Reasoning and Problem Solving
Statistics – Year 4

About This Resource

This resource is aimed at Year 4 Expected and has been designed to give children the opportunity to consolidate the skills they have learned Summer Block 4 Statistics.

The questions are based on a selection of the same 'small steps' that are addressed in the block, but are presented in a different way so children can work through the pack independently and demonstrate their understanding and skills.

Small Steps

Interpret charts
Comparison, sum and difference
Introducing line graphs
Line graphs

National Curriculum Objectives

Mathematics Year 4 (4S1) Interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs
Mathematics Year 4 (4S2) Solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs

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NPS

WHAT WE WILL DO FOR THIS ~~~ SCHOOL COMPETITION

VOTING CLOSED

Voting is now closed for Northwood Primary School's yearly competition. Every pupil was able to make their choice for what sort of contest would take place this year. The School Council is busy counting the votes!

Contest	Number of votes
Painting	ⅼⅼⅼⅼ ⅼⅼⅼⅼ ⅼⅼⅼⅼ ⅼⅼⅼⅼ ⅼⅼⅼⅼ ⅼⅼⅼⅼ ⅼⅼⅼⅼ ⅼⅼⅼⅼ ⅼⅼⅼⅼ ⅼⅼⅼⅼ Ⅰ
Running	ⅼⅼⅼⅼ ⅼⅼⅼⅼ ⅼⅼⅼⅼ ⅼⅼⅼⅼ ⅼⅼⅼⅼ ⅼⅼⅼⅼ ⅼⅼⅼⅼ ⅼⅼⅼⅼ ⅼⅼⅼⅼ ⅠⅠ
Building towers	ⅼⅼⅼⅼ ⅼⅼⅼⅼ ⅼⅼⅼⅼ ⅼⅼⅼⅼ ⅼⅼⅼⅼ ⅼⅼⅼⅼ ⅼⅼⅼⅼ ⅼⅼⅼⅼ ⅼⅼⅼⅼ ⅠⅠⅠ
Growing plants	ⅼⅼⅼⅼ ⅼⅼⅼⅼ ⅼⅼⅼⅼ ⅼⅼⅼⅼ ⅼⅼⅼⅼ ⅼⅼⅼⅼ ⅼⅼⅼⅼ ⅼⅼⅼⅼ ⅼⅼⅼⅼ ⅼⅼⅼⅼ ⅠⅠ

Shonae

We need to present the results to the school so we need to choose a graph which clearly shows which contest won the vote. I think we should do a bar chart.
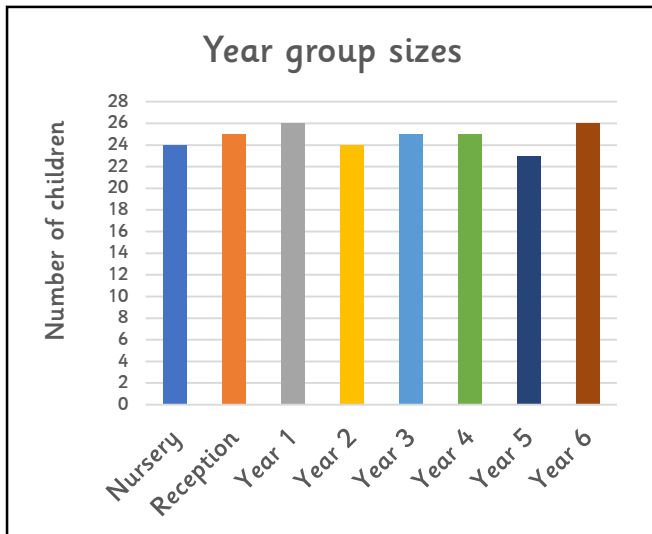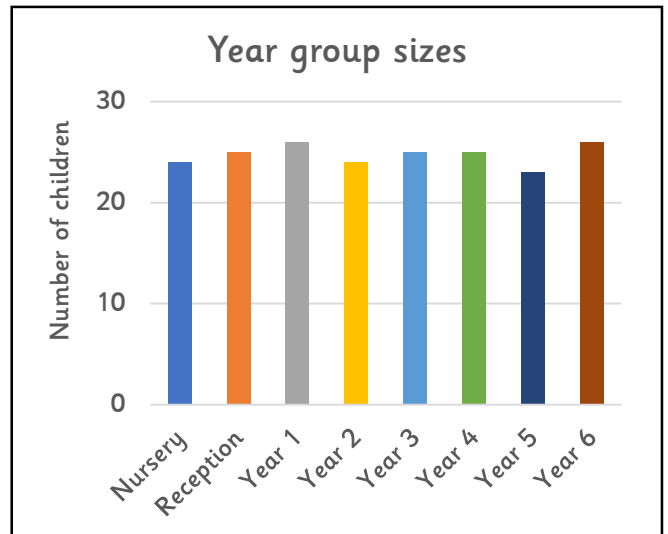
I think we should do a pictogram.

