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Repeated Chance Experiments - Year 4

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Repeated Chance Experiments



1. PREDICT
2. REPEAT
3. RECORD
4. COMPARE
5. EXPLAIN





Repeat the same chance action, record every outcome and use the evidence to explain what you notice.

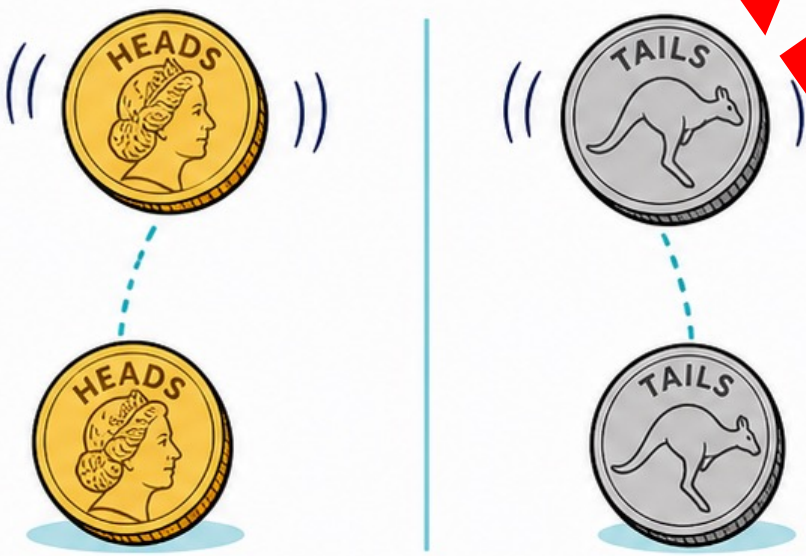
PREVIEW

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Does the Past Change the Next Chance?

INDEPENDENT

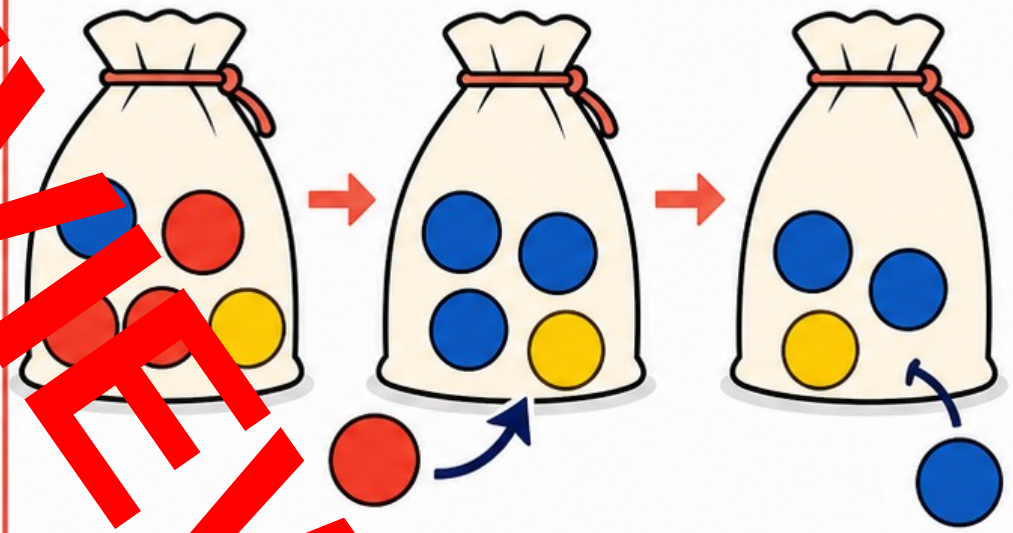
The next chance stays the same.



Example: each fair coin toss

DEPENDENT

An earlier result changes what remains.



Example: counters drawn without replacement

PREVIEW

Ask: Did the first outcome change the possible next outcomes?

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Spinner Investigation - Design

Name: _____

Colour the 8 sections so your spinner follows every rule.

- BLUE: most likely
- YELLOW: less likely
- RED: least likely
- GREEN: impossible



PREVIEW

I predict blue will appear about _____ times in 40 spins.

I predict yellow will appear about _____ times in 40 spins.

I predict red will appear about _____ times in 40 spins.

Green should appear ____ times.

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Spinner Investigation - Test

Name: _____

Spin 40 times. Record B, Y, R or G in every box.

	1	2	3	4	5	6	7	8	9	10
Spins 1-10										
Spins 11-20										
Spins 21-30										
Spins 31-40										

BLUE total: ____ | **YELLOW total:** ____ | **RED total:** ____ | **GREEN total:** ____

Which result was closest to your prediction?

What variation did you notice?

What would you change before testing again?

PREVIEW

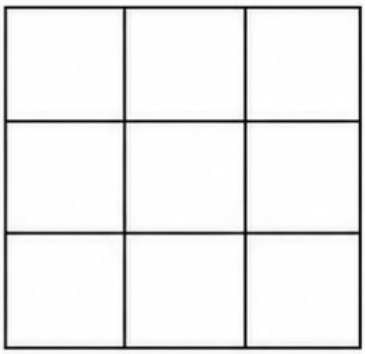
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First-Move Noughts and Crosses

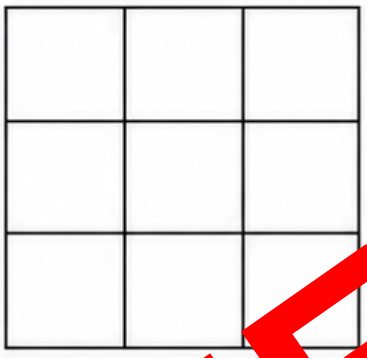
Names: _____

Play 12 games. Alternate who starts.
X always goes first. Record each winner or draw on Page 2.

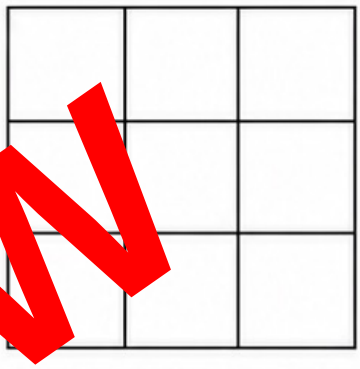
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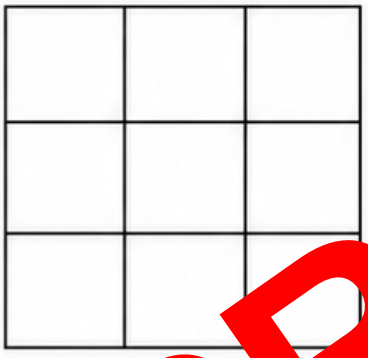
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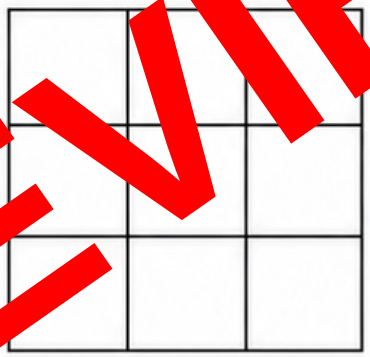
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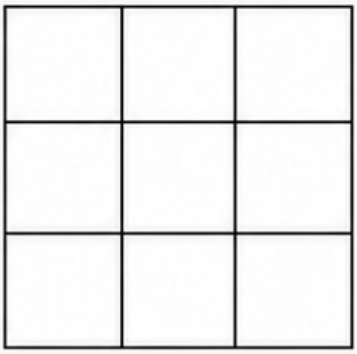
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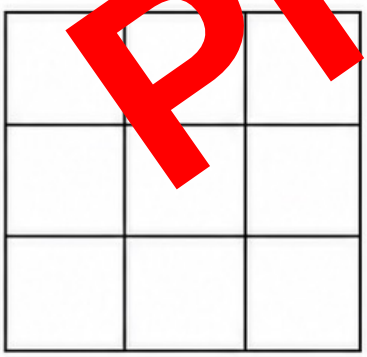
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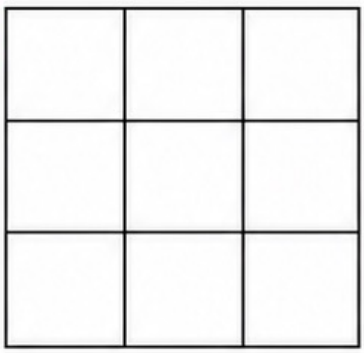
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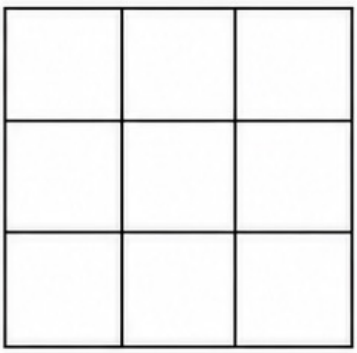
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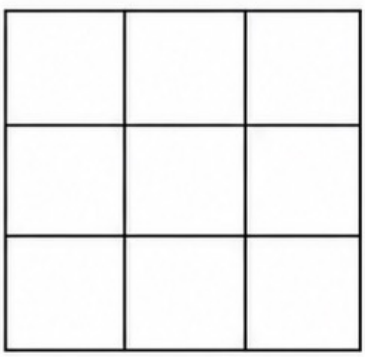
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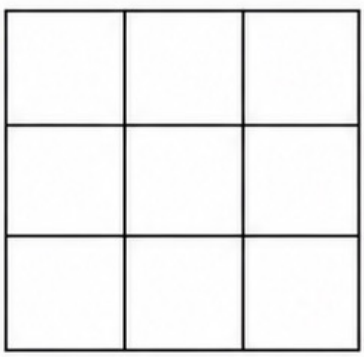
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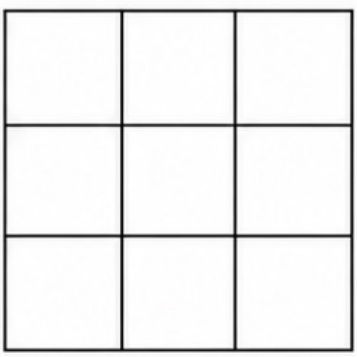
10



11



12



PREVIEW

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First-Move Results

Names: _____

Game	Starter	Result	Strategy note
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

PREVIEW

First-player wins: ____

Second-player wins: ____

Draws: ____

What relationship do you notice?

What would you test next?

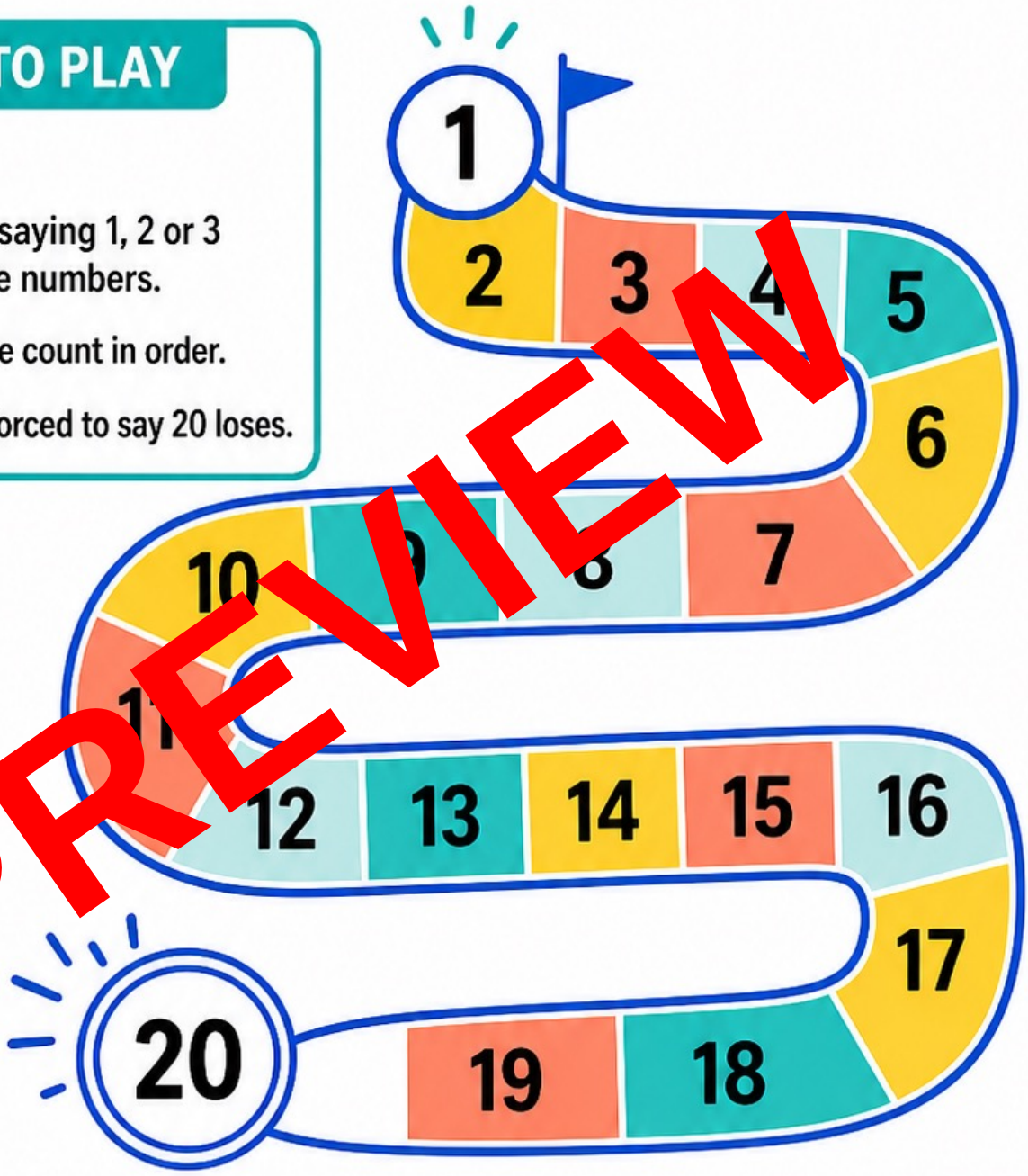
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Race to Twenty

Names: _____

HOW TO PLAY

1. Start at 1.
2. Take turns saying 1, 2 or 3 consecutive numbers.
3. Continue the count in order.
4. The player forced to say 20 loses.



