Name: _____ Date: _____

Explain and investigate

Answer, then explain how you know in a sentence.



1 A bag has 5 red and 2 blue counters. Linh says blue is impossible. Is Linh correct? Explain.

💡 Hint: Count each kind. Could the other one still be picked?

No. There are blue counters, so blue is possible, though less likely than red

2 A bag has 4 red and 4 blue counters. Nam says red must be picked first. Is Nam correct? Explain.

💡 Hint: Count each kind. Could the other one still be picked?

No. Either colour could be picked; both are equally likely

3 A bag has 7 green and 1 yellow counter. Mai says green is certain. Is Mai correct? Explain.

💡 Hint: Count each kind. Could the other one still be picked?

No. Green is likely, but yellow can be picked

4 A fair coin lands heads three times. Is the next toss certain to be tails? Explain.

💡 Hint: Count each kind. Could the other one still be picked?

No. Each fair toss has equally likely heads and tails; earlier tosses do not determine the next

5 A fair number cube is rolled. Compare the chance of rolling an odd number with the chance of rolling an even number. Explain.

💡 Hint: Count the outcomes (or counters) for each, then say which is more and why.

Equally likely: there are three odd faces and three even faces

6 A fair number cube is rolled. Is a number less than 5 more likely than a number greater than 4? Explain.

💡 Hint: Count the outcomes (or counters) for each, then say which is more and why.

Yes. Four faces are less than 5; two are greater than 4

7 Bag A has 3 red and 1 blue counter. Bag B has 2 red and 2 blue counters. Which bag gives a better chance of red? Explain.

💡 Hint: Count the outcomes (or counters) for each, then say which is more and why.

A. Both bags have 4 counters, but A has 3 red and B has 2 red

8 Bag A has 1 red and 1 blue counter. Bag B has 3 red and 3 blue counters. Compare the chance of red in the two bags. Explain.

💡 Hint: Count the outcomes (or counters) for each, then say which is more and why.

Equally likely in both: half the counters in each bag are red

9 A bag has 2 red and 5 blue counters. Add the fewest red counters to make red more likely than blue. How many do you add? Explain.

💡 Hint: Try one change at a time and count again after each one.

Add 4 red, making 6 red and 5 blue. Adding only 3 makes the counts equal

10 A bag has 6 red and 3 blue counters. Remove the fewest red counters to make blue more likely than red. How many do you remove? Explain.

💡 Hint: Try one change at a time and count again after each one.

Remove 4 red, leaving 2 red and 3 blue. Removing 3 only makes the counts equal

11 Make a bag of 8 counters using red and blue. Make red likely but not certain. Give one possible set and explain.

💡 Hint: Choose your numbers first, then check them against every rule.

Answers vary. Example: 5 red and 3 blue. Red is more than half but blue is still possible

12 Make a bag of 6 counters using red and blue. Make the colours equally likely. How many of each do you need? Explain.

💡 Hint: Choose your numbers first, then check them against every rule.

3 red and 3 blue. Equal counts make the colours equally likely

13 Make a spinner with 4 equal sections, coloured red or blue. Make blue impossible and red certain. Describe the sections.

💡 Hint: Choose your numbers first, then check them against every rule.

All 4 sections red; none blue

14 Make a spinner with 6 equal sections, coloured green or yellow. Make green unlikely but possible. Give one design and explain.

💡 Hint: Choose your numbers first, then check them against every rule.

Answers vary. Example: 1 green and 5 yellow. Green has fewer than half the sections but is possible

15 A spinner has 4 equal sections: 3 blue and 1 red. Change the fewest sections so red and blue are equally likely. What do you change? Explain.

💡 Hint: Try one change at a time and count again after each one.

Change 1 blue section to red. Then there are 2 sections of each colour

16 Cards show 1, 2, 3, 4, 5, and 6. One card is chosen. Compare picking a number less than 3 with picking a number greater than 3. Explain.

💡 Hint: Count the outcomes (or counters) for each, then say which is more and why.

