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SAMPLE

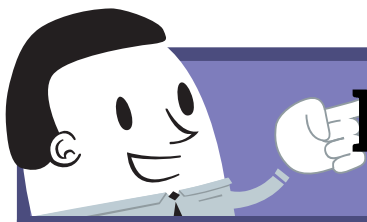


Pattern

Numeracy

- Nature's Patterns
- Fossilised Fractions
- Ridiculous Ravines

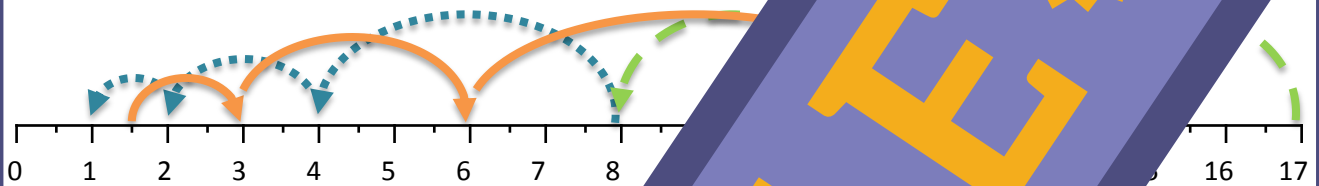
Resource code: 27052646



Nature's Patterns

A NAP Mate® Resource

As the Earth's surface changes, animals are sometimes forced to survive. Sometimes, some animals of the same species stay together. Over a very long period of time, if these groups stay separated, they can become two different and unique species.



Q1

The number line above represents the movement of two groups of animals. The groups of animals are from a certain valley. Fill in the blanks with the words provided.

Each year, the tree frogs move _____ the valley. The tree frog group moves _____ kilometres each year. This is a _____ sequence.



Each year, the mice move _____ the valley. Their distance from the valley could be described as _____.



Each year, the eagle moves _____ the valley. Their distance from the valley could be described as _____.

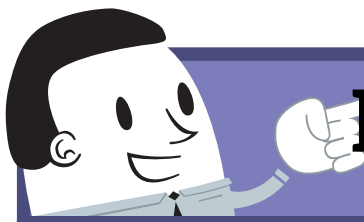
the	towards	three	an addition
a	a smaller	away from	a division



was not used to complete any of the sentences. Describe the movement using the sentence below.

_____ number of kilometres _____ the valley.

If the eagle moves 1.5 kilometres each year, draw their movement on the number line at the top of the page, starting from the valley.



Nature's Patterns

A NAP Mate® Resource

Q4

If each arrow represents one year of movement, how many years will it take for the frogs to reach the valley from their current location?

Q5

If the mice continue to move following the same path, how long will it take for them to reach the valley in five years time?

Q6

Why might the mice be moving towards the valley?



SAMPLE



Fossilised Fractions

A NAP Mate® Resource

Fossils are the remains of prehistoric plants or animals. They are found in rock, which can be analysed to determine how old the fossil is.

Q1

Fill in the blanks in the patterns below. Convert each answer to a mixed number and draw each fossil at the correct depth in the rock below.