PREVIEW

Example

Player A: 1, 2 → Player B: 3, 4, 5 → Player A: 6

Play several times. Test whether starting first or changing strategy affects the result.

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Race to Twenty – Strategy Lab

Names: _____



My prediction: Starting first will / will not affect the result because

Game	Starter	Winner	Strategy note
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

PREVIEW

First-player wins: _____

Second-player wins: _____



What pattern do you notice?



Write one strategy that seemed to work.



How could you test that strategy fairly?

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Possible Outcomes and Likelihood - Part 1

Name: _____

A. Write all possible outcomes.



1. Toss a fair coin.

_____

_____

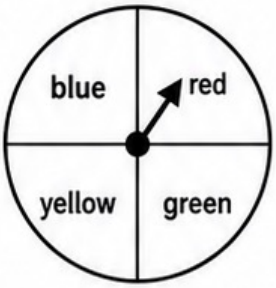


2. Roll a standard six-sided die.

_____

_____

_____



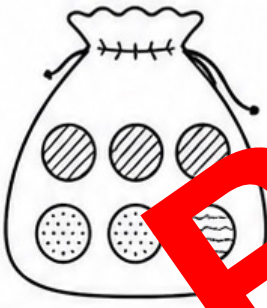
3. Spin a spinner with 4 equal sections: blue, red, yellow and green.

_____

_____

_____

_____



4. Draw one counter from a bag with 3 [illegible], red and 1 yellow counter.

_____

_____

_____

PREVIEW

B. Order each mixed set from least likely to most likely.

5. Mixed set: Draw red | Draw blue | Draw yellow

LEAST LIKELY → [ ] → [ ] → [ ] MOST LIKELY

6. Mixed set: Roll an odd number | Roll a number less than 6 | Roll a 1

LEAST LIKELY → [ ] → [ ] → [ ] MOST LIKELY

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Possible Outcomes and Likelihood - Part 1

Name: ANSWERS

A. Write all possible outcomes.



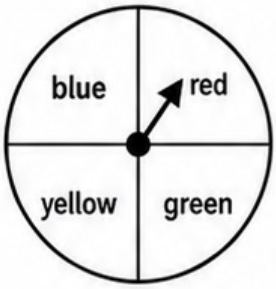
1. Toss a fair coin.

Heads, tails



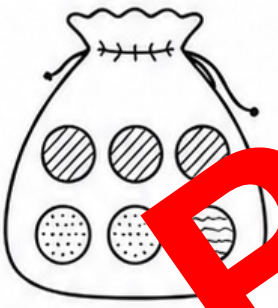
2. Roll a standard six-sided die.

1, 2, 3, 4, 5, 6



3. Spin a spinner with 4 equal sections: blue, red, yellow and green.

blue, red, yellow, green



4. Draw one counter from a bag with 3 blue, red and 1 yellow counter.

blue, red, yellow

PREVIEW

B. Order each mixed set from least likely to most likely.

5. Mixed set: Draw red | Draw blue | Draw yellow

LEAST LIKELY → Draw yellow → Draw red → Draw blue → MOST LIKELY

6. Mixed set: Roll an odd number | Roll a number less than 6 | Roll a 1

LEAST LIKELY → Roll a 1 → Roll an odd number → Roll a number less than 6 → MOST LIKELY

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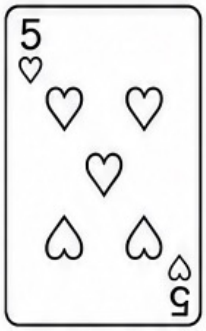
Possible Outcomes and Likelihood - Part 2

Name: _____

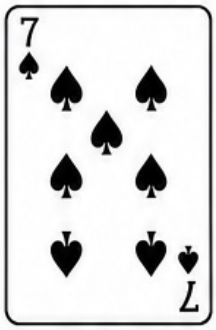
Use a standard deck of 52 cards with no jokers.

A. Write each probability as a fraction out of 52.

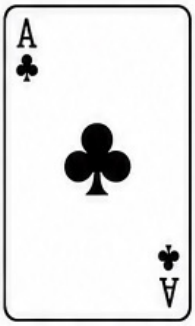
1. Draw a heart



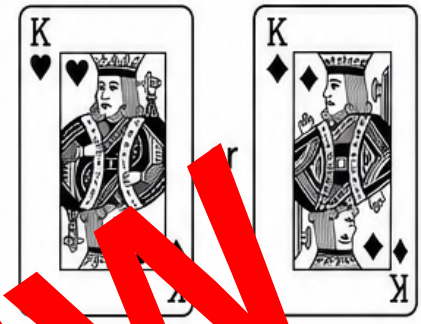
2. Draw a black card



3. Draw an ace



4. Draw a red king



B. Compare the outcomes.

5. Are you more likely to draw a black 2 or a red king? Explain.

6. Are you less likely to draw a club or a red card? Explain.

7. Order from least likely to most likely: a spade | a queen | a red card | the 6 of diamonds

LEAST LIKELY → → → MOST LIKELY

C. Overlapping outcomes

8. Can one card be both a queen and a red card? Give an example.

PREVIEW

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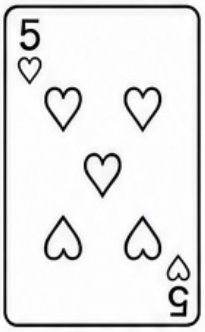
Possible Outcomes and Likelihood - Part 2

Name: ANSWERS

Use a standard deck of 52 cards with no jokers.

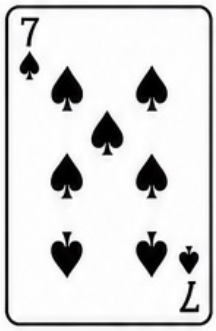
A. Write each probability as a fraction out of 52.

1. Draw a heart



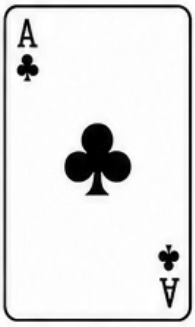
13/52

2. Draw a black card



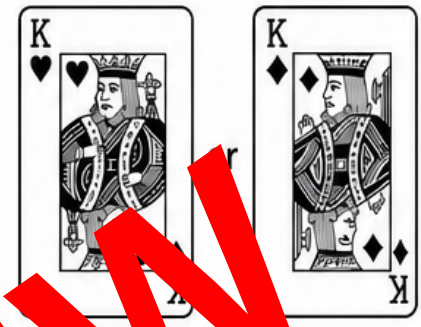
26/52

3. Draw an ace



4/52

4. Draw a red king



2/52

PREVIEW

B. Compare the outcomes.

5. Are you more likely to draw a black 2 or a red king? Explain.

Equally likely: 2/52 each

6. Are you less likely to draw a club or a red card? Explain.

A club is less likely: 13/52 compared with 26/52.

7. Order from least likely to most likely: a spade | a queen | a red card | the 6 of diamonds

LEAST LIKELY → 6 of diamonds → a queen → a spade → a red card → MOST LIKELY

C. Overlapping outcomes

8. Can one card be both a queen and a red card? Give an example.

Yes. Queen of hearts or queen of diamonds.

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Coin Toss Investigation - Trial A

Name: _____

Flip a fair coin 30 times. Record H for heads or T for tails.

A. Predict

I predict I will get more: ◯ HEADS / ◯ TAILS / ◯ ABOUT THE SAME

My reason: _____

_____

B. Record 30 flips

1	2	3	4	5	6		8	9	10
11	12	13	14	15	16		18	19	20
21	22	23		25	26	27	28	29	30

PREVIEW

C. Tota

HEADS	TAILS
_____	_____

D. Explain

Did your result match your prediction? Use your totals as evidence.

_____

_____

_____

_____

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Coin Toss Investigation - Trial B

Name: _____

Flip the same fair coin 30 more times. Record H for heads or T for tails.

A. Record 30 more flips

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28		30

B. Trial B totals

HEADS	TAILS
_____	_____

C. Compare

1. How were Trial A and Trial B like?

_____

_____

2. How were they different?

_____

_____

3. If Trial A ended with five heads in a row, would the next flip be more likely to be tails? Explain.

_____

_____

_____

D. Conclusion

What do repeated coin tosses show about variation and the chance of the next outcome?

_____

_____

_____

PREVIEW

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Independent or Dependent? - Part 1

Name: _____

For each scenario, tick Independent or Dependent.

SCENARIO	INDEPENDENT	DEPENDENT
1. Toss a fair coin, then toss it again. 	☐	☐
2. Roll a fair die, then roll it again. 	☐	☐
3. Draw a counter from a bag and do not replace it before the next draw. 	☐	☐
4. Draw a counter, replace it and mix the bag before the next draw. 	☐	☐
5. Spin the same fair spinner twice. 	☐	☐
6. Draw a card, keep it out, then draw another card. 	☐	☐
7. Cover a space on a game board so it cannot be chosen on the next turn. 	☐	☐
8. Rain is forecast before deciding whether an outdoor carnival can run. 	☐	☐

PREVIEW

Explain two choices

Scenario number: ____ My reason:

_____

_____

_____

Scenario number: ____ My reason:

_____

_____

_____

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Independent or Dependent? - Part 1

Name: ANSWERS

For each scenario, tick Independent or Dependent.

SCENARIO	INDEPENDENT	DEPENDENT
1. Toss a fair coin, then toss it again. 	☑	☐
2. Roll a fair die, then roll it again. 	☑	☐
3. Draw a counter from a bag and do not replace it before the next draw. 	☐	☑
4. Draw a counter, replace it and mix the bag before the next draw. 	☑	☐
5. Spin the same fair spinner twice. 	☑	☐
6. Draw a card, keep it out, then draw another card. 	☐	☑
7. Cover a space on a game board so it cannot be chosen next turn. 	☐	☑
8. Rain is forecast before deciding whether an outdoor carnival can run. 	☐	☑

PREVIEW

Explain two choices

Scenario number: 1 My reason:

The first toss does not change the chance of heads or tails on the next toss.

Scenario number: 3 My reason:

Without replacement, the first draw changes what remains in the bag.

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Independent or Dependent? - Part 2

Name: _____

Decide whether the first event changes the chance of what happens next. Explain with evidence.

1. Weather and an outdoor event



A school carnival is planned outdoors. Heavy rain begins. Does the weather change the chance that the outdoor carnival can run? Explain.

Independent / Dependent

○ ○

2. Counters without replacement



A bag has 3 blue and 2 red counters. A blue counter is drawn and not replaced. Does the first draw change the chance of blue on the next draw? Explain.

Independent / Dependent

○ ○

3. A run of heads



A fair coin shows heads four times in a row. Does this change the chance of heads on the next toss? Explain.

Independent / Dependent

○ ○

4. First-player results



Across 20 games, the first player won 12, the second player won 5 and 3 were draws. Does the result of Game 20 change the chance in Game 21? What relationship does the evidence suggest?

Independent / Dependent

○ ○

PREVIEW

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Independent or Dependent? - Part 2

Name: ANSWERS

Decide whether the first event changes the chance of what happens next. Explain with evidence.

1. Weather and an outdoor event



A school carnival is planned outdoors. Heavy rain begins. Does the weather change the chance that the outdoor carnival can run? Explain.

Independent / Dependent

○ ✓

Dependent. Heavy rain lowers the chance the outdoor carnival can run.

2. Counters without replacement



A bag has 3 blue and 2 red counters. A blue counter is drawn and not replaced. Does the first draw change the chance of blue on the next draw? Explain.

Independent / Dependent

○ ✓

Dependent. Blue changes from 3/5 before the draw to 2/4 after it.

3. A run of heads



A fair coin shows heads four times in a row. Does this change the chance of heads on the next toss? Explain.

Independent / Dependent

✓ ○

Independent. A fair coin is still 1/2 heads on the next toss.

4. First-player results



Across 20 games, the first player won 12, the second player won 5 and 3 were draws. Does the result of Game 20 change the chance in Game 21? What relationship does the evidence suggest?

Independent / Dependent

✓ ○

Independent. Game 20 does not cause Game 21. The evidence suggests the first player may have an advantage.

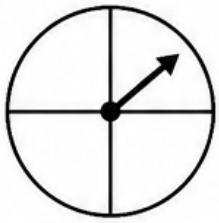
PREVIEW

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Comparing Repeated Results - Part 1

Name: _____

Three groups spun the same equal four-colour spinner 40 times.



GROUP	BLUE	RED	YELLOW	GREEN	TOTAL
Group A	12	8	11	9	
Group B	7	13	10	10	
Group C	11	9	8	12	

PREVIEW

Use the data

1. Calculate the total for each group.

   A ____ B ____ C ____

2. For Group A, which colour was most frequent? _____ Least frequent? _____

3. For Group B, which colour was most frequent? _____ Least frequent? _____

4. For Group C, which colour was most frequent? _____ Least frequent? _____

5. Did all three groups get exactly the same results? YES / ◯ NO ◯

6. Give two examples that show variation between the groups.

_____

_____

_____

_____

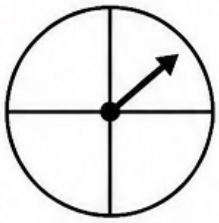
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Comparing Repeated Results - Part 1

Name: ANSWERS

Three groups spun the same equal four-colour spinner 40 times.



GROUP	BLUE	RED	YELLOW	GREEN	TOTAL
Group A	12	8	11	9	40
Group B	7	13	10	10	40
Group C	11	9	8	12	40

PREVIEW

Use the data

1. Calculate the total for each group.

A 40 B 40 C 40

2. For Group A, which colour was most frequent? Blue Least frequent? Red

3. For Group B, which colour was most frequent? Red Least frequent? Blue

4. For Group C, which colour was most frequent? Green Least frequent? Yellow

5. Did all three groups get exactly the same results? YES / ◯ NO ✓

6. Give two examples that show variation between the groups.

Blue varied: A 12, B 7, C 11.

Red varied: A 8, B 13, C 9.

