

Planning fair tests and reading data

Grade 6 science (Year 7 · Class 6) · Worksheet

Name: _____ Date: _____ Class: _____

These twenty problems train you to plan fair tests, name variables, write hypotheses and handle data with tables, means and charts.

The first problems check the vocabulary of investigations. The later ones ask you to read graphs, find anomalies and design an investigation. They suit Grade 6, Year 7 and Class 6 students working on science and engineering practices.

Level: Grade 6 science (Year 7 · Class 6) · **Curriculum:** SEP 3-4

Problem 1 Put the steps in order (easy)

1. Put these steps in the correct order: draw a conclusion, make a hypothesis, collect the data, ask a question, plan a fair test, analyse the results.

Problem 2 Name the variables (easy)

1. Hana asks: "Does water temperature change how fast sugar dissolves?" Name the variable she changes and the variable she measures.
2. Give two variables she must keep the same.

Problem 3 Question or hypothesis? (easy)

1. Which of these is a hypothesis? (a) Does light affect plant growth? (b) If a plant gets more light then it will grow taller, because it makes more food. (c) Plants are green.

Problem 4 Choose the instrument (easy)

1. Choose the best instrument and unit for each: (a) the time a ball takes to fall, (b) the volume of water in a cup, (c) the length of a plant stem, (d) the temperature of tea.

Problem 5 A simple mean (easy)

1. A student measures a pencil roll distance four times: 12 cm, 14 cm, 13 cm and 13 cm. Calculate the mean.

Problem 6 Reading a table (easy)

1. Plant heights after two weeks: sunny window 14 cm, shaded room 9 cm, cupboard 4 cm.

Which place gave the tallest plant? How much taller was it than the cupboard plant?

Problem 7 Is it fair? (medium)

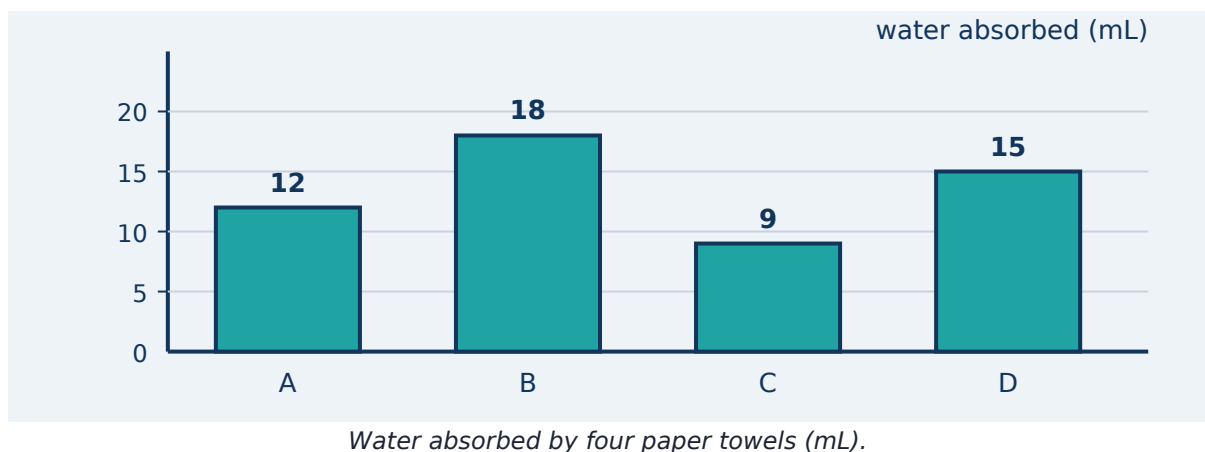
1. Mei tests paper helicopters. Helicopter 1 has long wings and is made of thin paper. Helicopter 2 has short wings and is made of thick card. She says long wings fall more slowly. Explain why her test is unfair and how to fix it.

Problem 8 Write a hypothesis (medium)

1. Kofi wants to test whether a bigger sail makes a toy boat go faster. Write a hypothesis using "If ... then ... because".

Problem 9 Absorbent towels (medium)

1. The chart shows how much water four paper towels soaked up from a tray. Which towel absorbed the most and which the least?
2. How many times more water did towel B absorb than towel C?



Problem 10 Spotting an anomaly (medium)

1. A pendulum swing is timed four times: 3.4 s, 3.6 s, 5.9 s and 3.5 s. Which result is an anomaly? Calculate the mean without it.

Problem 11 Mean and range (medium)

1. A cricket ball is thrown five times: 41 m, 38 m, 44 m, 40 m and 42 m. Calculate the mean and the range.

Problem 12 Choosing a scale (medium)

1. You draw a bar chart for the values 25, 40, 65 and 85 minutes. You choose a scale of 1 cm for every 10 minutes. Calculate the height of each bar in centimetres.

Problem 13 Faulty chart (medium)

1. A chart has no title, no labels on the axes, and the scale goes 0, 10, 20, 50, 60. List three faults and say how to fix each one.

