**S1 SCIENCE**

**PROBLEM SOLVING SKILLS**

**NAME: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**CLASS: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**TEACHER: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**



Tables

In science, one method of presenting information is to put it in a ***table***.

Not ***THIS*** type of table ***THIS*** type of table

|  |  |
| --- | --- |
| **Type of pet** | **Number of pupils** |
| Dog | 5 |
| Cat | 4 |
| Hamster | 2 |
| None | 3 |



A table gives us a quick way of seeing information that we can then use to understand information.

In science we use tables to present results of experiments in a neat, tidy and easy to read way.

Quite often, we would use the information to make a graph, which also has its uses!

**Answer the following questions about tables.**

**1. Reading from a table**

Stacey wants to find out about different types of animals. She has borrowed a book from the school library. The contents page is in the form of a table.

|  |  |
| --- | --- |
| **Title of Chapter** | **Page**  |
| Mammals | 1 |
| Birds | 15 |
| Reptiles | 22 |
| Amphibians | 36 |
| Insects  | 42 |
| Fish |  |

a) Which page should she go to read about insects? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

b) Which page would tell her about parrots? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

c) Which chapter has the most pages? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

d) Suggest a page number for “Fish”. (*Note that in this type of question, there is no definite right answer. Think about whether the page number will be* ***higher*** *or* ***lower*** *than the previous one. Then think* ***how******much*** *higher or lower will it be? Would this answer* ***make******sense****?)*

**2. Reading from a table**

Jack did an experiment in class where he measured the length of time it took for different volumes of water to boil. He presented his results in a table.

|  |  |
| --- | --- |
| **Volume of water (cm3)** | **Length of time (min)** |
| 10 | 1.5 |
| 20 | 3.0 |
| 30 | 4.5 |
| 40 | 5.0 |

a) Which volume of water took the longest to boil? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

b) Choose the correct word to complete the sentence.

***increases***

***decreases***

 As the volume of water *increases*, the length of time it takes to boil

c) How long do you think it will take 50cm3 of water to boil? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 (*think about the differences between the previous numbers, is there a pattern?)*

**3. Making a table**

**Read the following passage and put the information into the table below.**

Every day the waterworks supply us with huge amounts of clean water. **45%** of this water is used for washing ourselves and our clothes. We flush **35%** of our clean water down the toilet and use **6%** on the car and garden. We use **3%** of our water for cooking and **1%** for drinking.

Use this information to **complete** the table below.

|  |  |
| --- | --- |
| **Use** | **% of water** |
| Washing |  |
| Toilet |  |
| Car and garden |  |
| Cooking  |  |
| Drinking |  |

**4. Making a table**

A recent study has found that people spend a lot of money heating their homes, but a large amount of heat is lost. This makes heating your home even more expensive. The percentages of heat lost are shown in the diagram.

Use the information in the diagram to complete the table.

|  |  |
| --- | --- |
| **Where heat is lost from** | **Percentage of heat loss** |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

**5. Making a table**

****

****

Bar graphs

 Bar graphs are a good way to display information.

There are certain rules to follow when making a bar graph.

1. Choose which information to put onto which axis

– *The results always go on the y-axis (the right hand side of the table)*.

1. Add labels and units to each axis

– *These are the headings from the table.*

1. Add the names of the bars to the x-axis

– *Make sure the bars are the same width as each other and the same width apart*.

1. Add a scale to the y-axis

– *Look at the largest number and split this up evenly between the boxes on the graph paper. A scale should go up in regular amounts; 5’s, 10’s or 20’s, etc.*

1. Draw the bars going up to the height stated in the table

– *Always use a ruler!*

 **Now try the following questions.**

1. The table below gives the eye colours for a class of 30 pupils.

|  |  |
| --- | --- |
| Eye colour | Number of pupils |
| Blue | 12 |
| Brown | 9 |
| Grey | 3 |
| Green | 6 |

Draw the following bar graph to show this information.



 blue brown grey green

12

10

8

6

4

2

0

Eye colour

Number of pupils

2. Every year, many people in industry are injured because they do not wear protective clothing.

For one year in a factory, there were 18 hand injuries, 12 foot injuries, 6 head injuries and 5 eye injuries.

Use this information to **complete** the table below.

|  |  |
| --- | --- |
| Type of injury | Number of injuries |
| Hand |  18 |
|  |  |
|  |  |
|  |  |



Number of injuries

12

10

8

6

4

2

0

3. Every day the waterworks supply us with huge amounts of clean water. 45% of this water is used for washing ourselves and our clothes. We flush 35% of our clean water down the toilet and use 6% on the car and garden. We use 3% of our water for cooking and 1% for drinking.

Use this information to **complete** the table below.

|  |  |
| --- | --- |
| Use | % of water |
| Washing |  |
| Toilet |  |
| Car and garden |  |
| Cooking  |  |
| Drinking |  |

Use the information in the table to complete the bar graph.



Line graphs

Line graphs are almost the same as bar graphs. Don’t be intimidated – if you can do a bar graph, you can do a line graph!

The only difference is this time, there are numbers on the x-axis and you are “plotting points” (just like in maths) instead of drawing big bars!

The rules are almost the same as a bar graph

1. Choose which information to put onto which axis

– *The results always go on the y-axis (the right hand side of the table)*.