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Comparing Repeated Results - Part 2

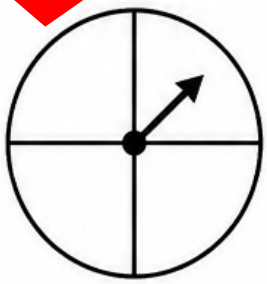
Name: _____

Combine the results from Groups A, B and C. Then use the evidence.

COLOUR	GROUP A	GROUP B	GROUP C	COMBINED TOTAL
Blue	12	7	11	
Red	8	13	9	
Yellow	11	10	8	
Green	9	10	12	

PREVIEW

Analyse the combined evidence



1. Find the combined total for each colour.

Blue ____ Red ____ Yellow ____ Green ____

2. How many spins were recorded altogether? _____

3. If the spinner is equal, about how many of each colour would you expect in 120 spins? _____

4. Which colour was most frequent? _____ Which was least frequent? _____ What was the difference? _____

5. Are the combined results broadly consistent with an equal spinner? YES / NO

6. Why did the three groups get different results even though they used the same spinner?

_____

_____

_____

_____

_____

Sukindi LEARNING

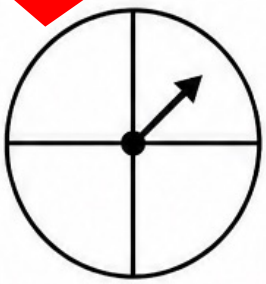
Comparing Repeated Results - Part 2

Name: ANSWERS

Combine the results from Groups A, B and C. Then use the evidence.

COLOUR	GROUP A	GROUP B	GROUP C	COMBINED TOTAL
Blue	12	7	11	30
Red	8	13	9	30
Yellow	11	10	8	29
Green	9	10	12	31

PREVIEW



Analyse the combined evidence

1. Find the combined total for each colour.

Blue 30 | Red 30 | Yellow 29 | Green 31

2. How many spins were recorded altogether? 120

3. If the spinner is equal, about how many of each colour would you expect in 120 spins? 30

4. Which colour was most frequent? Green Which was least frequent? Yellow What was the difference? 2

5. Are the combined results broadly consistent with an equal spinner? YES ✓ / NO ○

6. Why did the three groups get different results even though they used the same spinner?

Chance produces variation, so repeated groups do not have to match exactly. The combined totals are still close to the expected 30 for each colour.

Sukindi LEARNING

Plan a Chance Experiment - Part 1

Name: _____

Design a *fair* repeated chance experiment that another group can follow.

1. My question

What chance question will I investigate?

_____

_____

_____

_____

2. Chance device

What will I use? Tick one.

- ○ coin 
- ○ die 
- ○ spinner 
- ○ bag
- ○ ca[illegible]
- ○ ot[illegible]: _____

PREVIEW

3. Possible outcomes

List every possible outcome.

4. My pre[illegible]tion

What do I think will happen most and least often? Why?

_____

_____

_____

_____

5. What stays the same?

List the conditions I will keep fair for every trial.

_____

_____

_____

_____

6. Number of trials

Choose enough trials to see variation.

7. How I will record

Describe my tally, table or recording method.

_____

_____

_____

_____

Sukindi LEARNING

Plan a Chance Experiment - Part 2

Name: _____

Carry out the experiment from Part 1. Record every trial, then explain the evidence.

A. Record 25 trials

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25

B. Summarise

OUTCOME	TALLY	TOTAL

C. Analyse and expl

1. Did the most frequ outcom match prediction? Explain with totals.

2. What varia did I notice across the trials?

3. What relationship did I notice between the possible outcomes?

4. My evidence-based conclusion:

5. One useful next test:

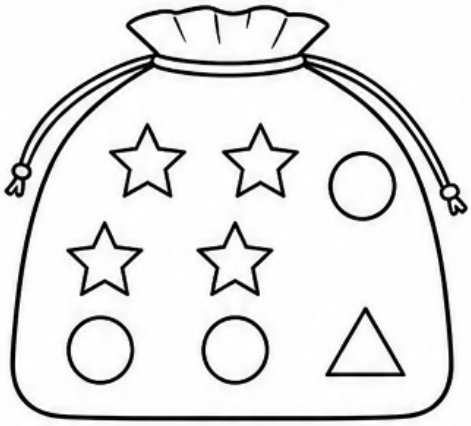
PREVIEW

Sukindi LEARNING

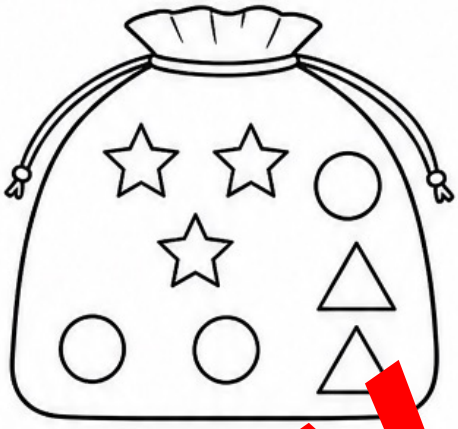
Carnival Chance Investigation - Assessment Part 1

Name: _____

At the carnival, a player draws one token from a bag. A star wins the top prize.



BAG A: 4 stars, 3 circles, 1 triangle



BAG B: 3 stars, 3 cir 2 tr ngles

Show what you kn w

1. List every possible type of token in both bag

_____

_____

2. For Bag A, which outco is mos likely? _____ Least likely? _____

3. For Bag B, whic oute ne i ost kely? _____ Least likely? _____

4. Write th nc draw g a star as a fraction.

Ba	___ / 8

Bag B	___ / 8

5. Which bag gives a better chance of a star? Explain with fractions.

_____

_____

_____

_____

6. Write one similarity and one difference between the bags.

_____

_____

_____

_____

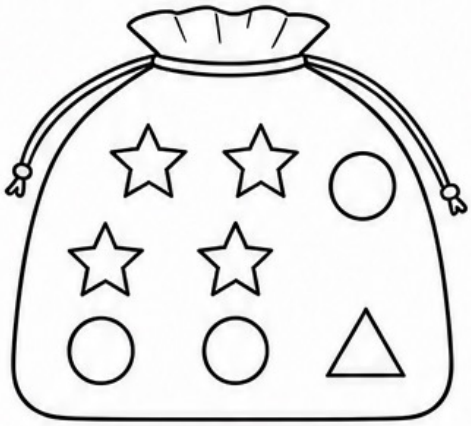
PREVIEW

Sukindi LEARNING

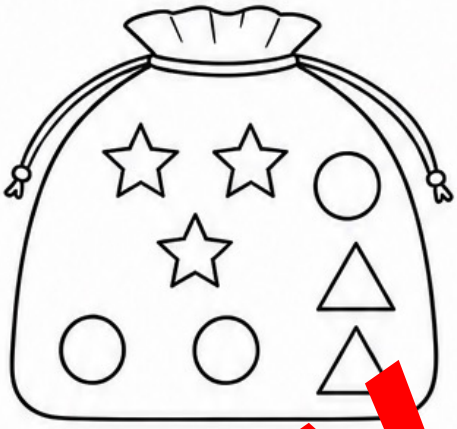
Carnival Chance Investigation - Assessment Part 1

Name: ANSWERS

At the carnival, a player draws one token from a bag. A star wins the top prize.



BAG A: 4 stars, 3 circles, 1 triangle



BAG B: 3 stars, 3 cir[illegible] 2 tr[illegible]ngles

PREVIEW

Show what you kn[illegible]w

1. List every possible type of token in both bag[illegible]

   Star, circle and triangle.

2. For Bag A, which outcom[illegible]s mos[illegible] likely? star Least likely? triangle

3. For Bag B, whi[illegible]outc[illegible]me i[illegible]nost[illegible]kely? star & circle Least likely? triangle

4. Write th[illegible]nc[illegible] draw[illegible]g a star as a fraction.

Ba[illegible]	4 / 8

Bag B	3 / 8

5. Which bag gives a better chance of a star? Explain with fractions.

   Bag A. Its chance is 4/8, which is greater than Bag B's 3/8.

6. Write one similarity and one difference between the bags.

   Similarity: both bags have 8 tokens and the same three outcome types.

   Difference: Bag A has more stars and fewer triangles.

Sukindi LEARNING

Carnival Chance Investigation - Assessment Part 2

Name: _____



Each token was replaced and the bag was mixed after every draw.
Study the results from 40 draws.



BAG	STARS	CIRCLES	TRIANGLES	TOTAL
Bag A	21	14	5	
Bag B	16	15	9	

Use evidence to explain

1. Calculate each total.

Bag A ____ Bag B ____

2. Which outcome was most and least frequent for each b[illegible]?

Bag A most: _____ le[illegible]st: _____

Bag B most: _____ le[illegible]t: _____

3. Do the results support the claim t[illegible] Bag A g[illegible] a[illegible]etter chance of a star? Explain with numbers.

4. Desc[illegible] one e[illegible]mple [illegible]ariation between expected and actual results.

5. Why does replacement make one draw independent of the next?

6. Propose a fair repeat test that another group could follow.

PREVIEW

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Carnival Chance Investigation - Assessment Part 2

Name: ANSWERS



Each token was replaced and the bag was mixed after every draw.
Study the results from 40 draws.



BAG	STARS	CIRCLES	TRIANGLES	TOTAL
Bag A	21	14	5	40
Bag B	16	15	9	40

Use evidence to explain

1. Calculate each total.

Bag A 40 | Bag B 40

2. Which outcome was most and least frequent for each bag?

Bag A most: stars least: triangles

Bag B most: stars least: triangles

3. Do the results support the claim that Bag A gives a better chance of a star? Explain with numbers.

Yes. Bag A produced 21 stars, compared with 16 stars from Bag B.

4. Describe one example of variation between expected and actual results.

Bag A expected about 20 stars but recorded 21, one more than expected.

5. Why does replacement make one draw independent of the next?

Replacement restores the same 8-token mix, so the first draw does not change the chance on the next draw.

6. Propose a fair repeat test that another group could follow.

Use the same bag for 40 draws. Replace and mix after every draw, use the same method and record every result.

PREVIEW

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Repeated Chance Experiments Rubric

Student: _____ Date: _____

BEGINNING	DEVELOPING	ACHIEVING	CONFIDENT	EXCEEDING
1. Identifying outcomes and likelihood				
Names few outcomes. ○	Names some outcomes with support. ○	Lists outcomes and compares likely and less likely. ○	Explains likelihood using fractions or counts. ○	Justifies complex comparisons and overlapping outcomes. ○
2. Conducting and recording repeated trials				
Needs support to follow a trial. ○	Completes trials; records partly. ○	Conducts fair repeat trials and records accurately. ○	Maintains controls and checks totals. ○	Refines the method and records efficiently. ○
3. Comparing variation and relationships				
States results only. ○	Notices a simple difference. ○	Compares results and describes variation. ○	Uses totals to explain patterns and relationships. ○	Evaluates evidence across multiple trials. ○
4. Explaining independent and dependent outcomes with evidence				
Cannot yet identify whether chance changes. ○	Identifies some examples with support. ○	Distinguishes independent and dependent outcomes. ○	Explains how an earlier event changes or does not change the next chance. ○	Justifies nuanced cases using evidence and fair-chance reasoning. ○

PREVIEW

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Repeated Chance Experiments

PREVIEW



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Learning Goal

Predict, repeat, record, compare and explain

to investigate chance outcomes with evidence.



PREVIEW

Possible Outcomes

An outcome is something that can happen.

Coin: Heads or tails

Dice: 1, 2, 3, 4, 5 or 6

Spinner: One of its labelled sections



PREVIEW

Likelihood Is Not Certainty

impossible → unlikely → even chance → likely → certain

A likely outcome can still fail to happen.



PREVIEW

The Experiment Cycle

PREDICT → REPEAT → RECORD → COMPARE → EXPLAIN

PREVIEW



Why Repeat?

One trial is weak evidence.

Many fair trials reveal patterns — and natural variation.



PREVIEW

Keep It Fair

Use the same chance device and method.

Change only the question you are testing.

Record every trial.



PREVIEW

Independent Outcomes

Five heads do not make tails due.

A fair coin is still 1/2 heads and 1/2 tails.

Past tosses do not control the next toss.



PREVIEW

Dependent Outcomes

A first event can change what remains.

Without replacement, the next probabilities change.



PREVIEW

Compare Repeated Results

Fair groups can get different totals.

Compare counts, describe variation and look for relationships.



PREVIEW

Games Reveal Relationships

Does going first matter?

Does a strategy change results?

Research the games before deciding.



PREVIEW

Plan an Investigation

Ask a testable question.

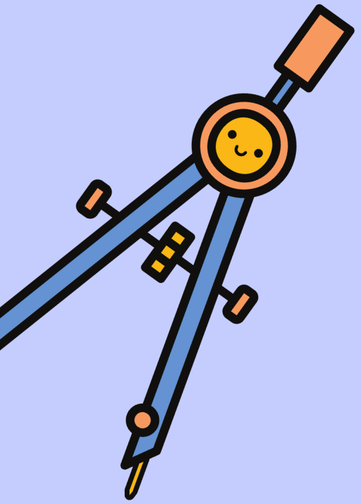
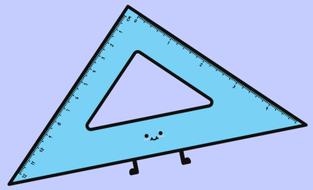
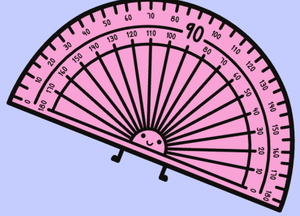
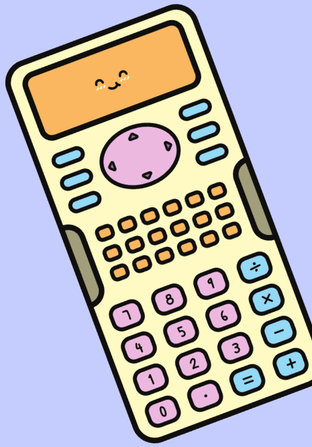
Choose enough fair trials.

Record every result.

