

# MAKING & USING A STUDY GUIDE for a test

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Study Guide: helps you ① summarize,  
② visualize, and ③ analyze  
concepts learned in class

\* Warning: simply making a study guide  
does not guarantee you an  
A+ on the test.

## Study Guide-5: Probability Distribution

~~X~~ Karissa solved the absolute value equation  $5 = 2|x - 3| + 2$  as shown.

$$5 = 2|x - 3| + 2$$

Subtract 2 from both sides.

$$3 = 2|x - 3|$$

Divide both sides by 2.

$$1.5 = |x - 3|$$

Separate the equation into two equations.

$$1.5 = x - 3 \text{ and } -1.5 = x - 3 \text{ Solve for } x.$$


$$x = \overset{+3}{\cancel{1.5}} \text{ and } x = \overset{+3}{\cancel{-4.5}}$$

$$\begin{array}{r} 1.5 \\ 3.0 \\ \hline x = 4.5 \end{array}$$

$$\begin{array}{r} 2 \text{ p.p.} \\ -1.5 \\ \hline x = 1.5 \end{array}$$

Part 1 out of 2

Complete the explanation of Karissa's mistake.

Part 1 

Complete the explanation of Karissa's mistake.

Karissa did not  correctly. Instead of doing the  operation to isolate the variable, she did the  operation.

Notes for Exam-5

Solve the equation  $2x^2 + 6x + 10 = 0$  for all values of  $x$ . Complete the explanation on the method you used, and why.

~~X~~?

$$ax^2 + bx + c = 0$$

$$a=2 \quad b=6 \quad c=10$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-6 \pm \sqrt{36 - 80}}{4}$$

$$= \frac{-6 \pm \sqrt{-44}}{4}$$

$i = \sqrt{-1}$

$$x = \frac{-6 \pm \sqrt{-4 \cdot 11}}{4} = \frac{\cancel{-6} \pm 2\sqrt{11}}{\cancel{4}^2}$$

$$x = \frac{-3 \pm i\sqrt{11}}{2}$$

The solution is  $x = \frac{\boxed{-3} \pm i\sqrt{\boxed{11}}}{\boxed{2}}$ .

The discriminant was  , so I continued through with the quadratic formula, because I knew the answer would be .

Notes for Exam-5

#3

Consider the equation  $y = \frac{3x - 2}{x + 2}$ . Is the function defined for the value of  $x$ ? Select Yes or No for A-C.

$x \neq -2$

$x = 2$



Yes



No

$\frac{3(2) - 2}{2 + 2} = \frac{6 - 2}{4} = \frac{4}{4} = 1 \checkmark$

$x = -2$



Yes



No

$x = 0$



Yes



No

$\frac{3(0) - 2}{0 + 2} = \frac{-2}{2} = -1 \checkmark$

#4

How can gathering and displaying data help a business owner?

A business owner can use  to keep track of , or of how many hours employees are working.

#5

How could data distributions help a doctor do his or her job? Complete the example.

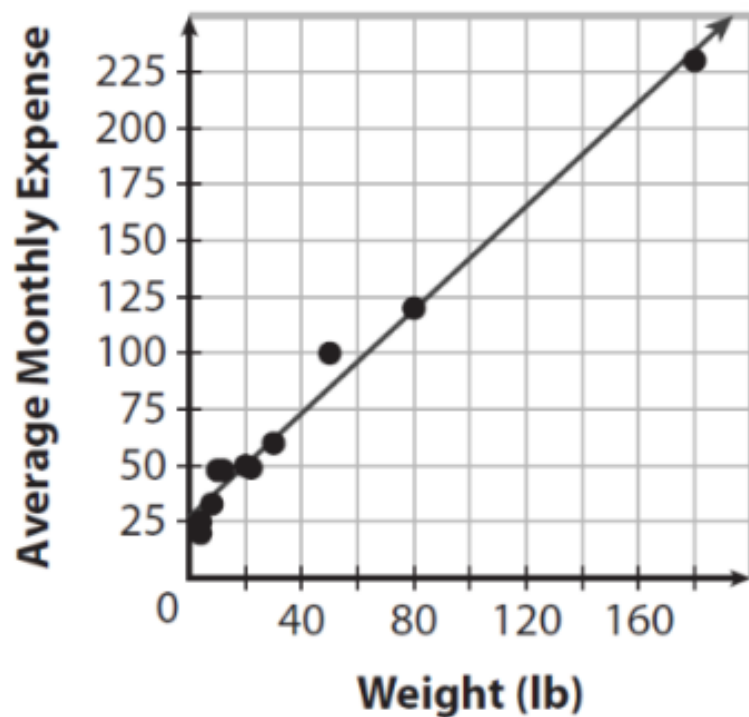
If the results of a medicine are normally distributed by effectiveness at different ages, then a doctor would know what  the medicine would be more effective for before prescribing it.



