MATHS FIELD GUIDE · GRADE 5

Use trials to estimate a chance

OPENING PROBLEM

Which trial set landed closer to half heads?

Heads	Tosses	Share
3	4	3/4
5	10	1/2

02 Compare a model with a record
03 Rules and worked cases
04 Test a spinner
05 Compare the models
06 Build the sample space first
07 Check your reasoning

ILLUSTRATED PROBLEM SHEET

Compare a model with a record

Relative frequency = event count ÷ trials. A short record can differ from a theoretical chance.

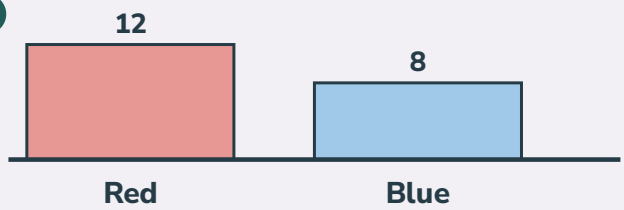
1

Heads	Tosses	Share
3	4	3/4
5	10	1/2

Which trial set landed closer to half heads?

The second. The first did not disprove a fair-coin model.

2



Estimate the chance of red from these twenty draws.

12/20 = 3/5. Record whether each counter was replaced before comparing trials.

3

Set	Hits	Tries
A	3	5
B	9	15

Combine the evidence.

Twelve hits in twenty tries gives 3/5. Pool counts before dividing.

4

Chance ¼
↓
80 trials
↓
80 × ¼ = 20

Does an expectation of twenty guarantee twenty hits?

No. Actual totals vary even when the chance stays fixed.

6 hits in 8 trials
75%.

6 hits in 12 trials
50%.

CHAPTER PROBLEM

One run has three successes in ten trials; another has seven in twenty. Find the combined estimate.

10/30 = 1/3. Combine counts, not equally weighted percentages.

MATHS REFERENCE · GRADE 5

Use trials to estimate a chance

An experiment repeats a chance process and records what happens.

Experimental probability is the event's observed count divided by the total number of trials. It is an estimate, not a guaranteed future result.

Cases to recognise

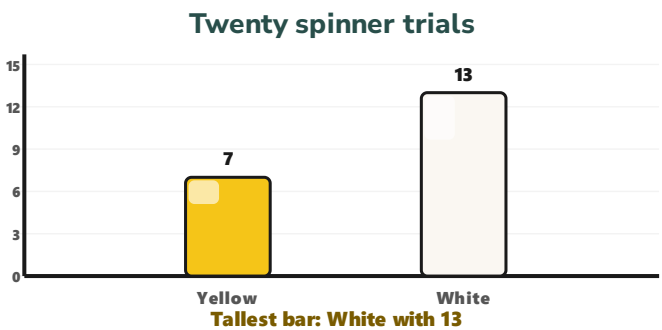
Situation	What to do and why
11 heads in 20 flips	Observed frequency is 11/20 = 55%.
9 heads in a further 30 flips	Combine totals: 20 in 50 is 40%.

Read the model

Record every trial

A spinner gives yellow seven times and white thirteen times in twenty trials.

The experimental probability of yellow is 7/20, or 0.35. Count all twenty trials in the denominator.



Bar graph

Compare with the model

A fair equal-sector spinner may have theoretical P(yellow) = 1/2.

The observed 7/20 is different. A small sample can vary; this difference alone does not prove the spinner is unfair.

trial One repetition of a chance process.
relative frequency Event count divided by trial count.
theoretical probability Chance predicted by an assumed model.
independent One trial's result does not change another trial's chance.



Draw one counter without looking. Which result is possible but less likely?

Blue. One of the four equal-chance counters is blue.

WORKED INVESTIGATION

Test a spinner

A spinner lands on red twelve times in 20 trials. The observed fraction is 12/20 = 3/5. Record the count together with the number of trials.

Look at this part	What it tells you
Trial set A	12 red in 20
Trial set B	15 red in 30
Combined	27 red in 50

Work it through

Combine the counts before dividing. The overall red frequency is 27/50 = 54%, between the first set's 60% and the second set's 50%.

