MATHTEACH: Statistics and Probability

Introduction to Statistics · C-ID MATHTEACH · numberbender.com

Name: _____ Date: _____ Score: / 30

Learning Objectives

- Compute mean, median, mode, and range of a data set
- Compute classical (theoretical) probability
- Count outcomes using permutations and combinations
- Read and interpret frequency tables and graphs

Simplify each expression completely. Show all steps and circle your final answer.

Combinations C(n,r)

1. A committee of 2 people is to be chosen from a group of 8 people. Order does not matter. How many committees are possible?

$$C(8,2) = \frac{8!}{2!\ 6!}$$

Answer: _____

2. A student must choose 4 questions to answer from a test that has 8 questions. How many ways can the student select the questions?

$$C(8,4) = \frac{8!}{4!\ 4!}$$

Answer: _____

3. A committee of 4 people is to be chosen from a group of 10 people. Order does not matter. How many committees are possible?

$$C(10,4) = \frac{10!}{4!\ 6!}$$

Answer: _____

4. A student must choose 3 questions to answer from a test that has 10 questions. How many ways can the student select the questions?

$$C(10,3) = \frac{10!}{3!\ 7!}$$

Answer: _____

5. A committee of 3 people is to be chosen from a group of 11 people. Order does not matter. How many committees are possible?

$$C(11, 3) = \frac{11!}{3!\ 8!}$$

Answer: _____

6. A student must choose 3 questions to answer from a test that has 11 questions. How many ways can the student select the questions?

$$C(11, 3) = \frac{11!}{3!\ 8!}$$

Answer: _____

7. A committee of 2 people is to be chosen from a group of 7 people. Order does not matter. How many committees are possible?

$$C(7, 2) = \frac{7!}{2!\ 5!}$$

Answer: _____

8. A student must choose 4 questions to answer from a test that has 8 questions. How many ways can the student select the questions?

$$C(8, 4) = \frac{8!}{4!\ 4!}$$

Answer: _____

Mean of a data set

9. Find the mean of the data set:

$$\{28,\ 38,\ 32,\ 7,\ 18,\ 29,\ 20,\ 26\}$$

Answer: _____

10. Find the mean of the data set:

$$\{17,\ 10,\ 19,\ 4,\ 14,\ 27\}$$

Answer: _____

11. Find the mean of the data set:

$$\{15,\ 14,\ 2,\ 24,\ 34,\ 27\}$$

Answer: _____

12. Find the mean of the data set:

$\{16, 18, 14, 22, 9, 25, 26\}$

Answer: _____

Median of a data set

13. Find the median of the data set:

$\{8, 13, 15, 16, 18, 19, 40\}$

Answer: _____

14. Find the median of the data set:

$\{1, 6, 8, 14, 27, 37\}$

Answer: _____

15. Find the median of the data set:

$\{7, 16, 28, 32, 34, 35, 38, 39\}$

Answer: _____

Mode of a data set

16. Find the mode:

$\{3, 3, 3, 4, 14, 15, 16, 17, 20\}$

Answer: _____

17. Find the mode:

$\{1, 11, 13, 14, 15, 17, 18, 18\}$

Answer: _____

18. Find the mode:

$\{3, 3, 6, 8, 9, 10, 15, 17\}$

Answer: _____

Range

19. Find the range:

$\{41, 18, 50, 16, 48, 13, 43\}$

Answer: _____

20. Find the range:

$\{23, 21, 29, 26, 48\}$

Answer: _____

21. Find the range:

$\{14, 27, 48, 2, 10, 7, 11, 23\}$

Answer: _____

Permutations P(n,r)

22. In how many ways can 3 students be chosen from a group of 10 students and arranged in a line (order matters)?

$$P(10, 3) = \frac{10!}{7!}$$

Answer: _____

23. A club needs to elect a President, Vice-President, and Secretary from 8 candidates. No person may hold more than one office. How many different officer lineups are possible?

