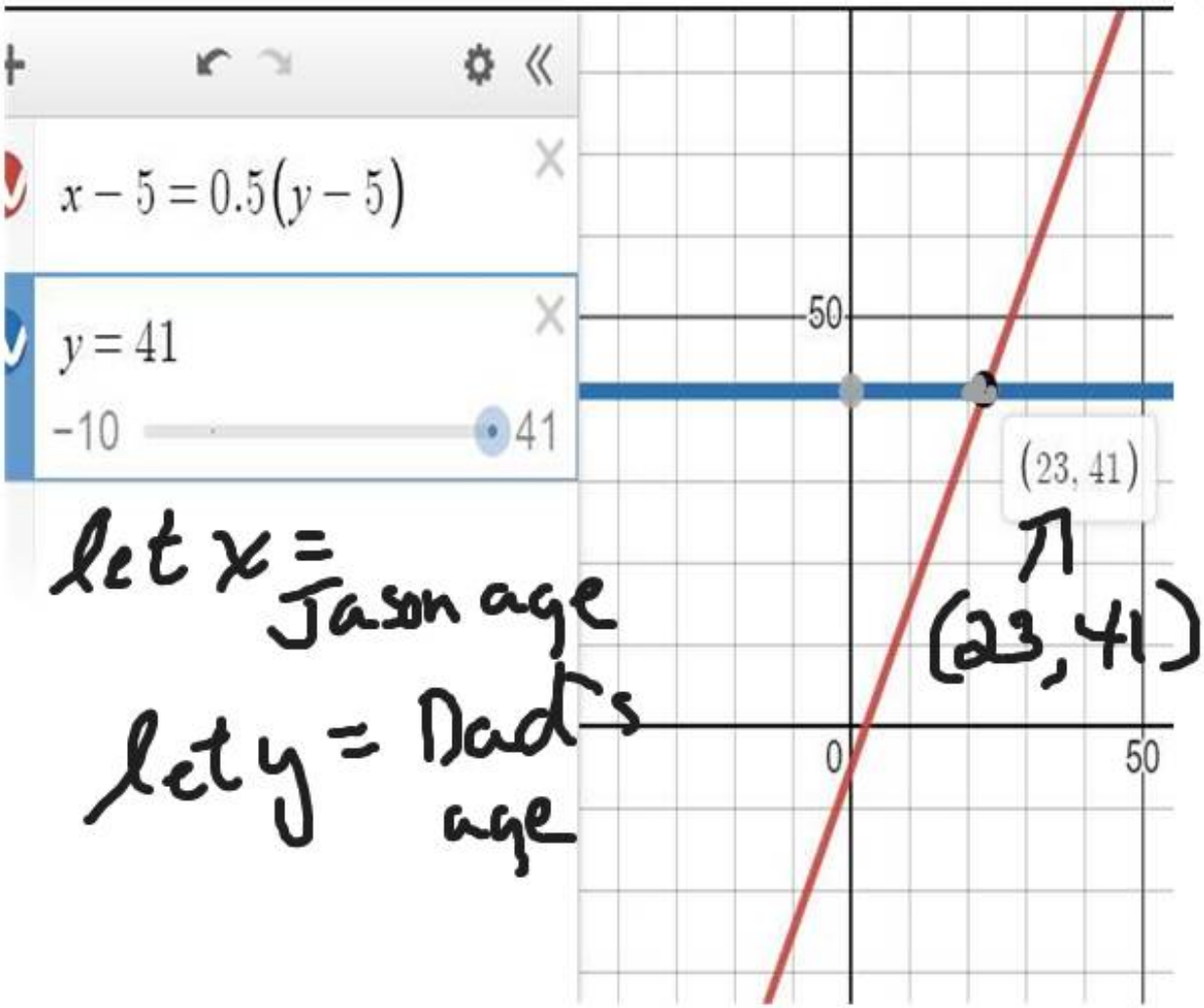
Jason is 23 Now ✓

At least 7 ways to figure this out!

