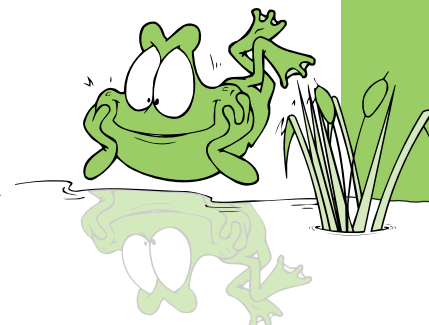




Maths - Contents

The Size Of The Problem	60
Trashy Trends	62
Crack The Campaign Code	64
The Low Down On Litter	67
Brain Benders	68



The Size Of The Problem



FOCUS

- What do current statistics tell us about stormwater?

OBJECTIVES

- Shade grids accurately to signify percentage values
- Convert fraction of 100 to a percentage value
- Understand relevant stormwater issues in our region

BACKGROUND

Stormwater, whisked away into underground drains, is often viewed by the general public as a nuisance, flood water with little or no ecological value. Few people are aware that it is discharged directly into waterways where the pollution it carries affects water quality, plants and animals. Few people understand how urban development has altered water runoff.

NOTES

The worksheet accompanying this lesson plan could be completed by the class as a whole, or by one group while others work with you in a focused teaching group, manipulating MAB to represent percentage values.

CSF II LINKS:

MATHS

4.1 / 4.3	Number
4.3	Chance & Data
4.3	Reasoning & Strategies

LEARNING TASKS

- 1/ Ask children to estimate how much water soaks into the ground during rainfall in urban and rural areas and convert fractional terms to percentage values.**
- 2/ Distribute worksheet and discuss stormwater runoff in relation to the surfaces.**
 - Students estimate and shade each beaker to represent runoff (rounding may be necessary).
- 3/ Model the shading of a 100 grid on an overhead transparency to represent these percentage values, revising the concept of % being parts out of 100.**
 - Use MAB as an alternative way of representing the same information. Identify how many small cubes or 100ths would represent the runoff in a given environment if the 100 block represented all available rainfall.
- 4/ Students complete worksheet, gauging the size of the stormwater problem, contributing factors, types of pollution and their impacts.**
- 5/ Discuss the statistics.**
 - Were students surprised at the data?
 - What are the biggest issues facing stormwater quality?
 - What assumptions can be made about ways to improve the situation?

MATERIALS

- Overhead transparency of 100 grid (optional)
- Overhead projector
- MAB blocks
- 'The Size Of The Problem' Student Worksheet
- Calculators for extension work

EXTENSION

Given two values, students calculate a percentage value eg. 1200kg of sediment out of a total of 1500kg of pollution was caught in a Daylesford gross pollutant trap.

ASSESSMENT

Can students recall and convert fraction / percentage equivalences eg, one quarter = 25%? Can they use percentages to make statements about data and use MAB to assist calculations?



The Size Of The Problem - Student Worksheet

Name: _____



Complete this stormwater worksheet to find out more on the impacts of stormwater pollution in the North Central Region of Victoria.

1/ Estimate and shade the amount of runoff in each beaker using the % stated.

2%	14%	73%	85%	98%

2/ Shade the grids below to find out what our stormwater pollution consists of:

Vegetation 70%	Litter 15%	Soil 15%

3/ Write each percentage value as a common fraction.

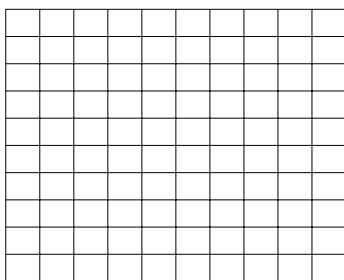
Vegetation 70% = /

Litter 15% = /

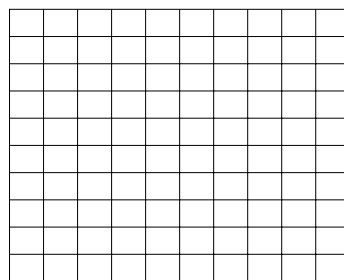
Soil 15% = /

4/ Shade the grids to show these alarming facts:

