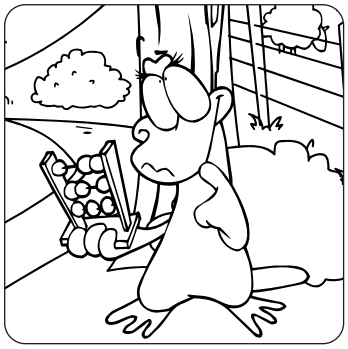


Maths - Contents

Rating River Health

I

FOCUS

- What is the condition of our waterways?

OBJECTIVES

- Use the internet to locate current data
- Read and interpret tabulated data
- Construct and interpret graphs

CSF II LINKS

MATHS
- 4.1 Chance & Data (S & I)
- 4.2 Chance & Data (S & I)
- 4.3 Chance & Data (S)

BACKGROUND

During 1999, NCCMA staff conducted surveys of the major waterways within each of the four catchments across North Central Victoria. They evaluated waterways in relation to bank stability, exotic flora, riparian vegetation width and instream habitat. This data enabled the condition of waterways to be rated and categorised, and formed the basis for formulating River Health Plans.

NOTES

This activity can be conducted as a whole class, or in small groups as part of a rotation of Maths activities. If internet access is a problem, see Resources '*Rating River Health*' on the CD and alter the activity accordingly.

LEARNING TASKS

1 Go to www.nccma.vic.gov.au

2 Students follow the instructions on the worksheet to move through the website via links, and locate the required information.

3 Allow time for students to extract data regarding the current condition of our waterways and to complete the table provided.

4 Choose a format and method to graph data.
- Provide students with a bar or circle graph template to complete.
- Challenge students to construct their own graph.
- Graph the data from your catchment.
- Graph data from all catchments.
- Compile data from all catchments onto the one graph.
- Select one category (e.g. marginal) and graph the breakdown.

5 Encourage students to interpret their data, construct statements about the findings and make comparisons.
- Perhaps students could pose questions for peers to answer from their graph?

6 Discuss the advantages and disadvantages of each data display format.

MATERIALS

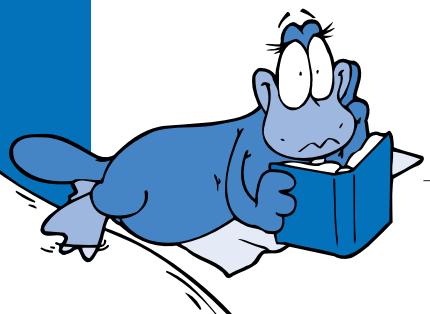
- ***'Rating River Health'* Student Worksheet**
- **Computers** with internet access
- **Graph** and blank paper
- **Ruler**
- **Pens** / pencils
- **Compasses**
- **Calculators**
- ***'Rating River Health'* Alternate Resource** (see 'Resources' on the CD) (optional)

EXTENSION

Complete Science activity, *'Virtual Habitat Survey'*. What are the names of the streams in each condition category? What is / can be done to improve their health?

ASSESSMENT

Can students read tabulated data? How independently were students able to construct graphs using given data? Could students construct statements using displayed data?



Rating River Health - Student Worksheet

Name _____

LOG ON to the internet.
ENTER the address www.nccma.vic.gov.au
CLICK 'Enter'.
CLICK 'Programs' (found in the task bar at the top of the web page).
CLICK 'Waterways'.
CLICK 'River Health'.
SCROLL down to the table under the subheading 'What is the current condition of our waterways?'.
READ the table carefully, notice the names of the four catchments in our region.
WRITE the names of each catchment across the top of the table below, leaving the first column blank.
READ the five categories that the waterways of each catchment have been placed into.
WRITE them into the left hand column of the table below.
COPY the data from the web page into your table.
LOG OFF the internet and return to your work area.

What is the current condition of our waterways?

The table states the percentage of waterways from each catchment area that are rated as being in 'Excellent', 'Good', 'Marginal', 'Poor' or 'Very Poor' condition.

1 Which catchment has the highest percentage of waterways in 'Good' condition? _____

2 Which catchment has the highest percentage of waterways in a 'Marginal' condition? _____

3 Which catchment has the highest percentage of waterways in 'Poor' condition? _____

4 In the Campaspe catchment, what percentage of waterways are in 'Very Poor' condition? _____

Stream Speed

M

FOCUS

- How fast do rivers flow?

