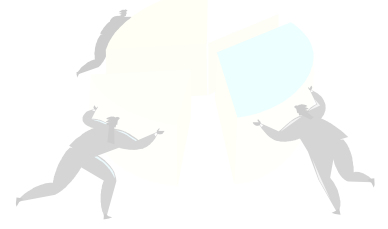


## Probability And Odds Examples



1. Will the Cubs or the Giants be more likely to win the game? What is the chance of drawing an ace from a deck of cards? What are the possibilities of rain today? What are the chances of getting heads in one toss of the coin? When we are uncertain about the occurrence of an event, we can attempt to measure the chances of it happening with **probability**.
2. The **probability** of an event is a ratio that tells how likely it is that an event will take place. The numerator is the number of favorable outcomes and the denominator is the number of possible outcomes. For example, when you toss a die, there are six ways it can fall. The probability of getting a “2” on one roll of a die is one chance out of six, or  $\frac{1}{6}$ . P(2) means **the probability of getting a 2 on one toss of a die**.

<b>Definition of Probability</b>	$P(\text{event}) = \frac{\text{number\_of\_favorable\_outcomes}}{\text{number\_of\_possible\_outcomes}}$
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3. Probe students knowledge by asking, “Suppose you have seven notebooks, three of which are blue, one red, two green, and one yellow. If you select one at random, do you have a greater chance of choosing any one color? What two colors do you have an equal chance of selecting?”

**The purpose of this question is to generate student involvement. Get their responses and make comments.**

**Answer → Yes, blue; red and yellow**

4. Ask students to name several areas in their life that would involve probability.

**Answers will vary. Sample answers would be the outcome of a sports event, a passing score on a test, or correctly predicting the homecoming queen.**

5. **Example** – Thomas has a collection of CDs that he plays regularly. He has six rock CDs, three country CDs, and four movie sound track CDs. If Thomas chooses a CD at random, what is the probability that he will pick a country CD?

$$P(\text{country CD}) = \frac{\text{number\_of\_country\_CDs}}{\text{total\_number\_of\_CDS}} = \frac{3}{13}$$

**The probability of choosing a country CD is 3 out of 13.**

6. **Example** – Kendra has a collection of various cereals on a shelf in the cabinet. Five of the cereals contain corn, two contain rice, and four contain oats. Without looking, she selects a box of cereal for breakfast. What is the probability that the cereal she selects will contain oats?

$$P(\text{oats}) = \frac{\text{number\_of\_oat\_cereals}}{\text{total\_boxes\_of\_cereal}} = \frac{4}{11}$$

**The probability of choosing an oat cereal is 4 out of 11.**

7. **Example** – Lynn collects stamps from different countries. He has five from Canada, two from France, one from Russia, four from Great Britain, and one from Germany. If he accidentally loses one stamp, what is the probability that it is the stamp from Russia?

$$P(\text{Russia}) = \frac{\text{stamps\_from\_Russia}}{\text{total\_number\_of\_stamps}} = \frac{1}{13}$$

**The probability of losing a stamp from Russia is 1 out of 13.**

8. **Example** – Grace has a collection of jerseys from college campuses that she has visited. Two jerseys come from colleges in Indiana, three from California, one from Ohio, one from Washington, D.C. and three from New York State. If she grabs a jersey without looking, what is the probability that she will grab one from Indiana?

$$P(\text{Indiana}) = \frac{\text{jerseys\_from\_Indiana}}{\text{total\_number\_of\_jerseys}} = \frac{2}{10} = \frac{1}{5}$$

**The probability of choosing a jersey from Indiana is one out of five.**

9. The probability of any event is always a value from 0 to 1, inclusive. In algebra this is written  $0 \leq P(event) \leq 1$ . If the probability of an event is 0, it is impossible for that event to occur. An event that is certain to occur has a probability of 1.