#6

A pet store asked loyal customers the weight of their dog and monthly budgeted expenses for owning it. The scatter plot shows the results of this survey with a line of best fit.

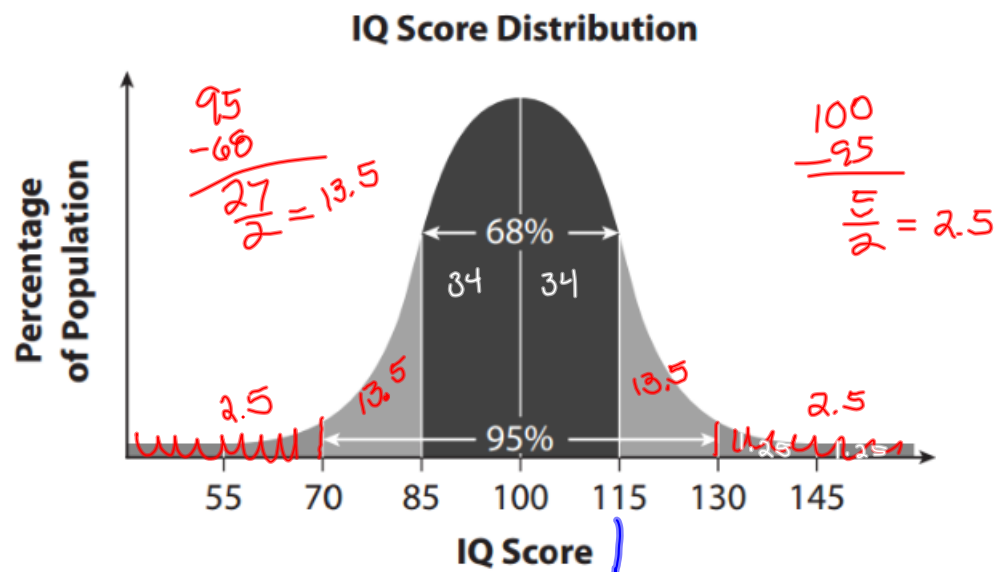
Approximate the monthly cost of a dog weighing 130 pounds.



According to the graph, for a dog weighing 130 lb, the expected monthly cost is about \$

Notes for Exam-5

The graph shows a normal distribution of Intelligence Quotient (IQ) scores.



#7

What percent of the population has an IQ score above 130?

2.5

% of the population has an IQ score above 130.

#8

What percent of the population has an IQ score above 115?

16

% of the population has an IQ score above 115.