OBJECTIVES

- Measure the flow rate in a local waterway
- Calculate travel distances according to given times
- Calculate travel time according to given distances

CSF II LINKS

MATHS
- 4.1 Measurement
- 4.2 Measurement
- 4.4 Measurement
- 4.2 Number
- 4.1 Reasoning & Strategies
- 4.3 Reasoning & Strategies

BACKGROUND

The speed of flows in waterways can greatly affect the type and diversity of animals and plants found in a waterway. See the *'Stream Speed'* Student Worksheet for more information.

NOTES

To complete this activity as a practical, hands-on task, you will need to visit a local waterway. You could conduct the Science activities, *'Habitat Survey'* and *'A Meandering Map'* simultaneously.

LEARNING TASKS

1 Plan a fieldtrip to a local waterway.

SAFETY Develop a safety plan, which identifies potential hazards, the risks and includes safety control measures.

2 Collect data about the flow rate of a local waterway.
- Measure ten metres along the bank of a straight section of a stream.
- Stand at the upstream mark, and throw a twig into the middle of the stream.
- Use a stopwatch to record how many seconds it takes to travel the ten metres.
- Divide the time by ten to calculate seconds per metre.
- Repeat three times to obtain an average rate.

3 Discuss the importance of accurate measurements.
- What factors affect flow speed along the length of a waterway?

4 Students complete the worksheet using the average flow speed.

5 To extend the task further and incorporate map reading, use local area maps and challenge students.
- Plot the distance travelled along a local waterway in a given time. Starting at a certain landmark, where would you end up?
- Calculate how long it would take to travel a given distance. For example, along the Campaspe River between Axedale and Elmore.

MATERIALS

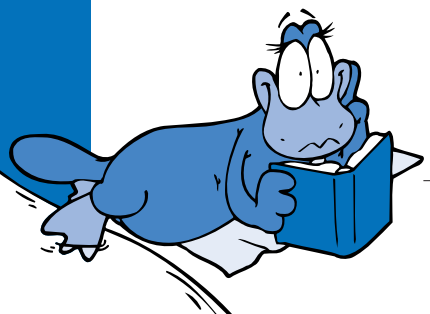
- **'*Stream Speed*' Student Worksheet**
- **Trundle wheel**
- **Tape measure**
- **Stopwatch**
- **Calculator**
- **Rocks** and twigs
- **Maps** of local area
- **Scrap paper**
- **String**

EXTENSION

Research the influence of stream flow rates on aquatic animals and sediment in waterways. Use photographs on the CD to show evidence of stream meanders, and pose the question 'Why do waterways meander?'

ASSESSMENT

Could students apply multiplication and division to practical situations involving time and length? Could they apply a seconds per metre ratio to mathematical challenges?



Stream Speed - Student Worksheet

Name _____

Did you know that the type and diversity of animals found in streams can depend on how quickly the water is moving?

The headwaters of waterways are found in the hills. Here, the water often flows quickly, tumbling over rocks and forming waterfalls. Fast-flowing waters are easy to spot by the swirling patterns and whirlpools on the surface.

Here, the aquatic animals live around the edges of the water in sheltered pools, deep holes, under rocks and logs, on plants or on the bottom of the waterway away from the fastest flowing water.

In the lower reaches of a waterway, the water usually flows slowly. In these slow moving waters fish such as the mighty Murray cod can grow to weigh 90 kilograms!

My local waterway is the _____.

The average flow rate of this waterway is _____ metres per second.

Use the flow rate above to solve the following challenges.
Complete calculations on a separate piece of paper and attach it to your worksheet.

1 How long would it take for a twig to travel:

a 100 metres along your waterway? _____

b 500 metres along your waterway? _____

c 750 metres along your waterway? _____

d 1 kilometre along your waterway? _____

2 How far could a twig travel along your waterway in:

a 1 minute? _____

b 15 minutes? _____

c 1 hour? _____

d 1 day? _____

e 1 week? _____

3 Water in the Murray River at Albury takes about one month to reach South Australia.

a How long would it take for a twig in the waterway you measured to travel to a town 12 kilometres downstream?

_____

b What distance could a twig in your waterway travel in one month?

_____

c Estimate where the twig would end up in a months time.