**Discuss with students the rationale of the values shown here. If an event will not occur, then there is no or zero chance of it happening. If it is guaranteed to happen then the “number of favorable outcomes” will equal the “number of possible outcomes” and the resulting ratio would be one to one. The probability of any other event would be between zero and one.**

10. Suppose a weather forecaster states that the probability of rain today is 0.25 or  $\frac{1}{4}$ .

This means that the probability that it will not rain is 0.75 or  $\frac{3}{4}$ . The **odds** that it will rain today are 1:3. The odds that it will not rain today are 3:1.

**An event that is certain to happen has a probability of 1. It is certain that it will either rain or not rain. Therefore, if the probability of rain is 0.25, the probability of no rain is  $(1 - 0.25)$  or 0.75.**

**If the probability of rain is 0.25, that is  $\frac{25}{100}$  or 1 chance out of 4 that it will rain. Therefore, the possible successes to the possible failures would be 1 to 3.**

<b>Definition of Odds</b>	The odds of an event occurring is the ratio of the number of ways the event can occur (successes) to the number of ways the event cannot occur (failures).
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**Odds = successes:failures**

**Give several examples of “successes” and “failures” to clarify. For example, out of 25 people, 10 are teens. The odds that a person is a teen would be 10 (successes) to 15 (failures).**

11. **Example** – Eleven poker chips are numbered consecutively 1 through 10, with two of them labeled with a 6 and placed in a jar. A chip is drawn at random. Find the probability of drawing a 6.

$$P(6) = \frac{\text{number\_of\_chips\_labeled\_6}}{\text{number\_of\_chips\_in\_the\_jar}} = \frac{2}{11}$$

**The probability of drawing a 6 is 2 out of 11.**

12. **Example** – Find the odds of drawing a 6 from the jar above. Find the odds of not drawing a 6.

**Odds of drawing 6 = number of chances to draw 6 : number of chances to draw other numbers**

**Odds of drawing 6 = 2:9 (Read as “2 to 9.”)**

**Odds of not drawing a 6 = number of chances to draw other numbers : number of chances to draw 6**

**Odds of not drawing a 6 = 9:2 (Read as “9 to 2.”)**

13. **Example:** The door prize at a party with 25 people is given by writing numbers 1 through 25 on the bottom of the paper plates used. What is the probability that an individual had the winning plate?

$$P(\text{winner}) = \frac{\text{number\_of\_winning\_plates}}{\text{number\_of\_plates}} = \frac{1}{25}$$

**The probability of having the winning plate is 1 out of 25.**

14. **Example:** What are the odds of winning the door prize above? What are the odds of not winning the door prize?

**Odds of winning = number of chances to win : number of chances to draw other numbers**

**Odds of winning = 1:24 (Read as “1 to 24.”)**

**Odds of not winning = number of chances to draw other numbers : number of chances to win**

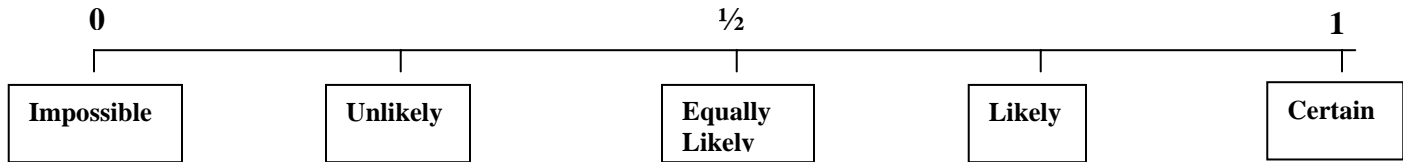
**Odds of not winning = 24:1 (Read as “24 to 1.”)**

Name: \_\_\_\_\_  
Date: \_\_\_\_\_  
Class: \_\_\_\_\_



## Probability and Odds Worksheet

The probability of occurrences of any event can be shown on the number line below. Locate the probability of each event described.



1. It will rain today.
2. Today is Saturday.
3. You are in Algebra class.
4. A coin will land tails up.
5. You will pass the next test.
6. You will go skiing tomorrow.