Use the evidence to answer.

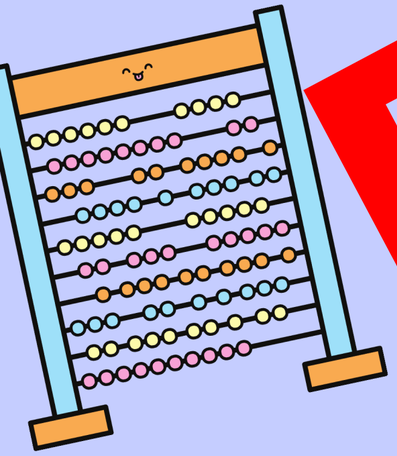


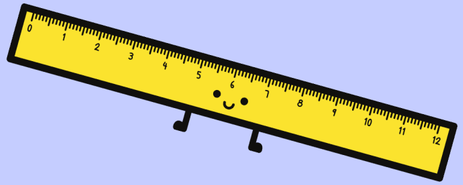
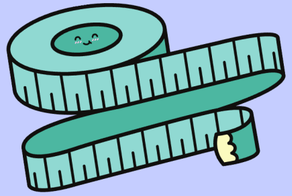
PREVIEW

Well Done!
What will you repeat,
repeat and compare?

PREVIEW



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Repeated Chance Experiments Quiz

PREVIEW



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Question 1

Why repeat a chan e e per nt?

A. Gua ntee he re ult

B. C ect evide a out outcomes

C. ange the rules each time

. Avoid recording



PREVIEW

Answer I

B. Collect evidence about outcomes.

Repeat trials give us data to compare.



PREVIEW

Question 2

True or false?

After five heads, a fair coin is more likely to land tails next.



PREVIEW

Answer 2

False

Each air coin to is independent.

The next t s is still 1/2 heads and 1/2 tails.



PREVIEW

Question 3

List every possible outcome

when rolling a standard six-sided die.

PREVIEW



Answer 3

1, 2, 3, 4, 5, and 6

PREVIEW



Question 4

Which event is dependent?

A. Tossing a fair coin twice

B. Rolling a fair die twice

C. Drawing a second counter without replacing the first

D. Spinning a fair spinner twice



PREVIEW

Answer 4

C. Drawing without replacement.

The first draw changes what remains.



PREVIEW

Question 5

Trial A: 12 heads, 8 tails

Trial B: 9 heads, 11 tails

State one similarity and one difference.

PREVIEW



Answer 5

Similarity: both trials used 20 flips and were close to even.

Difference: their exact totals varied.



PREVIEW

Question 6

T[illegible] or f[illegible]se?

Different res[illegible]s from two [illegible]repeated experiments

[illegible]dat[illegible]nat[illegible]lly prove the device is unfair.



PREVIEW

Answer 6

False

Variation is expected in repeated chance experiments.



PREVIEW

Question 7

Which is the fa re tes

A. Change e sp ner lfw

B. Use the same spin r and meth d or 40 spins; record every result

C. Sto when a favourite colour wins

D. Skip esults that look unusual



PREVIEW

Answer 7

B. Keep the conditions consistent and record every trial.

PREVIEW



Question 8

Why might a small number of trials not reflect the expected pattern?



PREVIEW

Answer 8

Chance variation is stronger in small samples.

More fair trials provide better evidence.



PREVIEW

Question 9

First players won 16 of 20 games. What is the best conclusion?

A. The first player will always win

B. Going first may matter and should be tested again

C. The game is impossible to study

D. Only the last game counts



PREVIEW

Answer 9

B. The evid ice s gge ts a l ationship.

Another repeat d s would s engthen the conclusion.



PREVIEW

Question 10

Name the five steps in the investigation cycle.

PREVIEW

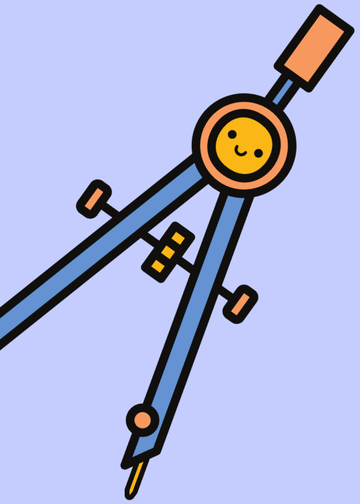
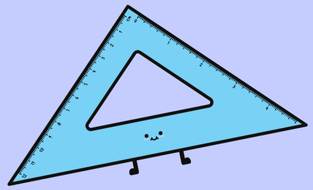
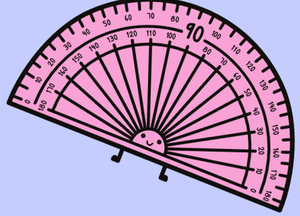
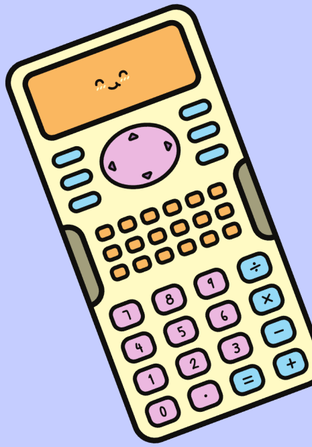


Answer 10

PREDICT → REPEAT → RECORD → COMPARE → EXPLAIN

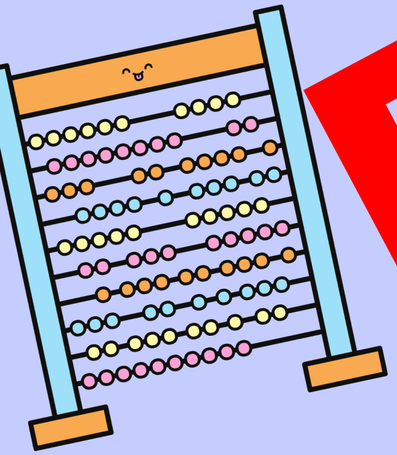
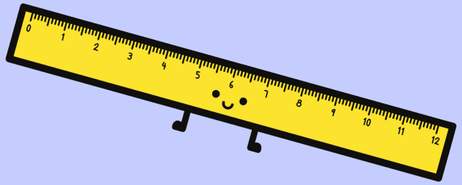
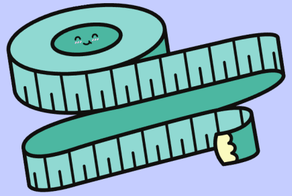
PREVIEW



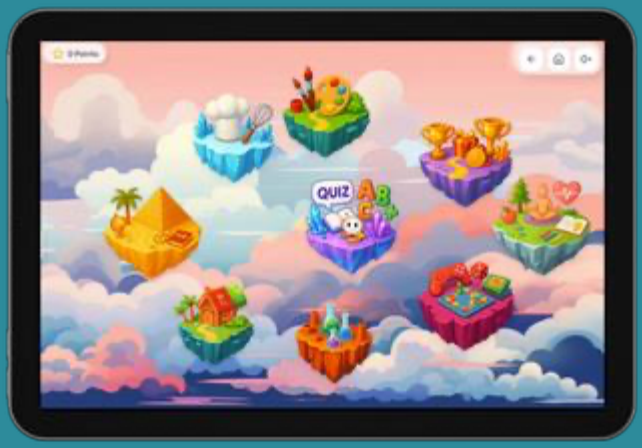





Quiz Complete!
Use evidence,
not guesses.

PREVIEW


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Conducting Repeated Chance Experiments - Year 5

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Chance Experiments at a Glance

PREVIEW

1



EVENT:
what we are investigating

2



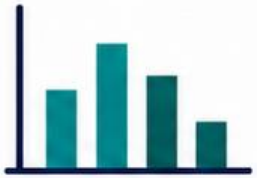
POSSIBLE OUTCOMES:
everything that could happen

3



THEORETICAL PROBABILITY:
expected chance before trials

4



EXPERIMENTAL FREQUENCY:
how often an outcome occurs

5



RELATIVE FREQUENCY:
frequency ÷ total trials

EXAMPLE 1: FAIR COIN



EVENT: getting Heads

POSSIBLE OUTCOMES	THEORETICAL PROBABILITY	EXPERIMENTAL FREQUENCY (OUT OF 10)	RELATIVE FREQUENCY
Heads	$\frac{1}{2}$	5	$\frac{5}{10} = \frac{1}{2}$
Tails	$\frac{1}{2}$	5	$\frac{5}{10} = \frac{1}{2}$

EXAMPLE 2: FAIR SIX-SIDED DIE



EVENT: rolling a 4

POSSIBLE OUTCOMES	THEORETICAL PROBABILITY	EXPERIMENTAL FREQUENCY (OUT OF 60)	RELATIVE FREQUENCY
4	$\frac{1}{6}$	10	$\frac{10}{60} =$
Not 4	$\frac{5}{6}$	50	$\frac{50}{60} = \frac{5}{6}$

EXAMPLE 3: UNEQUAL SPINNER



EVENT: landing on Blue, Green or Orange

POSSIBLE OUTCOMES	THEORETICAL PROBABILITY	EXPERIMENTAL FREQUENCY (OUT OF 40)	RELATIVE FREQUENCY
[illegible]	$\frac{1}{2}$	20	$\frac{20}{40} = \frac{1}{2}$
[illegible]	$\frac{1}{4}$	10	$\frac{10}{40} = \frac{1}{4}$
Orange	$\frac{1}{4}$	10	$\frac{10}{40} = \frac{1}{4}$

Repeat, record, compare and explain.

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Equal and Unequal Chance

EQUALLY LIKELY OUTCOMES

Outcomes have the same chance of occurring.



Heads $\frac{1}{2}$

Tails $\frac{1}{2}$

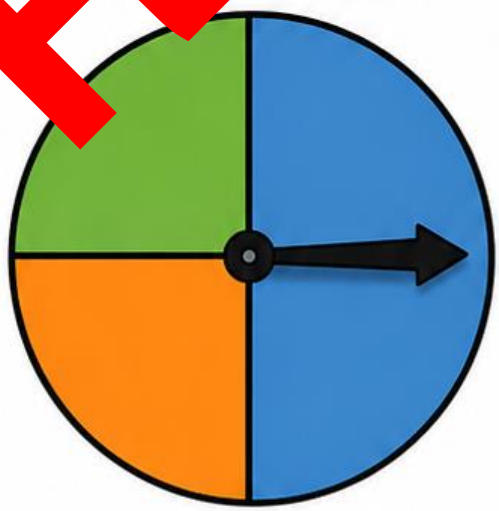


Each number: $\frac{1}{6}$

PREVIEW

UNEQUALLY LIKELY OUTCOMES

Some outcomes have a greater chance than others.



$\frac{1}{2}$

$\frac{1}{4}$

$\frac{1}{4}$

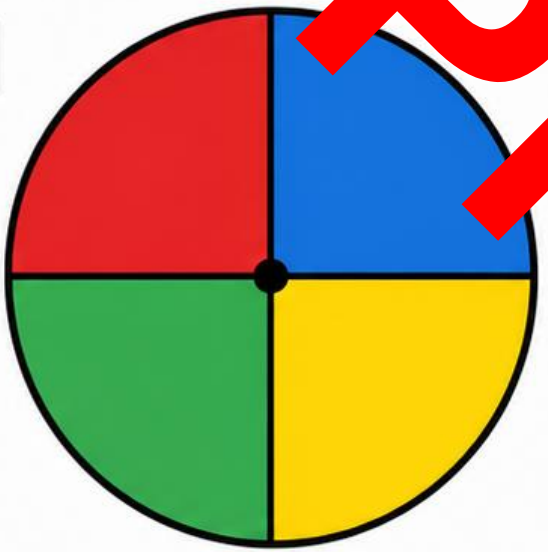
List the outcomes. Predict. Repeat the trial. Record and compare.

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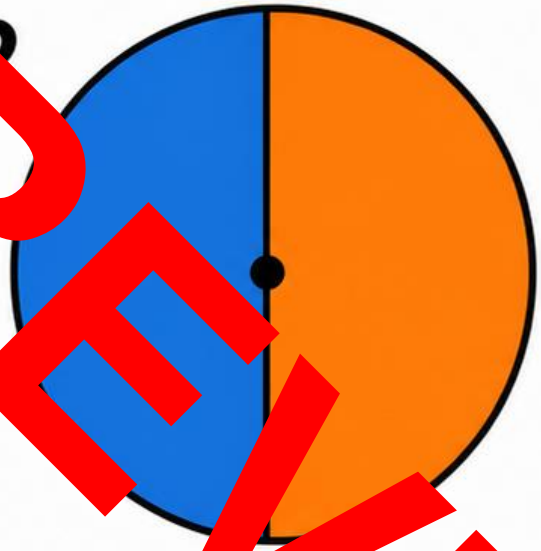
Spinner Lab: Ready-to-Use Spinners

Predict first. Spin 30 times. Record and compare.