$$P(8, 3) = \frac{8!}{5!}$$

Answer: _____

24. In how many ways can 3 students be chosen from a group of 6 students and arranged in a line (order matters)?

$$P(6, 3) = \frac{6!}{3!}$$

Answer: _____

25. A club needs to elect a President, Vice-President, and Secretary from 10 candidates. No person may hold more than one office. How many different officer lineups are possible?

$$P(10, 3) = \frac{10!}{7!}$$

Answer: _____

26. In how many ways can 3 students be chosen from a group of 6 students and arranged in a line (order matters)?

$$P(6, 3) = \frac{6!}{3!}$$

Answer: _____

27. A club needs to elect a President, Vice-President, and Secretary from 8 candidates. No person may hold more than one office. How many different officer lineups are possible?

$$P(8, 3) = \frac{8!}{5!}$$

Answer: _____

Classical (theoretical) probability

28. A bag contains 9 red, 6 blue, and 7 green marbles. One marble is drawn at random. Find P(red).

$$\text{red} = 9,\ \text{blue} = 6,\ \text{green} = 7$$

Answer: _____

29. A bag contains 5 red, 3 blue, and 9 green marbles. One marble is drawn at random. Find P(red).

$$\text{red} = 5,\ \text{blue} = 3,\ \text{green} = 9$$

Answer: _____

30. A bag contains 9 red, 3 blue, and 5 green marbles. One marble is drawn at random. Find P(red).

$$\text{red} = 9,\ \text{blue} = 3,\ \text{green} = 5$$

Answer: _____

Topics: Classical (theoretical) probability, Mean of a data set, Mode of a data set, Median of a data set, Combinations C(n,r), Permutations P(n,r), Range. All answers verified by independent computation.

Solutions

Combinations C(n,r)

1. A committee of 2 people is to be chosen from a group of 8 people. Order does not matter. How many committees are possible?

$$C(8,2) = \frac{8!}{2!\ 6!}$$

→ *Order does not matter, so use combinations: C(n,r) = n!/(r!(n-r)!).*
→ *C(8,2) = 8!/(2! * 6!) = 28.*

Answer: $C(8,2) = 28$

2. A student must choose 4 questions to answer from a test that has 8 questions. How many ways can the student select the questions?

$$C(8,4) = \frac{8!}{4!\ 4!}$$

→ *Selecting questions where order doesn't matter uses combinations.*
→ *C(8,4) = 8!/(4! * 4!) = 70.*

Answer: $C(8,4) = 70$

3. A committee of 4 people is to be chosen from a group of 10 people. Order does not matter. How many committees are possible?

$$C(10,4) = \frac{10!}{4!\ 6!}$$

→ *Order does not matter, so use combinations: C(n,r) = n!/(r!(n-r)!).*
→ *C(10,4) = 10!/(4! * 6!) = 210.*

Answer: $C(10,4) = 210$

4. A student must choose 3 questions to answer from a test that has 10 questions. How many ways can the student select the questions?

$$C(10,3) = \frac{10!}{3!\ 7!}$$

→ *Selecting questions where order doesn't matter uses combinations.*
→ *C(10,3) = 10!/(3! * 7!) = 120.*

Answer: $C(10,3) = 120$

5. A committee of 3 people is to be chosen from a group of 11 people. Order does not matter. How many committees are possible?

$$C(11,3) = \frac{11!}{3!\ 8!}$$

→ *Order does not matter, so use combinations: C(n,r) = n!/(r!(n-r)!).*
→ *C(11,3) = 11!/(3! * 8!) = 165.*

Answer: $C(11,3) = 165$

6. A student must choose 3 questions to answer from a test that has 11 questions. How many ways can the student select the questions?

$$C(11, 3) = \frac{11!}{3!\ 8!}$$

→ *Selecting questions where order doesn't matter uses combinations.*
→ *C(11,3) = 11!/(3! * 8!) = 165.*

Answer: $C(11, 3) = 165$

---

7. A committee of 2 people is to be chosen from a group of 7 people. Order does not matter. How many committees are possible?