7. **Problem Solve / Logic**. Five years ago, Jason was half his father's age. His dad is 41 years old now. How old is Jason **now**?

Graph! Applied Math

Logic, algebra, graphic, work backwards, graph ... guess and check?



let x = Jason age

let y = Dad's age

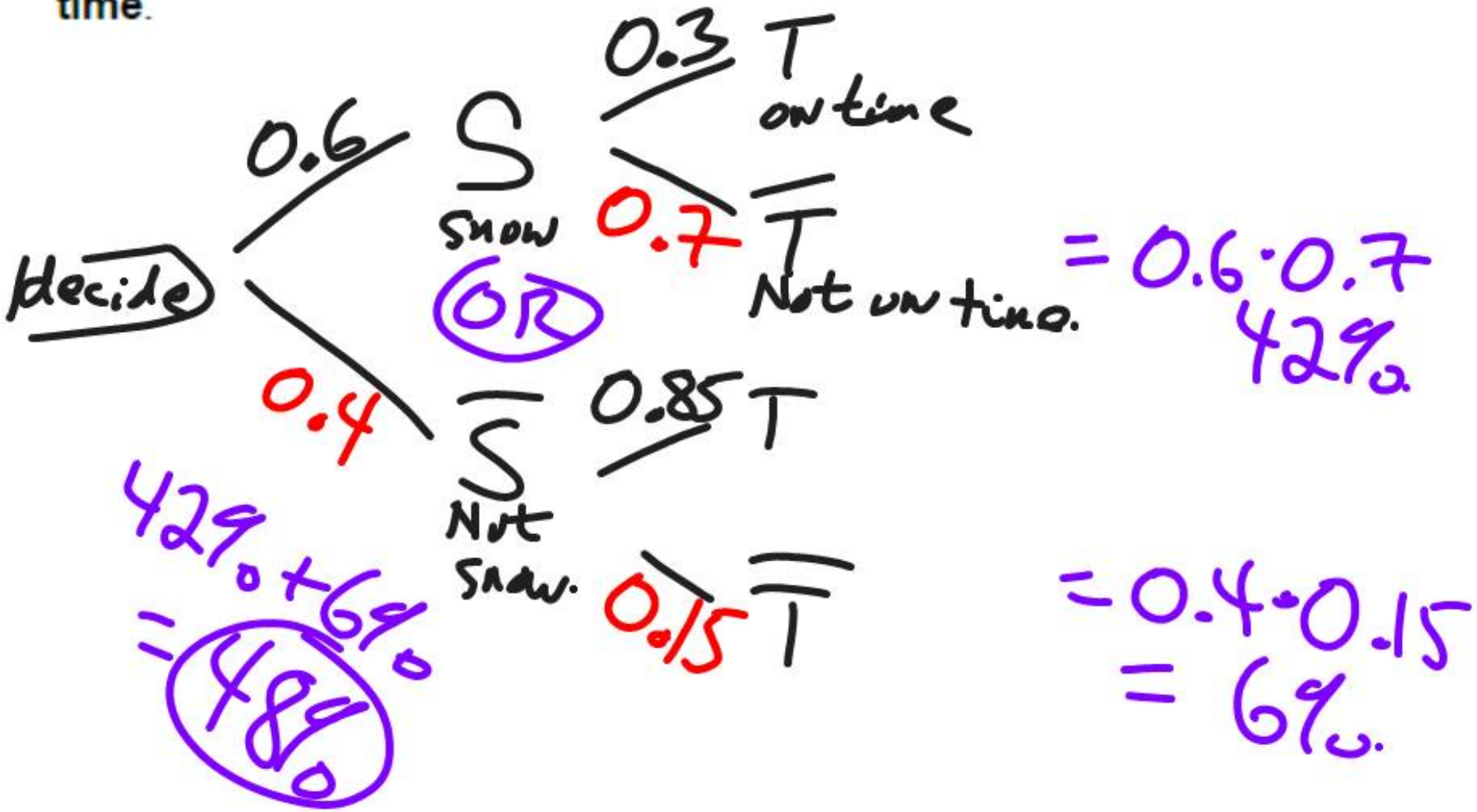
(23, 41)

At least 7 ways to figure this out!