Michael

1. What is the most suitable graph for showing the total number of votes for each contest type? Explain your choice.

Once the results are ready to be used in an assembly, the School Council decides to make another graph. They need to decide how to split the school into even teams. Several School Council members make bar charts to show how many children are in each year group in the school.
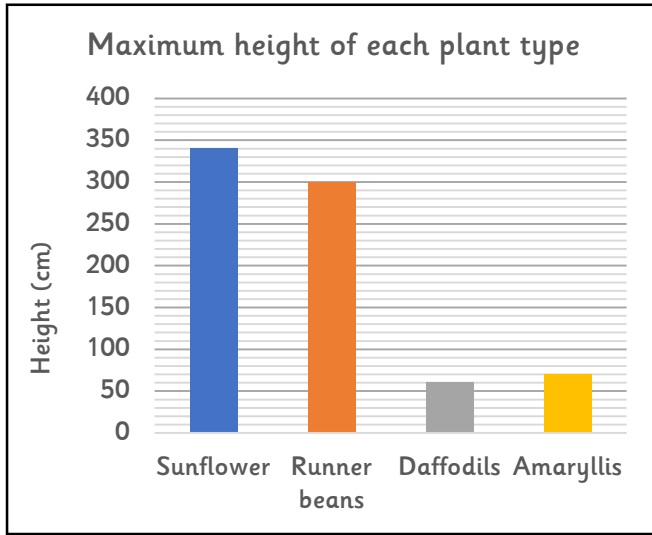
Carly's graph

Year group sizes

(Bar chart showing "Number of children" on the y-axis, scaled 0 to 28 in intervals of 2, with bars for: Nursery 24, Reception 25, Year 1 26, Year 2 24, Year 3 25, Year 4 25, Year 5 23, Year 6 26)

Clement's graph

Year group sizes

(Bar chart showing "Number of children" on the y-axis, scaled 0 to 30 in intervals of 10, with bars for: Nursery, Reception, Year 1, Year 2, Year 3, Year 4, Year 5, Year 6)

2. Which child has used the best scale for their graph? Explain your choice.

The School Council work out that if they split the school into infants and juniors, there will be 99 children in each team! Perfect! Now they need to work out what sort of plants the teams should grow. Their teachers give them some information to read.

	Amount needed for each watering (millilitres)	Amount of times per month the plant needs watering
Sunflowers	700ml	5
Runner beans	500ml	8
Daffodils	400ml	8
Amaryllis	400ml	12

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Maximum height of each plant type

Height (cm): 400, 350, 300, 250, 200, 150, 100, 50, 0

Plant types: Sunflower, Runner beans, Daffodils, Amaryllis

Plant type	Number of seeds or bulbs in a bag 🫘 = 4 seeds or bulbs
Sunflowers	🫘🫘🫘🫘🫘🫘◗
Runner beans	🫘🫘🫘🫘🫘🫘◢
Daffodils	🫘🫘◗
Amaryllis	◢

The School Council members ask a lot of questions about the information.