$$C(7, 2) = \frac{7!}{2!\ 5!}$$

→ *Order does not matter, so use combinations: C(n,r) = n!/(r!(n-r)!).*
→ *C(7,2) = 7!/(2! * 5!) = 21.*

Answer: $C(7, 2) = 21$

---

8. A student must choose 4 questions to answer from a test that has 8 questions. How many ways can the student select the questions?

$$C(8, 4) = \frac{8!}{4!\ 4!}$$

→ *Selecting questions where order doesn't matter uses combinations.*
→ *C(8,4) = 8!/(4! * 4!) = 70.*

Answer: $C(8, 4) = 70$

Mean of a data set

9. Find the mean of the data set:

$\{28, 38, 32, 7, 18, 29, 20, 26\}$

→ *Add all 8 values: 198.*
→ *Divide by n = {n}: {sum_values} ÷ {n} = {answer}.*

Answer: $\bar{x} = 24.75$

10. Find the mean of the data set:

$\{17, 10, 19, 4, 14, 27\}$

→ *Add all 6 values: 91.*
→ *Divide by n = {n}: {sum_values} ÷ {n} = {answer}.*

Answer: $\bar{x} = 15.1667$

11. Find the mean of the data set:

$\{15, 14, 2, 24, 34, 27\}$

→ *Add all 6 values: 116.*
→ *Divide by n = {n}: {sum_values} ÷ {n} = {answer}.*

Answer: $\bar{x} = 19.3333$

12. Find the mean of the data set:

$\{16, 18, 14, 22, 9, 25, 26\}$

→ *Add all 7 values: 130.*
→ *Divide by n = {n}: {sum_values} ÷ {n} = {answer}.*

Answer: $\bar{x} = 18.5714$

Median of a data set

13. Find the median of the data set:

$\{8, 13, 15, 16, 18, 19, 40\}$

→ *Sort the data: [8, 13, 15, 16, 18, 19, 40].*
→ *n = 7 — odd — take the middle value.*
→ *Median = {answer}.*

Answer: $\text{Median} = 16$

14. Find the median of the data set:

$\{1, 6, 8, 14, 27, 37\}$

→ *Sort the data: [1, 6, 8, 14, 27, 37].*
→ *n = 6 — even — average the two middle values (8 and 14).*
→ *Median = {answer}.*

Answer: $\text{Median} = 11$

15. Find the median of the data set:

$\{7, 16, 28, 32, 34, 35, 38, 39\}$

→ *Sort the data: [7, 16, 28, 32, 34, 35, 38, 39].*
→ *n = 8 — even — average the two middle values (32 and 34).*
→ *Median = {answer}.*

Answer: $\text{Median} = 33$

Mode of a data set

16. Find the mode:

$\{3, 3, 3, 4, 14, 15, 16, 17, 20\}$

→ *Tally each value's frequency.*
→ *3 appears 3 times — more than any other value.*
→ *Mode = {answer}.*

Answer: $\text{Mode} = 3$

17. Find the mode:

$\{1, 11, 13, 14, 15, 17, 18, 18\}$

→ *Tally each value's frequency.*
→ *18 appears 2 times — more than any other value.*
→ *Mode = {answer}.*

Answer: $\text{Mode} = 18$

18. Find the mode:

$\{3, 3, 6, 8, 9, 10, 15, 17\}$

→ *Tally each value's frequency.*
→ *3 appears 2 times — more than any other value.*
→ *Mode = {answer}.*

Answer: $\text{Mode} = 3$

Range

19. Find the range:

$\{41, 18, 50, 16, 48, 13, 43\}$

→ *Range = max – min.*
→ *max = 50, min = 13.*
→ *Range = {max_val} – {min_val} = {answer}.*

Answer: $\text{Range} = 37$

20. Find the range:

$\{23, 21, 29, 26, 48\}$

→ *Range = max – min.*
→ *max = 48, min = 21.*
→ *Range = {max_val} – {min_val} = {answer}.*

