

pick up the
Warm Up

FINDING PROBABILITIES

② Ralph estimates that he has a 60% chance of getting an A on his English test, and a 45% chance of getting an A on his physics test. What is the probability that he gets an A on both tests, assuming that the events are independent?

indep.
so
 $P(\text{both}) = P(A) \cdot P(B) = (0.6)(0.45) = 0.27$

3) Suppose a machine consists of two components, component A and component B, and the machine can function properly only if its components are functioning properly. On any given day, component A has a 5% probability of failure and component B has a 10% probability of failure. Assume that the component failures are independent events.

- a. Find the probability that component A will not fail on a given day. (0.95)

$$P(\text{A NOT FAIL}) = 1 - .05 = .95$$

- b. Find the probability that component B will not fail on a given day.

$$P(\text{B NOT FAIL}) = 1 - 0.1 = 0.9$$

- c. On any given day, find the probability that the machine will work correctly all day.

$$(0.95)(0.9) = 0.855$$

4) a) $P(\text{roll 3 sixes}) = P(\text{six and six and six}) = \frac{1}{6} \cdot \frac{1}{6} \cdot \frac{1}{6} = \left(\frac{1}{216}\right)$

b) $P(3 \text{ of a kind}) = P(\text{all 1's or all 2's or } \dots) = P(\text{all 1's}) + P(\text{all 2's}) + \dots$
 $= \frac{1}{216} + \frac{1}{216} + \dots = \frac{6}{216}$
 $= \frac{1}{36}$

c) $P(\text{NOT get 3 of a kind on any of the 5 turns}) = \left(\frac{35}{36}\right)\left(\frac{35}{36}\right)\left(\frac{35}{36}\right)\left(\frac{35}{36}\right)\left(\frac{35}{36}\right) \cdot P(\text{NOT getting 3 of a kind})$
 $\left(\frac{35}{36}\right)^5 = .868686$
 $= .869$
 $= 1 - \frac{1}{36} = \frac{35}{36}$

4

A game requires you to toss three dice each turn.

~~dice~~ indep.

- a. What is the probability that you will roll three sixes during a turn? $\frac{1}{6} \cdot \frac{1}{6} \cdot \frac{1}{6} = \frac{1}{216}$
- b. What is the probability that you will roll three of a kind during a turn?
- c. If you play the game for five turns, what is the probability that you will *not* get three of a kind during any turn?

$$P(\text{not 3 of a kind}) = 1 - \frac{1}{36} - \frac{1}{36} \dots \left(\frac{35}{36}\right)\left(\frac{35}{36}\right)\left(\frac{35}{36}\right)\left(\frac{35}{36}\right)\left(\frac{35}{36}\right) = 0.8686$$

$$\rightarrow = P(\text{all 1's or all 2's or all 3's etc}) = \frac{1}{216} + \frac{1}{216} + \frac{1}{216} + \frac{1}{216} + \frac{1}{216} + \frac{1}{216} = \frac{6}{216} = \frac{1}{36}$$

six times as likely!