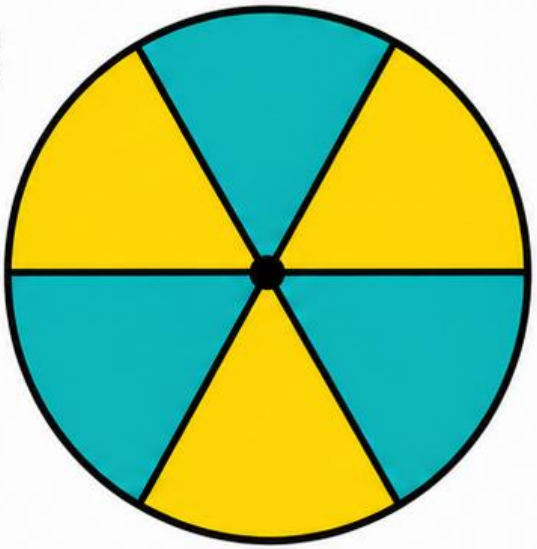
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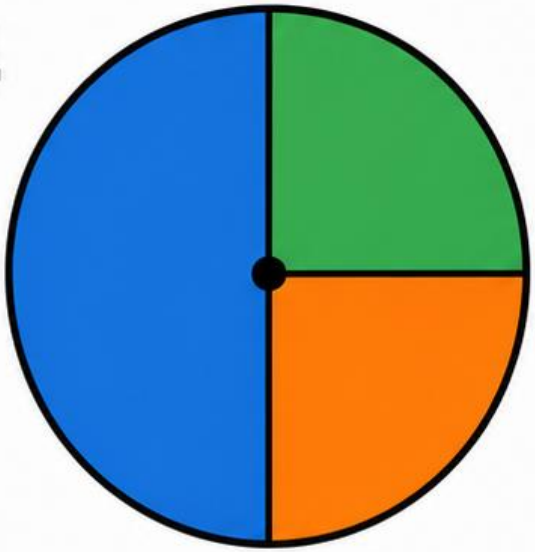
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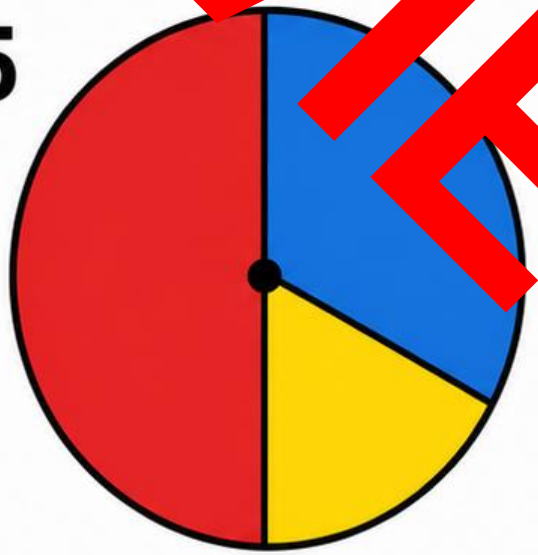
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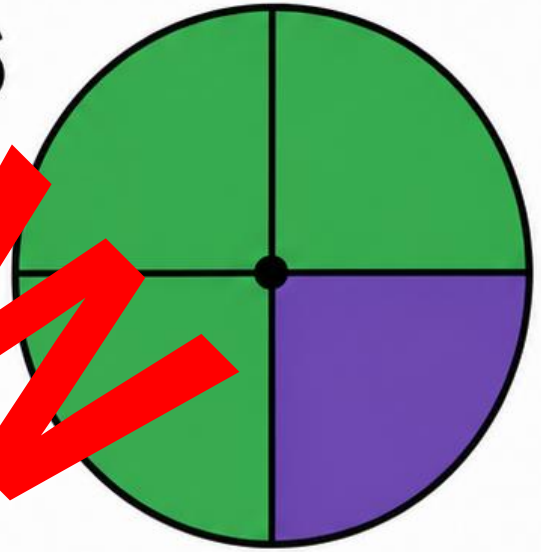
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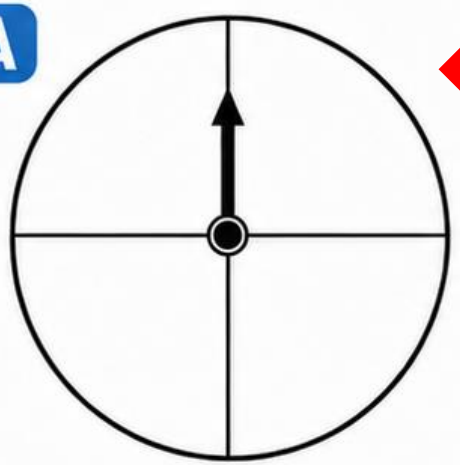
PREVIEW

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Spinner Lab: Create and Predict

Colour e[illegible] spi[illegible]edict the most and least likely outcomes. Spin 30 times and compare your results.

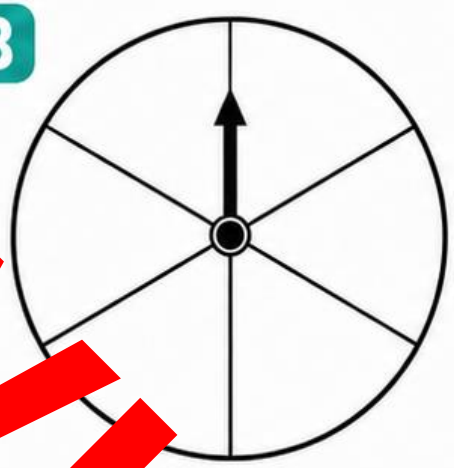
A



My pr[illegible]on:

Why:

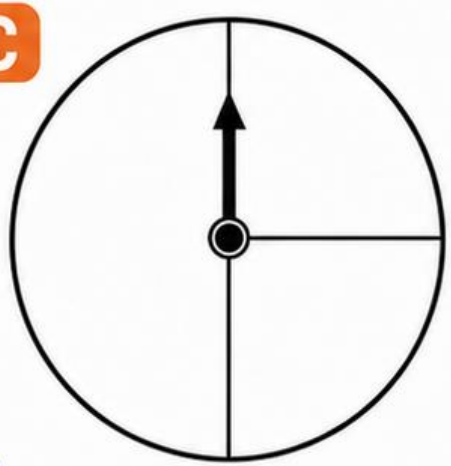
B



My prediction:

Why:

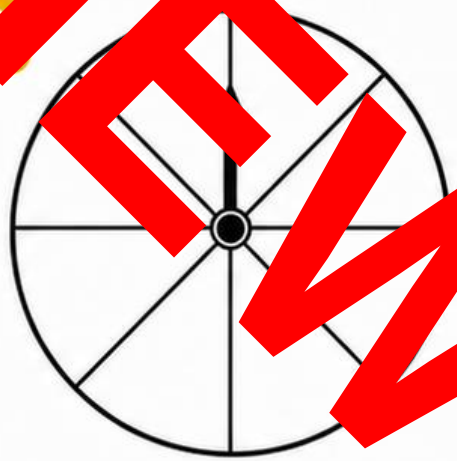
C



My prediction:

Why:

D

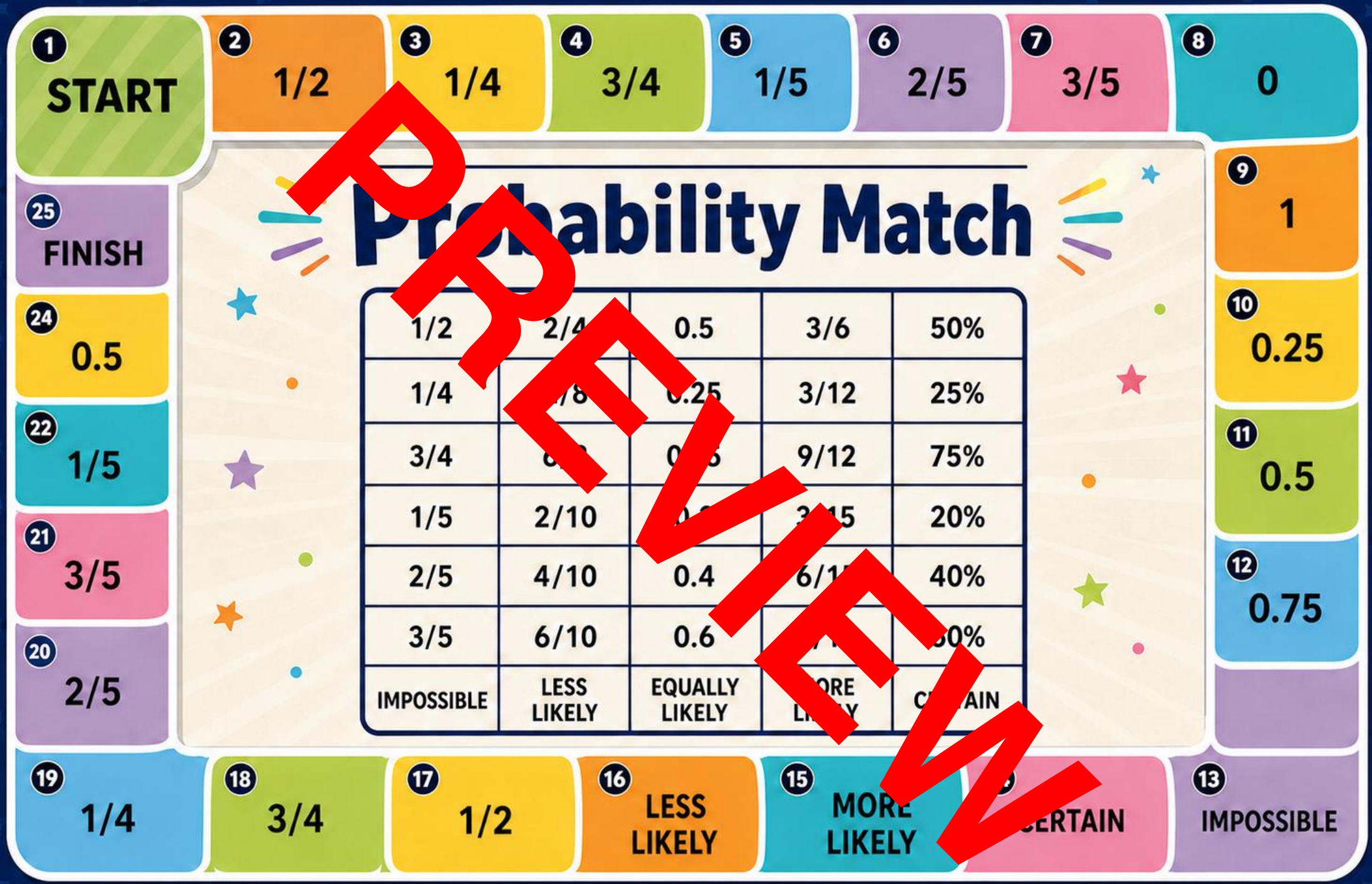


My prediction:

Why:

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Roll. Move. Cover a matching equivalent in the centre. First to cover five in a row wins.

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Probability Match: Rules and Challenge Cards

1. Each player chooses a marker.
2. Roll a die and move around the board.
3. Cover one matching equivalent in the centre.
4. The first player to cover five spaces in a row wins.

one-half	one-quarter	three-quarters
one-fifth	two-fifths	three-fifths
zero	one whole	impossible
certain	more likely	less likely

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Dice Risk Challenge

RULES

On your turn, roll one die.
Add the number to your round total.
You may **BANK** and keep the total
or **RISK** another roll.
If you roll a 1, the round total
becomes zero and your turn ends.
Play four rounds.
Highest grand total wins.



? Before each roll: What is the probability of rolling a 1? Does the previous roll change it?

Player	Round 1	Round 2	Round 3	Round 4	Grand Total

PREVIEW

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Dice Risk Challenge:
Player Score Sheet

Name: _____

ROUND 1

Roll 1	Roll 2	Roll 3	Roll 4	Roll 5	Roll 6	Roll 7	Roll	BANK or RISK?

Round total ☐ Did a 1 end the round? Yes ☐ No ☐

ROUND 2

Roll 1	Roll 2	Roll 3	Roll 4	Roll 5	Roll 6	Roll 7	Roll 8	BANK or RISK?

Round total ☐ Did a 1 the rou Yes ☐ No ☐

ROUND 3

Roll 1	Roll 2	Roll	Roll	Roll	Roll 6	Roll 7	Roll 8	BANK or RISK?

Round tota ☐ l end the round? Yes ☐ No ☐

ROUND 4

Roll	Roll	3	Roll 4	Roll 5	Roll 6	Roll 7	Roll 8	BANK or RISK?

nd total ☐ Did a 1 end the round? Yes ☐ No ☐

GRAND TOTAL ☐

When did you choose to bank? Why?

Did one roll affect the probability of the next roll? Explain.

PREVIEW

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Chance Stations: Setup and Group Score Sheet

PREVIEW

We [illegible] groups. Visit each station. Predict before testing.
Record the result. Explain whether the observed result matched the expected chance.

Station	Prediction	Result	Score	Explanation
1 Playing Cards				
2 Dice				
3 Coin Toss				
4 Marble Bag				
5 Spinners				

Which result surprised us most?

How did more trials change confidence?

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Chance Stations: Cards 1

1 PLAYING CARDS A

What is the probability of drawing a red card from a standard 52-card deck?



2 PLAYING CARDS B

What is the probability of drawing a face card (jack, queen or king) from a standard 52-card deck?



3 DICE A

Predict how many times each number will appear in 60 rolls of a fair six-sided die.



DICE B

A d was rolled 6 times:
1=8, 2=, 3=9, =11, 10, 6=10.
Which result d sults differed most from the expected fr y?



PREVIEW

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Chance Stations: Cards 2

1 COIN TOSS A

Predict the number of heads and tails in 40 tosses of a fair coin.



2 COIN TOSS B

If three heads occur in a row, is the next toss more likely to be tails? Explain.



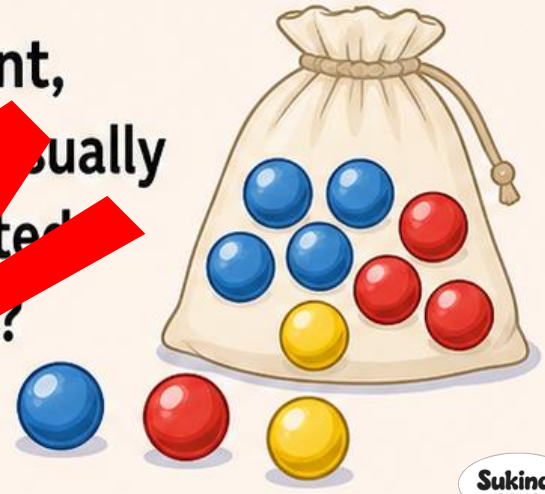
3 MARBLE BAG A

A bag has 5 blue, 3 red and 2 yellow marbles. What is the probability of each colour?



4 MARBLE BAG B

With replacement, would 50 draws usually match the expected fractions exactly? Explain.