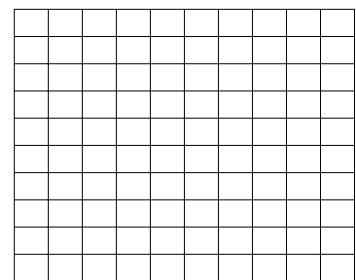
Of every 100 pieces of litter dropped 50 are cigarette butts



Of every 100 pieces of litter in our waterways 90 sink



Of every 100 platypus inspected, 10 have litter caught around them



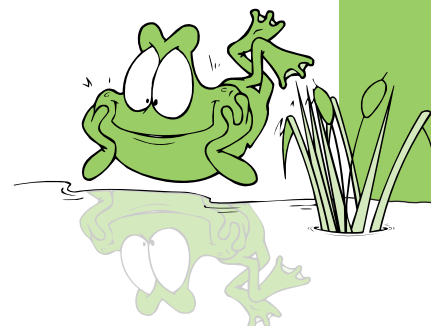
5/ Write each statistic as a percent value.

_____ % are cigarette butts

_____ % sink

_____ % have litter caught

6/ 61% of rivers and streams in North Central Victoria are in very poor condition and 31% are in moderate condition. What percent of streams are in good condition? _____%



FOCUS

- What litter trends exist within the schoolyard?
- Are bar graphs an effective way to display data?

OBJECTIVES

- Use tabulated data to construct a bar graph
- Compare and discuss various data display methods

BACKGROUND

It is essential to identify types and quantities of pollutants prior to developing a waste reduction strategy. Understanding littering behaviour helps us to design education programs which targets people who litter. There is no point targetting cigarette butts if paper products are your main pollutant.

NOTES

This activity is a follow-up to the Science activity 'Waste Watching'. The tabulated data used in generating bar graphs is obtained from the results of playground litter surveys.

CSF II LINKS

MATHS

- 4.2 / 4.3 Chance & Data
- 4.1 Reasoning & Strategies

LEARNING TASKS

1/ Copy the Student Worksheet onto an overhead transparency to assist students in designing their own graphs.

- Discuss it's layout, features, calibration, content, messages, etc.
- Assist students to make statements and questions about the information

2/ Review data from the Science activity 'Waste Watching'. Discuss the variety of data that could be graphed and the messages it might relay:

- Volume of each litter type in one zone on one particular day
- Total volume of each litter type in one particular zone
- Total volume of one particular litter type across all zones

3/ Discuss graph options - bar, line, pie, pictograph, etc.

4/ Students prepare their graphs. You may wish to assign graph topics so that comparisons can be made eg. between days, zones or litter types.

5/ Students use their bar graph(s) to construct written statements about the data and draw conclusions. Discuss the outcomes and generate questions about how litter problems can be addressed:

- What is the most littered item? Where is its source?
- Which areas of the school are prone to litter? Why?
- Are any days worse than others? Why?

MATERIALS

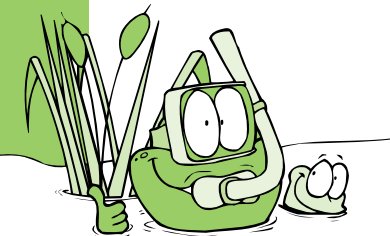
- Tally Sheet from the Science activity 'Waste Watching'
- Overhead transparency of 'Trashy Trends' Student Worksheet
- Graph paper
- Pencils
- Erasers
- Rulers

EXTENSION

Provide details such as weather conditions, canteen days, popularity of play areas or year levels found in certain areas. Discuss reduction strategies in the SOSE activities 'The 3R's Of Education' and take action in 'Let's Do Something!'.