Warm up

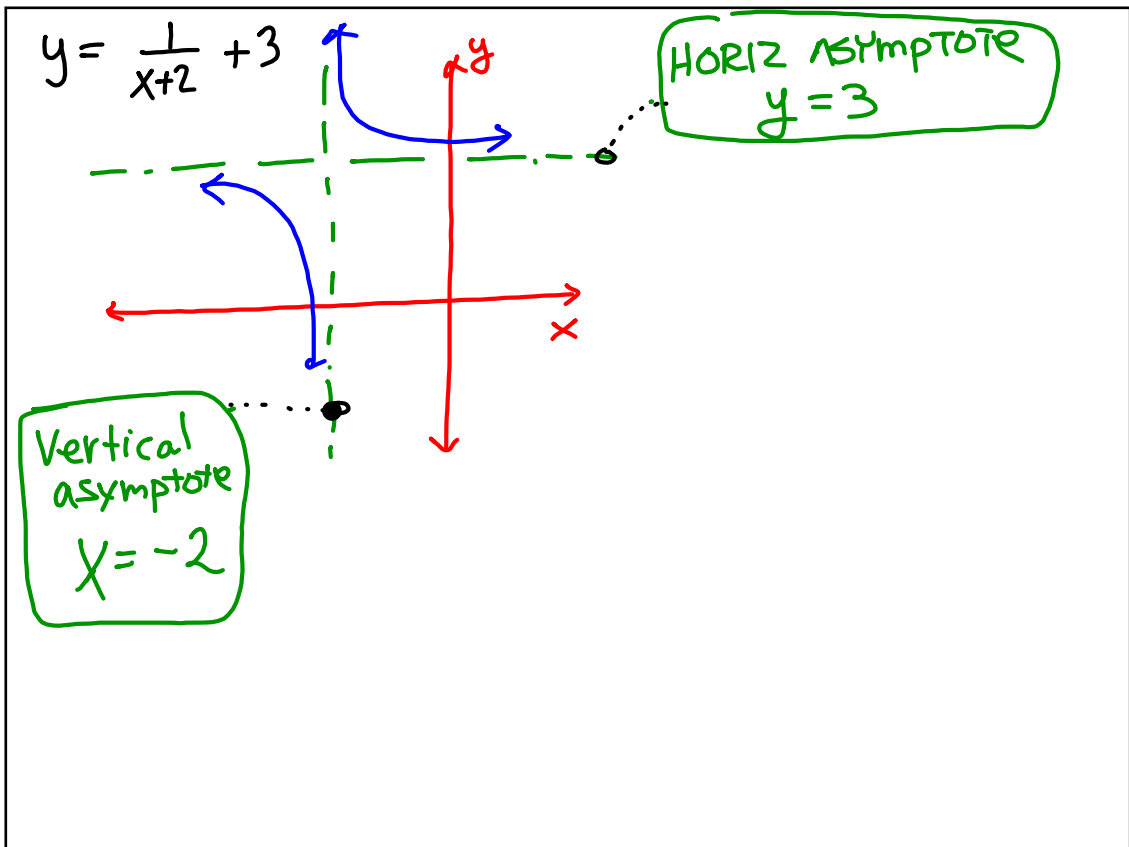
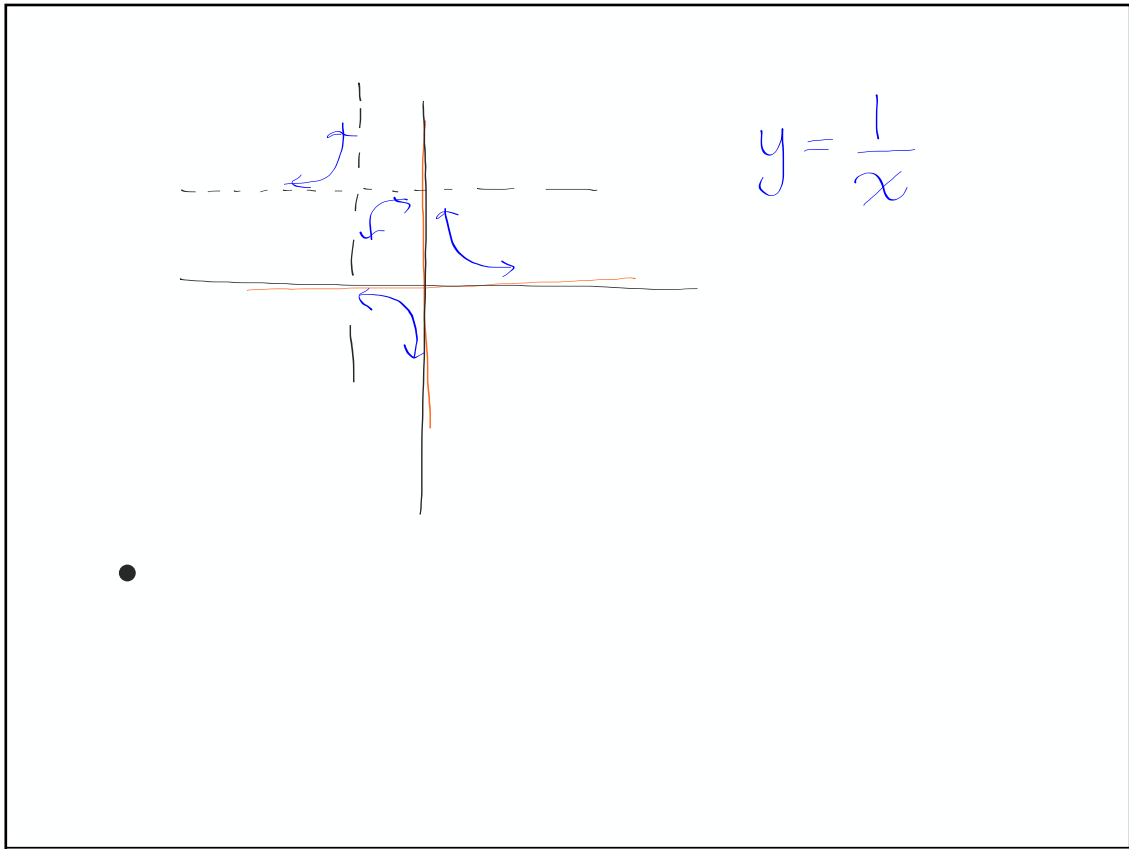
Rational
Function from Advanced
Algebra

