

# Grade 3 Probability Quiz – 45 minutes (Total: 75 points)

## Instructions (printable)

- Time: 45 minutes. Total points: 75.
  - Show all work in the spaces provided. Use drawings or lists when helpful.
  - Write answers clearly. For explanation items, use complete sentences.
  - This quiz includes short answers, reasoning items, and two items marked for peer feedback. Use the peer-feedback rubric at the end for those items.
  - No calculators needed.
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## Questions (15 questions – each worth 5 points)

1. (5 pts – Concept first / Explicit model)

A spinner is divided into 4 equal sections labeled Red, Blue, Yellow, and Green. The teacher models probability this way: Probability of Red = number of red sections  $\div$  total sections =  $1 \div 4 = 1/4$ .

- a) Write the probability of landing on Blue as a fraction.
- b) Explain in 1–2 sentences why that fraction shows the chance of Blue using unit reasoning and quantity relationships.

2. (5 pts)

A bag contains 6 marbles: 3 red, 2 blue, and 1 yellow.

- a) What is the probability of picking a red marble on one random draw? Write as a fraction.
- b) Is picking a red marble likely, unlikely, certain, or impossible? Write the word and one-sentence justification.

3. (5 pts – Experimental inquiry)

A spinner with 3 equal sections labeled A, B, and C was spun 20 times. Results: A – 8 spins, B – 7 spins, C – 5 spins.

- a) Write the experimental probability for each outcome (A, B, C) as fractions.
- b) Compare the experimental probabilities to the theoretical probability  $1/3$ . In one sentence say which outcome from the experiment seems closest to the theoretical probability and why.

4. (5 pts)

Toss a coin twice. List the complete set of possible outcomes (sample space). Then give the probability (as a fraction) of getting exactly one head.

5. (5 pts – True / False with reasoning)

Statement: "If an event is impossible, its probability is 1."

- Write True or False, then give a one-sentence explanation using correct probability language (certain, impossible, etc.).

6. (5 pts – Community scenario; collaborative casework)

At the school fair a spin wheel has 5 equal parts. One part wins a small prize and the other four parts do not win.

- a) If one student spins once, what is the probability they win? (fraction)
- b) Two different students each spin once. Show work and write the probability that at least one of the two students wins. Explain your method (you may use a list, table, or a short sentence).

7. (5 pts – Equivalence)

Circle the pair(s) that are equivalent probabilities and explain in one sentence why:

- A:  $\frac{2}{4}$
- B:  $\frac{1}{2}$
- C:  $\frac{4}{8}$
- D:  $\frac{1}{3}$

(State which letters are equivalent and give the short explanation.)

8. (5 pts – Mini-inquiry)

A spinner has 6 equal sections: 3 green, 2 red, and 1 blue.

- a) Without drawing, which color is most likely? Write the color and the probability as a fraction.
- b) Explain in 1 sentence how you used composition/decomposition of the sections to find the probability.

9. (5 pts – Coached practice)

A bag contains 10 marbles. The probability of picking a yellow marble at random is  $\frac{3}{10}$ .

- How many yellow marbles are in the bag? Show the short calculation that matches the fraction to the count.

10. (5 pts – Community counting)

On a neighborhood walk you count 12 houses. Three of the 12 houses have a compost bin in the front yard.

- a) If you choose one house at random, what is the probability it has a compost bin? Write as a fraction and a word (e.g., likely/unlikely).
- b) Explain how the fraction shows the relationship between the part (houses with compost bins) and the whole (total houses).

11. (5 pts – Vocabulary matching)

Match each probability word to its best meaning. Write the letter of the meaning next to the word.

Words:

- A: certain
- B: impossible
- C: likely
- D: unlikely
- E: equally likely

Meanings:

1. Cannot happen
2. Happens every time
3. About the same chance as not happening
4. Probably will happen
5. Probably will not happen

12. (5 pts – Complement)

A prize wheel has 10 equal sections: 4 blue, 3 yellow, 2 green, 1 red.

- a) What is the probability of landing on blue? (fraction)
- b) What is the probability of not landing on blue? (fraction, simplified)

13. (5 pts – Experimental vs theoretical reasoning)

A student flipped a fair coin 30 times and got 18 heads.

