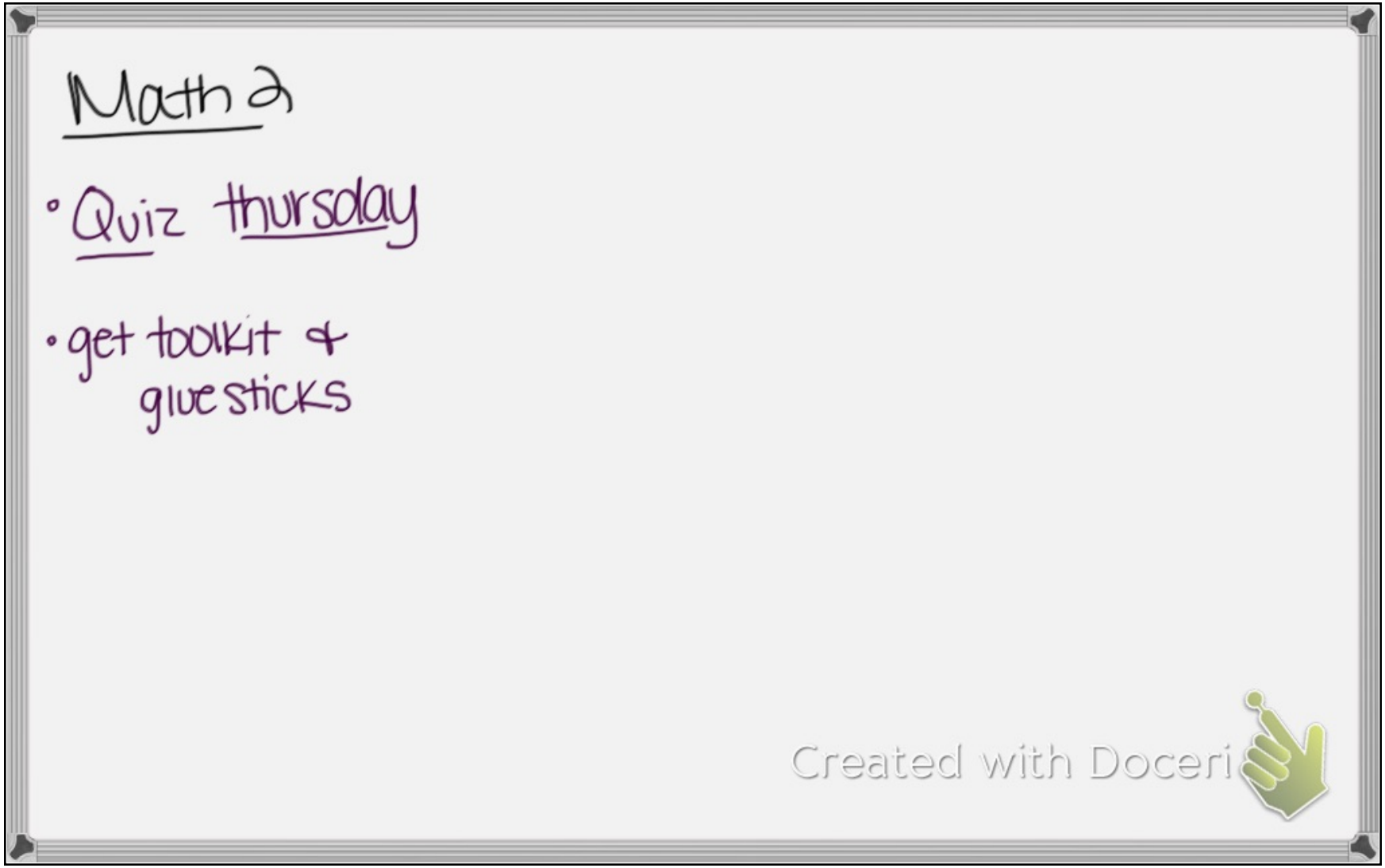
Math 2
• Quiz thursday
• get toolkit & glue sticks
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The Addition Rule

C1U8L1I2

Problem 1 is a class activity that involves two situations: in the first, you can add the probabilities to find the probability of event A or even event B occurring; in the second, you cannot add probabilities because to do so you would count some outcomes twice

MUTUALLY EXCLUSIVE (P(A) + P(B)):
Two events that do not impact each other (independent)

1)

Color of Shoes You Are Wearing Today	Number of Students
Blue	3
Black	9
White	2
Brown, Beige, or Tan	8
Red	0
Other	2

Color of Shoes You Own	Number of Students
Blue	10
Black	22
White	15
Brown, Beige, or Tan	19
Red	17
Other	19

OR one or the other - meets at least one criteria

Ex) A student owns black shoes or owns red shoes

- own only black shoes
- own only red shoes
- own both black & red shoes

A.) Which question below can you answer using just the data in your tables? Answer that question.

i. What is the probability that a randomly selected student from your class is wearing shoes today that are black or wearing shoes that are white? $\frac{11}{24}$

ii. What is the probability that a randomly selected student from your class owns shoes that are black or owns shoes that are white?