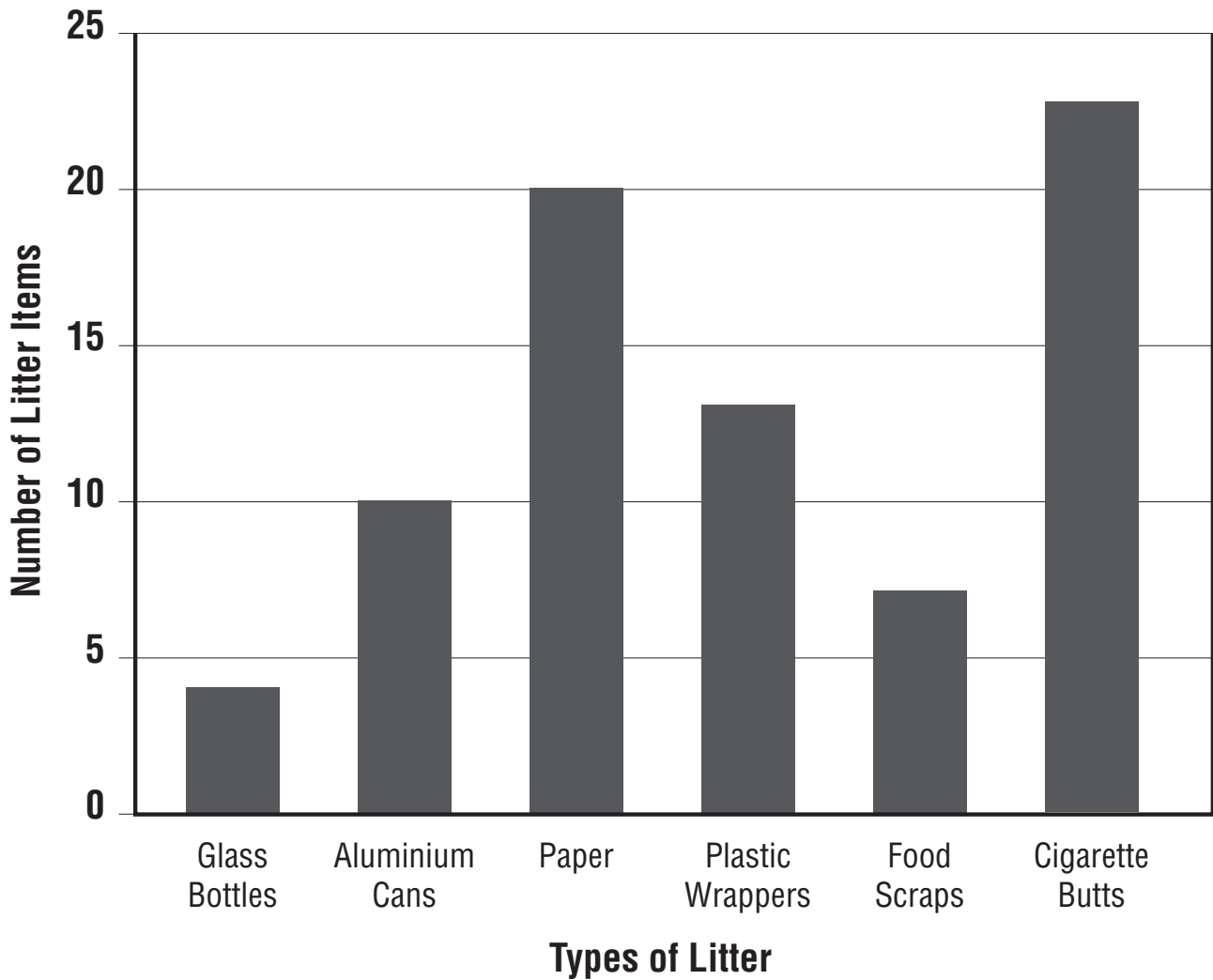
ASSESSMENT

Did students bar graphs have a title, titled axes, clearly marked calibrations, neatly ruled, labelled and shaded bars and key? Could they make inferences from the data?



Trashy Trends - Student Worksheet

Saturday's Park Litter Survey

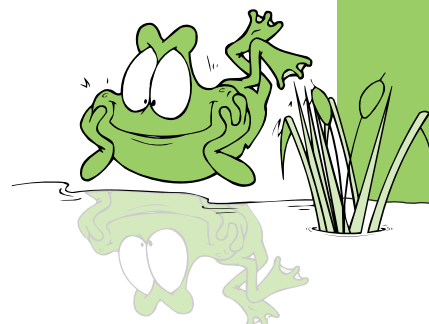


Write a statement about the results shown on this graph.

Statement

Write a question that you can ask another student about the results of Saturday's Park Litter Survey.

Question



FOCUS

- How are stormwater issues affecting the community?

OBJECTIVES

- Read and interpret word problems
- Solve algorithms of the four operations
- Use the clues to crack the code and reveal the slogan

BACKGROUND

The Victorian Government has committed \$22 million over 3 years to tackle urban stormwater pollution through the Victorian Stormwater Action Program. The City of Greater Bendigo received a grant through the program to undertake a community awareness campaign. The message of 'From Your Street To Your Creek' raises awareness of the fact that drains channel water directly from the town's streets to the Bendigo Creek.