Catch the mistake

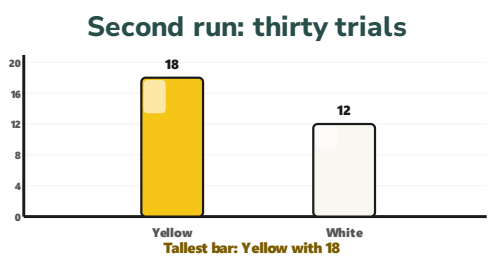
A simple average of 60% and 50% gives 55% and gives both sets the same weight. The larger set supplies more spins.

Compare the cases

Add trials using totals

Another thirty trials give eighteen yellows and twelve whites.

Together there are twenty-five yellows in fifty trials. The combined estimate is 25/50 = 1/2.



Bar graph

Do not average unequal-size runs casually

The first estimate came from twenty trials; the second from thirty.

Combine event counts and trial counts. Each run does not deserve equal weight when its size differs.

Change one condition

A fair spinner with half its area red could still produce these counts. Short sequences fluctuate even when every spin is fair.



What changed when the last blue was taken away?

A blue draw became impossible. A red draw is certain.

USE TRIALS TO ESTIMATE A CHANCE

Compare the models

More evidence, not certainty

A larger set of fair repeated trials can give a more useful estimate.

It does not guarantee the estimate improves after every new trial or lands exactly on the theoretical value.

Keep the experiment fair

Use the same process and record every result, including inconvenient ones.

Changing the spinner midway or deleting failures changes what the evidence describes.

The next trial has no debt

Three whites in a row do not make yellow “due” on the next independent fair spin.

Earlier results do not force the next result to repair the pattern.

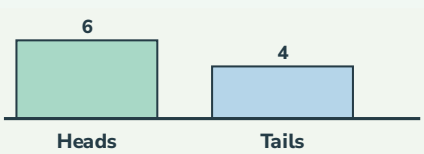
Explain your reasoning

A fair coin lands heads nine times in twenty trials. Find the experimental probability of heads.

9/20, or 0.45.

Two more worked cases

Situation	Reasoning
Predict outcomes from 40% over 75 trials	The estimate is 0.4 × 75 = 30. The actual count can differ.
A fair coin just showed four tails	With independent flips, the next head still has probability 1/2.



A child records ten coin tosses. Did both outcomes occur?

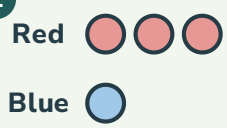
Yes. Heads occurred more often in this record.

ILLUSTRATED PROBLEM SHEET

Build the sample space first

Count possible results and check whether they are equally likely.

1



Four same-sized counters differ only in colour. On a random draw, which colour is likelier?

Red has three chances out of four. Blue has one.

2

Coin 1	Coin 2
H	H
H	T
T	H
T	T

Which results have exactly one head?

HT and TH. With two independent fair coins that is two of four results.

3



A fair die wins on 5 or 6. What is the chance of losing?

Four other faces lose. The chance is 4/6, or 2/3.

4



One red counter is added to a bag containing two red and two blue. Is it still fair by colour?

No. The new counts are three red and two blue.

No winning tickets
chance zero.

Every ticket wins
chance one.

CHAPTER PROBLEM

After four tails on an independent fair coin, must the next toss be heads?

No. The next toss still has probability one half for heads.

QUESTION BANK · FOLD OR COVER THE RIGHT COLUMN

Check your reasoning

Try the problem	Solution and reasoning
01 One group gets 1 hit in 2 tries, another gets 9 in 10. Is the pooled rate 70%?	No. Ten hits in twelve tries gives 5/6. The groups had different sizes.
02 Must ten fair coin tosses produce exactly five heads?	No. Five is the expected count over repeated sets of ten, not a promise for one set.
03 Ten more spins produce four reds. What is the new combined relative frequency?	Red occurred 27 + 4 = 31 times in 50 + 10 = 60 trials, so the new frequency is 31/60.
04 A die gives 9 sixes in 36 rolls. What is the observed frequency?	9/36 = 1/4. A fair die's theoretical chance remains 1/6.
05 Two children each report ten wins, one in twenty trials and the other in fifty. Who has the higher win rate?	Compare 10/20 with 10/50. The first rate is higher.

Try	1	2	3	4
Colour	R	B	R	R

Return each counter and mix before drawing again. Must B come next?

No. A short run of reds does not force the next colour.

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