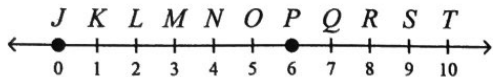


Honors Geometry - Ch. 13 (Probability) Study Guide

1. Find the probability that a point chosen at random from \overline{JP} is on the segment \overline{KO} .

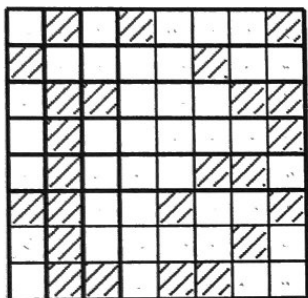


$$\frac{4}{6} = \frac{2}{3}$$

2. The delivery van arrives at an office every day between 3 PM and 5 PM. The office doors were locked between 3:15 PM and 3:35 PM. What is the probability that the doors were unlocked when the delivery van arrived?

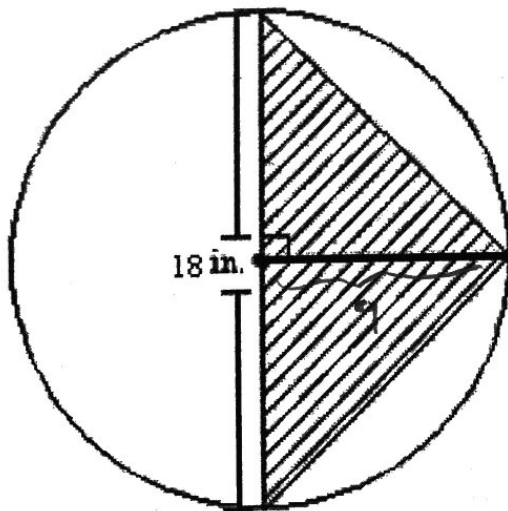
$$\frac{100}{120} = \frac{5}{6}$$

3. What is the probability that a point chosen at random on the grid will lie in the unshaded region?



$$\frac{40}{64} = \frac{5}{8}$$

4. Find the probability that a point chosen at random will lie in the shaded area.



$$\frac{1}{2}bh \Rightarrow A = \frac{1}{2}(18)(9) = 81$$

$$A = \pi r^2 = \pi(9)^2 = 81\pi$$

$$\frac{81}{81\pi} = \frac{1}{\pi}$$

5. A circular dartboard has a radius of 2 meters and a red circle in the center. Assume you hit the target at a random point. For what radius of the red center region does $P(\text{hitting red}) = 0.6$?

$$A = 4\pi$$

$$0.6(4\pi) = 2.4\pi$$

A

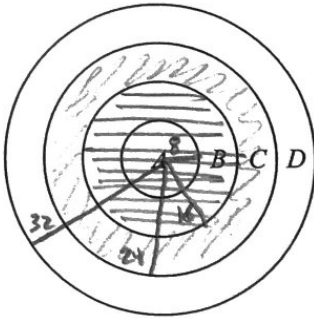
$$2.4\pi = \pi r^2$$

$$\sqrt{2.4} \sqrt{\pi^2} = \sqrt{\pi^2} r$$

$$1.55 = r$$

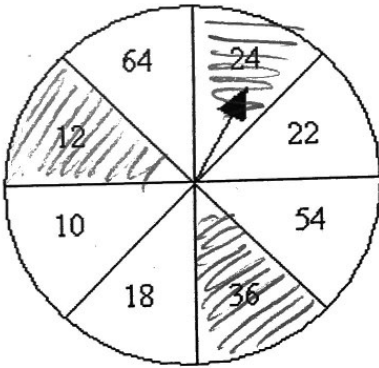
Name: _____

6. The radius of the bull's-eye of the dartboard is 8 inches. The radius of each concentric circle is 8 inches more than the radius of the circle inside it. If a dart lands at random on the dartboard, what is the probability that the dart will hit in area C?



$$\frac{576\pi - 256\pi}{1024\pi} = \frac{320\pi}{1024\pi} = \frac{5}{16}$$

7. In a batch of 860 calculators, 9 were found to be defective. What is the probability that a calculator chosen at random will be defective? Write the probability as a percent. Round to the nearest tenth of a percent if necessary. $\frac{9}{860} = 1.0\%$
8. Lynn and Dawn tossed a coin 60 times and got heads 33 times. What is the experimental probability of tossing heads using Lynn and Dawn's results? $\frac{33}{60} = \frac{11}{20}$
9. This is a spinner used in a board game. What is the probability that the spinner will land on a multiple of 3 and 4?



