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Surveys and Statistical Investigations – Year 4

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Statistical Investigations: Four Clear Steps



Good investigations stay fair, organised and evidence-based.

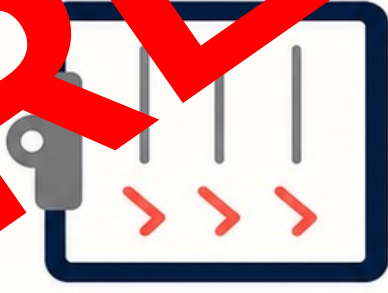
Statistical Investigation Quick Guide

ASK



- Is the question focused?
- Can a survey answer it?
- Are the words fair and neutral?

COLLECT



- Choose clear response categories.
- Ask the same question each time.
- Tally every response.

DISPLAY & ANALYSE



- Label the title, axes and categories.
- Compare the shape and variation.
- Note what is most, least and similar.

COMMUNICATE



- Use evidence from the data.
- Answer the research question.
- Name any limits.



A conclusion is strong when the data supports it.



Question Quest: Sort and Improve

Read each card. Place it in the correct zone. Then improve any weak question.



FOCUSED & FAIR

Clear, neutral and surveyable

TOO BROAD

Needs a sharper focus

LEADING OR BIASED

Pushes people towards an answer

NOT SURVEYABLE

Cannot be answered by collecting responses

Challenge: Choose one weak card and rewrite it as a focused, fair survey question.





Question Quest Cards – Set A



Which fruit do Year 4 students choose most often for lunch?



Don't you agree that reading is the best free-time activity?



What do people think about school?



Which month has the longest name?



Which playground area do Year 4 students use most at recess?



Why is sport better than art?



Cut along the dashed lines.



Question Quest Cards – Set B



Which after-school club would Year 4 students join next term?



How much is happiness?



Which is better, apples or the obviously tastier mangoes?



What is everyone's favourite thing?



Which transport method do students use to travel to school?



Shouldn't we have more exciting science lessons?



Cut along the dashed lines. Improve one weak question.

Human Survey Graph Lab — Prompt Cards

1

How do you usually travel to school?

A



Walk

B



Bike or scooter

C



Car

D



Bus

2

Which reading genre do you prefer?

A



Adventure

B



Mystery

C



Humour

D



Information

3

Which class celebration would you choose?

A



Picnic

B



Games

C



Craft

D



Movie

4

Which after-school club would you join?

A



Sport

B



Art

C



Music

D



Technology

5

Which playground area do you use most?

A



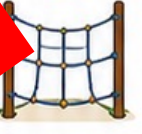
Oval

B



Court

C



Climbing area

D



Quiet area

6

Which weather do you enjoy most?

A



Sunny

B



Rainy

C



Windy

D



Cloudy

7

Which fruit would you choose for a snack?

A



Apple

B



Banana

C



Orange

D



Berries

8

Which pet would you prefer?

A



Dog

B



Cat

C



Fish

D



Bird



Choose one prompt. Stand behind the matching category sign.

Human Survey Graph Lab – Category Signs

A



Category:

B



Category:

C



Category:

D

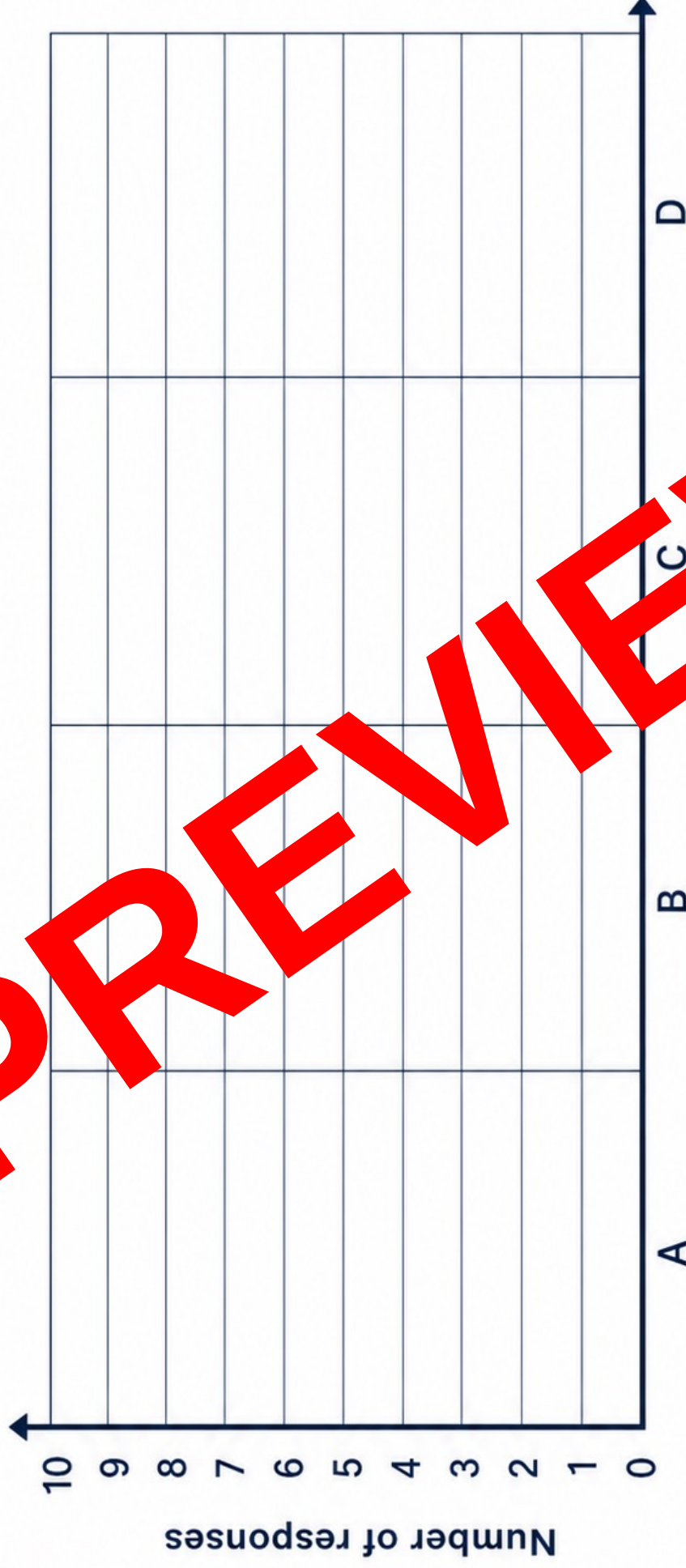


Category:

Place the signs in a row. Students stand behind their chosen category.

Human Survey Graph Lab

Survey question: _____



Place one counter or name card in the appropriate column.

Most: _____ Least: _____ Difference: _____

One observation: _____

Name: _____ Date: _____



Writing Strong Survey Questions



Classify each question. Write **F** for Focused and fair, **B** for Too broad, **L** for Leading or biased, or **N** for Not surveyable.

Question	Code
1. Which fruit do Year 4 students choose most often for lunch?	☐
2. Don't you agree that reading is the best free-time activity?	☐
3. What do people think about school?	☐
4. Which month has the longest name?	☐
5. Which playground area do Year 4 students use most at recess?	☐
6. Why is sport better than art?	☐



Explain your thinking.

7. Which question is useful for a survey?

8. Choose one weak question. What makes it weak?

A strong survey question is focused, fair and answerable with data.

Name: **ANSWERS**

Date: _____



Writing Strong Survey Questions



Classify each question. Write F for Focused and fair, B for Too broad, L for Leading or biased, or N for Not surveyable.

Question	Code
1. Which fruit do Year 4 students choose most often for lunch?	F
2. Don't you agree that reading is the best free-time activity?	
3. What do people think about school?	B
4. Which month has the longest name?	N
5. Which playground area do Year 4 students use most at recess?	F
6. Why is sport better than art?	L



Explain your thinking.

7. Which Question is useful for a survey?

It narrows down to a clear group, category and measurable choice.

8. Choose one weak question. What makes it weak?

Question 2 is leading because it suggests that reading is best.

A strong survey question is focused, fair and answerable with data.

Name: _____ Date: _____



Writing Strong Survey Questions – Improve It



Rewrite each weak question so it is focused, fair and surveyable.
Then add balanced response options.

1 What does everyone think about food?

Improved question: _____

Response options:

2 Isn't our playground already the best?

Improved question: _____

Response options:

3 Why is summer better than winter?

Improved question: _____

Response options:

4 How much is it?

Improved question: _____

Response options:

Your turn

Write one original survey question for Year 4 students. Include three or four balanced response options.

Response options:

Check: focused • neutral words • clear categories



Writing Strong Survey Questions – Improve It



Rewrite each weak question so it is focused, fair and surveyable.
Then add balanced response options.

1 What does everyone think about food?

Improved question: Which lunch option do Year 4 students prefer?

Response options:

2 Isn't our playground already the best?

Improved question: Which playground area do Year 4 students use most?

Response options:

3 Why is summer better than winter?

Improved question: Which season do Year 4 students prefer?

Response options:

4 How much do you enjoy maths?

Improved question: How much do Year 4 students enjoy maths games?

Response options:

Your turn

Write one original survey question for Year 4 students. Include three or four balanced response options.

Which class celebration would Year 4 students choose?

Response options:

Check: focused • neutral words • clear categories

Collect, Tally and Graph – Plan and Record

Name: _____

Date: _____

Research question:

Which class celebration would Year 4 students choose?

Plan

Participants: _____

Fair collection method: _____

Prediction: _____

Category	Tally	Frequency
Picnic		
Garden afternoon		
Art workshop		
Movie session		

Check: Total responses = _____

Ask each participant once. Record one response per person.

Collect, Tally and Graph – Display and Reflect

Name: _____

Date: _____

Graph title: _____



1. Which category was most popular? _____
2. Which category was least popular? _____
3. What is the difference between them? _____
4. Write one conclusion supported by the data. _____

5. State one limitation of this survey. _____

☐ title • ☐ labels • ☐ even scale • ☐ accurate bars

Name: _____

Date: _____

Park Picnic Survey – Record and Display

Twenty-four Year 4 students chose one picnic snack.

Snack	Tally	Frequency
Fruit cups	 	
Veggie sticks	 	
Mini sandwiches	 	
Cheese crackers		

Total responses = _____

Title: _____



Use the same scale for every category.