Answer: $\text{Range} = 27$

21. Find the range:

$\{14, 27, 48, 2, 10, 7, 11, 23\}$

→ *Range = max – min.*
→ *max = 48, min = 2.*
→ *Range = {max_val} – {min_val} = {answer}.*

Answer: $\text{Range} = 46$

Permutations P(n,r)

22. In how many ways can 3 students be chosen from a group of 10 students and arranged in a line (order matters)?

$$P(10, 3) = \frac{10!}{7!}$$

→ *Since order matters, use permutations: P(n,r) = n!/(n-r)!*
→ *P(10,3) = 10!/(7)! = 720.*

Answer: $P(10, 3) = 720$

23. A club needs to elect a President, Vice-President, and Secretary from 8 candidates. No person may hold more than one office. How many different officer lineups are possible?

$$P(8, 3) = \frac{8!}{5!}$$

→ *Each office is distinct, so order matters: use P(n,r).*
→ *P(8,3) = 8!/(5)! = 336.*

Answer: $P(8, 3) = 336$

24. In how many ways can 3 students be chosen from a group of 6 students and arranged in a line (order matters)?

$$P(6, 3) = \frac{6!}{3!}$$

→ *Since order matters, use permutations: P(n,r) = n!/(n-r)!*
→ *P(6,3) = 6!/(3)! = 120.*

Answer: $P(6, 3) = 120$

25. A club needs to elect a President, Vice-President, and Secretary from 10 candidates. No person may hold more than one office. How many different officer lineups are possible?

$$P(10, 3) = \frac{10!}{7!}$$

→ *Each office is distinct, so order matters: use P(n,r).*
→ *P(10,3) = 10!/(7)! = 720.*

Answer: $P(10, 3) = 720$

26. In how many ways can 3 students be chosen from a group of 6 students and arranged in a line (order matters)?

$$P(6, 3) = \frac{6!}{3!}$$

→ *Since order matters, use permutations: P(n,r) = n!/(n-r)!*
→ *P(6,3) = 6!/(3)! = 120.*

Answer: $P(6, 3) = 120$

27. A club needs to elect a President, Vice-President, and Secretary from 8 candidates. No person may hold more than one office. How many different officer lineups are possible?

$$P(8,3) = \frac{8!}{5!}$$

→ *Each office is distinct, so order matters: use P(n,r).*
→ *P(8,3) = 8!/(5)! = 336.*

Answer: $P(8,3) = 336$

Classical (theoretical) probability

28. A bag contains 9 red, 6 blue, and 7 green marbles. One marble is drawn at random. Find P(red).

$$\text{red} = 9,\ \text{blue} = 6,\ \text{green} = 7$$

→ *Count the total outcomes: 9 + 6 + 7 = 22.*
→ *P(red) = favorable / total = 9/22 = 9/22.*
→ *As a decimal: P(red) = 0.4091 (approx).*

Answer: $P(\text{red}) = \frac{9}{22} = 9/22 \approx 0.4091$

29. A bag contains 5 red, 3 blue, and 9 green marbles. One marble is drawn at random. Find P(red).

$$\text{red} = 5,\ \text{blue} = 3,\ \text{green} = 9$$

→ *Count the total outcomes: 5 + 3 + 9 = 17.*
→ *P(red) = favorable / total = 5/17 = 5/17.*
→ *As a decimal: P(red) = 0.2941 (approx).*

Answer: $P(\text{red}) = \frac{5}{17} = 5/17 \approx 0.2941$

30. A bag contains 9 red, 3 blue, and 5 green marbles. One marble is drawn at random. Find P(red).

$$\text{red} = 9,\ \text{blue} = 3,\ \text{green} = 5$$

→ *Count the total outcomes: 9 + 3 + 5 = 17.*
→ *P(red) = favorable / total = 9/17 = 9/17.*
→ *As a decimal: P(red) = 0.5294 (approx).*

Answer: $P(\text{red}) = \frac{9}{17} = 9/17 \approx 0.5294$