Greater than 3 is more likely: 4, 5, and 6 are three outcomes, while 1 and 2 are two

17 Cards show 1, 2, 3, 4, and 5. One card is chosen. Which numbers could be picked if the result is odd? Is odd more likely than even? Explain.

💡 Hint: Count the outcomes (or counters) for each, then say which is more and why.

1, 3, 5. Yes; there are three odd cards and two even cards

18 A bag has 2 red, 2 blue, and 2 green counters. Add 2 green counters. Which colour is most likely now? Explain.

💡 Hint: Try one change at a time and count again after each one.

Green. There are now 4 green, 2 red, and 2 blue

19 A bag has 3 red and 5 blue counters. Change the colour of one counter to make red and blue equally likely. Which colour must change? Explain.

💡 Hint: Try one change at a time and count again after each one.

Change one blue counter to red, giving 4 red and 4 blue

20 A bag has 4 red and 2 blue counters. A red counter is picked and kept out. Which colour is more likely on the next pick? Explain.

💡 Hint: Was the counter put back? Count what is in the bag for the next pick.

Red. The bag now has 3 red and 2 blue

21 A bag has 3 red and 2 blue counters. A red counter is picked and kept out. Compare red and blue on the next pick. Explain.

💡 Hint: Was the counter put back? Count what is in the bag for the next pick.

Equally likely. The bag now has 2 red and 2 blue

22 A bag has 3 red and 2 blue counters. A blue counter is picked and returned to the bag. Which colour is more likely on the next pick? Explain.

💡 Hint: Was the counter put back? Count what is in the bag for the next pick.

Red. The counter was returned, so the bag still has 3 red and 2 blue

23 A fair coin is tossed 10 times: 7 heads and 3 tails. Does this prove the coin is unfair? Explain.

💡 Hint: Each pick or roll is a new chance: earlier results do not change it.

No. Unequal results can occur by chance even with a fair coin; 10 tosses do not prove unfairness

24 A student rolls a fair number cube 12 times and gets six 1s. Must the next roll be a number other than 1? Explain.

💡 Hint: Each pick or roll is a new chance: earlier results do not change it.

No. Every roll can be 1; earlier rolls do not change the next roll

25 A student picks from a bag, replaces the counter, and repeats 10 times. The results are 8 red and 2 blue. Can the student be certain the bag has more red counters? Explain.

💡 Hint: Each pick or roll is a new chance: earlier results do not change it.

No. Results can vary by chance, especially in a small number of picks

26 A bag has 4 red and 2 blue counters. Describe a fair test to compare the results with your prediction. Explain what to do after each pick.

💡 Hint: Each pick or roll is a new chance: earlier results do not change it.

Example: predict red will occur more often. Mix the bag, pick without looking, record the colour, return the counter, and repeat many times. Compare results with the prediction

27 A game awards a point for rolling 1 or 2 on a fair number cube. Another awards a point for rolling 4, 5, or 6. Which game gives a better chance of a point? Explain.

💡 Hint: Count the outcomes (or counters) for each, then say which is more and why.

The second game. It has three winning faces, while the first has two

28 A bag has 2 red and 4 blue counters. You may add 2 counters of one colour. Which colour should you add to make the chance of red as high as possible? Describe the new chances.

💡 Hint: Try one change at a time and count again after each one.

Add red. There are 4 red and 4 blue, so the colours are equally likely. Adding blue would make red less likely

29 Design two different bags with 6 counters each. Both must make red more likely than blue, but red must be more likely in the first bag. State the contents and explain.

💡 Hint: Choose your numbers first, then check them against every rule.

Answers vary. Example: first bag 5 red and 1 blue; second bag 4 red and 2 blue. The bags have the same total, and the first has more red

30 A bag has 3 red and 3 blue counters. First add 2 red counters. Then remove 1 blue counter. How does each change affect the chance of red? Explain.

💡 Hint: Try one change at a time and count again after each one.

Adding red increases the chance of red, from 3 out of 6 to 5 out of 8. Removing blue increases it again to 5 out of 7