Name: _____

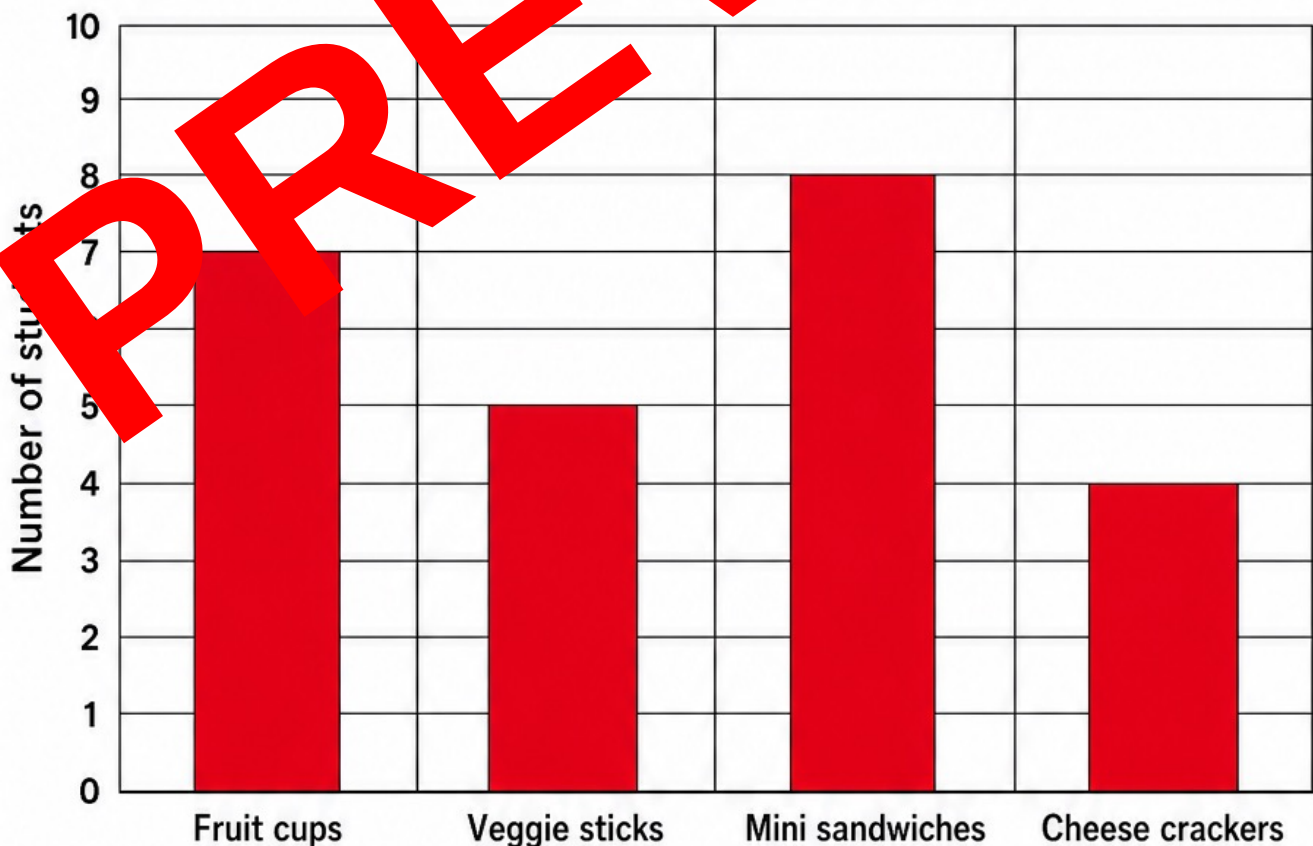
ANSWERS

Date: _____

Park Picnic Survey – Record and Display

Twenty-four Year 4 students chose one picnic snack.

Snack	Tally	Frequency
Fruit cups		7
Veggie sticks		5
Mini sandwiches		8
Cheese crackers		4

Total responses = **24**Title: **Park Picnic Snack Choices**

Use the same scale for every category.

Name: _____

Date: _____

Park Picnic Survey – Interpret and Evaluate

Snack	Frequency
Fruit cups	7
Veggie sticks	5
Mini sandwiches	8
Cheese crackers	4

Total students: 24

1. Which snack was most popular?

2. Which snack was least popular?

3. What is the difference between the highest and lowest frequencies?

4. Describe the shape of the distribution.

5. A student claims, 'Most students chose mini sandwiches.' Is this accurate? Explain.

6. Which shows exact values more clearly: a frequency table or a column graph? Explain.

7. State one limitation of this survey.

Use evidence from the data in every conclusion.

Name: ANSWERS

Date: _____

Park Picnic Survey – Interpret and Evaluate

Snack	Frequency
Fruit cups	7
Veggie sticks	5
Mini sandwiches	8
Cheese crackers	4

Total students: 24

1. Which snack was most popular?

Mini sandwiches.

2. Which snack was least popular?

Cheese crackers.

3. What is the difference between the highest and lowest frequencies?

4 students.

4. Describe the shape of the distribution.

Responses spread across all four categories; mini sandwiches are highest and cheese crackers lowest.

5. A student claims, 'Most students chose mini sandwiches.' Is this accurate? Explain.

No, it is the largest category, but 8 out of 24 is not more than half; say 'Mini sandwiches were the most popular.'

6. Which shows exact values more clearly: a frequency table or a column graph? Explain.

The frequency table, because it shows exact values directly.

7. State one limitation of this survey.

Only one class of 24 students was surveyed.

Use evidence from the data in every conclusion.

Name: _____

Date: _____

Club Ratings – Organise the Data

Twelve students rated each lunchtime club from 1 (not for me) to 5 (my favourite).