NOTES

This activity can be completed as classwork, for students who complete other activities ahead of time, or for homework to be collected at the end of the week.

LEARNING TASKS

1/ To revise the core skills required for this activity and to provide an example you may like to work through the first question below:

- A household produces 15kg of waste each week. How much waste do they accumulate over a 2 month period?

2/ Ask the class to identify the facts, the question and name which operation is required. Get a student to write the operation on the board and then you (or a student) can model how to solve it. State the solution in reference to the question.

3/ Repeat this process for the first question on the Worksheet.

4/ Students work through the sheets provided, calculating solutions, matching answers with the numbers in the mystery slogan and inserting letters until they are able to read the message.

- Encourage students to highlight or underline known facts and the key question to assist in identifying the operation required.

5/ Come together again as a class and discuss the slogan. Do you think it is a clever idea? Can you think of a slogan to educate the community about a stormwater issue in your area?

CSF II LINKS

MATHS

4.2 / 4.4

Number

MATERIALS

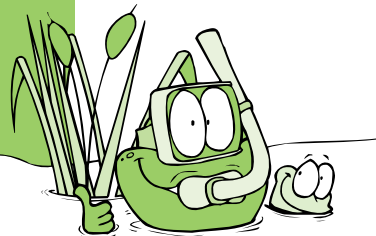
- Whiteboard
- Word problem examples
- 'Crack The Campaign Code' Student Worksheet
- Highlighter

EXTENSION

Students could devise similar challenges for classmates by using any of the four operations to reveal words from their glossary in the English activity, 'Stormwater Words'.

ASSESSMENT

Were students able to identify the operations required? Did they show clear working for each problem? How accurately were students able to solve the algorithms?



Crack The Campaign Code - Student Worksheet

Name: _____



The Bendigo community education program involves gluing a special sign onto all stormwater drains in town. Reveal the slogan on the signs used in Bendigo.

- 1 Read each word problem
- 2 Identify the operation required
- 3 Work out each answer showing your workings in the box
- 4 **Continue until you have answered all the questions**
- 5 Find the letter in the top corner of each box
- 6 Scan the mystery slogan for the numbers to match each answer
- 7 Insert letters where your numbers match those in the slogan
- 8 Keep going until you can read the slogan

R

During one month, a Maryborough Primary School held a Reduce, Reuse, Recycle campaign. They calculated that 423 pieces of A4 paper, used only on one side, were saved and used for scrap paper. If there are 9 classrooms in the school, on average how many pieces of A4 paper were reused in each room?

E

A St Arnaud handyman mows lawns five days a week. He empties the grass catcher onto a compost heap 13 times Monday, 25 times Tuesday and 8 times Wednesday. On Thursday he empties 4 times Wednesday's amount and on Friday he empties the catcher 14 times. How many loads of lawn clippings are collected each week?

S

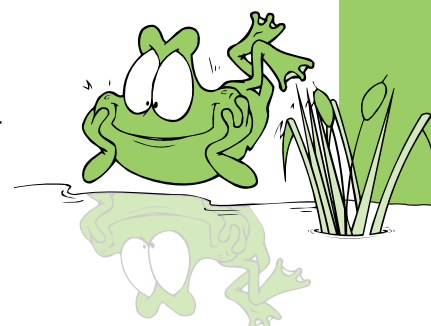
During a year long platypus survey, life threatening rubbish was removed from 16 out of the 73 animals caught. How many platypus would have been alive if the rubbish had not been removed?

K

Residents of Bendigo enjoy a recycling service once every fortnight. If there are 52 weeks in a year, how many times are recyclables collected each year?

M

Elmore has 32 streets. Each one has four stormwater inlet pits. How many pits direct water into the stormwater system in the town?



Crack The Campaign Code - Student Worksheet

U

After raking up 21 piles of autumn leaves in Castlemaine, Mrs. Johnson spread 15 piles as mulch over the garden. How many piles did she have left over to put in his compost bin?

O

A family in Swan Hill buys one newspaper each weekday and two newspapers each day of the weekend. If each is saved for recycling, how many are put out for collection each week?