$$13.5 + 2.5 = 16$$

#9

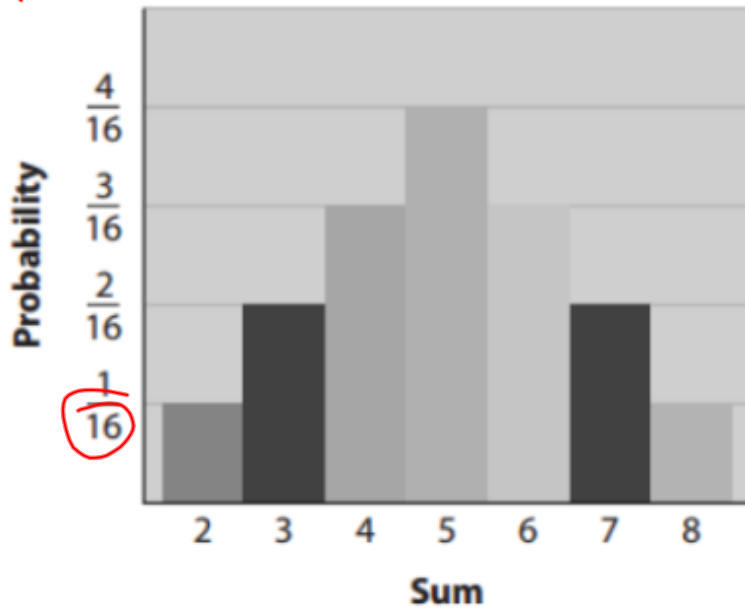
What percent of the population has an IQ score between 115 and 130?

13.5

% of the population has an IQ score between 115 and 130.

#10

Consider the histogram. Does the statement correctly describe the histogram? Select Yes or N



There are 16 data values.

A Yes  B No

Data is spread between 5 sums.

A Yes  B No

Each sum is equally likely.

A Yes  B No



~~\*/~~

Consider the shape of a histogram with a normal distribution. Choose True or False for each statement.

A histogram with normal distribution increases, but never decreases.

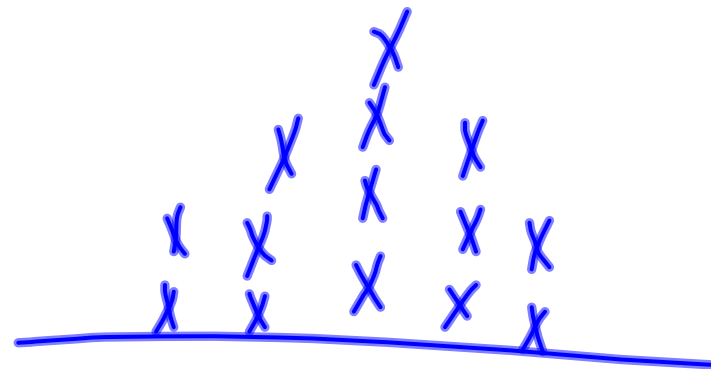
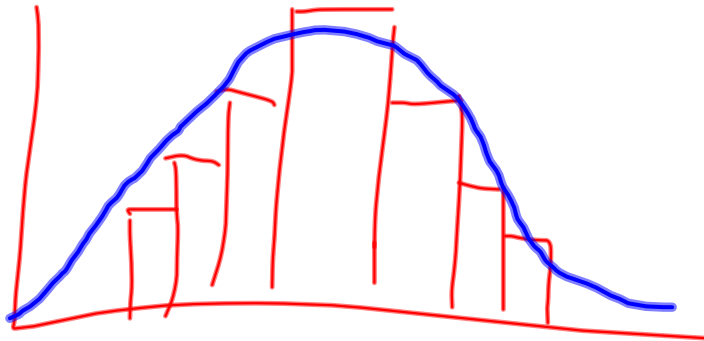
A True  B False

A histogram with normal distribution makes a bell curve. The bell could be wide or tall.

A True  B False

A histogram with normal distribution has the same shape as a line plot with normal distribution.

A True  B False



#12

A box plot shows the least and greatest data items, the upper and lower quartiles, and the median of all data. Find the median of these data:

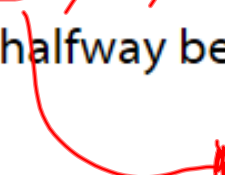
10, 26, 8, 1, 17, 2, 9, 23, 21, 2, 16, 20

The median is .

Order the data:

~~1, 2, 4, 8, 9, 10, 16, 17, 20, 21, 23, 26~~

The median is halfway between 10 and 16.


$$\frac{10 + 16}{2} = 13$$

#13

A box plot shows the least and greatest data items, the upper and lower quartiles, and the median of all data. Round to the nearest tenth when necessary. Find the upper quartile of these data:

10, 24, 8, 1, 17, 2, 9, 23, 22, 2, 14, 18

The upper quartile is .