$$\frac{3}{8}$$

10. You have the numbers 1–25 written on slips of paper. If you choose one slip at random, what is the probability that you will select a number that divisible by 4? $\frac{6}{25}$
11. A drug trial is testing the effectiveness of two drugs. If 50 patients are given Drug A, 20 patients are given Drug B, and 100 patients are given a placebo, what is the probability that a patient will NOT be given a placebo? $\frac{70}{170} = \frac{7}{17}$
12. You roll a standard number cube. Find $P(\text{number is not } 3)$.

$$\frac{5}{6}$$

Name: _____

ID: A

13. The results of a survey of students' favorite ice cream flavors are organized in the frequency table below. What is the relative frequency of the preference for chocolate?

| Flavor | Frequency |
|-----------------|-----------|
| Vanilla | 9 |
| Chocolate | 5 |
| Coffee | 6 |
| Mint | 3 |
| Black Raspberry | 3 |

26

$$\frac{5}{26}$$

14. The results of a survey of students' favorite color are organized in the frequency table below. What is the relative frequency of the preference for green?

| Color | Frequency |
|--------|-----------|
| Blue | 6 |
| Red | 9 |
| Yellow | 3 |
| Green | 5 |
| Purple | 5 |

28

$$\frac{5}{28}$$

15. The results of a survey of students' favorite food are organized in the frequency table below. What is the sum of all of the relative frequencies for all types of food?

| Food Preferred | Frequency |
|----------------|-----------|
| Pizza | 10 |
| Hamburger | 6 |
| Spaghetti | 1 |
| Hotdog | 5 |
| Taco | 4 |

16. A bag contains red, blue, green and yellow marbles. A student conducts a probability experiment picking marbles out of the bag one at a time. Use the results in the frequency table below to determine the experimental probability of picking a green marble.

| Result | red | blue | green | yellow |
|-----------|-----|------|-------|--------|
| Frequency | 8 | 5 | 5 | 1 |

$$\frac{5}{19}$$

17. A student rolls two non-standard number cubes in a probability experiment. Use the results in the frequency table below to determine the experimental probability of rolling at least one three.

| Result | 1, 1 | 1, 2 | 2, 2 | 1, 3 | 2, 3 | 3, 3 |
|-----------|------|------|------|------|------|------|
| Frequency | 6 | 5 | 7 | 5 | 5 | 10 |

$$\frac{20}{38} = \frac{10}{19}$$

Name: _____

18. A yogurt shop offers 6 different flavors of frozen yogurt and 12 different toppings. How many choices are possible for a single serving of frozen yogurt with one topping? $6 \cdot 12 = 72$
19. Suppose Ruth Ann has 3 routes she can choose from to get from school to the library, and 5 routes from the library to her home. How many routes are there from Ruth Ann's school to her home with a stop at the library? $3 \cdot 5 = 15$
20. Verne has 6 math books to line up on a shelf. Jenny has 4 English books to line up on a shelf. In how many more orders can Verne line up his books than Jenny?
 $6! - 4! = 720 - 24 = 696$
21. In how many different orders can 12 basketball players be listed in a program?
 $12! = 479,001,600$
22. Evaluate ${}_9P_4$. $\frac{9!}{(9-4)!} = \frac{9!}{5!} = \underline{9} \cdot \underline{8} \cdot \underline{7} \cdot \underline{6} = 3024$
23. There are 10 students participating in a spelling bee. In how many ways can the students who go first and second be chosen? $10 \cdot 9 = 90$
24. While organizing a film festival, you must decide which of the 12 movies will be shown on the big screen. You only have the budget to show 5 movies on this screen, and you want to be able to tell moviegoers which order the films will be shown. In how many different ways can you show 5 of the 12 movies on the big screen? $\underline{12} \underline{11} \underline{10} \underline{9} \underline{8} = 95,040$
25. Evaluate ${}_7C_6$. 7
26. At a high school, 7 students volunteer for a committee. How many different 5-person committees can be chosen? ${}_7C_5 = 21$
27. A local pizzeria offers 11 toppings for their pizzas and you can choose any 5 of them for one fixed price. How many different types of pizzas can you order with 5 toppings? ${}_{11}C_5 = 462$
28. There are 8 people on the ballot for regional judges. Voters can vote for any 4. Voters can choose to vote for 0, 1, 2, 3, or 4 judges. In how many different ways can a person vote?
 ${}_8C_0 + {}_8C_1 + {}_8C_2 + {}_8C_3 + {}_8C_4 = 1 + 8 + 28 + 56 + 70 = 163$
Determine whether each pair of actions results in independent or dependent events.
29. Pick one marble out of a bag. Then, without replacing the marble, pick another marble.
dependent
30. Toss a coin. Then spin the pointer of a spinner.
independent
31. Suppose Q and R are independent events, and $P(Q) = 0.39$, $P(R) = 0.85$. Find $P(Q \text{ and } R)$.
 $0.39 \cdot 0.85 = 0.3315 \Rightarrow 33.15\%$
32. Two urns contain white balls and yellow balls. The first urn contains 3 white balls and 6 yellow balls and the second urn contains 3 white balls and 8 yellow balls. A ball is drawn at random from each urn. What is the probability that both balls are white?