F

A gross pollutant trap installed by Hepburn Shire Council in Daylesford caught a total of 1500kg of pollution over a 5 month period. If 1350kg of this was made up of sediment and litter, how many kilograms of vegetation were caught?

Y

On average, each student in Donald discards 5 pieces of litter from their lunchbox each day. In a class of 27, how much litter is generated?

T

Echuca residents have 13 items of junk mail deposited in their mailbox each week. Many fall out and are blown or washed into stormwater drains. If 9 households 'No Junk Mail' signs on their mailboxes, how much paper pollution could be avoided each week?

Mystery Slogan

150	47	9	128	135	9	6	47	57	117	47	92	92	117
-----	----	---	-----	-----	---	---	----	----	-----	----	----	----	-----

117	9	135	9	6	47	C	47	92	92	26
-----	---	-----	---	---	----	----------	----	----	----	----



FOCUS

- What are students attitudes to litter and littering?
- When, where and what do students litter?

OBJECTIVES

- Present collected survey results as tabulated data
- Analyse data and construct descriptive statements

BACKGROUND

RMIT University students completed research that found many students do not take responsibility for their litter (28%). The main reasons were: insufficient bins, laziness and a ‘who cares’ attitude. Three main behaviour types were identified; ‘wedgers’ (stuff objects into spaces), ‘undertakers’ (bury litter) and ‘foul shooters’ (aim for bins but miss).

NOTES

This activity is a direct follow on to the surveys designed and undertaken in the English activity ‘*Learning About Littering*’. The activity should be adapted to the content of surveys written.

CSF II LINKS

MATHS

4.1 / 4.2 / 4.3 Chance & Data

LEARNING TASKS

1/ Discuss the need to collate survey results in order to analyse attitudes and behaviours, summarise data and highlight trends.

- Brainstorm various methods. Suggest the use of tables / tallying.
- Model the process, if necessary, using results from completed surveys.

2/ Students complete tables using survey results. They could:

- Tabulate the choices available in responding to one survey question and the results from one year level surveyed.

OBJECTS LITTERED BY YEAR FOUR

Paper	+++	5
Plastic food wrappers	+++ +++	15
Drink containers	+++ II	7
Food scraps	+++ +++	10

- Tabulate one particular question choice across several year levels:

FOOD WRAPPERS LITTERED BY EACH CLASS

Years P - 2	+++ +++	15
Years 3 - 4	+++ +++ III	18
Years 5 - 6	+++ +++ +++	20

- Use fractions / percentages to construct statements about results, eg. one in every four (25%) of Year 6 students litter at school.

3/ Discuss ways in which this information could be used in future.

MATERIALS

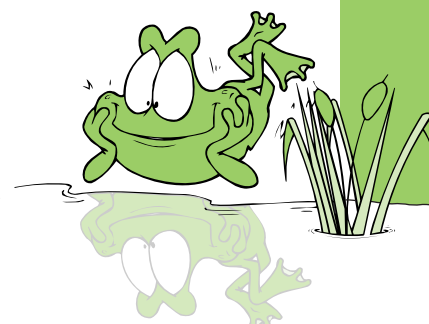
- Completed surveys from the English activity ‘*Learning About Littering*’
- Paper for tables
- Calculators

EXTENSION

Graph the results. Publish results in the school newsletter, or display on large posters.

ASSESSMENT

Were students able to accurately tabulate survey results? Could they generate numerical statements? Did they recognise the value of their information?



FOCUS

- What strategies can students use to solve problems?

OBJECTIVES

- Interpret problems and plan an approach
- Apply a variety of strategies to solve problems
- Formulate solutions and explain processes used

BACKGROUND

These activities highlight some real stormwater issues impacting on our environment. Many organisations are working together to combat these issues. Further information on each of the 'Brain Benders' can be obtained from Council, your local Waste Management Group, the North Central Catchment Management Authority or the Environment Protection Authority.

NOTES

The challenges provided can be used in any number of ways; the whole class or small groups all work on the same problem, small groups or individuals work on different problems and compare strategies or students complete problems for homework or in spare time.

LEARNING TASKS

Your approach to these activities will vary according to the variety of ways in which they can be implemented. The 'Brain Benders' Task Cards can be enlarged or photocopied.

1/ Devise your teaching method

- Students work in large / small groups or as individuals.
- All complete one task and compare strategies.
- Complete different tasks and compare or rotate.