Order the data:

1, 2, 2, 8, 9, 10, 14, 17, 18, 22, 23, 24

Lower quartile

$$\frac{10+14}{2}$$

12

Upper quartile

$$\frac{18+22}{2} = \boxed{20} = Q_3$$

#4

A box plot shows the least and greatest data items, the upper and lower quartiles, and the median of all data. Find the range of these data:

12, 25, 8, 1, 17, 2, 9, 23, 21, 2, 16, 19

Order the data:

1, 2, 2, 8, 9, 12, 16, 17, 19, 21, 23, 25

The range is the difference between the greatest term and the least term of the data.

$$25 - 1 = 24$$

The range is 24.

High - Low

#15

Find the median, mean, and range.

19, 4, 13, 6, 18, 5, 8, 3, 9, 5

Order the data from least to greatest.

~~3, 4, 5, 5, 6, 8, 9, 13, 18, 19~~The median is .

median

$$\frac{6+8}{2} = 7$$

The mean is .The range is .

$$\text{Mean} = \frac{3+4+5+5+6+8+9+13+18+19}{10}$$

$$\frac{\text{Sum}}{10}$$

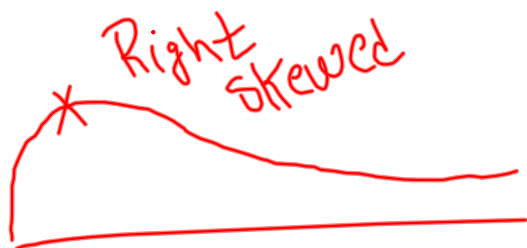
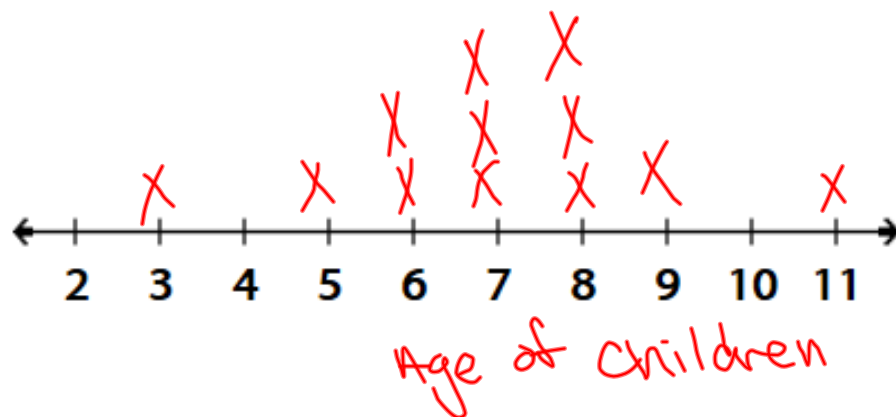
$$\frac{90}{10} = 9$$

$$\text{Range} = \text{High} - \text{Low} = 19 - 3 = 16$$

~~16~~

Select the correct line plot for the data. Based on the shape of the distribution, identify what type of distribution it is.