$$\frac{1}{3} \cdot \frac{3}{9} \cdot \frac{3}{11} = \frac{1}{11}$$

Name: _____

ID: A

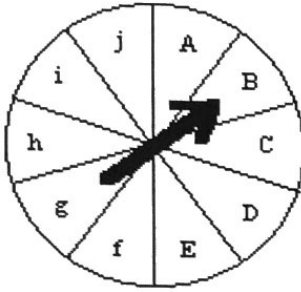
33. A pet store has two tanks of tropical fish. The first tank contains 7 blue fish and 3 yellow fish and the second tank contains 10 blue fish and 8 yellow fish. If Keisha randomly purchases a fish from each tank, what is the probability that both fish will be blue?

$$\frac{7}{10} \cdot \frac{10}{18} = \frac{7}{18}$$

34. Suppose S and T are mutually exclusive events, $P(S) = 20\%$, and $P(T) = 22\%$. Find $P(S \text{ or } T)$.

$$20\% + 22\% = 42\%$$

35. If all possible results are equally likely, what is the probability that a spin of the spinner will land on an upper case letter or a consonant?



$$\begin{array}{l} \text{UCL} \\ \frac{5}{10} \end{array} + \begin{array}{l} \text{Cons.} \\ \frac{7}{10} \end{array} - \begin{array}{l} \text{UCL} \\ \text{Cons.} \\ \frac{3}{10} \end{array} = \frac{9}{10}$$

36. A sixteen-sided number cube has the numbers 1 through 16 on each face. Each face is equally likely to show after a roll. What is the probability that you will roll an even number or an odd prime number? Round to the nearest thousandth.

$$\frac{8}{16} + \frac{5}{16} = \frac{13}{16}$$

37. Joey's sock drawer is unorganized and contains 3 black dress socks, 7 black ankle socks, 4 brown dress socks, and 3 brown ankle socks. What is the probability that Joey chooses a sock at random that is brown or is a dress sock?

$$\frac{7}{17} + \frac{7}{17} - \frac{4}{17} = \frac{10}{17}$$

38. On St. Patrick's Day, you took note of who was coming into your restaurant wearing green. The two-way frequency table shows the results of your survey. What is the probability that a randomly chosen customer will be a female wearing green? Round to the nearest thousandth.

| Wearing Green | Yes | No | Totals |
|---------------|-----|-----|--------|
| Male | 36 | 83 | 119 |
| Female | 44 | 68 | 112 |
| Totals | 80 | 151 | 231 |

$$\frac{44}{231}$$

39. The table shows the results of a survey of students in two math classes. The students were asked whether they watched more than one hour of TV the night before.

Find $P(\text{more than 1 hour of TV} \mid \text{6th period class})$. Round to the nearest thousandth.

TV Survey Results

| | Yes | No |
|------------------|-----|----|
| 3rd period class | 10 | 10 |
| 6th period class | 11 | 8 |

$$\frac{11}{19}$$

Name: _____

ID: A

40. Each person in a group of college students was identified by graduating year and asked when he or she preferred taking classes: morning, afternoon, or evening. The results are shown in the table. Find the probability that the student preferred morning classes given he or she is a junior. Round to the nearest thousandth.