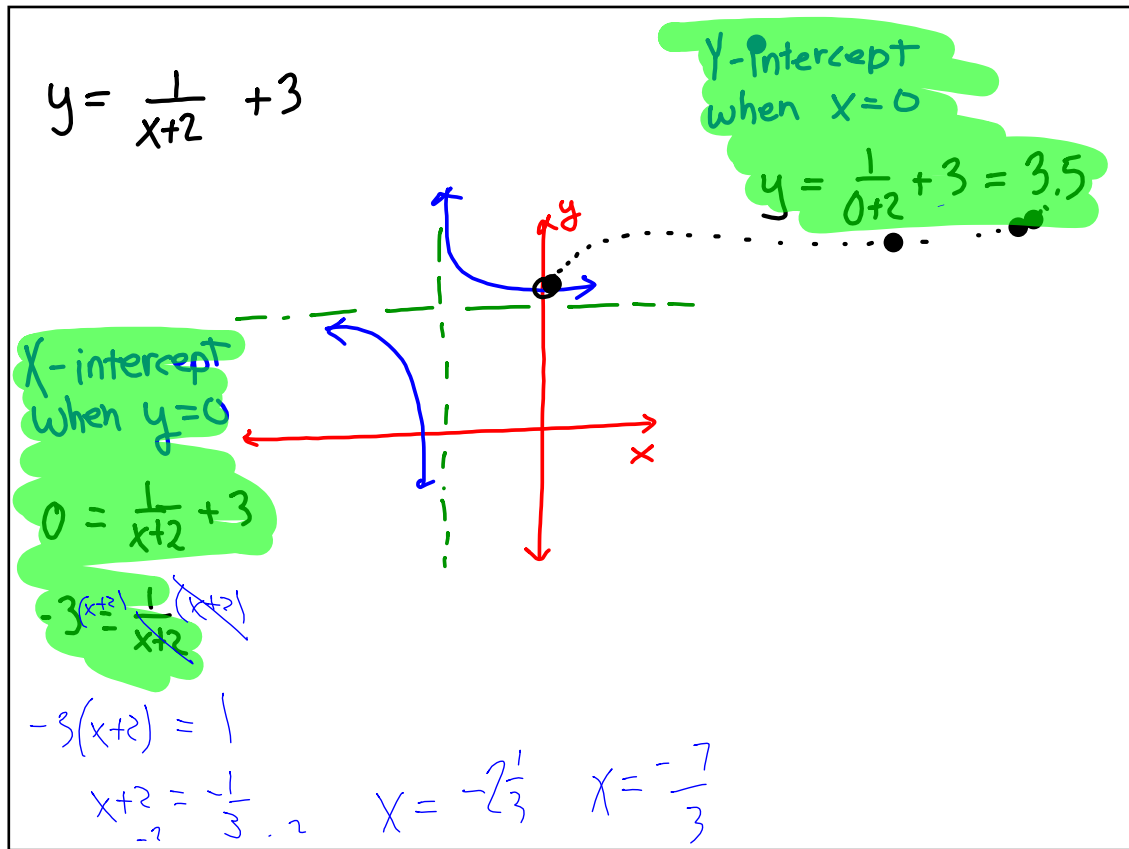
①

$$y = \frac{1}{x+2} + 3$$

- what is the equation of the vertical asymptote:
- what is the equation of the horizontal asymptote:
- what is the y-intercept
- what are (is) the x-intercept(s)?
- sketch the graph below, label it, be sure to draw any asymptotes with a dotted line. Always draw asymptotes first before drawing the function itself.

$$y = \frac{1}{x}$$





X-intercept
 when $y=0$
 $0 = \frac{1}{x+2} + 3$
 $-3 = \frac{1}{x+2}$
 $-3(x+2) = 1$
 $x+2 = -\frac{1}{3}$
 $x = -\frac{1}{3} - 2 = \left(-\frac{7}{3}\right) - 2\frac{1}{3}$