Problem 14 Seeds that germinate (medium)

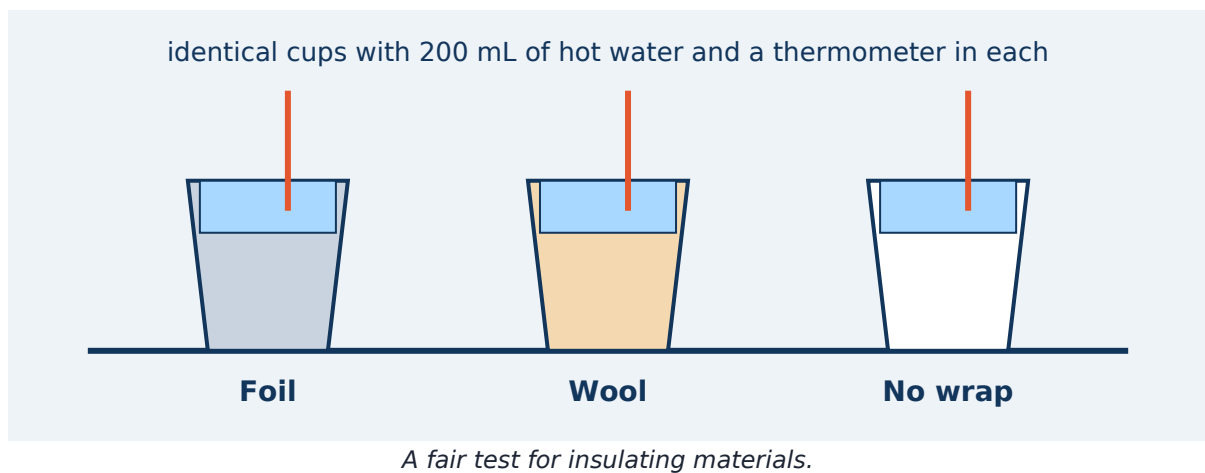
1. Out of 24 bean seeds kept in light, 18 sprouted. Out of 24 seeds kept in the dark, 12 sprouted. Calculate the percentage that sprouted in each group.
2. Calculate the difference in percentage points.

Problem 15 Convert the volumes (medium)

1. Convert 1.5 L to mL and 250 mL to L.
2. Three cups hold 245 mL, 250 mL and 255 mL. Calculate the mean volume.

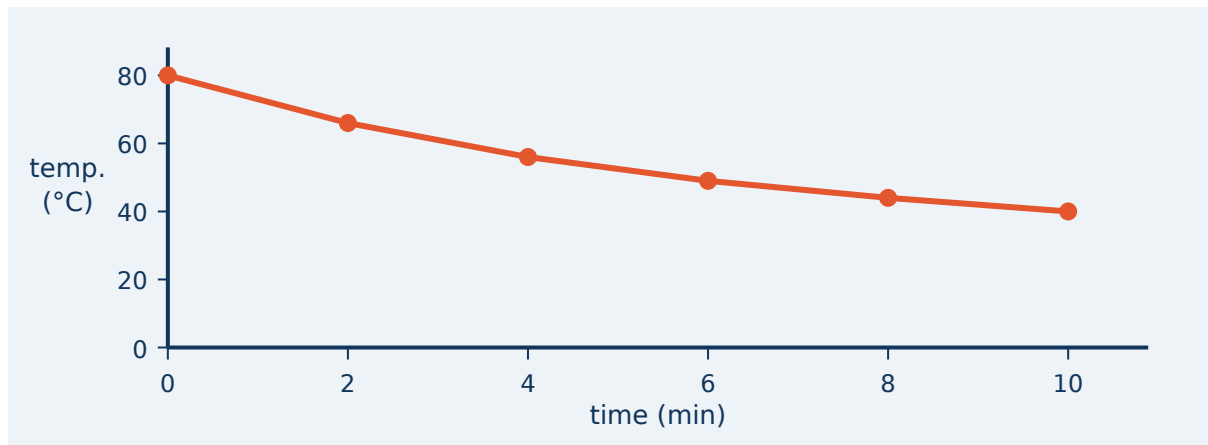
Problem 16 Insulated cups (hard)

1. Kofi wraps two cups, one in foil and one in wool, and leaves the third cup bare (see the figure). He measures the water temperature after 10 minutes. Name the independent variable and the dependent variable.
2. State three controlled variables.
3. Which cup do you expect to be warmest after 10 minutes? Give a reason.



Problem 17 Cooling graph (hard)

1. The graph shows the temperature of a cup of tea as it cools. Read the temperature at 6 minutes.
2. Calculate the temperature fall in the first 4 minutes and the mean rate of cooling in °C/min for that time.
3. Calculate the mean rate between 6 and 10 minutes. Describe how the cooling rate changes.



Cooling curve of a cup of tea.

Problem 18 Bouncing balls (hard)

1. Zainab drops a ball three times on each surface. Bounce heights (cm): grass 20, 22, 21; carpet 30, 28, 32; wood 50, 52, 51; concrete 55, 58, 61. Calculate the mean for each surface.
2. Which two surfaces have results that are clearly different? Use the ranges to justify your answer.

Problem 19 Is one plant enough? (hard)

1. Aarav puts one bean plant in sunlight and one in shade. After a week the sunlight plant grew 8 cm and the shade plant grew 5 cm. He says sunlight makes plants grow more. Why is his evidence weak?
2. He repeats with five plants in each place. Sunlight: 8, 9, 7, 8, 8 cm. Shade: 5, 4, 6, 5, 5 cm. Calculate both means and the difference.

Problem 20 Design your own test (hard)

1. Plan an investigation into whether the colour of a cloth changes how warm it gets in sunshine. Write the question, a hypothesis with a reason, the independent, dependent and three controlled variables, the instrument for measuring, and how you will repeat the test.
2. Sketch the headings of a results table.