Survey of Class Times

| | Freshman | Sophomore | Junior | Senior |
|-----------|----------|-----------|--------|--------|
| Morning | 20 | 14 | 16 | 17 |
| Afternoon | 5 | 10 | 2 | 7 |
| Evening | 15 | 15 | 8 | 14 |

$$\frac{16}{26} = \frac{8}{13}$$

41. The two-way frequency table shows the results of a survey of college students. Find the probability that a student's first class of the day is a humanities class, given the student is male. Round to the nearest thousandth.

First Class of the Day

| | Male | Female |
|------------|------|--------|
| Humanities | 70 | 80 |
| Science | 50 | 80 |
| Other | 60 | 70 |

$$\frac{70}{180} = \frac{7}{18}$$

42. The probability distribution shows the results of a survey of people's fear of flying on an airplane. Find the probability that a person who is afraid of flying has never flown before. Round to the nearest thousandth.

History of Flying Survey

| | Have Flown Before | Have Not Flown Before | Totals |
|-------------------|-------------------|-----------------------|--------|
| Afraid to Fly | 0.01 | 0.07 | 0.08 |
| Not Afraid to Fly | 0.79 | 0.13 | 0.92 |
| Totals | 0.8 | 0.2 | 1 |

$$0.07$$

43. One-hundred students were allowed to re-take an exam for their math course. The probability distribution shows how studying for the latest exam affected their grade when compared with the first time they took the exam. What is the probability that a student who studied for the exam saw an increase in their exam grade? Round to the nearest thousandth.

Exam Grades

| | Studied | Did Not Study | Totals |
|-------------------|---------|---------------|--------|
| Raise in Grade | 0.52 | 0.06 | 0.58 |
| No Raise in Grade | 0.05 | 0.37 | 0.42 |
| Totals | 0.57 | 0.43 | 1 |

$$0.52$$

44. In a college biology class, only half of the class earned a passing grade. Out of all the students, 45% studied and passed. What is the probability of someone having studied, given that they passed?

$$P(\text{studied} | \text{passed}) = \frac{P(\text{both})}{P(\text{passed})} = \frac{0.45}{0.50} = 0.9$$

45. At Roberta's cafe half of her regular customers order her famous low-fat chicken sandwich. The probability of a regular customer ordering the chicken sandwich and losing weight last month was 40%. What is the probability of someone losing weight given that they regularly ordered the sandwich?

$$P(\text{lose weight} | \text{sandwich}) = \frac{P(\text{both})}{P(\text{sandwich})} = \frac{0.40}{0.50} = 0.80$$

46. In a survey of a town, 56% of residents own a car, 21% of residents own a truck, and 4% of residents own both a car and a truck. What is the conditional probability that a person who owns a car also owns a truck? Round to the nearest whole number.

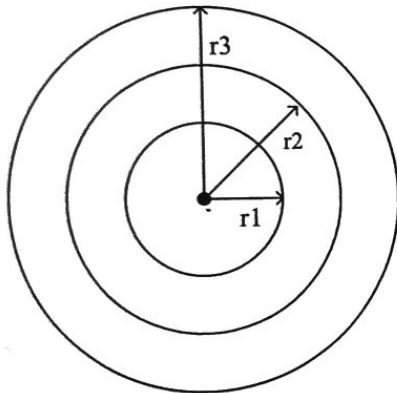
$$\frac{0.04}{0.56} = 0.071$$

47. Marcus is playing a carnival game where he must guess the color of a candy bean before he pulls it out of a hat. He gets five tries and will earn 3 points every time he guesses correctly. However, he will lose 1 point for an incorrect guess. If there are 4 red, 2 green, and 2 yellow candy beans in the hat and Marcus guesses red every time, how many points can he expect to earn?

$$(3)\left(\frac{1}{2}\right) + (3)\left(\frac{1}{2}\right) + (3)\left(\frac{1}{2}\right) + (3)\left(\frac{1}{2}\right) + (3)\left(\frac{1}{2}\right) = \frac{3}{2} + \frac{3}{2} + \frac{3}{2} + \frac{3}{2} + \frac{3}{2} = \frac{15}{2}$$

Use the dartboard below to calculate the expected values in terms of π .

$$-\frac{1}{2} - \frac{1}{2} - \frac{1}{2} - \frac{1}{2} - \frac{1}{2} = -\frac{5}{2} = -\frac{10}{4} = -\frac{5}{2}$$