2/ Students read each challenge. They may choose to highlight / underline key facts or make notes about the variables to consider.

- There is no one correct strategy to use and likewise, no one correct solution. The aim for students is to solve the challenge in a way that they feel comfortable and to achieve a solution that they can justify.

3/ Encourage students to explain their process to you or to a peer.

- These challenges work very well when used in conjunction with a student learning journal.

4/ Recording anecdotal records while students solve and chat about the scenarios and when they explain their strategy is recommended as an effective evaluation tool.

CSF II LINKS:

MATHS

4.2 / 4.3 / 4.4 Reasoning & Strategies

MATERIALS

- 'Brain Benders' Student Worksheet
- Phone books
- Calculators
- Scrap paper
- Graph paper
- Measuring tapes
- Trundle wheels

EXTENSION

Challenge students to evaluate their own work. How do they know if their solution is reasonable? Could there be alternative solutions? What did they learn about stormwater issues?

ASSESSMENT

Which strategies did students prefer? What does their choice of strategy tell you about their level of thinking, confidence and skill? Could students explain their process?



Brain Benders - Student Worksheet

WHOPPING WASTE!

On average, each household generates approximately 40kg of waste per week. Using the phone book for your region estimate:

- The amount of waste generated across the region each week
- The amount of waste generated by the whole region throughout a year
- How long would it take to accumulate 10 million kilograms?

Complete the challenge again. This time, with a recycling and composting program in place, each household now generates half the amount of waste. How does that change the figures above?

WHAT'S THAT STENCH?



Pet droppings contribute to stormwater pollution and pose a serious threat to waterways due to the concentration of nutrients and bacteria that are released into our creeks and rivers when the droppings break down.

One dog or cat alone causes little damage but just imagine the impact of tonnes of pet droppings created by the thousands of furry friends that live in our towns and cities!

Use any strategy you like to estimate:

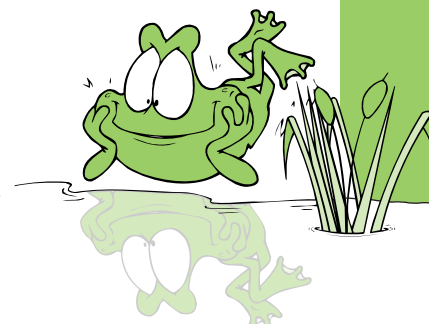
- The number of cats and dogs owned by families attending your school
 - The number of cats and dogs owned by families of all schools in your town
 - How many kilograms of waste would there be in the two examples above if each dog produces 300g of waste per day and each cat 100g?
-

WEED EXPLOSION

Garden clippings and food scraps release large amounts of nutrients into our waterways and encourage the growth of weeds. These 'intruders' revel in their new environment, competing with and replacing native species and clogging up waterways. They are often inedible for native animals and disturb and modify the natural food chain.

If one weed can reproduce and grow three new plants in just a fortnight:

- How many weeds will exist after two months, six months, one year, one decade?
- If one quarter of all weeds die off every summer, how will this affect numbers?



THOSE BEASTLY BUTTS

Did you know that Australian's throw away 32 billion cigarette butts every year! In Bendigo alone, it is estimated that 2.9 million butts are discarded each week.

- Approximately how many cigarette butts are littered each day?

Each cigarette butt is about 3cm long. If this litter was placed end to end, how many times could it:

- Stretch across your room?
- Circle your school along the yard boundary?

RECYCLING REMEDIES

One recycled milk carton can be manufactured to make 5 sheets of A4 office paper.

Consider the amount of paper that could be made from recycled materials by using:

- The milk cartons your family uses in one week
- The milk cartons your family uses in one year
- The milk cartons your whole class and their families use in one week
- How long would it take to supply each class in the school with 5 reams of paper?



PLASTIC PREVENTION

Plastic bags are handed out in most stores. They often only have one item in them and they are often only used for a short period of time. However, when blown or washed into our waterways they entangle wildlife, float on the surface, create unsightly mess and can take up to 3 years to break down.

Investigate and estimate one of the following:

- The average life span of a plastic shopping bag taken from the supermarket to the rubbish bin
- The number of plastic bags issued at your local supermarket per day, per week, per year



Brain Benders - Student Worksheet

Name: _____