Sport	5	4	5	3	4	5	2	4	5	3	4	5
Art	4	3	2	5	3	4	1	3	2	4	1	3
Music	3	4	2	5	1	3	4	2	3	1	4	4
Coding	5	4	5	3	2	4	5	3	4	5	3	5

Club	Rating 1	Rating 2	Rating 3	Rating 4	Rating 5	Total
Sport						
Art						
Music						
Coding						

Check: Each row total = _____

Which ratings appear most often? _____

Name: ANSWERS

Date: _____

Club Ratings – Organise the Data

Twelve students rated each lunchtime club from 1 (not for me) to 5 (my favourite).

Sport	5	4	5	3	4	5	2	4	5	3	4	5
Art	4	3	2	5	3	4	1	3	2	4	1	3
Music	3	4	2	5	1	3	4	2	3	5	1	4
Coding	5	4	5	3	2	4	5	3	4	5	3	5

Club	Rating 1	Rating 2	Rating 3	Rating 4	Rating 5	Total
Sport	0	2	2	4	5	12
Art	1	2	4	3	2	12
Music	2	2	3	3	2	12
Coding	0	1	3	3	5	12

Check: Each row total = 12

Which ratings appear most often? Rating 5

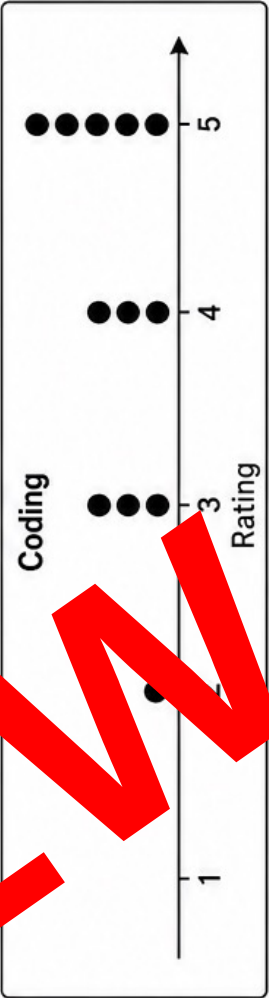
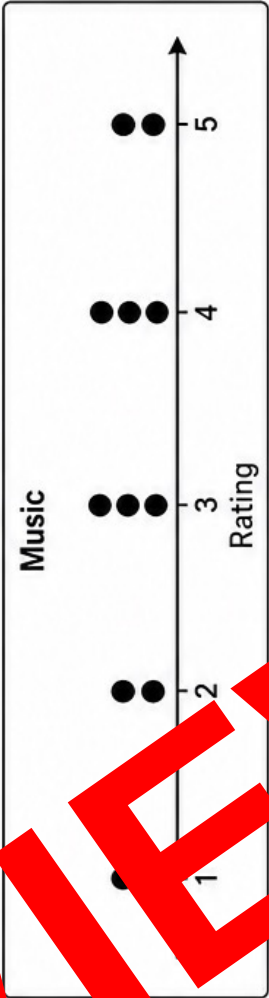
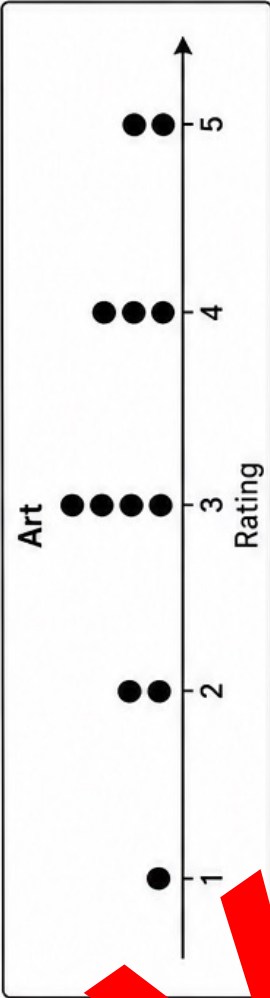
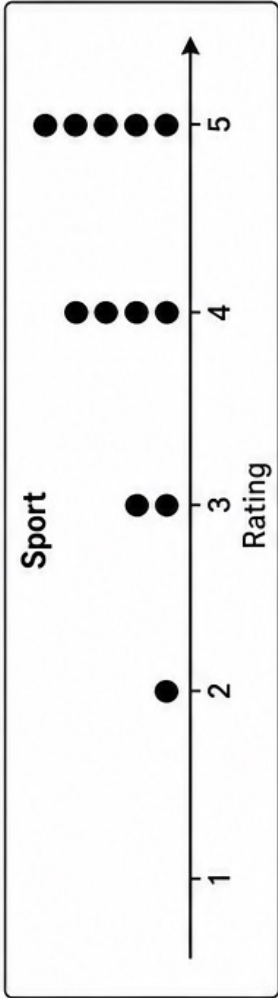
Club Ratings – Compare Distributions

Name: _____

Date: _____

Twelve students rated each club from 1 to 5:

Club	Rating 1	Rating 2	Rating 3	Rating 4	Rating 5
Sport	0	1	2	3	5
Art	1	2	4	3	2
Music	2	2	3	3	2
Coding	0	1	3	3	1



- Which club has the most ratings of 4 or 5?

- Which clubs include ratings from 1 to 5?

- Which two clubs each have five rating-5 responses?

- Which distribution is most concentrated at the high end? Explain.