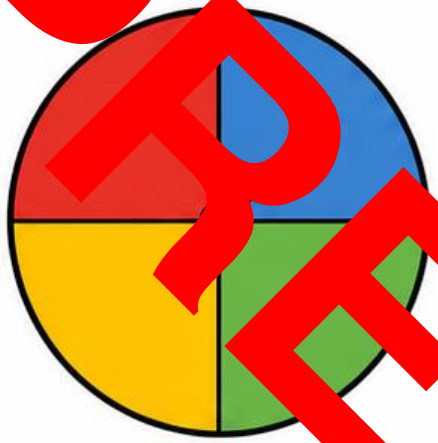
PREVIEW

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Chance Stations: Cards 3

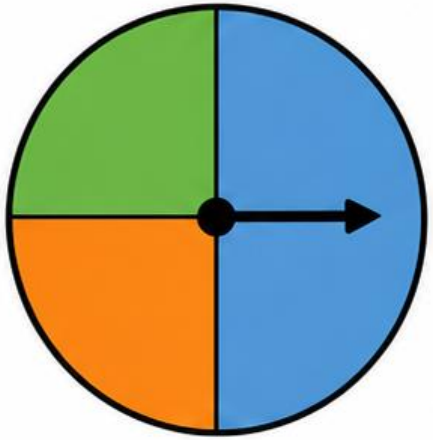
1 SPINNER A

A spinner has four equal sectors. What is the probability of each colour?



2 SPINNER B

Blue covers $\frac{1}{2}$, green covers $\frac{1}{4}$ and orange covers $\frac{1}{4}$. Which outcome is most likely?

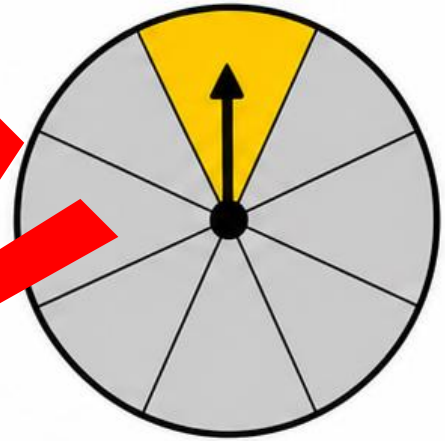


3 SAMPLE SIZE

Which result is usually more stable: 20 trials or 200 trials? Why?

4 BIASED GAME

A prize spinner has one winning sector and seven losing sectors. Is the game fair? Justify your answer.



PREVIEW

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Chance Stations: Cards 4

COMPARE RESULTS

Group A roll[illegible]8 si[illegible]0 tr[illegible]ls.
Group B rolled 12 sixes in 100[illegible]
How can both results be re[illegible]iable?





EXPLAIN VARIATION

Why do repeated samples from the same chance experiment produce different frequencies?



DESIGN A FAIR TEST

Design a repeatable chance experiment.
List the outcomes, number of trials and recording method.





JU[illegible]TIFY A PREDICTION

[illegible]has [illegible]ue, 3 red and 1 yellow counter.
[illegible]edict t[illegible]most [illegible]least likely colours and justify.

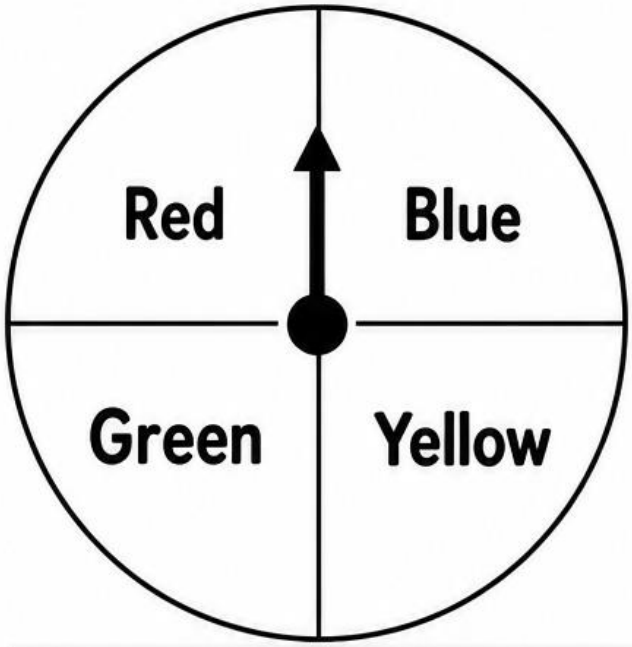


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WORKSHEET 1: SPINNER RESULTS

EXPERIMENT



PREDICTIONS (BEFORE YOU SPIN)

COLOUR	SECTOR FRACTION	PREDICTED FREQUENCY OUT OF 30
◯ Red		
◯ Blue		
◯ Green		
◯ Ye		

★ **DIRECTIONS:** Spin 30 times. Record each ult wi tally, t rite the total.

COLOUR	TALL	TOTAL
◯ Red		
◯ Blue		
◯ Green		
◯ Yellow		

★ ich c r occurred most often? _____

_____

★ Which occurred least often? _____

_____

★ Were your results exactly what you predicted? Explain. _____

_____

_____

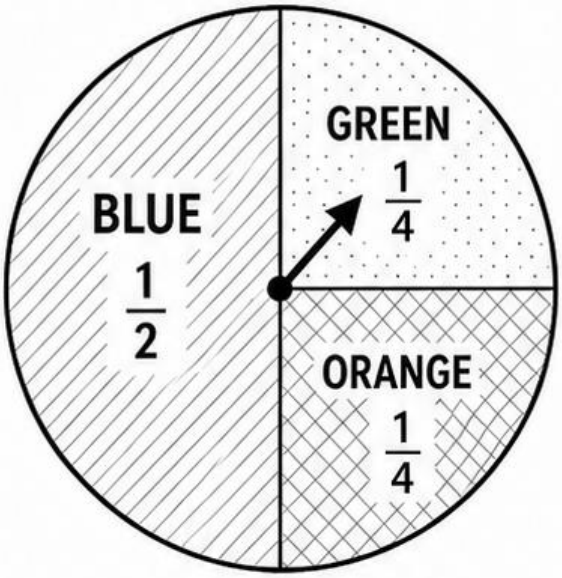
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PREVIEW

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Worksheet 1: Spinner Results - Analyse and Explain

Name: _____



In 40 spins, the results were Blue 18, Green 12, Orang[illegible]0.

1. Write the theoretical probability of each colour.

2. Write each observed result as a relative fre[illegible]ncy.

3. Which colour differed m[illegible]rom i[illegible]xpected frequency?

4. Did the exper[illegible]nt pr[illegible]pinner was unfair? Explain.

5. Predict the [illegible]roximate frequencies for 400 spins.

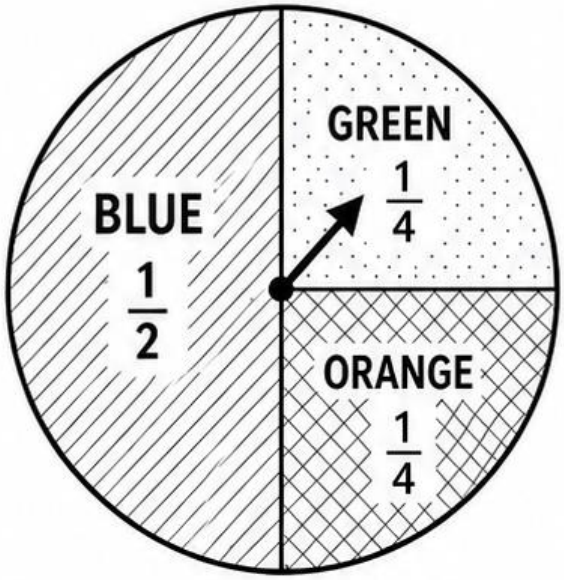
6. Why would 400 spins usually give a more stable comparison than 40 spins?

PREVIEW

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Worksheet 1: Spinner Results - Analyse and Explain

Name: ANSWERS



In 40 spins, the results were Blue 18, Green 12, Orange 10.

1. Write the theoretical probability of each colour.

Blue $\frac{1}{2}$; Green $\frac{1}{4}$; Orange $\frac{1}{4}$.

2. Write each observed result as a relative frequency.

Blue $\frac{18}{40} = \frac{9}{20} = 0.45$; Green $\frac{12}{40} = \frac{3}{10} = 0.30$; Orange $\frac{10}{40} = \frac{1}{4} = 0.25$.

3. Which colour differed most from its expected frequency?

Blue and Green each differ from the expected frequency by 2 spins.

4. Did the experiment prove the spinner was unfair? Explain.

No. Random variation in 40 spins does not prove the spinner is unfair.

5. Predict the approximate frequencies for 400 spins.

About 200 blue, 100 green and 100 orange.

6. Why would 400 spins usually give a more stable comparison than 40 spins?

A larger sample reduces the effect of chance variation, so relative frequencies usually sit closer to the theoretical probabilities.

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WORKSHEET 2: PLAYING CARD CHANCE EXPERIMENT

EXPERIMENT INSTRUCTIONS



Use a standard shuffled deck. Draw one card, record it, replace it, and shuffle again. Repeat for 20 trials.

PREDICTION

Most likely colour: _____

Most likely suit: _____

Chance of drawing an ace: _____

TRIAL	CARD DRAWN	COLOUR	SUIT	ACED?
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

OUTCOME	TALLY	TOTAL
Red		
Black		
Hearts		
Diamonds		
Clubs		
Spades		
Aces		
Face cards		

What pattern did you notice?

_____

_____

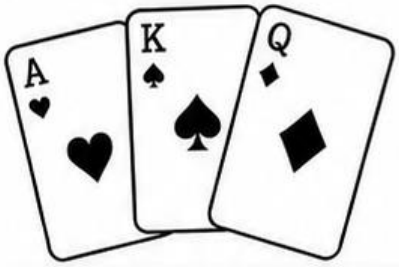
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Worksheet 2: Playing Card Chance - Analyse

Name: _____



52 cards: 26 red, 26 black, 13 hearts, 12 face cards, 4 aces.

A group made 20 draws with replacement: 11 red, 9 black, 5 hearts and 4 face cards.

1. What is the theoretical probability of drawing a red card?

_____

2. What is the theoretical probability of drawing a black card?

_____

3. What is the theoretical probability of drawing a heart?

_____

4. What is the theoretical probability of drawing a face card?

_____

5. What is the theoretical probability of drawing an ace?

_____

6. Compare the observed frequencies with the expected probabilities.

_____

_____

_____

7. How could the results change if cards were not replaced after each draw?

_____

_____

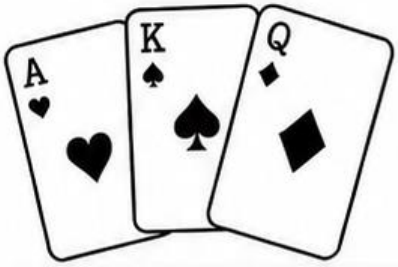
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PREVIEW

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Worksheet 2: Playing Card Chance - Analyse

Name: ANSWERS



52 cards: 26 red, 26 black, 13 hearts, 12 face cards, 4 aces.

A group made 20 draws with replacement: 11 red, 9 black, 5 hearts and 4 face cards.

1. What is the theoretical probability of drawing a red card?

26/52 = 1/2

2. What is the theoretical probability of drawing a black card?

26/52 = 1/2

3. What is the theoretical probability of drawing a heart?

13/52 = 1/4

4. What is the theoretical probability of drawing a face card?

12/52 = 3/13

5. What is the theoretical probability of drawing an ace?

4/52 = 1/13

6. Compare the observed frequencies with the expected probabilities.

Red: 11/20 = 0.55 (slightly above 0.5); black: 9/20 = 0.45 (slightly below 0.5); hearts: 5/20 = 0.25 (matches); face cards: 4/20 = 0.20 (close to 3/13).

7. How could the results change if cards were not replaced after each draw?

Without replacement, the deck composition changes after each draw, so later probabilities depend on the cards already removed.

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WORKSHEET 3: COIN TOSS COMPARISONS



EXPERIMENT



LEARNING PURPOSE:
Compare repeated trials and look for variation.

PREDICTION



In 20 tosses, I predict Heads: ____ Tails: ____

Will every round match? Why or why not?

_____

Toss one fair coin 20 times in each round. Record a tally and total.
Complete three rounds.

ROUND AND OUTCOME	TALLY	TOTAL OUT OF 20	RELATIVE FREQUENCY
Round 1 Heads			
Round 1 Tails			
Round 2 Heads			
Round 2 Tails			
Round 3 Heads			
Round 3 Tails			

TOTALS: All rounds: Heads ___ / 60 Tails ___ / 60

1. Which round was closest to equal?

_____

_____

2. Describe one difference between the rounds.

_____

_____

PREVIEW

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WORKSHEET 3:
COIN TOSS COMPARISONS

ANALYSE AND EXPLAIN

For a fair coin, $P(\text{Heads}) = \frac{1}{2}$ and $P(\text{Tails}) = \frac{1}{2}$.

1. How did your three rounds differ?

2. Which round was closest to the theoretical 10 Hea nd 10 Tails?

3. Calculate the relative frequency of Heads ross a tosses.

4. Did a run of the same o prove t coin was unfair? Explain.

5. W 0 tos sually be closer to $\frac{1}{2}$ than 20 tosses? Why?

6. Write a conclusion using the words **variation**, **relative frequency** and **sample size**.

CHALLENGE

If Heads occurred 312 times in 600 tosses, what was its relative frequency?

PREVIEW

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WORKSHEET 3: COIN TOSS COMPARISONS

ANALYSE AND EXPLAIN

ANSWERS — SAMPLE RESULTS

For a fair coin, $P(\text{Heads}) = \frac{1}{2}$ and $P(\text{Tails}) = \frac{1}{2}$.

1 How did your three rounds differ?

Sample rounds: 12H/8T, 10H/10T and 9H/11T; the totals varied.

2 Which round was closest to the theoretical 10 Heads and 10 Tails?

Round 2; it was exactly 10 Heads and 10 Tails.

3 Calculate the relative frequency of Heads across all 60 tosses.

31/60 ≈ 0.517.

4 Did a run of the same outcome show the coin was unfair? Explain.

No. Short runs can occur by chance and do not prove unfairness.

5 Would 60 tosses usually be closer to $\frac{1}{2}$ than 20 tosses? Why?

Yes. A larger sample usually reduces variation and approaches $\frac{1}{2}$.

