

Name _____

Date _____

13.3 Experiments and expected results — worksheet

Find experimental probabilities from trials, calculate expected numbers, and compare experimental results with theory. · 41 questions · Show your working.

Remember

- **Theoretical** probability is what *should* happen: favourable ÷ total.
- **Experimental** probability is what *did* happen: successes ÷ trials.
- **Expected number = probability × number of trials.**
- The expected number is an average, not a promise. Getting 8 sixes in 60 rolls instead of 10 is perfectly normal.
- As the number of trials grows, experimental probability usually moves **closer** to the theoretical value.
- A small difference is ordinary variation; a large, persistent one suggests **bias**.
- When outcomes are **not** equally likely — a drawing pin, a weighted spinner — only an experiment can give the probability.
- This is the same idea as sample size in Unit 6: more trials, more trustworthy.

A · Fluency — Expected numbers and experimental probabilities.

- 1 A fair spinner has 6 equal sectors. It is spun 60 times. How many times would you **expect** each number?

- 2 A fair spinner has 4 equal sectors. It is spun 100 times. How many times would you **expect** each number?

- 3 A fair spinner has 8 equal sectors. It is spun 80 times. How many times would you **expect** each number?

- 4 A fair spinner has 5 equal sectors. It is spun 50 times. How many times would you **expect** each number?

- 5 A fair spinner has 3 equal sectors. It is spun 120 times. How many times would you **expect** each number?

- 6 A fair spinner has 10 equal sectors. It is spun 200 times. How many times would you **expect** each number?

- 7 A fair spinner has 6 equal sectors. It is spun 90 times. How many times would you **expect** each number?

- 8 A fair spinner has 4 equal sectors. It is spun 40 times. How many times would you **expect** each number?
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- 9 In 60 trials an event happened 12 times. What is the **experimental probability**?
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- 10 In 100 trials an event happened 30 times. What is the **experimental probability**?
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- 11 In 90 trials an event happened 18 times. What is the **experimental probability**?
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- 12 In 50 trials an event happened 7 times. What is the **experimental probability**?
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- 13 In 200 trials an event happened 25 times. What is the **experimental probability**?
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- 14 In 45 trials an event happened 9 times. What is the **experimental probability**?
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- 15 An event has probability $\frac{1}{2}$. In 40 trials, how many times would you expect it?
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- 16 An event has probability $\frac{1}{4}$. In 80 trials, how many times would you expect it?
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- 17 An event has probability $\frac{1}{6}$. In 60 trials, how many times would you expect it?
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- 18 An event has probability $\frac{3}{5}$. In 100 trials, how many times would you expect it?
-
- 19 An event has probability $\frac{2}{3}$. In 90 trials, how many times would you expect it?
-
- 20 An event has probability $\frac{1}{5}$. In 75 trials, how many times would you expect it?
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B · Reasoning — Theory against experiment.

- 21 What is **experimental probability**?
- ☐ A guess
 - ☐ Successes divided by the number of trials
 - ☐ The same as theoretical probability
 - ☐ Always $\frac{1}{2}$
- 22 What is **theoretical probability**?
- ☐ What actually happened
 - ☐ What should happen, worked out from the outcomes
 - ☐ A guess
 - ☐ The average
- 23 A fair coin is tossed 10 times and gives 7 heads. Is the coin unfair?
- ☐ Yes, definitely
 - ☐ Not necessarily — 10 trials is far too few to tell
 - ☐ Yes, because $7 > 5$
 - ☐ It cannot be decided ever

- 24** What happens to experimental probability as the number of trials increases?
- ☐ It gets further from the theoretical value
 - ☐ It usually gets closer to the theoretical value
 - ☐ It stays the same
 - ☐ It becomes exact
- 25** How do you find the **expected number** of successes?
- ☐ Divide the trials by the probability
 - ☐ Multiply the probability by the number of trials
 - ☐ Add them
 - ☐ Subtract them
- 26** Will the expected number always be exactly what happens?
- ☐ Yes
 - ☐ No
- 27** You want to know the probability of a drawing pin landing point-up. What should you do?
- ☐ Use favourable ÷ total
 - ☐ Carry out many trials and use the experimental probability
 - ☐ Guess 1/2
 - ☐ It cannot be found
- 28** Experimental and theoretical probability differ for a fair dice. What is the most likely reason?
- ☐ The dice is loaded
 - ☐ Ordinary variation in a limited number of trials
 - ☐ The maths is wrong
 - ☐ The dice has 7 faces

C · Challenge — Comparing the two, and spotting bias.

- 29** A dice is rolled 300 times. How many sixes would you expect?
- _____
- 30** A spinner gives a 3 on 24 of 80 spins. What is the experimental probability as a percentage?
- _____
- 31** A coin is tossed 500 times and gives 260 heads. How far is the experimental probability from 0.5, in percentage points?
- _____
- 32** An event has probability 0.15. In 400 trials, how many times would you expect it?
- _____
- 33** A spinner is spun 200 times and lands on red 90 times. If it were fair with 4 equal sectors, how many reds would be expected?
- _____

D · Word problems — Factories, penalties and spinners.

- 34** A dice is rolled 120 times. How many even numbers would you expect?
- _____

- 35** A bag has 5 counters, 2 of them red. In 100 draws with replacement, how many reds would you expect?

- 36** A factory finds 3 faulty items in 150. What is the experimental probability as a percentage?

- 37** If 2% of items are faulty, how many faults would you expect in 5000 items?

- 38** A coin is tossed 80 times. How many tails would you expect?

- 39** A spinner has 10 equal sectors. In 250 spins, how many times would you expect sector 7?

- 40** A survey finds 45 of 300 people cycle. What percentage is that?

- 41** A goalkeeper saves 18 of 45 penalties. What is the experimental probability as a percentage?