HW

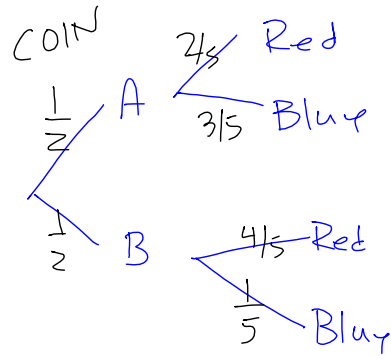
Sets Assignment #7

**Let me know if you want
me to go over a problem.**

p. 486
(8)

2 red
3 blue

4 red
1 blue



$$\begin{aligned} \text{a) } P(\text{red}) &= \frac{1}{2} \cdot \frac{2}{5} + \frac{1}{2} \cdot \frac{4}{5} \\ &= \frac{6}{10} \end{aligned}$$

$$\text{b) } P\left(\begin{matrix} \text{Ur} \\ \text{B} \end{matrix} \middle| \text{red}\right)$$

p. 490

$$P(A) = \frac{2}{5} \quad P(B) = \frac{1}{3} \quad P(A \cup B) = \frac{1}{2}$$

(2)

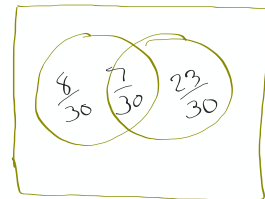
$$\text{a) } P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$\frac{1}{2} \binom{15}{15} = \frac{2}{5} \binom{6}{6} + \frac{1}{3} \binom{10}{10} - X$$

$$\frac{15}{30} = \frac{12}{30} + \frac{10}{30} - X$$

$$\frac{15}{30} = \frac{22}{30} - X$$

$$X = \frac{22}{30} - \frac{15}{30}$$



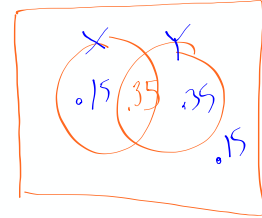
$$\text{b) } P(B|A) = \frac{P(A \cap B)}{P(A)} = \frac{\frac{7}{30}}{\frac{15}{30}} = \frac{7}{30} \cdot \frac{30}{15} = \frac{7}{15}$$

$$\text{c) } P(A|B) = \frac{P(A \cap B)}{P(B)} =$$

$$\begin{aligned} \text{(3)} \quad & P(X) = .5 \\ \text{(a)} \quad & P(Y) = 0.7 \end{aligned} \left. \begin{array}{l} \\ \end{array} \right\} \text{independ. so } P(X \text{ and } Y) = P(X) \cdot P(Y) \\ & = (.5)(.7) = .35$$

$$\text{(b)} \quad P(X \text{ or } Y) = P(X) + P(Y) - P(X \text{ and } Y) \\ = .85$$

$$\text{(c)} \quad P(\text{Neither } X \text{ or } Y) = P(\text{NOT } X \text{ and NOT } Y) = (.5)(.3) \\ = .15$$



$$\text{(d)} \quad P(X \text{ and } Y') = P(X) \cdot P(Y') = (.5)(.3)$$

$$\text{(e)} \quad P(X | Y) = \frac{P(X \cap Y)}{P(Y)} =$$

Test will be on
Sets
Venn Diagrams
Probability

P3

Draft 1
introduction

P4

Draft 2
Revisions + Data Collection + Descript. of
Data Collection
Process

P5

Final Draft

BB

Test Can use formula sheet

HW Recording Sheet

$$\begin{aligned} 10 @ 10 &= 100 \\ 1 @ 5 &= 5 \\ \hline &= 105 \end{aligned}$$

// assign

$$\frac{\quad}{105}$$

Preparation

Study Problems

Packet with lists of suggested review problems and solutions.

B.B.

Probability Review

Conditional Probability Practice

- 3 50 students go bushwalking. 23 get sunburnt, 22 get bitten by ants and 5 are both sunburnt and bitten by ants. Determine the probability that a randomly selected student:
- a escaped being bitten
 - b was either bitten or sunburnt
 - c was neither bitten nor sunburnt
 - d was bitten, given that the student was sunburnt
 - e was sunburnt, given that the student was not bitten.

Another Practice

Bin A contains 3 red and 2 white tickets. Bin B contains 4 red and 1 white. A die with 4 faces marked A and two faces marked B is rolled and used to select bin A or B. A ticket is then selected from this bin. Determine the probability that:

- a the ticket is red
- b the ticket was chosen from B given it is red.