8. **Dependent Probability**. The weather report calls for a 60% probability of snow in northern Manitoba on Tuesday. The flight from Thompson to Flin Flon has a 30% probability of being on time **when it is snowing**. There is an 85% probability of the flight being on time **when it is not snowing**.

a) Use a graphic organizer to show all possible outcomes for this situation.

b) Determine the probability that the flight on Tuesday will **not be on time**.



BONUSES (two marks each)

For this quiz, you will be **able to** exceed 100%, so make sure you try the bonuses.

9. A pair of dice is placed in a container and shaken well. What is the probability of rolling:

a. doubles **or** a sum of 9?

b. a sum less than 6 **or** doubles?

"D" "9"

"<6" D

Need a sample space ✓

Sum	Die 1: 1	2	3	4	5	6
Die 2: 1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

a)

$P(D \text{ or } 9) = P(D) + P(9) - P(D \text{ and } 9)$

$= \frac{6}{36} + \frac{4}{36} = \frac{10}{36}$

$= \frac{5}{18} \approx 27.8\%$

b) $P(\text{"<6" or } D) = P(<6) + P(D) - P(<6 \text{ AND } D)$

$= \frac{10}{36} + \frac{6}{36} - \frac{2}{36} = \frac{14}{36} = \frac{7}{18} \approx 38.8\%$

10. Seven blue marbles and five yellow marbles are placed in a bag. A marble is drawn, placed back in the bag and a second marble is chosen. What is the probability rounded to 3 decimal places of drawing two blue marbles or two yellow marbles?

Prob (A matching pair)

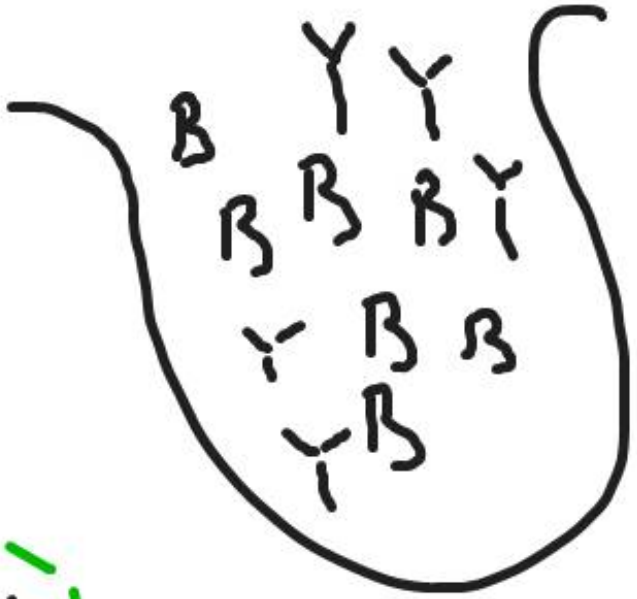
$P(B_1) \cdot P(B_2) = P(B_1, B_2)$

$\frac{7}{12} \cdot \frac{7}{12}$ Two Blues $\frac{49}{144}$

OR

$P(Y_1) \cdot P(Y_2) = P(Y_1, Y_2)$

$\frac{5}{12} \cdot \frac{5}{12}$ Two Yellow $\frac{25}{144}$



$P(B_1, B_2 \text{ or } Y_1, Y_2) = P(Y_1, Y_2) + P(B_1, B_2)$

$= \frac{25}{144} + \frac{49}{144}$

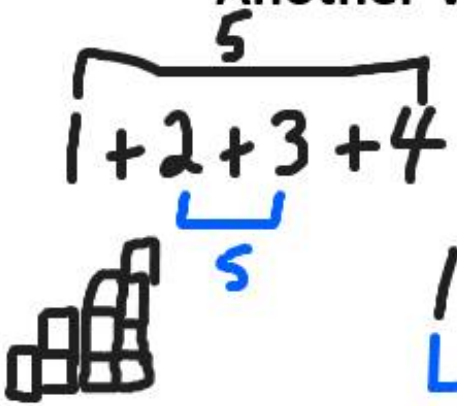
$= 51.39\%$

11. **Problem Solve**. Determine the sum of the whole counting numbers from one to 40 inclusive.