- a) What is the experimental probability of heads from this experiment? (fraction)
- b) The theoretical probability of heads is  $\frac{1}{2}$ . Explain in 1–2 sentences whether the experimental result is close to the theoretical result and why.

14. (5 pts – Composition & decomposition with numbers)

Choose one card at random from six numbered cards: 1, 2, 3, 4, 5, 6.

- a) What is the probability of picking an even number? (fraction)
- b) If you pick an even number, list those even numbers and then give the probability that the

number is greater than 3 among those evens.

15. (5 pts – Create & explain; peer-feedback target)

Design a spinner with 8 equal parts using items from your community (for example: apple, bike, tree, bus, dog, cat, mailbox, bench). Write which item is your favorite and:

- a) State the probability (fraction) of the spinner landing on your favorite.
- b) In 1–2 sentences explain why this fraction, and show an equivalent fraction using decomposition or composition (for example, show how  $\frac{4}{8}$  is the same as  $\frac{1}{2}$ ).  
(This question is marked for peer feedback – use the peer-feedback rubric below.)

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## Peer-feedback rubric (use for Questions 3, 6, and 15)

- Score 3 – Excellent explanation
  - Correct answer and clear reasoning.
  - Uses counts or fractions accurately and links to the model (spinner, list, or experiment).
  - Explanation uses at least one mastery thread term (unit, part/whole, equivalent, compose/decompose).
- Score 2 – Partial explanation
  - Correct answer but explanation is missing some reasoning or has a small error.
  - Shows counts or fractions but does not fully connect to the model words.
- Score 1 – Needs improvement
  - Incorrect answer or explanation shows misunderstanding (counts wrong or uses probability words incorrectly).

Label peer feedback with the rubric score (3/2/1) and a one-sentence suggestion.

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## Answer Key and Scoring Guide (detailed explanations)

Each question worth 5 points. Rubric gives point distribution often as: Correct answer and clear explanation = 5; correct answer with minimal explanation = 3–4; partial work or incorrect answer with reasoning = 1–2; blank or no work = 0. Detailed solutions below.

1. Answer:

- a)  $1/4$ .
- b) Explanation: There is 1 blue section out of 4 equal sections, so  $1 \div 4 = 1/4$ .  
Scoring (5 pts): 3 pts for correct fraction, 2 pts for explanation referencing "1 out of 4" or unit reasoning.

2. Answer:

- a) Probability red =  $3/6 = 1/2$  (can simplify to  $1/2$ ).
- b) Likely. Explanation: Half the marbles are red (3 out of 6), so getting red is likely.  
Scoring: 3 pts for correct fraction (simplified), 2 pts for correct word and justification.

3. Answer:

- a) Experimental probabilities:  $A = 8/20 = 2/5$ ;  $B = 7/20$ ;  $C = 5/20 = 1/4$ .
- b) Theoretical probability for each is  $1/3 \approx 6.67/20$ . A ( $2/5 = 8/20$ ) is closest to  $1/3$  because  $8/20$  is closer to  $6.67/20$  than  $7/20$  or  $5/20$ ; or say A has the closest count to the expected  $20/3 \approx 6.7$ .  
Scoring: 2 points per correct experimental fraction (up to 4), 1 point for correct comparative sentence (explain closeness).

Peer-feedback: Use rubric.

4. Answer:

- Sample space: HH, HT, TH, TT (list of 4 outcomes).
- Exactly one head outcomes: HT and TH  $\rightarrow$  2 out of 4  $\rightarrow$  probability =  $2/4 = 1/2$ .  
Scoring: 3 pts for full sample space, 2 pts for correct probability and simplification.

5. Answer:

- False. Explanation: An impossible event has probability 0, while a certain event has probability 1.  
Scoring: 3 pts for correct True/False, 2 pts for explanation using 0 and 1 and correct terminology.

6. Answer:

- a) Single spin win probability =  $1/5$ .
- b) Two students each spin once. Probability at least one wins =  $1 - P(\text{both lose})$ .  
 $P(\text{a student loses}) = 4/5$ .  $P(\text{both lose}) = (4/5) \times (4/5) = 16/25$ .  
So probability at least one wins =  $1 - 16/25 = 9/25$ .  
Alternate listing method: list outcomes (win/lose pairs) and count favorable pairs (but complement is shorter).  
Scoring: 2 pts for part (a), 3 pts for part (b): 2 pts for correct complement setup and calculation, 1 pt for clear explanation or alternate correct listing.