Drawing not to scale

48. $r_1 = 2$, bull's eye worth 3 points
 $r_2 = 4$, middle ring worth 1 point
 $r_3 = 2\sqrt{6}$, outer ring worth -1 point

$$\left(\frac{4\pi}{24\pi}\right)(3) + \left(\frac{16\pi - 4\pi}{24\pi}\right)(1) + \left(\frac{24\pi - 16\pi}{24\pi}\right)(-1) = \left(\frac{1}{6}\right)(3) + \left(\frac{1}{2}\right)(1) + \left(\frac{1}{3}\right)(-1) = \frac{1}{2} + \frac{1}{2} - \frac{1}{3} = \frac{2}{3}$$

49. Use the values below for r .

- $r_1 = \sqrt{2}$, bull's eye worth 5 points
 $r_2 = 2$, middle ring worth ?
 $r_3 = 4$, outer ring worth -1 point

$$\left(\frac{2\pi}{16\pi}\right)(5) + \left(\frac{4\pi - 2\pi}{16\pi}\right)(x) + \left(\frac{16\pi - 4\pi}{16\pi}\right)(-1) = 0$$

$$\left(\frac{1}{8}\right)(5) + \left(\frac{1}{8}\right)(x) + \left(\frac{3}{4}\right)(-1) = 0$$

What number of points would the middle ring have to be set at in order to result in an expected value of zero?

$$\frac{5}{8} + \frac{1}{8}x - \frac{3}{4} = 0$$

$$\frac{5}{8} + \frac{1}{8}x - \frac{6}{8} = 0$$

$$\frac{1}{8}x - \frac{1}{8} = 0$$

$$\frac{1}{8}x = \frac{1}{8}$$

$$\boxed{x = 1}$$

Name: _____

ID: A

50. A gymnast is planning which vault to perform at an upcoming competition. Her most difficult vault, vault #1 can earn her a 9.1. However, 75% of the time she does not successfully complete it and is disqualified with zero points. Her other option, vault #2, is a vault that can earn her 5.4 points, and she completes it 95% of the time. Which vault should she choose? Explain.

$$V\#1 \Rightarrow (0.25)(9.1) + (0.75)(0) = 2.275$$

$$V\#2 \Rightarrow (0.95)(5.4) + (0.05)(0) = 5.13$$

51. Yun is making some investments in the stock market. Stock for Company A has a 30% chance of losing \$12,000, a 45% chance of breaking even, and a 25% chance of earning Yun \$11,000. Assuming Yun would like the odds to be in favor of her gaining money, should she invest in Company A? Explain.

$$(0.30)(12,000) + (0.45)(0) + (0.25)(11,000) = 3600 - 2750 = 850 \rightarrow \text{YES}$$

52. A study of a small town shows that 50% of two-story homes have computers in them. If a home has only one-story, the probability of it having a computer inside is 35%. In Dawn's neighborhood, 75% of homes are two-story homes. There are no homes with greater than two-stories.

- Draw a tree diagram based on the information.
- Find $P(\text{having a two-story home in Dawn's neighborhood and having a computer})$. Round to the nearest tenth. Show your work.
- Find $P(\text{having a computer in Dawn's neighborhood})$. Round to the nearest tenth. Show your work.

53. A study of traffic patterns in a large city shows that if the weather is rainy, there is a 50% probability of an automobile accident occurring during the morning commute. If the weather is clear, the probability of an accident is reduced to 25%. Suppose the weather forecast for tomorrow predicts a 75% chance of rain.

- Draw a tree diagram based on the information.
- Find $P(\text{it will rain tomorrow and there will be an accident})$. Round to the nearest tenth. Show your work.
- Find $P(\text{there will be an accident tomorrow})$. Round to the nearest tenth. Show your work.