6 Write a conclusion using the words **variation**, **relative frequency** and **sample size**.

As sample size increases, relative frequency usually moves closer to $\frac{1}{2}$, although variation still occurs.

CHALLENGE

If Heads occurred 312 times in 600 tosses, what was its relative frequency?

312/600 = 0.52.

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WORKSHEET 4: EQUAL AND UNEQUAL DICE EXPERIMENT

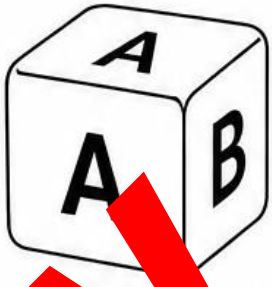
SETUP

Die A is a standard fair die with faces 1, 2, 3, 4, 5, 6.

Die B has labelled faces A, A, A, B, C, D.



DIE A



PREDICTION

Most likely on Die A: _____

Most likely on Die B: _____ because _____

Roll each die 30 times. Tally each result and calculate the relative frequency.

TABLE 1: DIE A — EQUAL CHANCES

OUTCOME	TALLY	TOTAL	RELATIVE FREQUENCY
1			
2			
3			
4			
5			
6			

TABLE 2: DIE B — UNEQUAL CHANCES

OUTCOME	FACE FRACTION	TALLY	TOTAL
A			
B			
C			
D			

Was Die A close to equal? _____

_____

How did Die B show unequal chances? _____

_____

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WORKSHEET 4: EQUAL AND UNEQUAL DICE

ANALYSE AND EXPLAIN

Die A



Die A: each outcome has probability $\frac{1}{6}$.

Die B

A	A	A	B	C	D

Die B faces: A, A, A, B, C, D, so $P(A) = \frac{1}{2}$ and $P(B) = P(C) = P(D) = \frac{1}{6}$.

1. Compare your most and least frequent outcomes for Die A.

2. Why might Die A totals differ even though the chanc[illegible]?

3. Which Die B outcome should occu[illegible] often[illegible]xplain using a fraction.

4. Compare the [illegible]ntal r[illegible]e f[illegible]uency of A with $\frac{1}{2}$.

5. [illegible]ow cou[illegible]you dec[illegible]whether a die is probably biased?

6. Write a conclusion comparing equal and unequal chance experiments.

CHALLENGE

Predict the expected frequencies for Die B in 120 rolls.

PREVIEW

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WORKSHEET 4: EQUAL AND UNEQUAL DICE

ANALYSE AND EXPLAIN

ANSWERS — SAMPLE RESULTS

Die A



Die A: each outcome has probability $\frac{1}{6}$.

Die B

A	A	A	B	C	D

Die B faces: A, A, A, B, C, D, so $P(A) = \frac{1}{2}$ and $P(B) = P(C) = P(D) = \frac{1}{6}$.

1 Compare your most and least frequent outcomes for Die A.

Sample: 4 was most frequent (7); 2 was least frequent (

2 Why might Die A totals differ even though the outcomes are equal?

Random variation occurs in a small set of rolls.

3 Which Die B outcome should occur most often? Explain using a fraction.

A, because 3 of the 6 faces are A, so P(A)=3/6=1/2.

4 Compare experimental relative frequency of A with $\frac{1}{2}$.

Sample: 16/30 = 0.533, which is close to 1/2.

5 How could you decide whether a die is probably biased?

Roll many times and compare relative frequencies with the expected probabilities.

6 Write a conclusion comparing equal and unequal chance experiments.

Equal outcomes share the same theoretical chance; unequal outcomes do not.

Experimental results vary but usually approach those chances with more trials.

CHALLENGE

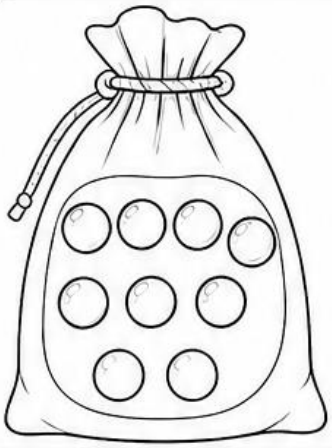
Predict the expected frequencies for Die B in 120 rolls.

A: 60; B: 20; C: 20; D: 20.

PREVIEW

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WORKSHEET 5: MARBLE PULL EXPERIMENT



Bag contents:
5 red marbles,
3 blue marbles,
2 yellow marbles
(10 total).

PROBABILITY REFERENCE TABLE		
COLOUR	FRACTION OF BAG	PREDICTED OUT OF 40
Red		
Blue		
Yellow		

Without looking, draw one marble, rec[illegible]its co[illegible], replace it, and mix the bag. Repeat for 40 trials.

COLOUR	TALLY	TOTA[illegible]	RELATIVE FREQUENCY
Red			
Blue			
Yellow			

After [illegible]rials

M[illegible]t frequ[illegible]lour: _____

Re[illegible]e frequ[illegible]y: _____

After 40 trials

Most frequent colour: _____

Relative frequency: _____

1. Did [illegible]most common colour match your prediction?

2. Why must the marble be replaced each time?

PREVIEW

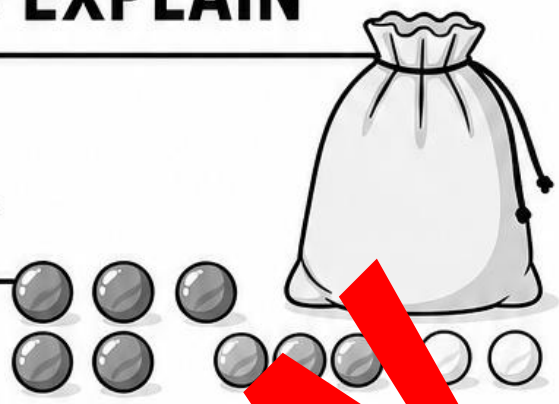
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WORKSHEET 5: MARBLE PULL

ANALYSE AND EXPLAIN

Bag: 5 red, 3 blue, 2 yellow.

$P(\text{Red}) = \frac{1}{2}$, $P(\text{Blue}) = \frac{3}{10}$, $P(\text{Yellow}) = \frac{1}{5}$.



1. Which colour had the greatest theoretical chance? Explain.

2. Compare your experimental relative frequencies with the theoretical probabilities.

3. Why might 40 pulls not match the exact expected frequencies?

4. What would change if you did not replace each marble?

5. Predict the expected numbers of red, blue and yellow in 200 pulls with replacement.

6. Write a conclusion about how repeated trials can estimate probability.

CHALLENGE

If 18 of 40 pulls were red, how far was the relative frequency from $\frac{1}{2}$?

PREVIEW

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WORKSHEET 5: MARBLE PULL

ANALYSE AND EXPLAIN

ANSWERS – SAMPLE RESULTS

Bag: 5 red, 3 blue, 2 yellow.

$P(\text{Red}) = \frac{1}{2}$, $P(\text{Blue}) = \frac{3}{10}$, $P(\text{Yellow}) = \frac{1}{5}$.



1 Which colour had the greatest theoretical chance? Explain.

Red; 5 of 10 marbles are red, so $P(\text{Red}) = \frac{1}{2}$.

2 Compare your experimental relative frequencies with the theoretical probabilities.

Sample: Red $\frac{19}{40} = 0.475$, Blue $\frac{13}{40} = 0.325$, Yellow $\frac{8}{40} = 0.20$; all are close to the theoretical values.

3 Why might 40 pulls not match the exact expected frequencies?

Random variation occurs in a sample of 40 pulls.

4 What would change if you did not replace each marble?

The bag composition and probabilities would change after each pull.

5 Predict the expected numbers of red, blue and yellow in 200 pulls with replacement.

Red 100, Blue 60, Yellow 40.

6 Write a conclusion about how repeated trials can estimate probability.

With many repeated trials, relative frequencies usually approach the theoretical probabilities.

CHALLENGE

If 18 of 40 pulls were red, how far was the relative frequency from $\frac{1}{2}$?

$\frac{18}{40} = 0.45$; it is 0.05 below $\frac{1}{2}$.

PREVIEW

Sukindi LEARNING

ASSESSMENT: REPEATED CHANCE EXPERIMENTS

PART A — CONCEPTS AND CALCULATIONS

Name: _____ Date: _____

Preview

1. Which word ... an ... that ... ? [1]

(A) impos...ble (B) u...like... (C) ...like... (D) ce...in

2. Write the probability of Heads on a fair coin as a fraction. [1]



_____

3. A fair spinner has 4 equal sections; 3 are blue.
Write $P(\text{Blue})$. [1]



_____

4. True or False: Experimental results must exactly match theoretical probability. [1]

TRUE FALSE

5. In 50 rolls, a 6 appeared 9 times.
Write its relative frequency as a fraction. [1]



_____

Preview

6. Which samp... is mor... reli...le for ...stima...ing ...roba...ity ...20 t...als o... 50... trial... [1]
Explain brief...

_____

7. A bag has 2 red and 8 green counters.
Which colour is more likely? [1]

○○ ○○○○○○○○

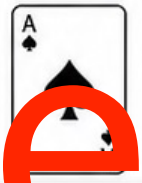
_____

8. Explain the difference between theoretical probability and experimental relative frequency. [1]

_____

_____

9. A card is dra... and replaced.
State why re...acemen... matters. [1]



_____

Preview

10. Circle the fa... experiment... [1]

a balanced coin tossed 100 times

OR

a coin placed Heads-up each trial

PART A: ____ / 10

Sukindi LEARNING

ASSESSMENT: REPEATED CHANCE EXPERIMENTS

PART B — DATA, REASONING AND DESIGN

Preview

TASK 1 — INTERPRET DATA [5 marks]

Outcome	A	B	C	D
Frequency in 80 spins	36	22	14	8

a) Identify the most likely experimental outcome. _____ [1]

b) Write the relative frequency of outcome B. _____ [1]

c) Order the outcomes from least likely to most likely. _____ [1]

d) Explain whether or not equal chance is supported by this data. [2]

_____

_____

TASK 2 — COMPARE SAMPLES [4 marks]

Class 1 tossed a coin 20 times: 14 Heads. Class 2 tossed a coin 200 times: 106 Heads.

a) Calculate the relative frequency of Heads for Class 1 and for Class 2. [2]

Class 1: _____ Class 2: _____

b) Which result is closer to $\frac{1}{2}$? Explain why larger samples often help. [2]

_____

_____

TASK 3 — DESIGN A FAIR TEST [6 marks]

Design an experiment to test whether a six-sided die is fair.

Prediction [1]

_____

Method
Include at least 60 rolls
[2]

_____

_____

Results table
[1]

Face	1	2	3	4	5	6	Total
Frequency							

(Add tally marks first, then totals.)

How you will decide [2]

_____

_____

PART B:	____ / 15
TOTAL:	____ / 25

Sukindi LEARNING

ASSESSMENT: REPEATED CHANCE EXPERIMENTS

PART A — CONCEPTS AND CALCULATIONS ANSWERS

Name: _____ Date: _____

Preview

1. Which word describes an outcome that cannot happen? [1]

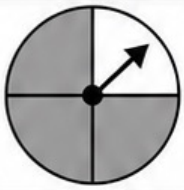
(A) impossible (B) unlikely (C) likely (D) certain

2. Write the probability of Heads on a fair coin as a fraction. [1]



1/2

3. A fair spinner has 4 equal sections; 3 are blue. Write $P(\text{Blue})$. [1]



3/4

4. True or False: Experimental results must exactly match theoretical probability. [1]

TRUE (FALSE)

5. In 50 rolls, a 6 appeared 9 times. Write its relative frequency as a fraction. [1]



9/50

Preview

6. Which sample is more reliable for estimating probability: 20 trials or 500 trials? Explain briefly. [1]

500 trials; a larger sample usually gives a more reliable estimate.

7. A bag has 2 red and 8 green counters. Which colour is more likely? [1]

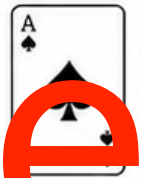


Green

8. Explain the difference between theoretical probability and experimental relative frequency. [1]

Theoretical probability is predicted from possible outcomes; experimental relative frequency comes from observed trials.

9. A card is drawn and replaced. State why replacement matters. [1]



Replacement keeps the possible outcomes and probabilities the same each draw.

Preview

10. Circle the fair experiment. [1]

(a balanced coin tossed 100 times) OR (a coin placed Heads-up each trial)

PART A: 10 / 10

Sukindi LEARNING

ASSESSMENT: REPEATED CHANCE EXPERIMENTS

PART B — DATA, REASONING AND DESIGN

ANSWERS — SAMPLE RESPONSE

Preview

TASK 1 — INTERPRET DATA [5 marks]

Outcome	A	B	C	D
Frequency in 80 spins	36	22	14	8

a) Identify the most likely experimental outcome. A [1]

b) Write the relative frequency of outcome B. 22/80 = 11/40 = 0.275 [1]

c) Order the outcomes from least likely to most likely. D, C, B, A [1]

d) Explain whether or not equal chance is supported by this data. No. Equal chance would be about 20 each; the frequencies differ greatly. [2]

TASK 2 — COMPARE SAMPLES [4 marks]

Class 1 tossed a coin 20 times: 14 Heads. Class 2 tossed a coin 200 times: 106 Heads.

a) Calculate the relative frequency of Heads for Class 1 and for Class 2. [2]

Class 1: 14/20 = 0.70 Class 2: 106/200 = 0.53

b) Which result is closer to $\frac{1}{2}$? Explain why larger samples often help. [2]

Class 2 is closer to 1/2. Larger samples usually reduce random variation.

TASK 3 — DESIGN A FAIR TEST [6 marks]

Design an experiment to test whether a six-sided die is fair.

Prediction [1]

Each face will occur about 1/6 of the rolls.

Method *Include at least 60 rolls.* [2]

Roll the same die at least 60 times in the same way; tally every result.

Results table Headings [1]

Face	1	2	3	4	5	6	Total
Frequency	11	9	10	8	12	10	60

(Add tally marks first, then totals.)

How you will decide [2]

Compare each relative frequency with 1/6; large repeated differences may suggest bias.