a. Ages of children: ~~3, 8, 11, 7, 6, 7, 6, 9, 7, 8, 5, 8~~



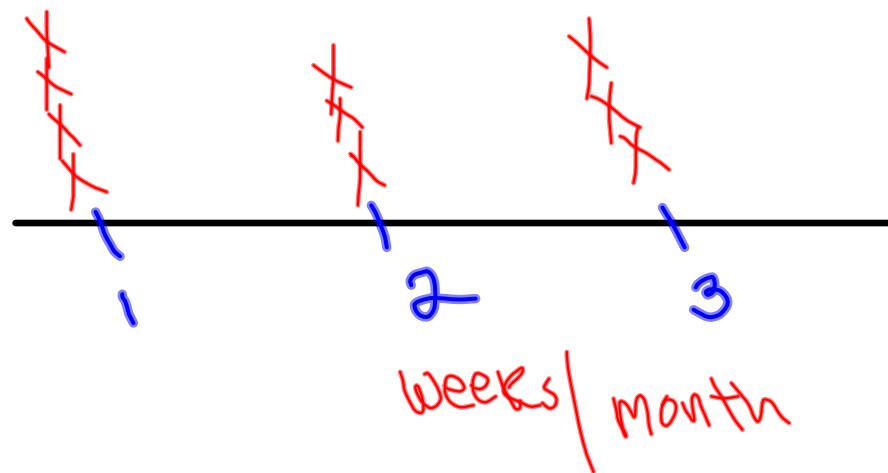


#17

A local business surveys a random sample of about 500 employees to see if they are working overtime and, if so, how many hours per week and how many weeks per month. The company has four types of employees: sales, engineer, manager, and clerical. The 40 employees surveyed were evenly split between the four employment categories. Ten worked overtime last month. The table lists the data for those 10 people.

Employee	Avg. Overtime/Week	Weeks/Month
Manager	8	3
Manager	10	1
Sales	3	1
Engineer	2	3
Manager	8	2
Clerical	8	2
Sales	4	3
Engineer	3	1
Manager	7	1
Sales	2	2

Complete the line plot for the number of weeks per month the sample of employees works overtime.



#10

Two number cubes are tossed. Find the probability. Enter your answer as a fraction.

The **sum** is prime.

The probability that the sum is prime is  .

+	1	2	3	4	5	6
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

$$\frac{15}{36} \div 3 = \frac{5}{12}$$

$$\frac{\text{number of favorable outcomes}}{\text{number of outcomes}} = \frac{15}{36} = \frac{5}{12}$$

Two number cubes are tossed. Find the probability. Enter your answer as a fraction.

The **product** is prime. #19

The probability that the product is prime is   .

●	1	2	3	4	5	6
1	1	●	●	4	●	6
2	●	4	6	8	10	12
3	●	6	9	12	15	18
4	4	8	12	16	20	24
5	●	10	15	20	25	30
6	6	12	18	24	30	36

① is neither  
 $\frac{6}{36} = \frac{1}{6}$

A hand-made quilt is first prize in a fund-raiser raffle. The table shows information about all the ticket buyers. Given that the winner of the quilt is a **man**, what is the probability that he resides in **Sharonville**?

	Men	Women	Total
Forestview	30	40	70
Sharonville	20	30	50

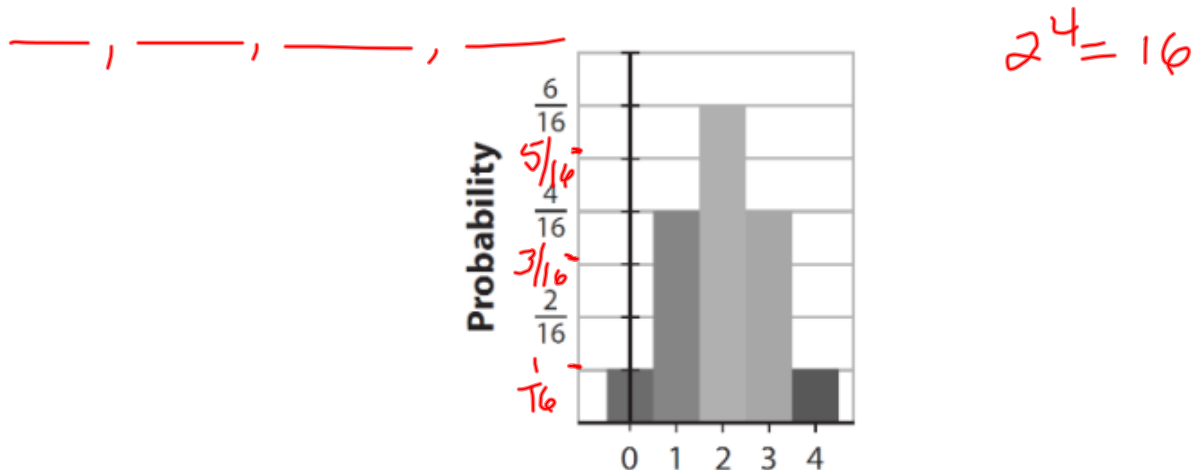
The probability is  %.

$$\frac{20}{50}$$

$$\begin{aligned}
 P(\text{Man}|\text{Sharonville}) &= \frac{P(\text{Man and Sharonville})}{P(\text{Man})} \\
 &= \frac{20}{50} \\
 &= 0.4 \times 100 = \boxed{40\%}
 \end{aligned}$$

#21

You flip a coin 4 times in a row. The histogram shows the theoretical probability distribution for this situation.



a. What is the probability of getting 2 or more heads? If necessary, round your answer to three decimal places.