Peer-feedback: Use rubric.

7. Answer:

- Equivalent pairs: A ( $2/4$ ), B ( $1/2$ ), and C ( $4/8$ ) are equivalent because they all simplify or convert to  $1/2$ . D ( $1/3$ ) is not equivalent.
- Short explanation:  $2/4 = 1/2$  and  $4/8 = 1/2$  so they represent the same part/whole relationship.  
Scoring: 3 pts for identifying letters A, B, C as equivalent, 2 pts for correct explanation.

8. Answer:

- a) Most likely color: Green. Probability =  $3/6 = 1/2$ .
- b) Explanation: There are 3 green parts out of 6 total parts; composing the 6 parts and decomposing the 3 favorable shows  $3 \div 6 = 1/2$ .  
Scoring: 3 pts for correct probability and color, 2 pts for explanation using compose/decompose language or correct reasoning.

9. Answer:

- There are 3 yellow marbles. Explanation: Probability  $3/10$  means 3 out of 10 marbles are yellow, so count = 3.  
Scoring: 3 pts for correct count (3), 2 pts for showing relation  $3/10$  and explanation.

10. Answer:

- a) Probability =  $3/12 = 1/4$ . Word: unlikely (or "not likely") – teacher may accept "unlikely" with reasoning.
- b) Explanation: 3 is the part (houses with compost bins) and 12 is the whole (total houses), so part/whole =  $3/12 = 1/4$ .  
Scoring: 3 pts for correct fraction (simplified), 2 pts for correct word and explanation linking part/whole.

11. Answer (matching):

- A: certain -> 2. Happens every time
  - B: impossible -> 1. Cannot happen
  - C: likely -> 4. Probably will happen
  - D: unlikely -> 5. Probably will not happen
  - E: equally likely -> 3. About the same chance as not happening
- Scoring: 1 point per correct match (5 total).

12. Answer:

- a) Probability blue =  $4/10 = 2/5$ .
  - b) Probability not blue =  $1 - 2/5 = 3/5$  (or compute remaining counts:  $3+2+1 = 6/10 = 3/5$ ).
- Scoring: 3 pts for part (a) (correct reduced fraction), 2 pts for part (b) correct complement and simplification.

13. Answer:

- a) Experimental probability =  $18/30 = 3/5$ .
  - b) Theoretical probability is  $1/2 = 0.5$ . Experimental  $3/5 = 0.6$ . This is somewhat close but not exact; with 30 trials some variation is expected, so 18 heads is a reasonable result though slightly above the theoretical value.
- Scoring: 3 pts for correct fraction, 2 pts for explanation comparing 0.6 to 0.5 and noting variation in experiments.

14. Answer:

- a) Even numbers among 1–6: 2, 4, 6 -> 3 favorable out of 6 -> probability =  $3/6 = 1/2$ .
  - b) Evens are {2, 4, 6}. Among these evens, numbers greater than 3 are {4, 6} -> 2 out of 3 evens -> probability =  $2/3$ .
- Scoring: 3 pts for part (a) correct fraction and simplification, 2 pts for part (b) correct listing and fraction.

15. Answer (sample model and rubric scoring):

- a) Example student answer: If spinner parts are Apple, Bike, Tree, Bus, Dog, Cat, Mailbox, Bench and favorite = Bike, probability =  $1/8$ .
  - b) Explanation: There is 1 Bike part out of 8 equal parts so  $1/8$ . An equivalent fraction by composition:  $2/16$  or by decomposition if I grouped 2 parts as "transport" and showed  $1/8 = 2/16$  (students may show an equivalent like  $4/32$ , or decompose as  $1/8 = (1 \div 8)$ ). To show a clear equivalence using composition, a student might show  $1/8 = 2/16$  and explain both represent the same part/whole.
- Scoring: 3 pts for correct fraction and naming favorite, 2 pts for an explanation showing an equivalent fraction and linking to part/whole.

Peer-feedback: Use rubric. Expect a peer score (3/2/1) and a one-sentence suggestion.

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End of exam.