_____

CHALLENGE Mark out a distance of 100 metres in your school ground. Check above to see how long it would take for a twig to travel that distance in your local waterway. Have a friend time you while you try to walk the 100 metres in the same time a twig would take. Were you too slow or too fast? Adjust your speed and try again. How accurate are you able to be? Give your friend a go at this activity

Woolly Waterways

M

FOCUS

- How can we measure the length of waterways?

OBJECTIVES

- Measure waterways using string
- Calculate distance according to a given scale

CSF II LINKS

MATHS 4.1 Space
4.3 Space
4.4 Space
4.5 Space
4.4 Measurement

BACKGROUND

A meander is a curve in the course of a waterway. Waterways meander as a result of terrain, geology and human barriers. The total length of a waterway can be twice that of a direct path between the start and end point.

NOTES

In this activity, students will use a variety of strategies to measure the length of a waterway on a map as accurately as possible. Contact the North Central Catchment Management Authority if you require local area maps.

LEARNING TASKS

1 Discuss with students.
- Who measures the length of waterways and why do they do it?
- Why are waterways difficult to measure?
- How could the length of a waterway be measured?
- Can the length of a waterway change? How?
- How can we measure the length of a waterway from the classroom?

2 Complete part one of the worksheet as a class. Ask students to estimate the length (cm) of the two lines.
- Which line was more difficult to estimate?

3 Students measure each line.
- Which line was easier to measure? How did you measure it?
- How effective was your method of measuring the wavy line?
- Is there an easier or more accurate way to measure it?

4 Using an enlarged example, use wool to measure its length, then lie the wool along a ruler to establish distance.
- Is there another method that might work just as well?

5 Use the worksheet to convert both lengths to kilometres.
- Why are scales used on maps?

6 Students complete the rest of the sheet independently.

MATERIALS

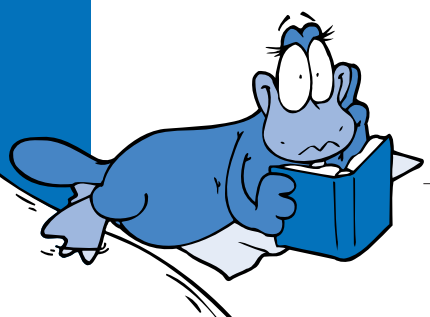
- ***'Woolly Waterways'* Student Worksheet**
- **Whiteboard** / butcher's paper
- **Wool**
- **Blue Tac**
- **Rulers**
- **Maps** of local area
- **Calculators**

EXTENSION

Obtain local area maps and challenge students to measure waterways in your catchment and calculate their length. Place them in ascending order. Compare the distance between two riverside towns by road and by river using both ruler and wool methods.

ASSESSMENT

Were students able to use a variety of methods to measure waterway lengths? Could they use a scale to calculate distance accurately? Could students read local maps?

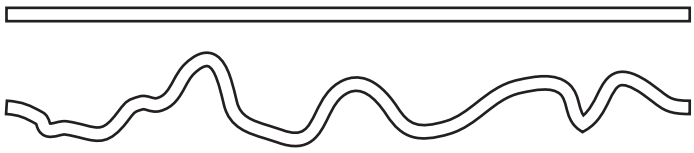


Woolly Waterways - Student Worksheet

Name _____

Part 1

1 Estimate the length of the two rivers below:



Estimate _____ cm

Estimate _____ cm

2 Measure each line above. Straight river _____ cm. Wavy river _____ cm.

3 If the scale for the rivers above is **1 cm = 5 km**,
a the straight line is _____ km long
b the wavy river is _____ km long.

Part 2

4 Estimate the length of each river below, measure each one using your preferred method then calculate their distance by using the scales given:

1 cm = 2 km

Estimate _____

Measure _____

Distance _____

1 cm = 7 km

Estimate _____

Measure _____

Distance _____

1 cm = 9 km

Estimate _____

Measure _____

Distance _____

Creeklines Of Colour

M

FOCUS

- What colour is an Eastern Rosella?

OBJECTIVES

- Solve mathematical problems
- Colour picture segments according to the given key
- Learn about the Eastern Rosella's habitat and diet

CSF II LINKS:

MATHS 4.1 Number (M)
4.2 Number (M & P)
4.3 Number (N)

BACKGROUND

The types of animals that are found in the riparian zones of waterways are often good indicators of how healthy the area is. Healthy riparian zones are home to a variety of mammals, birds, reptiles, amphibians and invertebrates. Riparian zones in poor condition have a reduced abundance and diversity of organisms.