**Find each probability if a die is rolled.**

7.  $P(3)$
8.  $P(\text{even number})$
9.  $P(\text{number less than } 1)$
10.  $P(\text{a number divisible by } 4)$
11.  $P(\text{a number greater than } 1)$

**On questions 12 through 15, find the odds in favor of each outcome if a die is rolled.**

12. A number greater than 3
13. A multiple of 2
14. Not a 4
15. A number divisible by 3
16. If the probability of an event occurring is  $\frac{2}{3}$ , what are the odds of the event occurring?
17. If the probability of an event occurring is  $\frac{3}{7}$ , what are the odds that it will not occur?

18. If the odds in favor of an event occurring are 7:5, what is the probability of the event occurring?
19. If the odds against an event occurring are 9:14, what is the probability of the event occurring?

**The number of males and females enrolled in Blue Dolphin High School are listed per class in the table below. Use this table to answer questions 20 through 23.**

20. If a student is chosen at random, what is the probability that the student is a female?
21. If a student is chosen at random, what is the probability that the student is a male in Grade 11?

<b>Blue Dolphin High School</b>		
Grade	Male	Female
9	120	150
10	100	100
11	130	110
12	150	175

22. If one student is chosen to represent the student body, what are the odds in favor of selecting a female?
23. If one student is chosen from Grade 12, which is more likely, selecting a male or selecting a female?

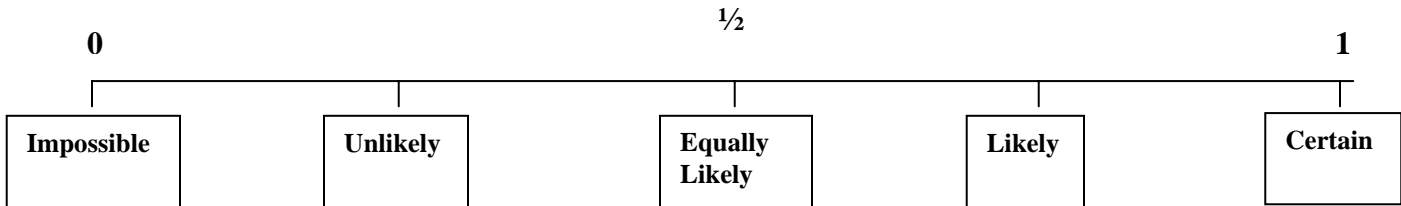
**A card is selected at random from a deck of 52 cards.**

24. What are the odds in favor of selecting a heart?
25. What is the probability of selecting an ace?



## Probability and Odds Worksheet Key

The probability of occurrences of any event can be shown on the number line below. Locate the probability of each event described.



1. It will rain today.
2. Today is Saturday.
3. You are in Algebra class.
4. A coin will land tails up.
5. You will pass the next test.
6. You will go skiing tomorrow.

**Answers will vary for Exercises 1, 2, 5, and 6.**  
**3 – 1 if in Algebra class, 0 if not in Algebra.**  
**4 – one-half**

**Find each probability if a die is rolled.**

7.  $P(3) \rightarrow \frac{1}{6}$
8.  $P(\text{even number}) \rightarrow \frac{1}{2}$
9.  $P(\text{number less than 1}) \rightarrow 0$
10.  $P(\text{a number divisible by 4}) \rightarrow \frac{1}{6}$
11.  $P(\text{a number greater than 1}) \rightarrow \frac{5}{6}$

**On questions 12 through 15, find the odds in favor of each outcome if a die is rolled.**

12. A number greater than 3 → 1:1

13. A multiple of 2 → 1:1

14. Not a 4 → 5:1

15. A number divisible by 3 → 1:2

16. If the probability of an event occurring is  $\frac{2}{3}$ , what are the odds of the event occurring? → 2:1

$\frac{2}{3}$  means two successes out of three possible ways. Therefore, there can only be one failure.

17. If the probability of an event occurring is  $\frac{3}{7}$ , what are the odds that it will not occur? → 4:3

$\frac{3}{7}$  means three successes out of 7 possible ways. Therefore, there can be only 4 failures.