- Write one comparison supported by the data.

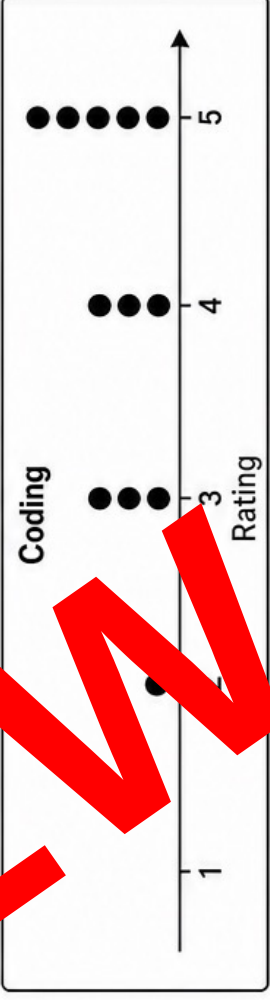
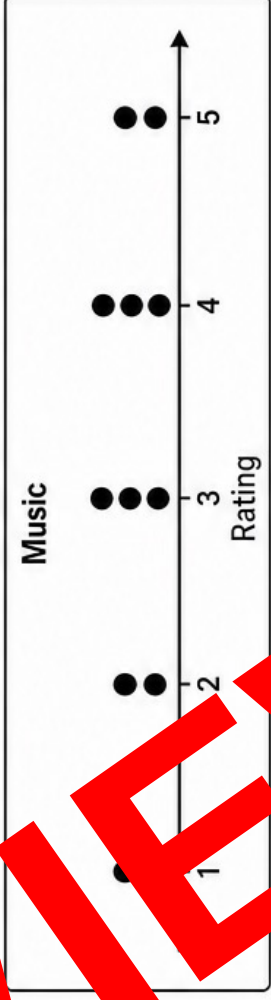
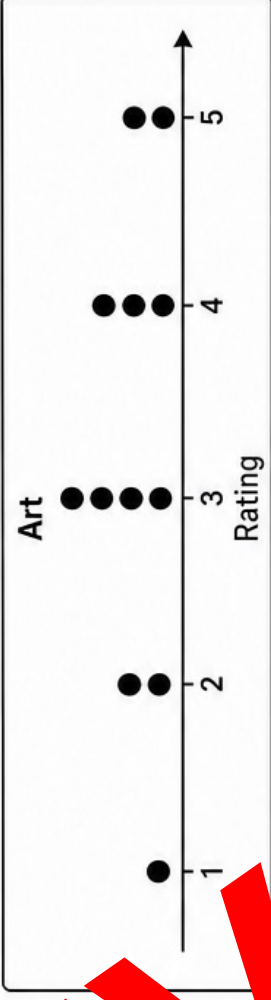
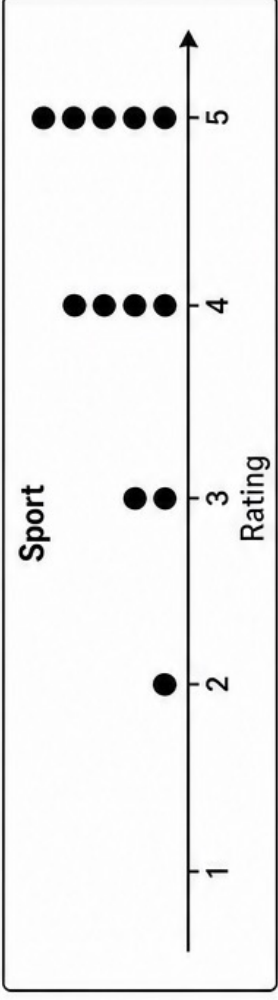
Club Ratings – Compare Distributions

ANSWERS

Name: _____ Date: _____

Twelve students rated each club from 1 to 5.

Club	Rating 1	Rating 2	Rating 3	Rating 4	Rating 5
Sport	0	1	2	3	5
Art	1	2	4	3	2
Music	2	2	3	3	2
Coding	0	1	3	3	1



1. Which club has the most ratings of 4 or 5?

Sport: 9 ratings of 4 or 5.

2. Which clubs include ratings from 1 to 5?

Art and Music: both span ratings 1 to 5.

3. Which two clubs each have five rating-5 responses?

Sport and Coding.

4. Which distribution is most concentrated at the high end? Explain.

Sport; 9 of 12 ratings are 4 or 5.

5. Write one comparison supported by the data.

Sport has 9 high ratings, while Art has 5.

