

Study Guide

Unit 2 Test Review 4 with Expected Value

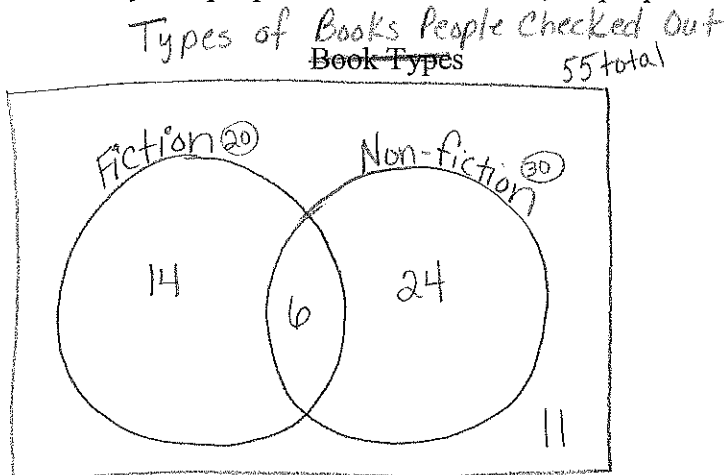
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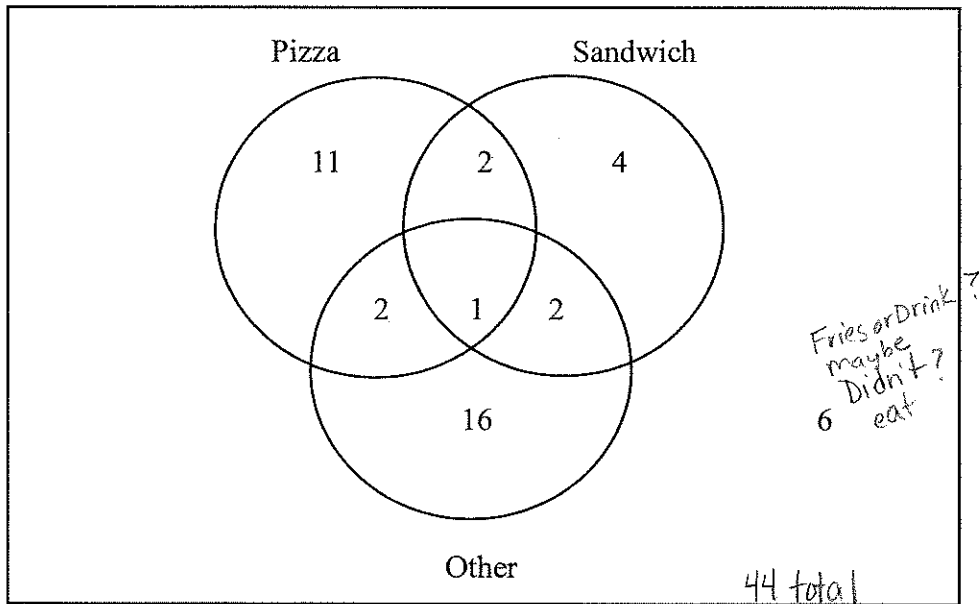
Please express all probabilities as simplified fractions.

1 - 4. Create a Venn diagram with the following characteristics representing types of books 55 people checked out on Tuesday from the library. 20 people checked out fiction; 30 people checked out non-fiction; 6 people checked out both.



5. What is the probability that a randomly chosen student checked out:
 fiction? $\frac{20}{55} = \frac{4}{11}$
 non-fiction? $\frac{6}{30} = \frac{1}{5}$
fiction | non-fiction
given

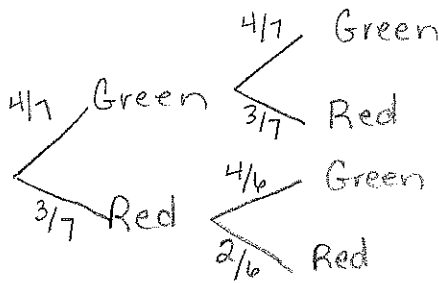
The following diagram represents entrées people ate at lunch yesterday.