NOTES

The profile of the Eastern Rosella featured at the bottom of the worksheet may be a useful model as students plan, research and present their own animal profiles for the English activity, *'Wanted'*.

LEARNING TASKS

1 Revise mathematical terms and concepts.
- Multiples, factors, less than, greater than, prime numbers, decimals and fractions.

2 Complete a sample problem as a whole class.

3 Students begin the worksheet.
- Complete calculations on spare paper and attach to the worksheet.
- Use a calculator to check solutions before colouring the worksheet.

4 Students may add more detail to the picture and illustrate the habitat, breeding habits or diet of the Eastern Rosella.

5 Discuss the Eastern Rosella.
- Where have you seen them?
- What have you noticed about their behaviour?
- Does our local area provide habitat and breeding sites for Rosellas?

6 You may wish to integrate English skills by asking students to highlight key words in the profile of the Eastern Rosella.

MATERIALS

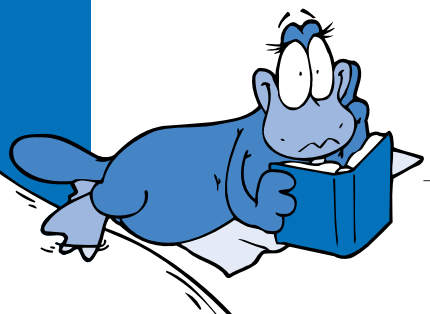
- ***'Creeklines of Colour'*** **Student Worksheet** (you can enlarge to A3)
- **Whiteboard**
- **Scrap paper** for calculations
- **Coloured pencils**
- **Calculators**
- **Highlighter**

EXTENSION

Students create a similar challenge for their animal profile for the English activity, *'Wanted'*. Students can undertake a bird survey around the school or a local waterway, and graph the results.

ASSESSMENT

Were students able to independently solve the variety of problems presented? Which concepts did students find most difficult? Do any concepts require revision?