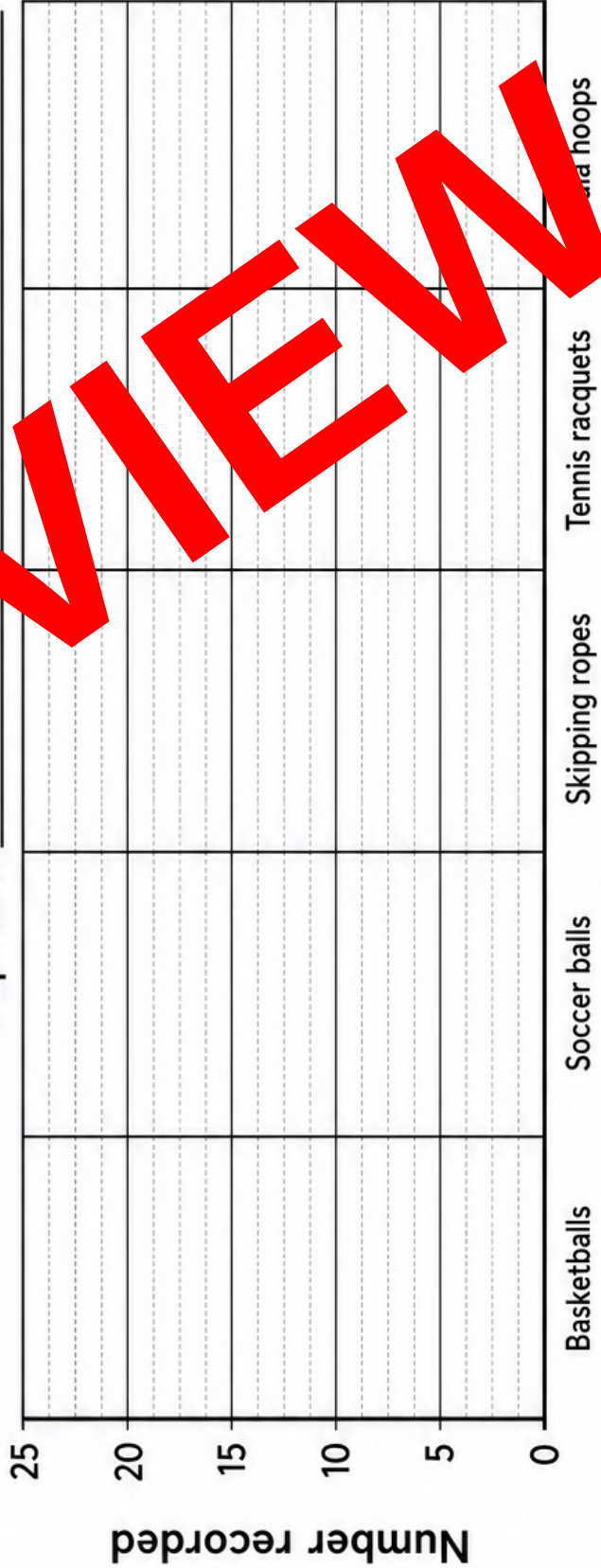
Sports Equipment Survey – Read and Display

Name: _____ Date: _____

A Year 4 class recorded how often each item was used in one week and how many students requested more.

Equipment	Current use	Requests for more
Basketballs	18	9
Soccer balls	24	16
Skipping ropes	30	6
Tennis racquets	12	14
Hula hoops	15	5

Graph title: _____



Draw two bars for each item. Use the same scale.

Sports Equipment Survey – Read and Display

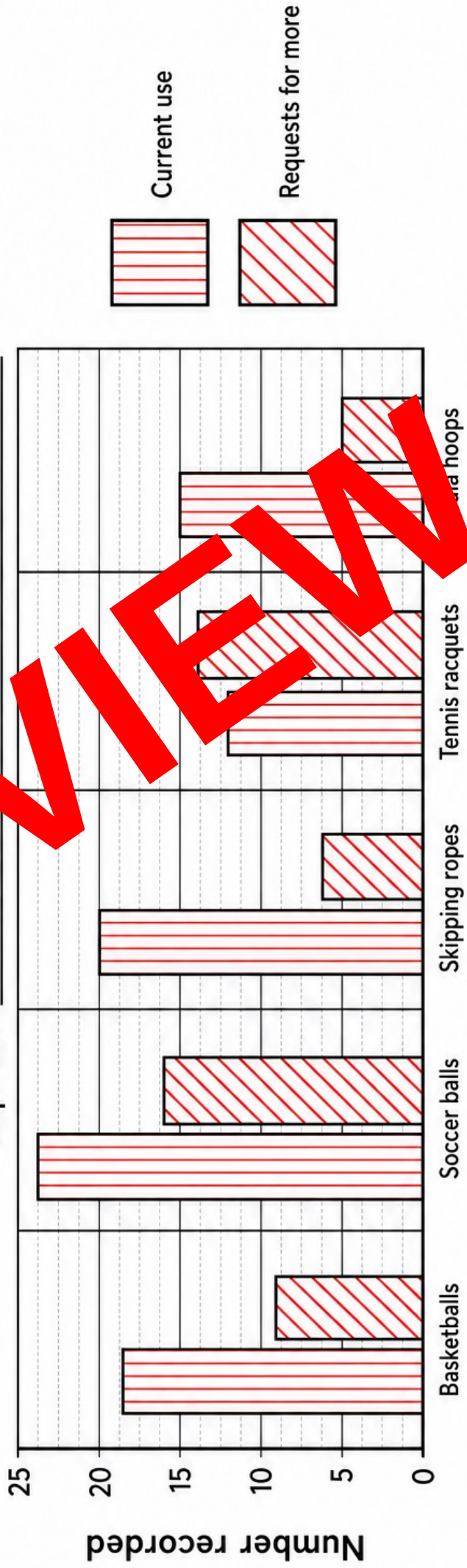
Name: _____ Date: _____

ANSWERS

A Year 4 class recorded how often each item was used in one week and how many students requested more.

Equipment	Current use	Requests for more
Basketballs	18	9
Soccer balls	24	16
Skipping ropes	20	6
Tennis racquets	12	14
Hula hoops	15	5

Graph title: _____ Equipment Use and Requests



Draw two bars for each item. Use the same scale.

