

# Likelihood Concepts

38. The flu virus is spreading through a classroom of 30 students. 20 students have been vaccinated. There have been 9 cases of the flu. 3 students who had received the vaccine caught the flu. When measured as an absolute change (difference), how much did the vaccine reduce the chance of catching the flu? When measured as a relative change (percent change), how much does the vaccine reduce the chance of catching the flu?

	no flu	flu		<u>chance</u>
unvaccinated	4	6	$\Rightarrow$	$\frac{6}{10} = 60\%$
vaccinated	17	3	$\Rightarrow$	$\frac{3}{20} = 15\%$

a) absolute change

subtract

$$60\% - 15\% = 45\% \text{ less likely}$$

b) relative change

% change = change  $\div$  original

$$45\% \div 60\% = 0.75 = 75\% \text{ as likely}$$

39. A store's website allows people to rate how much they liked a certain purchase. <sup>10</sup> Ten people rated it 0 stars, 24 rated it 1 star, 42 people rated it 2 stars, and 84 rated it 3 stars. What is the overall rating (the weighted average)?

<u>People</u>	<u>Stars</u>	<u>% of People</u>	<u>Product</u>
10	0	$10 \div 160 = 6.25\%$	$0 \cdot 0.0625 = 0$
24	1	$24 \div 160 = 15\%$	$1 \cdot 0.15 = 0.15$
42	2	$42 \div 160 = 26.25\%$	$2 \cdot 0.2625 = 0.525$
+ 84	3	$84 \div 160 = 52.5\%$	$3 \cdot 0.525 = 1.575$
<u>160 total</u>			total + <u><u>2.25 stars</u></u>

30. There are 33 ways to roll 4 or more on two dice. So we write can probability as the fraction  $\frac{33}{36}$  or as the rounded percentage **92%**.

31. There are 33 ways to roll 4 or more on two dice, so there are  $36 - 33 = 3$  ways this might not happen. The odds are **33 to 3**. We can reduce the odds and say **11 to 1**.

32. Multiply across each row, using RIP LOP on only one of the percentages in each row, to find the expected values.

Item	Score	% of Grade	Expected Value
Attendance	45%	16%	7.2
Homework	70%	20%	14
Midterm #1	55%	17%	9.35
Midterm #2	75%	18%	13.5
Final	?? %	29%	<b>27.95</b>
			<b>72</b>

then

$y \cdot 0.29 = 27.95$   
 $\div 0.29$

y

$\approx 96\%$

} 44.05

$72 - 44.05 = 27.95$

Since she wants an overall grade of 72% in the class, the final exam needs an expected value of  $72 - 44.05 = 27.95$ , which requires a final exam score of **96%**

33. To earn a final exam score of 96% on a test that has 47 questions will require **46 correct problems**.

40. There are three different routes for driving from home to work. The three routes are nearly the same distance, so it is only the traffic lights that matter for deciding which route is quickest. The first route crosses many small streets. There are five traffic lights, each has only a 15% chance of being red, and a red light delays you 1 minute. The second route crosses a few medium-sized streets. There are three traffic lights, each has a 40% chance of being red, and a red light delays you 2 minutes. The third route crosses one major street. There is only one traffic light, but it has a 75% chance of being red, and a red light delays you 3 minutes. Which route is expected to be quickest?

### Route One

<u>delay</u>		<u>chance</u>	=	<u>product</u>
1	•	0.15	=	0.15
1	•	0.15	=	0.15
1	•	0.15	=	0.15
1	•	0.15	=	0.15
1	•	0.15	=	0.15
				<u>0.75 min delay</u>

### Route Two

<u>delay</u>		<u>chance</u>	=	<u>product</u>
2	•	0.4	=	0.8
2	•	0.4	=	0.8
2	•	0.4	=	0.8
				<u>2.4 min delay</u>

### Route Three

<u>delay</u>		<u>chance</u>	=	<u>product</u>
3	•	0.75	=	2.25 min delay

44. Joyce pays for a \$900 payday loan for 18 days with a post-dated check for \$907.55. What was the loan's simple interest rate?

$$I = P \cdot r \cdot t$$

$$7.55 = \underline{900} \cdot r \cdot (\underline{18 \div 365})$$

$$\frac{7.55}{44.32} = r$$

$$17\% = r$$

$$900 \cdot 0.0493 = \$44.37$$

35. A store puts an item on sale using a chain of three discounts. The first two discounts are 15% and 25%. If the desired single equivalent discount rate is 40%, what should the size of the third discount rate?

0.85 remaining

0.75 remaining

0.75 remaining

0.75 remaining

$$\$100 \cdot 0.85 \cdot 0.75 \cdot y = \$60$$

$$63.75 \cdot y = 60$$

$$\div 63.75$$

$$\div 63.75$$

$$y = 94\% \text{ remaining}$$

so

6% off

for 3<sup>rd</sup> discount