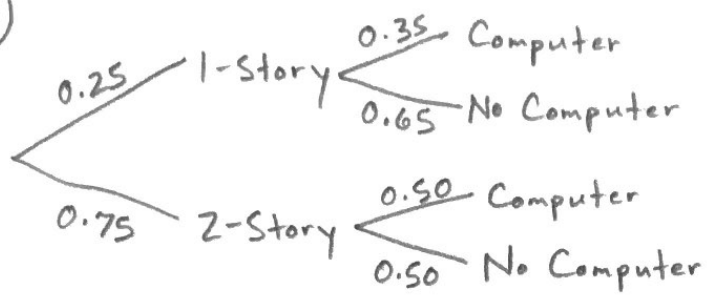
54. A pet store reported the following statistics:
55% of customers adopt a dog
40% of customers that adopt a dog adopt an adult dog
25% of customers adopt a different adult pet

Draw a tree diagram. How many customers adopt adult pets?

55. At this week's practice, 20 bowlers played a game, where each had 20 turns. 1 bowler got 5 strikes, 3 bowlers got 6 strikes, 2 bowlers got 8 strikes, 5 bowlers got 10 strikes, 4 bowlers got 11 strikes, 2 bowlers got 12 strikes, 1 bowler got 13 strikes, and 2 bowlers got 15 strikes. What is the probability distribution for the number of strikes each bowler got?

56. At a track meet, 50 people ran the 100-meter dash. 2 people finished in 11 seconds, 5 people finished in 12 seconds, 8 people finished in 13 seconds, 10 people finished in 14 seconds, 21 people finished in 15 seconds, 2 people finished in 16 seconds, and 2 people finished in 17 seconds. What is the probability distribution for the finish times?

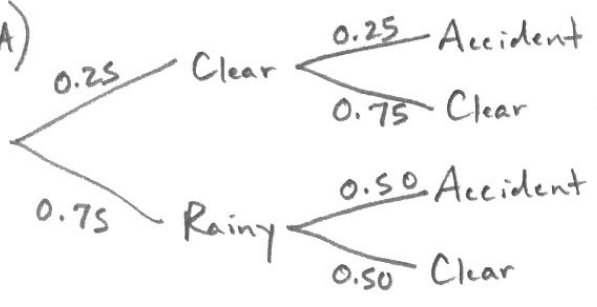
52 A)



B) $(0.75)(0.50) = 0.375$
 $= \underline{37.5\%}$

C) $(0.75)(0.50) + (0.25)(0.35) = 0.4625$
 $= \underline{46.25\%}$

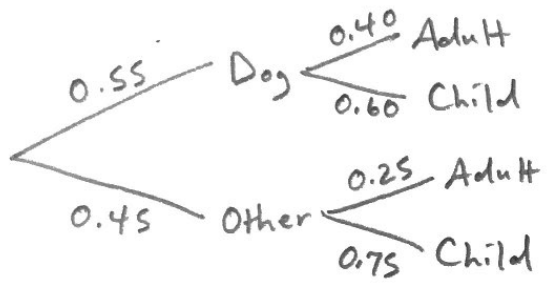
53 A)



B) $(0.75)(0.50) = 0.375$
 $= \underline{37.5\%}$

C) $(0.25)(0.25) + (0.75)(0.50) = 0.4375$
 $= \underline{43.75\%}$

54



$(0.55)(0.40) + (0.45)(0.25) = 0.3325$
 $= \underline{33.25\%}$

55

| Strikes | Frequency | Rel. Freq. |
|---------|-----------|-------------------------------|
| 5 | 1 | $\frac{1}{20}$ |
| 6 | 3 | $\frac{3}{20}$ |
| 8 | 2 | $\frac{2}{20} = \frac{1}{10}$ |
| 10 | 5 | $\frac{5}{20} = \frac{1}{4}$ |
| 11 | 4 | $\frac{4}{20} = \frac{1}{5}$ |
| 12 | 2 | $\frac{2}{20} = \frac{1}{10}$ |
| 13 | 1 | $\frac{1}{20}$ |
| 15 | 2 | $\frac{2}{20} = \frac{1}{10}$ |

56

| Time | Frequency | Rel. Freq. |
|------|-----------|-------------------------------|
| 11 | 2 | $\frac{2}{50} = \frac{1}{25}$ |
| 12 | 5 | $\frac{5}{50} = \frac{1}{10}$ |
| 13 | 8 | $\frac{8}{50} = \frac{4}{25}$ |
| 14 | 10 | $\frac{10}{50} = \frac{1}{5}$ |
| 15 | 21 | $\frac{21}{50}$ |
| 16 | 2 | $\frac{2}{50} = \frac{1}{25}$ |
| 17 | 2 | $\frac{2}{50} = \frac{1}{25}$ |