Sports Equipment Survey – Interpret and Decide

Name: _____

Date: _____

Equipment	Current use	Requests for more
Basketballs	18	9
Soccer balls	24	16
Skipping ropes	20	6
Tennis racquets	12	14
Hula hoops	15	5

1. Which item had the highest current use?

2. For which item were requests for more greater than current use?

3. What is the difference between current use and requests for soccer balls?

4. Recommend the equipment purchase. Use data to justify each choice.

5. Evaluate this claim: 'Buy only the most-used item.' What does it overlook?

6. Which display makes paired comparisons easier: the table or a grouped column graph? Explain.

7. State one limitation of this data when planning a budget.

Compare both data sets before making a recommendation.

Sports Equipment Survey – Interpret and Decide

Name: ANSWERS Date: _____

Equipment	Current use	Requests for more
Basketballs	18	9
Soccer balls	24	16
Skipping ropes	20	6
Tennis racquets	12	14
Hula hoops	15	5

1. Which item had the highest current use?

Soccer balls.

2. For which item were requests for more greater than current use?

Tennis racquets: 14 requests, 12 uses.

3. What is the difference between current use and requests for soccer balls?

8.

4. Recommend the equipment purchase, use data to justify each choice.

Soccer balls: high use and 16 requests.

Tennis racquets: requests exceed use.

5. Evaluate this claim: 'Buy only the most-used item.' What does it overlook?

It overlooks requests, condition and cost.

6. Which display makes paired comparisons easier: the table or a grouped column graph? Explain.

Grouped graph for quick comparison; table for exact values.

7. State one limitation of this data when planning a budget.

Costs and equipment condition are not shown.

Compare both data sets before making a recommendation.



Cupcake Creator – Survey and Plan



Name: _____

Date: _____

A bakery needs one new cupcake for the school fair. Survey your class before you design it.



1 Cake flavour question

Which cake flavour would you choose?

Option	Tally	Frequency
Vanilla		
Chocolate		
Lemon		
Carrot		
Total:		

2 Icing question

Which icing flavour would you choose?

Option	Tally	Frequency
Vanilla		
Chocolate		
Lemon		
Vanilla		
Total:		

Fair-survey checklist

- ✓ ask each person once •
- ✓ use the same options •
- ✓ record every response





Cupcake Creator – Design with Data



Name: _____

Date: _____

OUR SURVEY RESULTS



Most popular
cake flavour

Frequency



Most popular
icing flavour

Frequency



Total participants

MY EVIDENCE-BASED CUPCAKE

Product name:

Chosen cake flavour:

Sketch and label your cupcake design



- 1 Which evidence supports your design?

- 2 Did one option have a clear lead, or were results close?

- 3 State one limitation of your survey.

- 4 How could the bakery collect stronger data next time?



Design choices should match the data.

School Celebration Survey Investigation – Plan

Name: _____

Date: _____

Class: _____

Assessment page 1 of 3

Student brief: Plan a fair survey that helps your class choose one school celebration.

A. Purpose – What decision will your data help make?

B. Research question – write one focused, neutral, surveyable question.

C. Participants – who will you survey and how many?

D. Response categories – four balanced category boxes.

1. 	2. 	3. 	4.
-------------------	-------------------	-------------------	-------------------

E. Fair collection method – explain how each person will be asked once and responses recorded.

F. Prediction – state and justify a prediction.

Prediction – Which celebration do you think will be most popular? _____

Justification – Why do you think so?

Plan checklist – have you included:

☐	1. A focused, surveyable research question?
☐	2. Neutral words (no leading or biased language)?
☐	3. Clear participants (who and how many)?
☐	4. Four balanced response categories?
☐	5. A fair collection method (each person asked once and recorded)?
☐	6. A prediction with a justification?

School Celebration Survey Investigation – Collect and Display

Name: _____

Date: _____

Assessment page 2 of 3

Category	Tally	Frequency	
Total responses			

Digital tool used (if any): _____

Graph title: _____



Display checklist

title	☐
categories labelled	☐
even scale	☐
accurate bars	☐
neat and readable	☐

Why is a column graph suitable for your categorical data?

School Celebration Survey Investigation – Interpret and Communicate

Name: _____

Date: _____

Assessment page 3 of 3

1.	Which category had the highest frequency? State the value. _____ _____
2.	Which had the lowest? State the value. _____ _____
3.	Compare two categories using a difference. _____ _____
4.	Describe the shape and variation of the distribution. _____ _____
5.	Write a conclusion supported by at least two data values. _____ _____
6.	Evaluate your display: what does it show clearly and what could be improved? _____ _____
7.	State one limitation of your investigation. _____ _____
8.	Make a recommendation for the class and justify it with evidence. _____ _____

☐

I checked that my conclusion matches my data.

School Celebration Survey Investigation – Rubric

Student: _____

Teacher: _____

Score: ____ / 25

Criteria	5 – Excellent	4 – Strong	3 – Sound	2 – Developing	1 – Beginning
1. Research question and fair plan	focused neutral question, clear participants, balanced options and fair method.	clear plan with one minor omission.	workable plan with some support needed.	broad, biased or incomplete plan.	question cannot guide a survey.
2. Data collection and recording	complete accurate tallies and frequencies with correct total.	complete accurate recording with one minor error.	mostly accurate with some errors.	several errors or missing data.	data is incomplete or unusable.
3. Display choice and construction	suitable display with accurate bars, title, labels and even scale.	clear display with one minor convention error.	readable display with some issues.	incomplete or potentially misleading display.	display absent or unreadable.
4. Interpretation and comparison	accurately compares values and describes shape and variation.	mostly accurate comparisons using evidence.	simple correct comparisons.	weak or partly inaccurate interpretation.	conclusions do not match data.
5. Evidence-based communication	clear conclusion, limitation and recommendation supported by data.	clear conclusion and evidence with a minor gap.	clear conclusion with some evidence.	unsupported or incomplete communication.	no valid conclusion.