Creeklines Of Colour - Student Worksheet

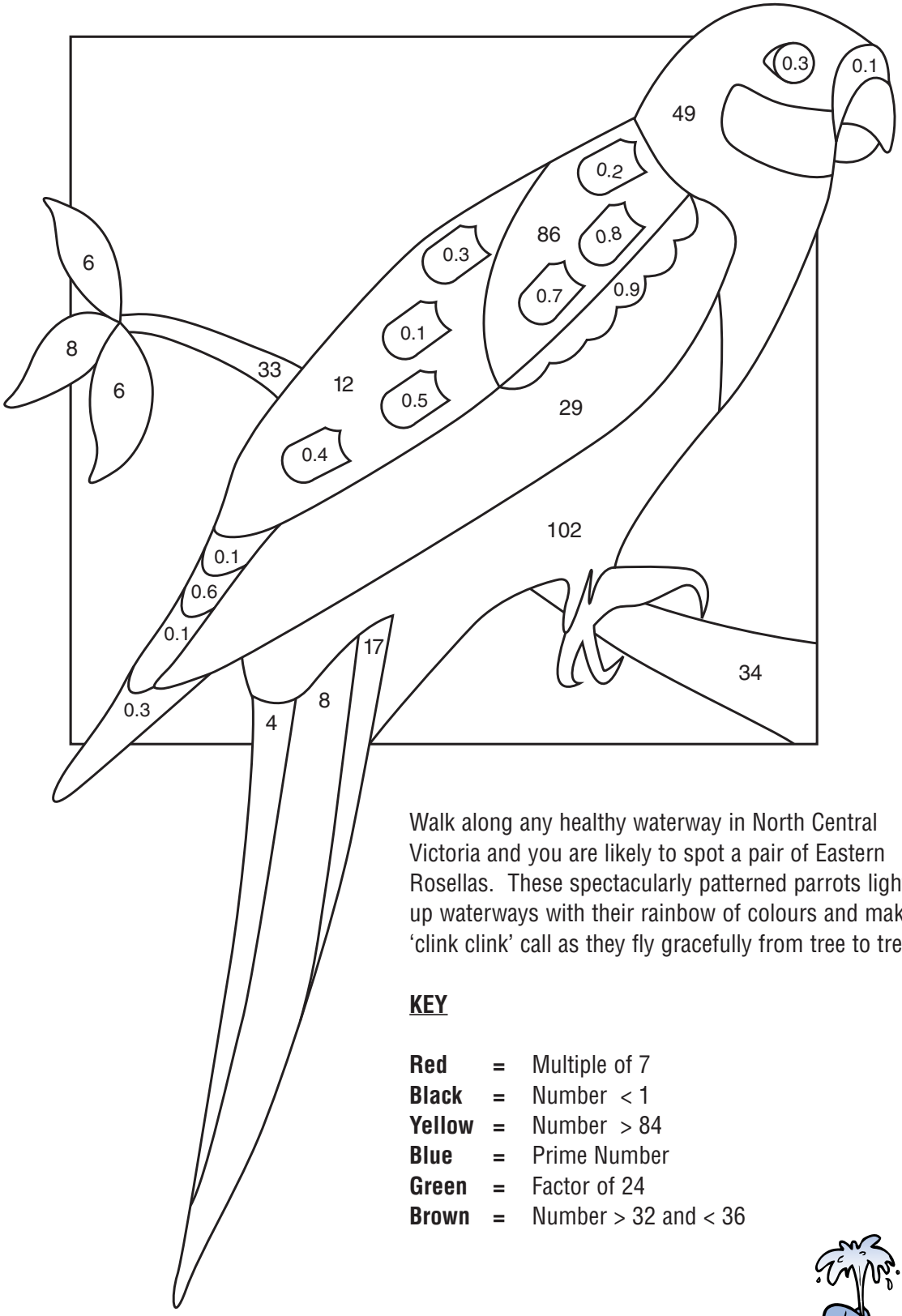
Name _____

Colour in Rosie

REVIEW the number in each section of Rosie's head, body and tail.

USE the information in the key to categorise each of Rosie's numbers on a blank page.

COLOUR in each area, using the key.



Walk along any healthy waterway in North Central Victoria and you are likely to spot a pair of Eastern Rosellas. These spectacularly patterned parrots light up waterways with their rainbow of colours and make a 'clink clink' call as they fly gracefully from tree to tree.

KEY

Red	=	Multiple of 7
Black	=	Number < 1
Yellow	=	Number > 84
Blue	=	Prime Number
Green	=	Factor of 24
Brown	=	Number > 32 and < 36

Brain Benders

C

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

CSF II LINKS

MATHS 4.2 Reasoning & Strategies
4.3 Reasoning & Strategies
4.4 Reasoning & Strategies

BACKGROUND

These activities highlight some real issues impacting on our waterways. Many organisations are working together to combat these issues. Further information on each of the 'Brain Benders' can be obtained from North Central Catchment Management 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 worksheets can be enlarged or photocopied.

1 Students read each challenge.
- They may underline key facts or make notes about the variables to consider.
- There are many strategies and answers that students could develop.
- The aim is for students to solve the challenge in a way that they feel comfortable and to reach a solution that they can justify.

2 Encourage students to explain their process to you or a peer.
- These challenges work very well when used in conjunction with a student learning journal.

3 Use the record sheet to record observations while students work.

ANSWERS

Catastrophic Carp 16.2 million, 8.1 million.

Weed Explosion 1 fortnight = 4 weeds, therefore for every fortnight multiply by 4. One month (lunar) = 16 weeds (2 fortnights), 6 months (calendar) = 8192 weeds, 1 year = 67 108 864. If we assume all weeds die on one day (28 February), 2048 would die. After this time the weeds would again multiply by a factor of 4 per fortnight, overall loss of almost 17 million weeds.

Swollen Rivers 672 cm, 28.2 m.

MATERIALS

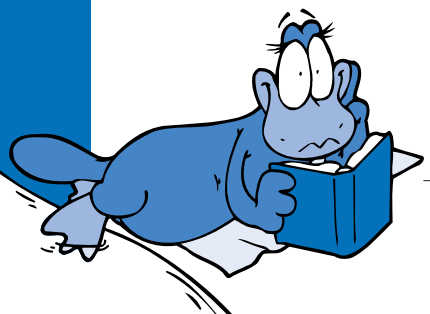
- ***'Brain Benders'*** **Student Worksheets 1, 2 & 3**
- **Concrete materials for problem solving** such as calculators, scrap paper, modelling materials, local area maps
- ***'Record Sheet'*** (see Extras section)

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 waterway 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 1

Name _____

Catastrophic Carp

Carp were brought to Australia in the 1850s and became a nuisance in the 1960s when they escaped into the Murray River. Sometimes called the 'rabbits of the river', carp are prolific breeders and their spread and domination of our waterways is now considered a major environmental problem. Carp can grow as large as 17 kilograms and females can produce up to 300 000 eggs per kilogram of body weight!