18. If the odds in favor of an event occurring are 7:5, what is the probability of the event occurring? →  $\frac{7}{12}$

**7:5 means 7 successes and 5 failures for a total of 12 outcomes.**



19. If the odds against an event occurring are 9:14, what is the probability of the event occurring?  $\rightarrow \frac{14}{23}$

**9:14 means 9 failures and 14 successes for a total of 23 outcomes.**

**The number of males and females enrolled in Blue Dolphin High School are listed per class in the table below. Use this table to answer questions 20 through 23.**

20. If a student is chosen at random, what is the probability that the student is a female?

**535 female students, 500 male students**

**1035 total students  $\rightarrow \frac{535}{1035} = \frac{107}{207}$**

<b>Blue Dolphin High School</b>		
Grade	Male	Female
9	120	150
10	100	100
11	130	110
12	150	175

21. If a student is chosen at random, what is the probability that the student is a male in Grade 11?

**130 male students in grade 11**

**1035 total students  $\rightarrow \frac{130}{1035} = \frac{26}{207}$**

22. If one student is chosen to represent the student body, what are the odds in favor of selecting a female?

**535 female students, 500 male students**

**or 107 female students to every 100 male students**

**$\rightarrow$  107:100**

23. If one student is chosen from Grade 12, which is more likely, selecting a male or selecting a female?

**There are more female (175) students than male students (150) in the 12th grade. Therefore, it is more likely to choose a female.**

**A card is selected at random from a deck of 52 cards.**

24. What are the odds in favor of selecting a heart?

**There are 13 hearts and 39 nonhearts.**

**13:39 or 1:3**

25. What is the probability of selecting an ace?

**There are 4 aces and a total of 52 cards.**

$$\frac{4}{52} = \frac{1}{13}$$

Student Name: \_\_\_\_\_

Date: \_\_\_\_\_

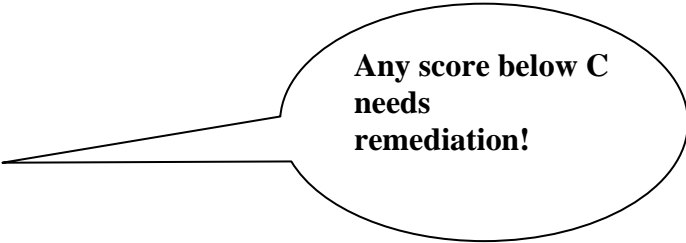
## Probability and Odds Checklist

1. On questions 1 through 6, did the student locate the probability of the occurrence on the number line correctly?
  - a. All six (30 points)
  - b. Five out of six (25 points)
  - c. Four out of six (20 points)
  - d. Three out of six (15 points)
  - e. Two out of six (10 points)
  - f. One out of six (5 points)
  
2. On questions 7 through 11, did the student find the probability correctly?
  - a. All five (25 points)
  - b. Four of the five (20 points)
  - c. Three of the five (15 points)
  - d. Two of the five (10 points)
  - e. One of the five (5 points)
  
3. On questions 12 through 15, did the student find the odds in favor of each outcome correctly?
  - a. All four (20 points)
  - b. Three of the four (15 points)
  - c. Two of the four (10 points)
  - d. One of the four (5 points)
  
4. On questions 16 and 17, did the student find the odds of the event correctly?
  - a. Both (10 points)
  - b. One of the two (5 points)
  
5. On questions 18 and 19, did the student find the probability of the event correctly?
  - a. Both (10 points)
  - b. One of the two (5 points)
  
6. On questions 20 and 21, did the student use the table correctly to determine the probability of the event?
  - a. Both (10 points)
  - b. One of the two (5 points)

7. On questions 22 and 23, did the student use the table correctly to determine the odds of the event?
- a. Both (10 points)
  - b. One of the two (5 points)
8. On question 24, did the student find the odds in favor of selecting a heart?
- a. Yes (10 points)
  - b. No, set up comparison but used incorrect data (5 points)
9. On question 25, did the student find the probability of selecting an ace?
- a. Yes (10 points)
  - b. No, set up ratio but used incorrect data (5 points)

Total Number of Points \_\_\_\_\_

- A 121 points and above
- B 108 points and above
- C 94 points and above
- D 81 points and above
- F 80 points and below



**Any score below C  
needs  
remediation!**