Teacher feedback

Surveys and Statistical Investigations



Learning Intentions

- Plan and conduct a fair statistical investigation.
- Collect categorical data from a survey.
- Display, compare and communicate what the data shows.



What Is a Statistical Investigation?

A statistical investigation answers a question with data.

It follows four connected stages: ask; collect; display and analyse; communicate.



The Four-Step Cycle

1. ASK a focused research question.
2. COLLECT fair and accurate data.
3. DISPLAY & ANALYSE the distribution.
4. COMMUNICATE an evidence-based conclusion.



A Useful Research Question

- Is focused on one clear idea.
- Names the group being surveyed.
- Can be answered by collecting data.
- Uses fair, neutral words.



Focused, Measurable and Answerable

Too broad: What do people think about school?

Stronger: Which playground area do 90% of students use most at recess?



Fair Wording and Balanced Options

Avoid wording that pushes people towards an answer.

Use clear categories that cover reasonable choices.

Ask the same question the same way each time.



Participants and Collection

Decide who will take part, how many people you need and how many responses you will collect.

Ask each participant one question and record every response.



Categorical Data

Categorical data groups responses by type, label or choice.

Examples: transport method, favourite game, playground area or club choice.



Tallies and Frequencies

- Use tally marks to record responses quickly.
- Group tally marks in fives.
- Frequency is the total for a category.
- Check that frequencies match the number surveyed.



Using Digital Tools

A spreadsheet can organise categories, check totals and create a graph.

Digital tools help with accuracy, but they can't replace a fair question or careful collection.



Choose a Suitable Display

- A column graph compares category frequencies.
- A stacked dot plot compares ratio distributions.
- A table shows exact values clearly.

Choose the display that best answers the question.



Build a Clear Column Graph

Include a descriptive title, labelled categories and a vertical axis that starts at zero.

Keep bars equal in width and plot each frequency accurately.



Describe the Shape

Look across the distribution.

Is there one clear peak? Are several categories similar? Are responses balanced?

Describe the pattern without inventing a cause.



Describe Variation

Variation means that responses differ.

A distribution is spread out when many categories or ratings are used. It is concentrated when responses cluster in only a few categories or ratings.



Evaluate a Display

Ask: Is the scale even? Are labels complete? Do the numbers make sense? Could the design mislead the reader?

Different displays can emphasize different features.



Write an Evidence-Based Conclusion

State the finding and support it with values.

Use “most” only when more than half chose that option.

Name one limitation: what does this investigation not show?



Plan Your Own Investigation

1. Write a focused, fair question.
2. Choose participants and response categories.
3. Collect and organise the data.
4. Display and compare the distribution.
5. Conclude, communicate and name limitation.





Well Done!



Surveys and Statistical Investigations Quiz



Question 1

Which is the strongest survey question?

- A. What do people think about school?
- B. Which snack do Year 4 students choose most often for lunch?
- C. Why is sport better than art?
- D. Which month has the longest name?



Answer 1

B. It names a clear group and choice, uses neutral wording, and can be answered with survey data.



Question 2

True or false: Leading wording can bias survey results.



Answer 2

True. Leading wording can push participants towards a particular response.



Question 3

Short answer: Name one feature of a fair dice-competition.



Answer 3

Possible answers: ask everyone the same question, ask each person once, record every response, or choose participants fairly



Question 4

A tally shows one group of five and three extra marks. What is the frequency?

- A. 5
- B. 6
- C. 8
- D. 13



Answer 4

C. The frequency is 8.



Question 5

True or false: A graph scale may use different intervals in different sections.



Answer 5

False. The scale must use equal intervals so the display is accurate and not misleading.



Question 6

Short answer: Which shows exact values more directly—a frequency table or a column graph?



Answer 6

A frequency table shows exact values more correctly. A column graph makes visual comparisons quicker.



Question 7

Sport ratings have frequencies 0, 1, 2, 4, 5 for ratings 1 to 5. Which description is best?

- A. Concentrated at the high end
- B. All ratings are equally likely
- C. Concentrated at the low end
- D. There is no variation



Answer 7

A. Nine of the twelve ratings are 4 or 5, so the distribution is concentrated at the high end.



Question 8

True or false: If 8 of 24 students chose mini sandwiches—more than any other category—it is accurate to say “Most students chose mini sandwiches.”



Answer 8

False. Mini sandwiches were the most popular category, but only 24 is not more than half.



Question 9

Short answer: State one limitation of surveying only one class



Answer 9

The results may not represent other Year 4 classes in the school because the sample is small and limited to one class.



Question 10

Soccer balls had 24 uses and 16 requests for more tennis rackets had 12 uses and 14 requests. Which recommendation uses both data sets?

- A. Buy only hula hoops
- B. Prioritise soccer balls and tennis rackets
- C. Ignore requests for more
- D. Make no purchases



Answer 10

B. Soccer balls show high use and demand, requests for tennis rackets exceed current use.





Well Done!