Anya	"How fast does each type of plant grow?"
Shonae	"What is the tallest plant type?"
Carly	"If we bought one bag of each type of seed or bulb, how many seeds and bulbs would we have in total?"
Onua	"What is the difference in maximum height between runner beans and amaryllis?"
Michael	"What is the cost of each daffodil bulb?"
Clement	"Which type of plant will need the most water per month?"

3. Which children have asked questions that cannot be answered using the graphs?

4. Answer the questions which can be answered by looking at the graphs and charts.

Two of the School Council members have interesting thoughts about the information they have been given.

Anya

The shorter a plant can grow, the more water it needs in a month.

The more seeds or bulbs you get in a bag, the taller the plant can grow.

Onua

5. Are these two rules always correct? Explain why.

The School Council decides that the competition should be a sunflower growing contest. They want to see their plants grow very tall! The children in each team will water their flowers and measure how tall they grow.

Soon the children have enough measurements to make some line graphs showing the early growth of their tallest sunflowers.

Infants' tallest sunflower

Height (cm) vs Time (weeks)

Juniors' tallest sunflower

Height (cm) vs Time (weeks)
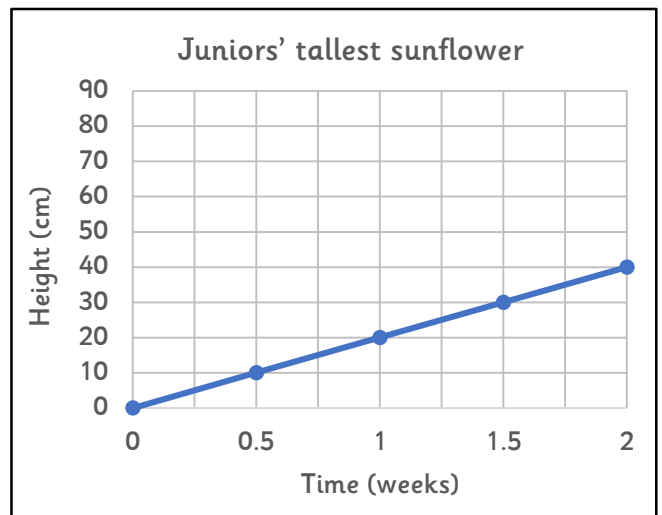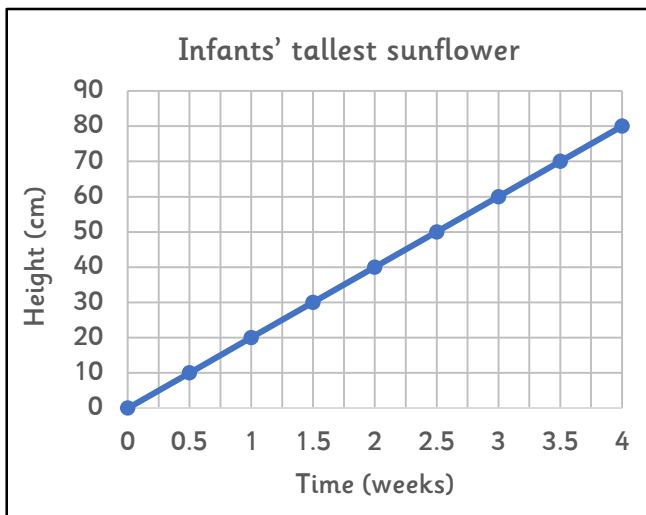
The School Council are allowed to see the graphs to keep an eye on how the contest is going.

6. Shonae has noticed that the lines on the graphs are at very different angles. What could this mean?

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Shonae

> Oh wow! Over the first 2 weeks the infants' tallest sunflower grew higher, faster! You can tell because the line on the infants' graph is much steeper!