1. Add labels and units to each axis

– *These are the headings from the table.*

1. **Add a scale to the x-axis**

**– *Look at the largest number and split this up evenly between the boxes on the graph paper. A scale should go up in regular amounts; 5’s, 10’s or 20’s, etc.***

1. Add a scale to the y-axis

– *Look at the largest number and split this up evenly between the boxes on the graph paper. A scale should go up in regular amounts; 5’s, 10’s or 20’s, etc.*

1. **Plot your points**

**– *look at the value for the x-axis, then how far up the y-axis it needs to go and mark the point with an “x”***

1. **Join the dots using a “line of best fit” or a curve**
* ***Use a ruler to draw a straight line that goes through as many points as possible***
* ***If it looks like it curves, then free hand a line that curves through most of the points.***

**Now try the following questions.**

1. **Use the information to make a line graph. Follow the rules on the previous page.**

|  |  |
| --- | --- |
| **Concentration (Mol/l)** | **Time to react ( s )** |
| **0.5** | **4** |
| **1** | **8** |
| **1.5** | **12** |
| **2** | **15** |
| **2.5** | **16** |



Question

Where is the reaction the fastest? At the start or at the end? **And** how do you know?

2.

|  |  |
| --- | --- |
| Time (s)  | Mass ( g) |
| 0 | 140 |
| 3 | 100 |
| 6 | 60 |
| 9 | 45 |
| 12 | 35 |
| 15 | 20 |



**Question**

What happens to the mass as the time increases?

3.

|  |  |
| --- | --- |
| Temperature (oC)  | Volume of gas ( cm3) |
| 0 | 0 |
| 20 | 5 |
| 35 | 30 |
| 50 | 40 |
| 65 | 45 |
| 80 | 45 |
| 100 | 45 |



**Question**

a)What happens to the volume of gas after 65 Co?

b) What does tell you about the chemical reaction?

4. Make a line graph using the data given.

|  |  |
| --- | --- |
| Time ( hours) | Rain fall (cm) |
| 1 | 5 |
| 2 | 2 |
| 3 | 12 |
| 4 | 7 |
| 5 | 4 |
| 6 | 8 |
| 7 | 2 |
| 8 | 1 |
| 9 | 6 |
| 10 | 3 |





**Question**. What hour had the highest rain fall?

|  |  |
| --- | --- |
| Leg length (thigh) (cm) | Time of 40 yard dash (s) |
| 20 | 9 |
| 22 | 10 |
| 26 | 11 |
| 28 | 10 |
| 32 | 8 |
| 33 | 8 |
| 35 | 12 |
| 38 | 15 |
| 39 | 9 |
| 40 | 10 |

5.





**Question**

Does a longer leg length make a faster 40 yard dash?

Averages

Calculate the average (mean) by adding up the figures and then dividing by the number of figures:

**average = total amount ÷ total number of figures**

**Example**

Find the average of 2, 4, 6

The total amount is 2 + 4 + 6 = 12

There are 3 numbers so the average is 12 ÷ 3 = 4

**Calculate the average of these figures:**

1. 5, 12, 7

2. 6, 9, 15

3. 21, 32, 28

4. 44, 37, 48, 35

5. 92, 76, 88, 80

6. Different electrical appliances have different power ratings.



What is the *average* power rating of these appliances?

1. 

What is the average length of the sharks?

Percentages

There are ***two*** percentage skills you need to master

 1. How to find a percentage of a number

 2. How to convert a number to a percentage

Remember!

*PER* means *divided by*

**PER**

**CENT**

*CENT* means a *hundred*

So *percent* literally means \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**1. How to find a percentage of a number**

To find 50% of 10, the calculation is

 50 x 10 = 5

100

Try the following calculations

3. Josh wants to buy a football, the price is £15. It’s on sale with 15% off. How much is the price reduced by?

1. There are 20 pupils in a class, 10% have green eyes. How many have green eyes?

2. A bottle of juice normally has a volume of 250cm3. Now 20% extra has been added. How much more juice is there?

**2. How to convert a number to a percentage**

To find what percentage 5 is out of 10, you *divide* 5 by 10 and *multiply* by 100

For example, if you get 20 out of 25 for a test, what percentage did you get?

 20 x 100 = 80%

25

Try these questions

3. Mr Hamilton found that 7 first years were late one morning. Out of 150 pupils, what percentage were late?

2. A ring that weighs 2g contains 0.1g copper. What percentage of the ring is copper?

1. Jenna got 18/22 for her science test. What percentage did she get?

Ratio

Ratio shows us how much of something there is compared to something else.

For example

How many boys are in your class? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

How many girls are in your class? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

The ratio of boys to girls is \_\_\_\_\_\_\_ : \_\_\_\_\_\_\_

If the two numbers can be divided by the same number, it can be *simplified*.

For example

The ratio of boys to girls in 1.2 is **8:10.**

The numbers 8 and 10 can both be divided by 2, so the simplified ratio is **4:5**

**Try the following questions**

The ratio of stars to moons is \_\_\_\_\_ : \_\_\_\_\_

 The ratio of black circles to white is \_\_\_\_\_ : \_\_\_\_\_

 The ratio of dogs to bones is ­­­\_\_\_\_\_ : \_\_\_\_\_

(lucky dog!)