Imagine one pair of carp are released in a river system. The four kilogram female produces eggs in their first year, she grows two kilograms per year for the next five years and they continue to breed successfully in each of those years.

Use any strategy you like to calculate

- The number of eggs the pair will produce and add to the river system over the six years.
- If only half of the eggs produced each breeding season actually survive and there are no further deaths. How many carp will be living in the river system at the end of the six-year period?

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.

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 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 people in your region.
- The weight of dropping created by these pets.

Weed Explosion

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

If one weed can reproduce and grow three new weeds in just a fortnight,

- How many weeds will exist after 1 fortnight, 1 month (lunar), six months (calendar) and one year (calendar)?
- Assuming the first weed was planted August 28th, and one quarter of all weeds die-off every summer, how will this affect numbers?

Can you graph these two scenarios? Why or why not?

Brain Benders - Student Worksheet 2

Name _____

Migration Marathon

The Golden Perch (or 'Yellowbelly') is a fish commonly found in waters within North Central Victoria. They are carnivorous, feeding mainly on worms, yabbies, shrimp and small fish. They can live for as long as 20 years. The largest recorded Golden Perch was 75 cm long and weighed 23 kg!

The Golden Perch is a fascinating fish due to its ability to travel extremely long distances. The longest recorded migration is approximately 1000 kilometres.

Imagine that the roads in the North Central Region are waterways. Starting at your town and using a map of the region…

- Where could a Golden Perch travel during a journey of 1000 kilometres?
- Mark the route your Golden Perch could take and list the towns it would pass through.

Plastic Prevention

Plastic bags are handed out in most stores throughout the country. Often they only have one item in them and are used for a short period of time. If people are careless the bags can be blown or washed into our waterways entangling wildlife, floating on the surface and creating unsightly scenes. Plastic bags can take up to three years to breakdown.

Investigate and estimate one of the following

- The average life span of a plastic shopping bag from the supermarket to the rubbish bin.
- The number of plastic bags issued at your local supermarket per hour, per day, per week, per year.
- The number of plastic bags your family brings home each week

Can you the work out how many bags your family brings home in one decade?

Swollen Rivers

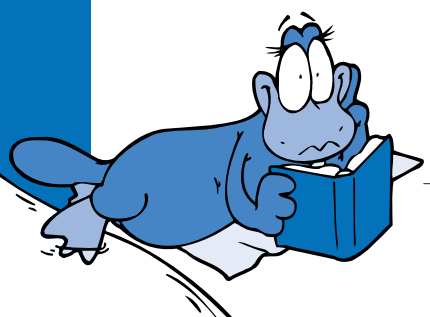
A river in flood can be ten times deeper and may carry 100 times more water than usual. Sometimes the water level rises slowly and other times, after heavy rain, levels can rise very quickly.
After constant rainfall, your local waterway begins to rise. Prior to the rain, the river height was three metres.

If the level rises fourteen centimetres every hour over the next two days…

- How high will the water level reach?

In a flood, if the depth of the water is greater than the height of the riverbank, floodwaters will spill out over the surrounding land. Imagine your local waterway has banks 5 metres high. Every metre of floodwater that rises over the riverbank, spreads 6 metres away from the river channel.

- How far will the floodwaters spread from the river channel in the flood mentioned above?
- In your town, what features in the landscape could be flooded (crops, buildings, streets, parks)?



Brain Benders - Student Worksheet 3

Name:

SEE

What **FACTS** have you been given?	What is the actual **QUESTION**?

PLAN

Which **STRATEGY** will you try?

- ❑ Use an operation
- ❑ Look for a pattern
- ❑ Draw a graph
- ❑ Make a list
- ❑ Draw a diagram
- ❑ Make a table
- ❑ Guess and check
- ❑ Work backwards
- ❑ Act it out
- ❑ Make it
- ❑ Other

DO

ANSWER

CHECK

Does your answer fit the question?

❑ Yes ❑ No