Preview

Preview

PART B: 15 / 15

TOTAL: 25 / 25

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REPEATED CHANCE EXPERIMENTS — ASSESSMENT RUBRIC

PREVIEW





Student: _____ **Date:** _____

CRITERION	BEGINNING	DEVELOPING	ACHIEVING	CONFIDENT	EXCEEDING
1. Theoretical probability	Needs substantial support to identify outcomes. Ideas are limited or inaccurate.	Identifies some outcomes with support. Probability ideas partially correct.	Lists all equally likely outcomes and calculates theoretical probabilities correctly and independently.	Calculates theoretical probabilities accurately and explains reasoning clearly.	Explains theoretical probability with insight and applies ideas to new situations.
2. Conducting repeated experiments	Needs substantial support to follow steps. Repeats are too few or not fair.	Follows steps with some support. Repeats are done but may not be fair or consistent.	Conducts a fair experiment. Uses a suitable number of repeats independently.	Plans and runs a fair experiment carefully. Chooses an appropriate number of repeats and justifies it.	Plans efficient experiments and justifies choices. Adapts methods and applies to new situations.
3. Recording and calculating relative frequency	Needs substantial support to record results. Calculations are usually incorrect or missing.	Records some results. Calculates relative frequency with some support. Errors remain.	Records results clearly. Calculates relative frequency correctly and independently.	Organises data clearly and calculates relative frequency accurately and independently.	Uses efficient methods and checks accuracy. Calculates in different ways and explains choices.
4. Comparing results and explaining variation	Comparisons need substantial support. Explanation of variation is limited or missing.	Makes simple comparisons with support. Explains variation with limited detail.	Compares theoretical and experimental results. Explains variation using appropriate ideas.	Explains variation clearly using data and mathematical ideas.	Explains variation in depth using evidence. Connects results to other contexts or ideas.
5. Reasoning, fairness and conclusions	Conclusions need substantial support. Fairness ideas are limited.	States a conclusion with some support. Recognises basic fairness.	Draws a supported conclusion. Explains fairness and makes reasonable statements.	Draws well-justified conclusions. Explains fairness in depth.	Draws insightful conclusions. Justifies ideas with strong reasoning and applies to new contexts.

TOTAL: ____ / 25

STRENGTH

NEXT STEP

KEY: Achieving indicates the expected Year 5 standard for this unit.

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Conducting Repeated Chance Experiments

PREVIEW



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Learning Focus

- Predict outcomes before collecting data.
- Conduct the same chance experiment many time
- Record frequencies accurately
- Compare experimental resu with th retical p bility.
- Explain variation mpl .

PREVIEW



Key Language

Chance experiment — an action with an uncertain result

Event — an outcome or group of outcomes we are interested in.

Outcome — one possible result.

Trial — one repetition of the experiment

PREVIEW



Expected and Observed

Theoretical probability predicts likelihood from th[illegible]os[illegible]e ou[illegible]es.

Experimental frequency counts w[illegible]actual[illegible]app[illegible]s.

Relative frequenc[illegible]ncy[illegible]tal number of trials.

PREVIEW



Predict Before You Test

1. List all possible outcomes.
2. Decide whether the outcomes are equally likely.
3. Write a probability or expected frequency.
4. Test the prediction with repeated trials.

PREVIEW



A Fair Coin

Possible outcomes: Heads and Tails.

P(Heads) = 1/2 P(Tails) = 1/2

In 20 tosses, 10 He... ...pecte... but another total can occur.



PREVIEW

Relative Frequency

If Heads occurs 18 times in 30 tosses:

relative frequency of Heads = 18/3[illegible]/5 = 0[illegible]

It describes the ob[illegible]sult[illegible]d guarantee for the next toss.



PREVIEW

Why Samples Vary

Two groups can repeat the same fair experiment and record different totals.

Random variation is expected.

A short streak is normal and does not prove the equipment is unfair.



PREVIEW

Sample Size Matters

Small samples can vary widely.

As the number of trials increases, relative frequencies usually become more stable and move closer to theoretical probabilities.

They do not need to match exactly.



PREVIEW

A Fair Six-Sided Die

Outcomes: 1, 2, 3, 4, 5, 6

Each outcome has probability 1/6.

An even number has probability 3/6 = 1/2.

PREVIEW



Unequal Outcomes

Imagine a die labelled A, A, A, B, C, D.

$p(A) = 3/6 = 1/2$

$p(B) = p(C) = p(D) = 1/6$

A should occur most often over many rolls.

PREVIEW



Fair or Biased?

A fair spinner gives equal-sized regions to outcom[illegible] m[illegible]t to [illegible] equal chances.

A biased spinner gives some outc[illegible]s a gr[illegible]r ch[illegible]nce.

Use design eviden[illegible]pend[illegible]esults together.

PREVIEW



Playing Cards

A standard deck has 52 cards.

p(red) = 26/52 = 1/2

p(heart) = 13/52 = 1/4

p(ace) = 4/52 = 1/1

p[illegible]ese probabilities constant.



PREVIEW

Marbles With Replacement

Bag: 5 red, 3 blue, 2 yellow marbles.

P(red) = 1/2 P(blue) = 3/10 P(

Replace and mix

each trial begins the same way.



PREVIEW

Without Replacement

When an item is not replaced, the bag or deck co[illegible]osi[illegible] cha[illegible]s.

The probabilities for the next trial [illegible]ge to

Trials are no longe[illegible] unde[illegible]ntical conditions.

PREVIEW



Compare Results

Ask:

- Which outcome occurred most and least often?
- How close were relative frequencies to theoretical probabilities?
- What variation appeared between rounds or groups?
- Would more trials refine our estimate?



PREVIEW

Design a Fair Test

- State a prediction.
- Use the same equipment and method every trial.
- Complete a suitable number of trials.
- Record every result in a tally or table.
- Compare relative frequencies with expected probabilities.

PREVIEW



Review

PREDICT possible results.

REPEAT the chance experiment.

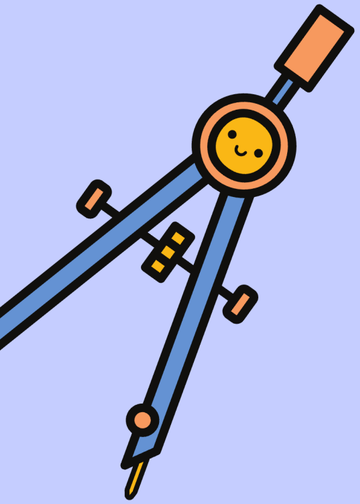
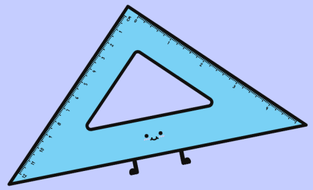
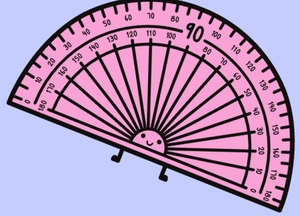
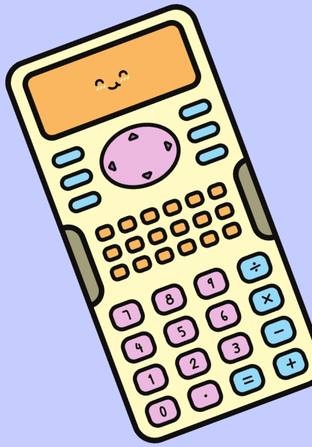
RECORD frequencies accurately.

COMPARE observed and exp d resul

EXPLAIN variation effe sample size.

PREVIEW

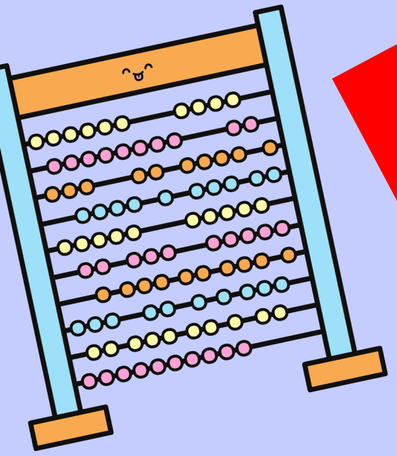
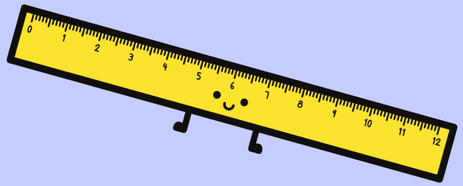
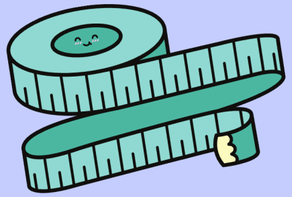


Well Done

Now conduct your own repeated chance experiments.

PREVIEW


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Repeated Chance Experiments Quiz

PREVIEW



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Question 1 - True or False

A chance experiment can have known possible outcomes even though the next result is unknown.

TRUE or FALSE?

PREVIEW



Answer 1

TRUE

We can list the possible outcomes [illegible] we [illegible] know which one will occur next.



PREVIEW

Question 2 - Multiple Choice

What is the theoretical probability of rolling an even number on a fair six-sided die?

A. 1/6

B. 1/3

C. 1/2

D. 2/3

PREVIEW



Answer 2

C. 1/2

The even outcomes are 2, 4 and 6. The probability is 3/6 = 1/2

PREVIEW



Question 3 – Short Answer

A coin lands Heads 18 times in 30 tosses.

What is the experimental relative f[illegible]uency [illegible]ea[illegible]?

PREVIEW



Answer 3

18/30 = 3/5 = 0.6

PREVIEW



Question 4 - Multiple Choice

Which spinner is biased?

A. Four equal colour sections

B. Two equal halves

C. Eight equal nu ctio

D. Sections size /2, 1/4 and

PREVIEW



Answer 4

D

The sections are unequal, so the outcomes do not have equal chances.



PREVIEW

Question 5 - True or False

Ten Heads in a row is impossible when tossing a fa co

TRUE or FALSE?

PREVIEW



Answer 5

FALSE

A long streak is unlikely, but it is p[illegible]ble.

PREVIEW



Question 6 – Short Answer

Two groups use the same fair spinner for 30 trials and obtain different totals.

Why can this happen?

PREVIEW



Answer 6

Random variation occurs in repeated chance exp[illegible]me[illegible] esp[illegible]g with smaller samples.

PREVIEW



Question 7 – Multiple Choice

What usually happens when trials increase from [illegible] to [illegible]?

A. Variation becomes impossible

B. Relative frequencies becom[illegible]more st[illegible]ble

C. Every outcome [illegible]qual[illegible]

D. Theoretical p[illegible]babilit[illegible]nange[illegible]

PREVIEW



Answer 7

B. Relative frequencies become more stable.

A larger sample usually gives a b estim of t oretic robability.

PREVIEW



Question 8 - Short Answer

What is the probability of drawing a red card from a standard card deck?

PREVIEW



Answer 8

26/52 = 1/2

PREVIEW



Question 9 - True or False

Replacing a marble after every pull keeps the bag composition and probabilities constant.

TRUE or FALSE?

PREVIEW



Answer 9

TRUE

Each trial begins with the same set of possible outcomes.

PREVIEW



Question 10 - Multiple Choice

Which procedure is the fairest test of a die?

A. Roll until a 6 appears

B. Roll 100 times in the same way and record every result

C. Ignore results that are not the same

D. Change dice halfway through

PREVIEW



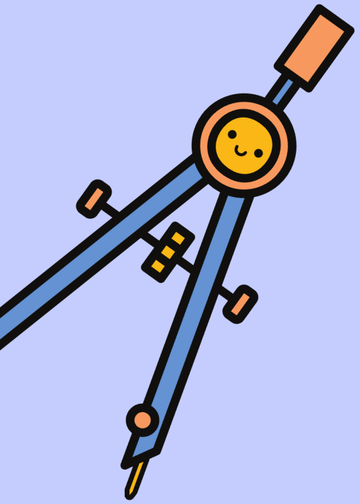
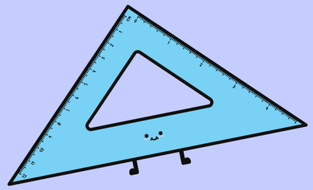
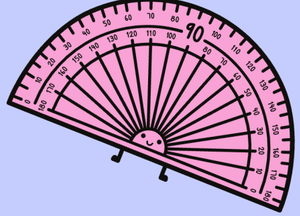
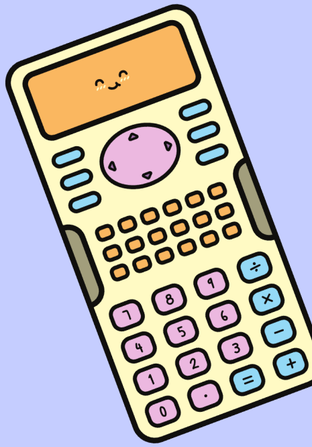
Answer 10

B

Use one consistent method, manu[illegible]s and [illegible]omp[illegible]te rec[illegible] of results.

PREVIEW

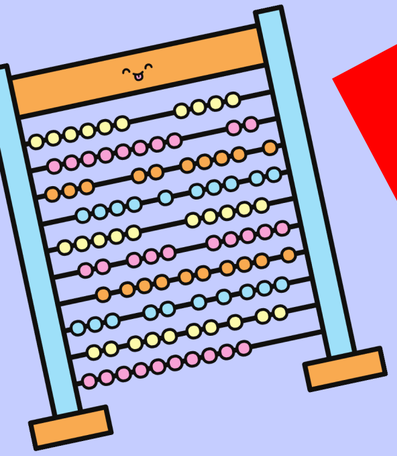
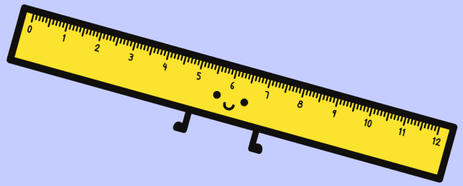
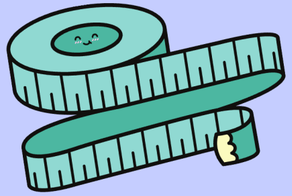


Well done!

You have completed the quiz.

PREVIEW


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