Bin A contains 3 red and 2 white tickets. Bin B contains 4 red and 1 white. A die with 4 faces marked A and two faces marked B is rolled and used to select bin A or B. A ticket is then selected from this bin. Determine the probability that:

- a** the ticket is red **b** the ticket was chosen from B given it is red.

The diagram shows a probability tree starting from a root point. The first level branches into 'bin A' with probability $\frac{4}{6}$ and 'bin B' with probability $\frac{2}{6}$. From bin A, the second level branches into 'ticket R' with probability $\frac{3}{5}$ and 'ticket W' with probability $\frac{2}{5}$. From bin B, the second level branches into 'ticket R' with probability $\frac{4}{5}$ and 'ticket W' with probability $\frac{1}{5}$. Checkmarks and circled numbers 1 and 2 are placed next to the 'R' outcomes from bins A and B respectively.

a $P(R)$

$$= \frac{4}{6} \times \frac{3}{5} + \frac{2}{6} \times \frac{4}{5} \quad \{\text{the } \checkmark \text{ paths}\}$$

$$= \frac{20}{30}$$

$$= \frac{2}{3}$$

b $P(B|R) = \frac{P(B \cap R)}{P(R)}$

$$= \frac{\frac{2}{6} \times \frac{4}{5}}{\frac{20}{30}} \quad \leftarrow \text{path } \textcircled{2}$$

$$= \frac{2}{5}$$

Question 1 on handout

The probability that Greta's mother takes her shopping is $\frac{2}{5}$. When Greta goes shopping with her mother she gets an icecream 70% of the time. When Greta does not go shopping with her mother she gets an icecream 30% of the time.

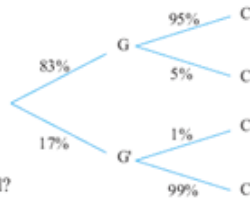
Determine the probability that

- a** Greta's mother buys her an icecream when shopping.
b Greta went shopping with her mother, given that her mother buys her an icecream.

Question #2 On Your Hand Out

- 10 A sociologist examined the criminal justice system. Following exhaustive interviews which included the use of lie detector test results, she published her findings. Her results were given on a tree diagram.

G ≡ guilty C ≡ convicted
G' ≡ not guilty C' ≡ not convicted



- What percentage of people were correctly judged?
- What is the probability of convicting a person given he/she is guilty?
- What is the probability of acquitting a person given he/she is innocent?
- Which of the answers to **b** and **c** would you prefer to be the higher?
- What is the probability that a randomly selected person on trial will be convicted?
- What is the probability that a randomly selected person on trial is guilty given that he/she is not convicted?

- 5 A saw mill receives logs of various lengths from a plantation. The length of a log is important in being able to produce timber of the length required. The following data indicates the lengths of the latest 100 logs received.

Length	Frequency
8 - 8.9	3
9 - 9.9	4
10 - 10.9	14
11 - 11.9	12
12 - 12.9	18
13 - 13.9	20
14 - 14.9	14
15 - 15.9	7
16 - 16.9	8

- What is the probability of a log being less than 11 metres long arriving at the saw mill?
- What is the probability of a log being longer than 15 metres arriving at the saw mill?
- In the next batch of 50 logs, how many would be expected to be between 11 m and 15 m long?

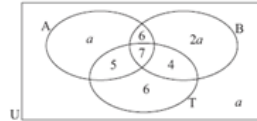
- 7 In a golf match, Annette has 70% chance of hitting the green when using a nine iron and Kari has 90% chance when using the same club. If, at a particular hole, they both elect to use a nine iron to play to the green, determine the probability that:
- a both hit the green
 - b neither hits the green
 - c at least one hits the green
 - d only Annette hits the green

- 8 Jar A contains 3 white and 2 red marbles. Jar B contains 6 white and 4 red marbles. A jar is selected at random and then two marbles are selected without replacement. Determine the probability that:
- a both marbles are white
 - b two red marbles are picked from Jar A.

9 Given that $n(U) = 60$:

a Find a .

b If A represents all students who like athletics, B represents all students who like basketball and T represents all students who like tennis, find the probability that a randomly chosen student:



- i likes athletics
- ii dislikes basketball
- iii likes basketball and tennis
- iv likes athletics or tennis
- v likes all three sports
- vi likes exactly one sport
- vii likes athletics and tennis but not basketball.
- viii likes athletics and tennis but not basketball.