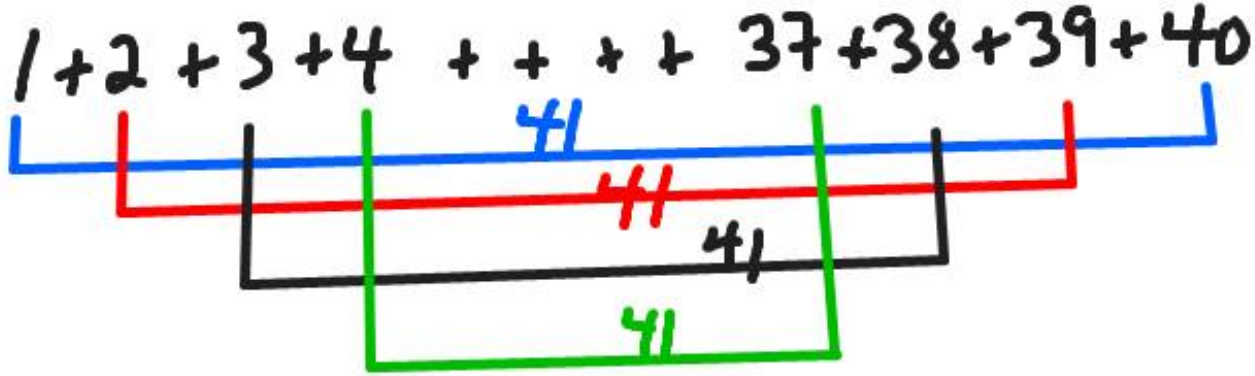
lol Done this about 10 times now!

One way to solve a problem is to look for a pattern

Another way is to make the problem simpler



See a pattern? maybe even a formula?



41·20=820

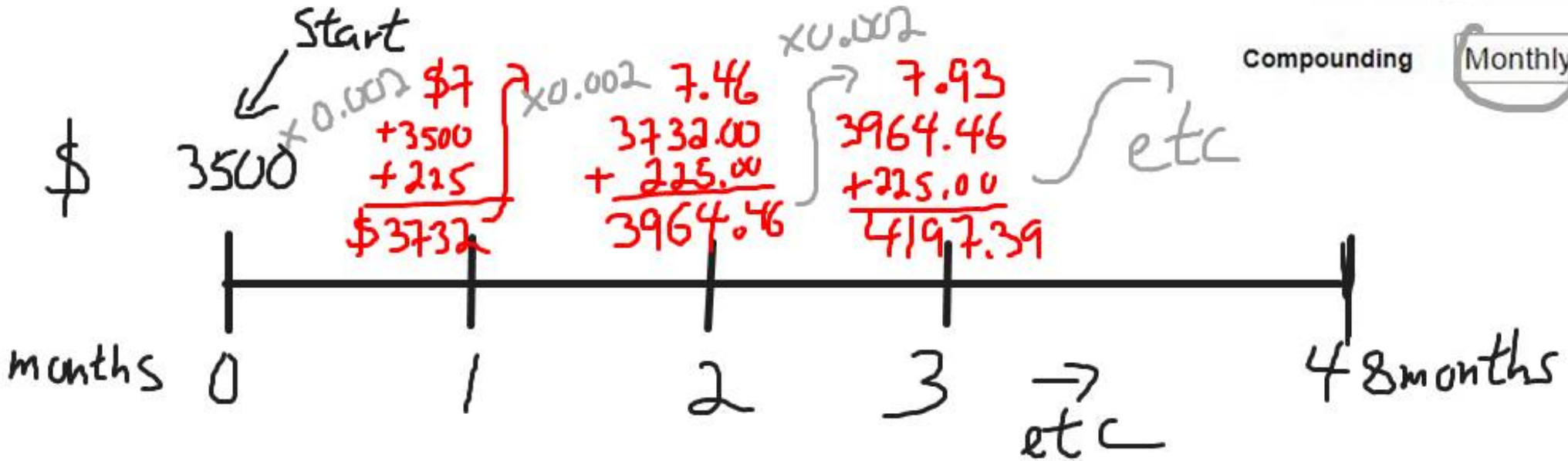
12. Annuity Payments. Evan has $3,500 in his savings account but he wants to add more to save up for a boat. He is able to deposit $225 monthly. The bank offers him a 2.4% interest rate. He estimates he wants to buy the boat in four years.