The probability of getting 2 or more heads is about   $\frac{6}{16} + \frac{4}{16} + \frac{1}{16} = \frac{11}{16}$

b. What is the probability of getting at most 2 heads? If necessary, round your answer to three decimal places.

The probability of getting at most 2 heads is about   $H=2$   $\frac{1}{16} + \frac{4}{16} + \frac{6}{16}$

c. How do you know that the coin is fair?

The coin is fair because the distribution shown in the histogram is . If the probability of getting heads were not  $\frac{1}{2}$ , then the distribution would be .

# Notes for Exam-5

You roll 2 number cubes at the same time. Let  $X$  be a random variable that represents the sum of the numbers rolled.

#22

Part 1 out of 5

Complete the table to show the sums that are possible. In the table, the row heads are the numbers that are possible on one number cube, and the column heads are the numbers that are possible on the other number cube.

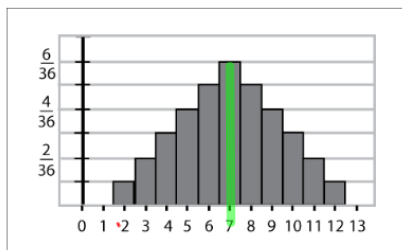
	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

$6 \cdot 6 = 36$

Complete the second row of the table to show the number of ways that you can get each sum. Then find the probability of each sum to complete the third row.

Sum	2	3	4	5	6	7	8	9	10	11	12
Frequency	1	2	3	4	5	6	5	4	3	2	1
Probability	$\frac{1}{36}$	$\frac{2}{36}$	$\frac{3}{36}$	$\frac{4}{36}$	$\frac{5}{36}$	$\frac{6}{36}$	$\frac{5}{36}$	$\frac{4}{36}$	$\frac{3}{36}$	$\frac{2}{36}$	$\frac{1}{36}$

Select the correct histogram of the probability distribution.



What is the probability that you roll a sum of 4 or less? If necessary, round your answer to three decimal places.

$$\begin{aligned}
 P(X \leq 4) &= P(X = 2) + P(X = 3) + P(X = 4) \\
 &= \frac{1}{36} + \frac{2}{36} + \frac{3}{36} \\
 &= \frac{6}{36} \\
 &\approx 0.167
 \end{aligned}$$

What is the probability that you roll a sum of 3 four times in a row? If this happened, would you question whether the number cubes are fair?

The probability of rolling a sum of 3 four times is

$$\left(\frac{1}{18}\right)^4 = \frac{1}{104,976}$$

$\frac{2}{36} = \frac{1}{18}$

This probability is so low that it calls into question the fairness of the number cubes.



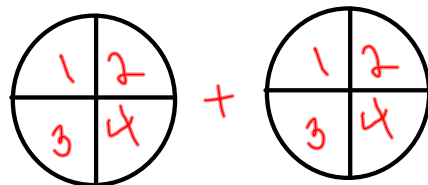
# Notes for Exam-5

A spinner has 4 equal sections that are labeled 1, 2, 3, and 4. You spin the spinner twice and find the **sum** of the 2 numbers it lands on. Let  $X$  be a random variable that represents the sum of the 2 numbers.

#23

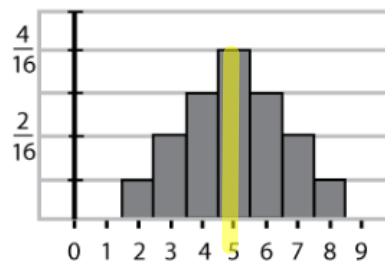
Part 1 out of 4  
Complete the table.