Not sure

B) Why can't the other question in Part a be answered using just the information in the tables?

multiple people own more than one color shoe → overlap

C) As a class collect information that can be used to answer the other question.

16 → both 22 + 15 = 37 - 16 = $\frac{21}{24}$

2) The Minnesota student survey asks teens questions about school, activities, and health. Ninth-graders were asked, "How many students in your school are friendly?" The number of boys and girls who gave each answer are shown in the table below.

HOW MANY STUDENTS IN YOUR SCHOOL ARE FRIENDLY?

ANSWER	BOYS	GIRLS	TOTAL
All	480	303	783
Most	13,199	14,169	27,368
Some	7,920	8,874	16,794
A few	1,920	1,815	3,735
None	480	50	530
TOTAL	23,999	25,211	49,210

Suppose you pick one of these students at random.

a) Find the probability that the student said all students are friendly. 783/49,210

b) Find the probability that the students said most students are friendly. 27368/49,210

c) Find the probability that the students is a girl. 25,211/49210

d) Find the probability that the student is a girl and said that all students are friendly. 303/49,210

e) Think about how you would find the probability that the student said that all students are friendly or said that most students are friendly. Can you find the answer to this question using your probabilities from parts a and b? 28151/49210

f) Think about the probability that the student is a girl or said that all students are friendly.

i. Can you find the answer to this question using just your probabilities from parts a and c? No → overlap

ii. Can you find the answer also using part d? 783 + 25211 - 303 = 25691/49210

3) Two events are said to be **mutually exclusive (or disjoint)** if it is impossible for both of them to occur on the same outcome. Which of the following pairs of events are mutually exclusive? 1/6 4/3 2/5

a. You roll a sum of 7 with a pair of dice, you get doubles on the same roll. 1/1 2/2 3/3 4/4 5/5 6/6 (4/4) M.E.

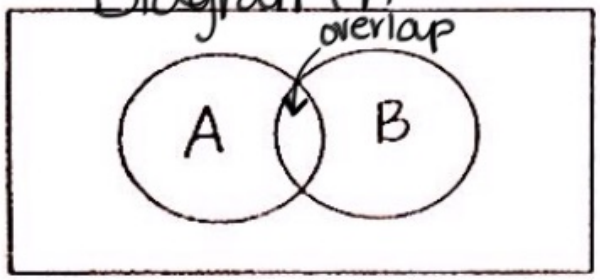
b. You roll a sum of 8 with a pair of dice, you get doubles on the same roll. ~~M.E.~~

c. Issac wear white shoes today in class; Issac wears black shoes today in class M.E.

d. Yen owns white shoes; Yen owns black shoes ~~M.E.~~

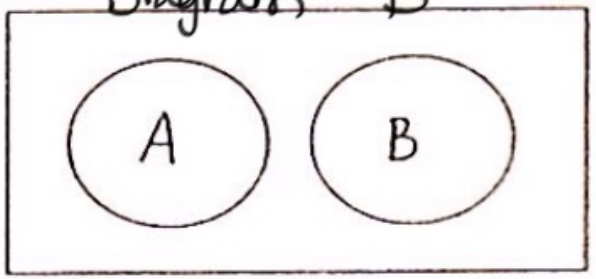
↳ He can own both

Diagram A



Not mutually Exclusive

Diagram B



Mutually exclusive

Use the Venn diagrams for questions 4 and 5.

...events are mutually exclusive.

a Which of the *Venn* diagrams below better represents the situation?

B

b What does that fact that *A* and *B* are mutually exclusive mean about *P(A and B)* – the probability that *A* and *B* both happen on the same outcome?

0/total

c When *A* and *B* are mutually exclusive, how can you find the probability that *A* happens or *B* happens (or both happen)? Add individual probabilities → P(A) + P(B)

P(A or B) ⇒ P(A ∪ B)

d Write a symbolic rule for computing the probability that *A* happens or *B* happens, denoted P(A or B), when *A* and *B* are mutually exclusive. This rule is called the **Addition Rule for Mutually Exclusive Events.**

$$P(A \cup B) = P(A) + P(B)$$

5.) Suppose two events are not mutually exclusive.

a Which of the *Venn* diagrams below better represents the situation?