a) How much will he have saved for the boat after 4 years?

b) How much interest does his investment make?

[*Use an App Do hand-drawn screen shot*]

Present Value	-3,500
Payments	-225
Future Value	4,197.39
Annual Rate (%)	2.4
Periods	3
Compounding	Monthly



Int $\frac{0.024}{12} = 0.002$/month

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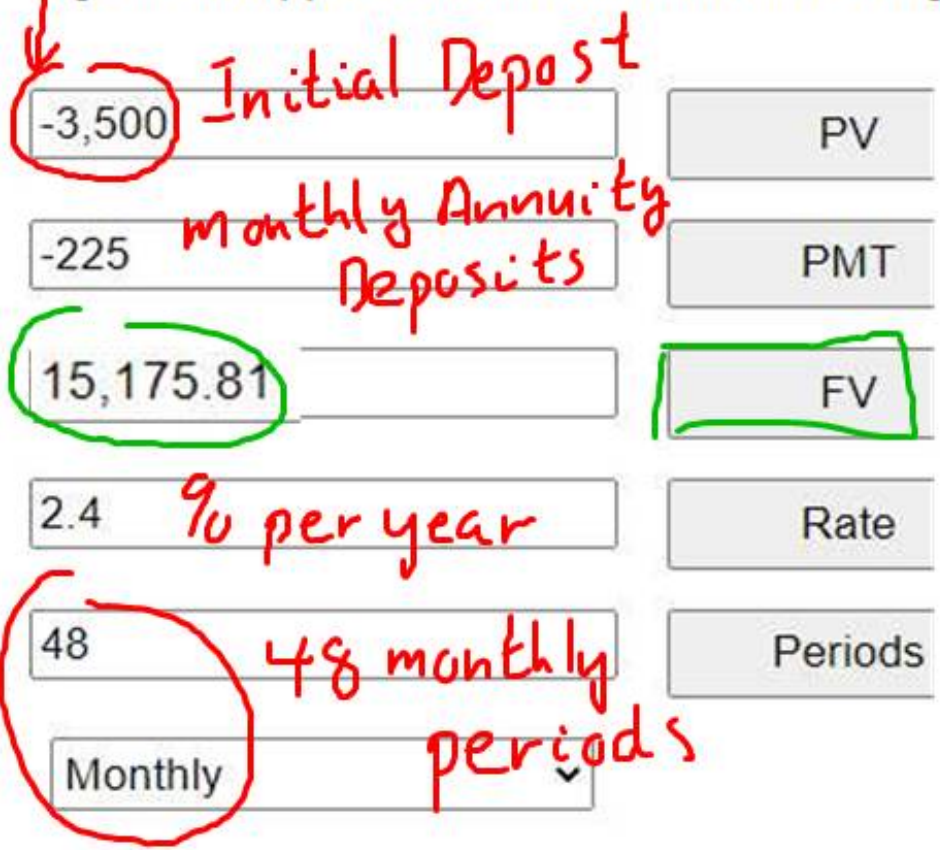
a) How much will he have saved for the boat after 4 years?

b) How much interest does his investment make?

Maybe use an App instead

negative

[*Use an App Do hand-drawn screen shot*]



lol

a) He saved up $15,175.81

b) He paid in

$3500 + $225.48

= 14,300

Total − Principal

15,175.81 − 14,300

= $875.81 Interest