Sum	2	3	4	5	6	7	8
Frequency	1	2	3	4	3	2	1
Probability	$\frac{1}{16}$	$\frac{2}{16}$	$\frac{3}{16}$	$\frac{4}{16}$	$\frac{3}{16}$	$\frac{2}{16}$	$\frac{1}{16}$



		1	2	3	4
1	+	2	3	4	5
2		3	4	5	6
3		4	5	6	7
4		5	6	7	8

$4 \cdot 4 = 16$



What is the probability of getting a **sum of 5 or more**? If necessary, round your answer to 3 decimal places.

$$\begin{aligned}
 P(X \geq 5) &= P(X=5) + P(X=6) + P(X=7) + P(X=8) \\
 &= \frac{4}{16} + \frac{3}{16} + \frac{2}{16} + \frac{1}{16} \\
 &\approx 0.625
 \end{aligned}$$

$P(X > 5) = P(X < 5)$  because the histogram of the probability distribution is symmetric with respect to  $X = 5$ .

## Notes for Exam-5

You roll two number cubes at the same time. Let  $X$  be a random variable that represents the absolute value of the difference of the numbers rolled.

Part 1 out of 5

a. What are the possible values of  $X$ ?

#24

The possible values of  $X$  are , , , , , and .

$ y-x $	1	2	3	4	5	6
1	0	1	2	3	4	5
2	1	0	1	2	3	4
3	2	1	0	1	2	3
4	3	2	1	0	1	2
5	4	3	2	1	0	1
6	5	4	3	2	1	0

Absolute Difference	0	1	2	3	4	5
Probability	$\frac{6}{36}$	$\frac{10}{36}$	$\frac{8}{36}$	$\frac{6}{36}$	$\frac{4}{36}$	$\frac{2}{36}$

Is the probability distribution symmetric? *Right Skewed*



Yes



No

The probability distribution is skewed right because in a histogram of the distribution, the tallest bar would occur at 1, with bars to the right decreasing in height.

Find the probability of getting a difference **greater than 4**.

$$\begin{aligned}
 P(X > 4) &= P(X = 5) \\
 &= \frac{2}{36} \\
 &= \frac{1}{18}
 \end{aligned}$$

So, the probability of getting a difference greater than 4 is  $\frac{1}{18}$ .

Notes for Exam-5

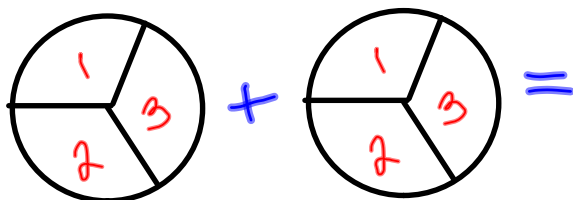
A spinner has three equal sections, labeled 1, 2, and 3. You spin the spinner twice and find the **sum** of the two numbers the spinner lands on.

#25

Part 1 out of 4

a. Let  $X$  be a random variable that represents the sum of the two numbers. What are the possible values of  $X$ ?

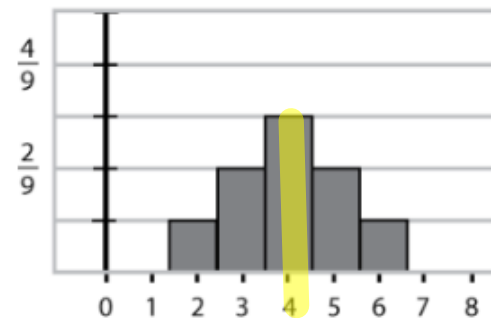
The possible values of  $X$  are , , , , and .



$3 \cdot 3 = 9$

+		1	2	3
1		2	3	4
2		3	4	5
3		4	5	6

Sum	2	3	4	5	6
Probability	$\frac{1}{9}$	$\frac{2}{9}$	$\frac{3}{9}$	$\frac{2}{9}$	$\frac{1}{9}$



d. What is the probability that the sum is not 5?

The probability is  $\frac{7}{9}$ .

This is the sum of the areas of the bars for the outcomes 2, 3, 4, and 6.