A

b What does that fact that *A* and *B* are not mutually exclusive mean about *P(A and B)* – Where is the probability represented in the *Venn* diagram?

the overlap or intersection

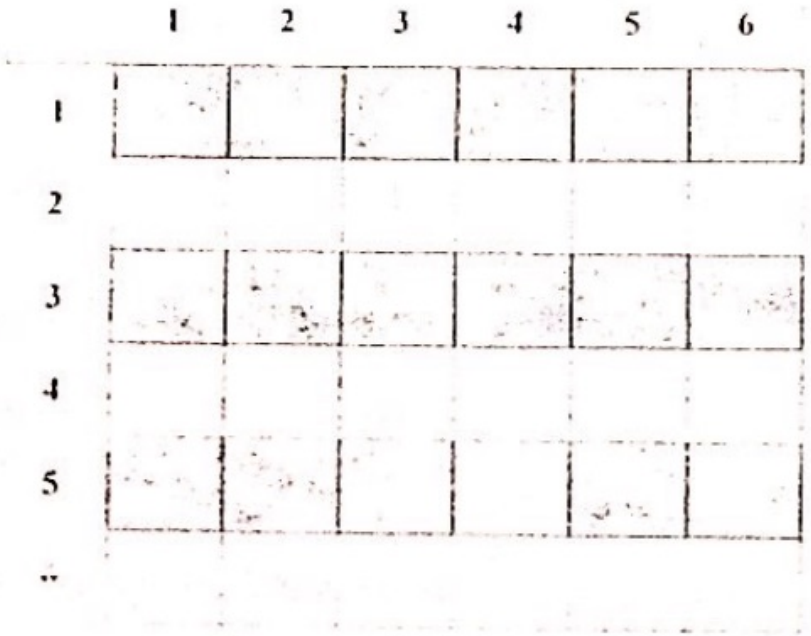
c When *A* and *B* are mutually exclusive, how can you find the probability that *A* happens or *B* happens (or both happen)? Add probabilities then subtract overlap

P(A) + P(B) − P(Both)

d Write a symbolic rule for computing the probability that *A* happens or *B* happens, denoted P(A or B), when *A* and *B* are mutually exclusive. This rule is called the **Addition Rule.**

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

6.) Test your results on the following problems about rolling a pair of dice



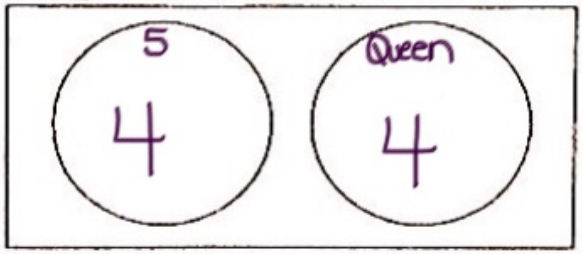
a) Find the probability that you get doubles or a sum of 5.
P(D or S5) =

b) Find the probability that you get doubles or a sum of 2.
P(D or S2) =

Mutually Exclusive Events and Inclusive Events Name: _____

Mutually Exclusive Event: when events cannot occur at the same time.

Ex: Drawing a 5 or a Queen out of a deck (52)



Probability of Mutually Exclusive Events:

P(A or B) = P(A) + P(B)

P(A ∪ B)

Ex 1: Given that you have a standard deck of 52 cards, find the following.

a. What is the probability that you draw a 2 or a queen?

$P(2) = \frac{4}{52}$ $\quad \frac{4}{52} + \frac{4}{52} = \frac{8}{52} \approx .1538$ or 15.4%

$P(Q) = \frac{4}{52}$

b. What is the probability that you draw a club or a heart?

$P(\text{club}) = \frac{13}{52}$ $\quad \frac{13}{52} + \frac{13}{52} = \frac{26}{52} = .5$ or 50%

$P(\text{heart}) = \frac{13}{52}$

Ex 2: The Film Club at school has a collection of movies. They have them listed by categories. They have 10 comedy films, 8 horror films, 12 romance films and 6 documentary films. What is the probability that a movie randomly selected will be either a horror, comedy, or documentary film?

$P(\text{horror}) = \frac{8}{36}$

$P(\text{Comedy}) = \frac{10}{36}$

$P(\text{Documentary}) = \frac{6}{36}$

$\frac{8}{36} + \frac{10}{36} + \frac{6}{36} = \frac{24}{36} \approx .667$ or 66.7%.

Probability of an Inclusive Event: → Something in Common

$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$ → overlap

$P(A \cup B) = P(A \cap B)$

Ex 3: David asked 100 students what subjects they liked out of math and science. 32 liked math, 41 liked science and 12 said that they like both. What is the probability that a student chosen would like math or science?

$P(\text{Science}) + P(\text{Math}) - P(\text{Both})$

$$\frac{41}{100} + \frac{32}{100} - \frac{12}{100} = \frac{61}{100} = 61\%$$

Ex 4: Avery is drawing cards from a standard deck. What is the probability that she draws a card that is either a heart or a jack?

Jack of hearts

$P(\text{Jack}) + P(\text{heart}) - P(\text{Both})$

$$\frac{4}{52} + \frac{13}{52} - \frac{1}{52} = \frac{16}{52} \text{ or } .308 \rightarrow 30.8\%$$

Deck of Cards

52 total Cards in a Deck!

- 26 Black Cards
  - 13 Clubs
  - 13 Spades
- 26 Red Cards
  - 13 hearts
  - 13 diamonds

} suits

* 4 of every type of card *

2-10, Jack, Queen, King, Ace

* Face Cards → Jack, Queen, King (12)