6. How many people ate pizza, but not a sandwich? $11 + 2$ 6. 13
 7. How many people ate something other than pizza or a sandwich? 7. 16 or 22
 8. What's the probability that a randomly chosen pizza eater had another entrée as well? 8. $\frac{5}{16}$
 9. If you choose diner at random, what is the probability that you get someone who didn't eat? 9. $\frac{6}{44} = \frac{3}{22}$
 10. What is the probability that a randomly chosen diner ate a sandwich given that they ate another entrée? 10. $\frac{6}{28} = \frac{3}{14}$
- $4 + 2 + 16 + 6 = 28$ $4 + 2 = 6$

Marbles are in a bag: 4 green and 3 red. You pick one. If you get a green, you put it back. If you get a red, you don't. Then you pick a second marble.

11. Draw a tree diagram with probabilities.



GG $(4/7)(4/7) = 16/49$
 GR $(4/7)(3/7) = 12/49$
 RG $(3/7)(4/6) = 2/7$
 RR $(3/7)(2/6) = 1/7$

12. What is the probability that you get one of each?
 GR or RG $12/49 + 2/7 = 26/49$

12. $\frac{26}{49}$

13. What is the probability that they are both yellow?

13. 0

14. What is the probability that neither is red? GG $16/49$

14. $\frac{16}{49}$

15. What is the probability that they are both the same?
 RR or GG $\frac{16}{49} + \frac{1}{7} = \frac{23}{49}$

15. $\frac{23}{49}$

You roll a die and flip a coin. Find the indicated probability.

16. $P(2 | \text{even}) = \frac{2}{4} = \frac{1}{2}$

19. $P(\text{even and head}) = \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$

17. $P(\text{tail and 3}) = \frac{1}{2} \cdot \frac{1}{6} = \frac{1}{12}$

20. $P(\text{tail or 3}) = \frac{1}{2} + \frac{1}{6} - \frac{1}{12} = \frac{7}{12}$

18. $P(\text{head} | \text{tail}) = 0$

21. $P(5 \text{ or } 6 | \text{head}) = \frac{2}{6} = \frac{1}{3}$

Consider the following table of students and footwear.

Activities	Males	Females	
Lace-up	10	4	14
Sandals	2	12	14
Boots	3	1	4
	15	17	32

23. $P(\text{male}) = \frac{15}{32}$

24. $P(\text{sandals or female}) = \frac{14}{32} + \frac{17}{32} - \frac{12}{32} = \frac{19}{32}$

25. $P(\text{female and sandals}) = \frac{12}{32} = \frac{3}{8}$ 26. $P(\text{male} | \text{boots}) = \frac{3}{4}$ 27. $P(\text{lace-up} | \text{female}) = \frac{4}{17}$

28. Calculate and interpret the meaning of the expected value: You pay \$3 to play a game of dice. If you roll a 1 or 2, you get nothing. For every other roll, you get the face value in dollars.

EV: $\$0$ $-3(\frac{1}{3}) + 0(\frac{1}{6}) + 1(\frac{1}{6}) + 2(\frac{1}{6}) + 3(\frac{1}{6}) = 0$ $0 + 0(\frac{1}{3}) + 3(\frac{1}{6}) + 4(\frac{1}{6}) + 5(\frac{1}{6}) + 6(\frac{1}{6}) = 3 - 3 = 0$

Outcome	1 or 2	3	4	5	6
Prob.	$\frac{2}{6} = \frac{1}{3}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$
Net Gain	-3	0	1	2	3
Winning	0	3	4	5	6

Interpretation: After repeated plays we would expect to break even.

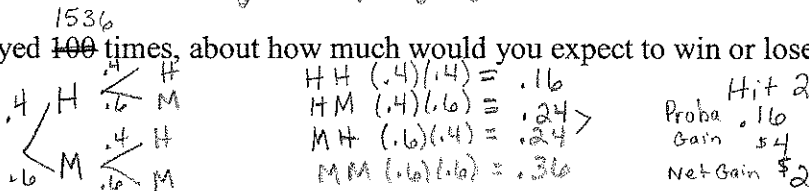
If you played 100 times, about how much would you expect to win or lose? $100(0) = \$0$

29. Calculate the expected value of a game where you have a .4 chance of hitting the target. You pay \$2 to play. You get three shots. If you hit the target three times, you get \$5; two times, you get \$4; once, you get \$3.

EV: $\$0.08$ $4(.16) + 3(.48) + 0(.36) = \$2.08 - \$2 = .08$
 or $2(.16) + 1(.48) + (-2)(.36) = .08$

Interpretation: The average of playing the game over & over would be about 8¢.

If you played 100 times, about how much would you expect to win or lose? $(1536)(.08) = \$122.88$



Hit 2	Hit 1	Hit 0
Prob. .16	.48	.36
Gain \$4	\$3	0
Net Gain \$2	\$1	-\$2