7. Do you agree with Shonae? Why?

After a few more weeks, the juniors' tallest sunflower is stretching high above the infants' tallest sunflower! "Wow!" exclaimed Carly, "How has it grown so tall!?"
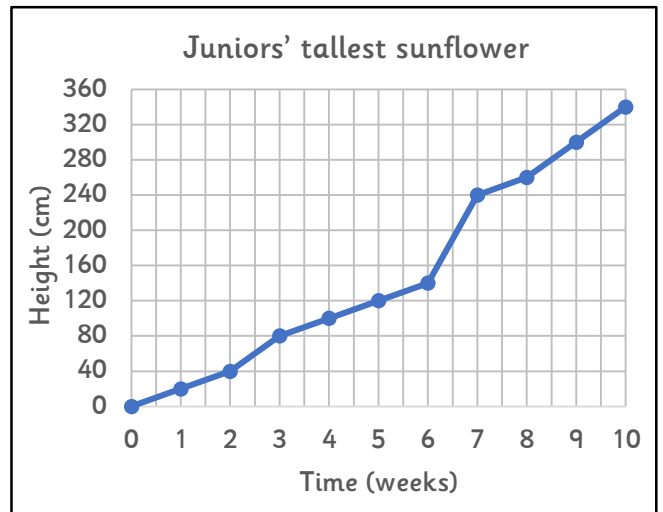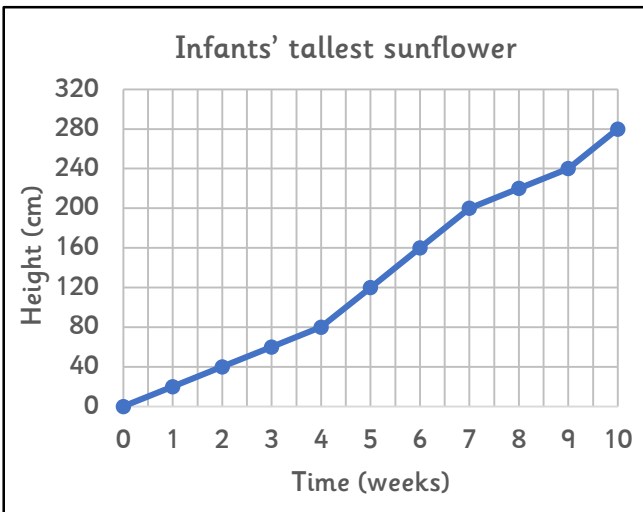
Rosa

> When we went out to water our sunflowers, I saw Craig from Year 4 pouring something that wasn't water onto one of the juniors' sunflowers! It might have been something to make the flower grow faster. That's not allowed!

> What? No I didn't! I was just pretending to pour something. I had a 'Super-Duper-Grow' plant feed bottle with me but I never actually poured it! You can't prove anything!
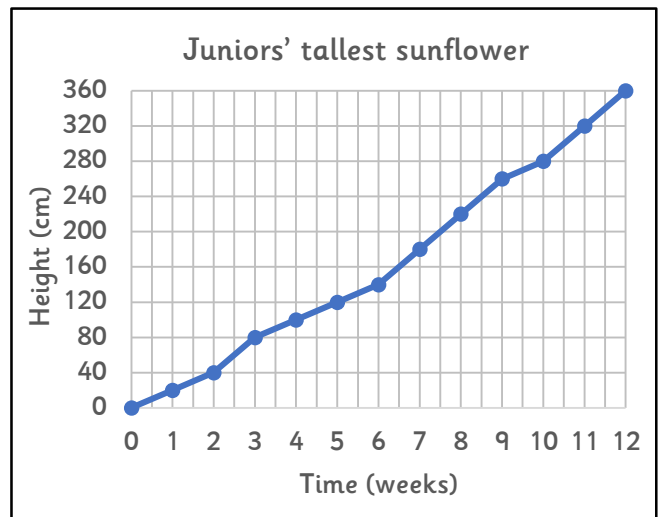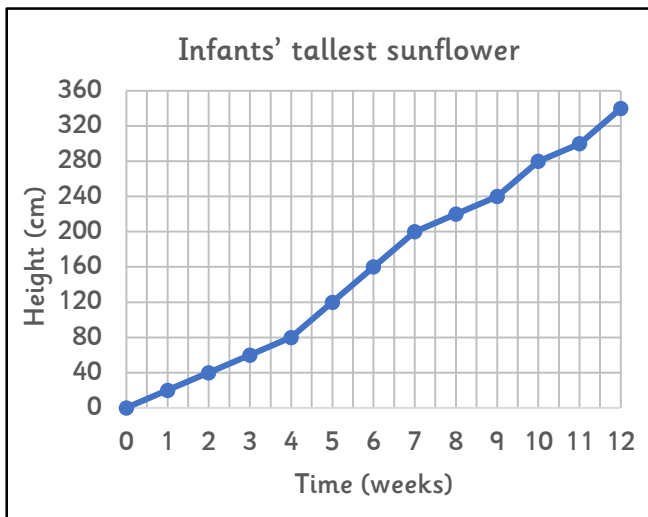
Craig

The School Council look at two graphs showing the growth of the sunflowers. It was Craig's turn to water the flowers at the end of the sixth week.

Infants' tallest sunflower

Height (cm): 320, 280, 240, 200, 160, 120, 80, 40, 0
Time (weeks): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

Juniors' tallest sunflower

Height (cm): 360, 320, 280, 240, 200, 160, 120, 80, 40, 0
Time (weeks): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

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8. Does the graph suggest that Craig is guilty? Explain why.

Thank goodness Craig only poured the plant feed on one of the flowers! At least the School Council can measure the juniors' second tallest flower to make it a fair contest!

A few weeks later, it's the end of the competition! The final graphs can be drawn and the winning team can be found... It's the juniors!

Infants' tallest sunflower

Height (cm): 360, 320, 280, 240, 200, 160, 120, 80, 40, 0

Time (weeks): 0 1 2 3 4 5 6 7 8 9 10 11 12

Juniors' tallest sunflower

Height (cm): 360, 320, 280, 240, 200, 160, 120, 80, 40, 0

Time (weeks): 0 1 2 3 4 5 6 7 8 9 10 11 12

After the result is announced, the infants and juniors debate it in the playground!

9. Decide whether each statement below is 'true' or 'false'. Use the graphs above to find the answers.

Statement	
"The juniors would have won even if the contest finished at 6.5 weeks."	
"The juniors' sunflower grew faster than the infants' sunflower in the first 4 weeks."	
"If only we stopped at 8 weeks! Then it would have been a draw!"	
"The juniors only won by 10cm!"	

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1. A bar chart would be best. The totals are what needs to be shown and bar charts show differences between totals most clearly.

2. Carly. Her scale on the y-axis makes it easy to see the value of each bar. Clement's large scale makes it difficult to work out the value of each bar accurately.

3. Anya and Michael.

4. Shonae – sunflower; Carly – 63; Onua – 230cm. Clement – amaryllis.

5. No, neither rule is *always* correct. Anya's rule is disproven as the runner bean can grow 300cm but only needs 4,000ml of water per month, whereas amaryllis only grows 70cm and needs 4,800ml of water per month. Onua's rule is disproven as there are fewer amaryllis bulbs than daffodil bulbs but amaryllis grows taller than daffodils.

6. Various answers; for example: It could suggest that the infants' plant is growing faster than the juniors' plant. It could suggest that the infants' plant has received more water/sunlight than the juniors' plant.

7. No. Shonae has assumed that a steeper line shows faster growth but she has not looked at the scales of the graphs. The two sunflowers have in fact grown at the same rate (10cm per half week) in the first two weeks, both measuring exactly 40cm at the 2 week mark. The line only appears steeper on the infants' graph because it shows data for 4 weeks, whereas the juniors' graph shows data for 2 weeks

8. Both graphs show that the sunflowers are growing at a consistent rate for the first 5 weeks. However, at week 6, the juniors' sunflower grows rapidly. This suggests that Craig did use 'Super-Duper-Grow' on the sunflower.

9.

"The juniors would have won even if the contest finished at 6.5 weeks."	False
"The juniors' sunflower grew faster than the infants' sunflower in the first 4 weeks."	True
"If only we stopped at 8 weeks! Then it would have been a draw!"	True
"The juniors only won by 10cm!"	False

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