Sequence 1: $\frac{4}{5}$ → $\frac{3}{5}$ → → $3\frac{1}{5}$ →

Sequence 2: → $7\frac{6}{8}$ → $5\frac{5}{8}$ →

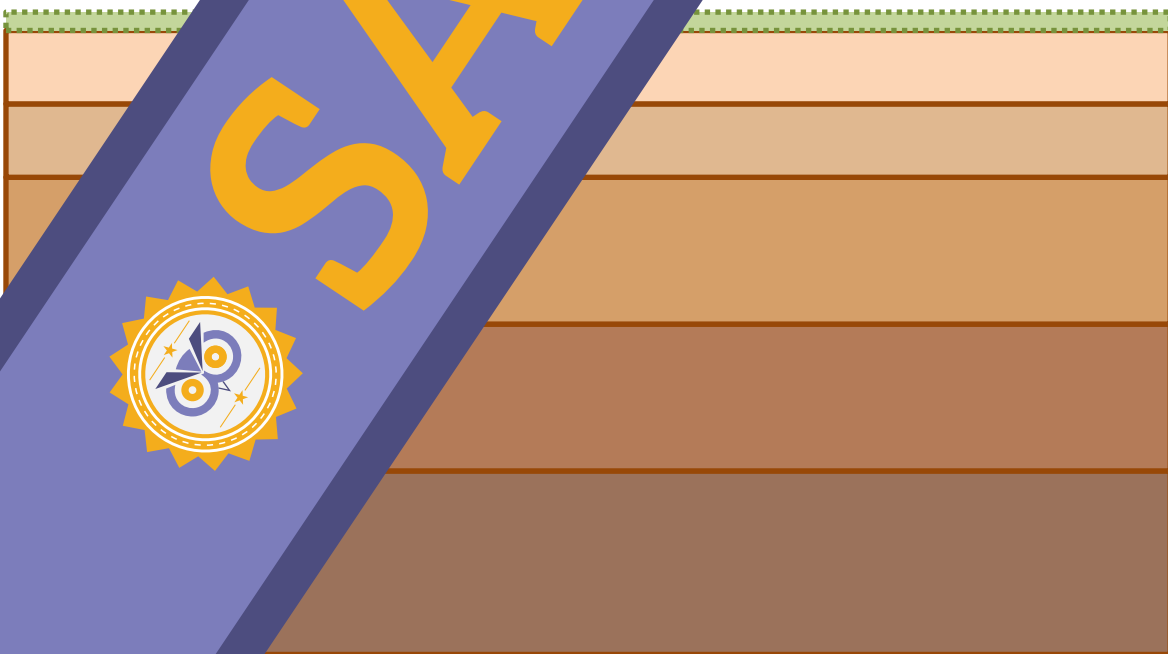
Sequence 3: $\frac{3}{4}$ → $1\frac{1}{2}$ →

Sequence 4: $4\frac{1}{3}$ → → $2\frac{2}{3}$

Sequence 5: → $2\frac{2}{3}$ → $7\frac{1}{9}$



SAMPLE



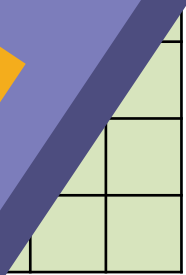
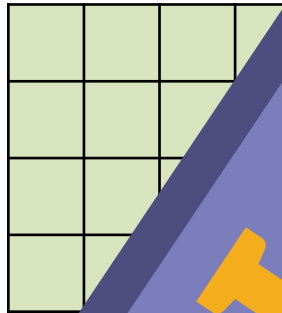
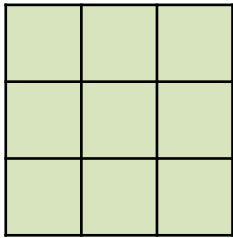
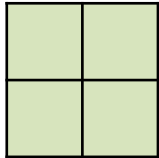


Fossilised Fractions

A NAP Mate® Resource

Q2

Because it is very difficult to study large areas of land, scientists use small sample squares to study. Calculate the size of each sample square.



_____ m²

_____ m²

_____ m²

Q3

Counting up each small square to find the area is slow. Using the width x height is much quicker. Calculate the area, but using width x height is much quicker. Calculate the area, but using width x height is much quicker.

Q4

Scientists use small sample squares to estimate information about the total area. Use the information below to fill in the blanks.



Total grid area: _____

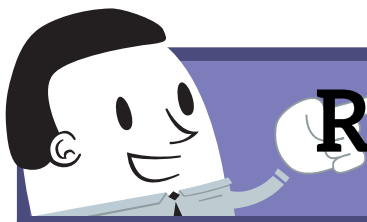
Fossils in sample area: _____

Average fossils per metre²: _____

Estimated fossils in 100m²: _____

Estimated fossils in 3500m²: _____





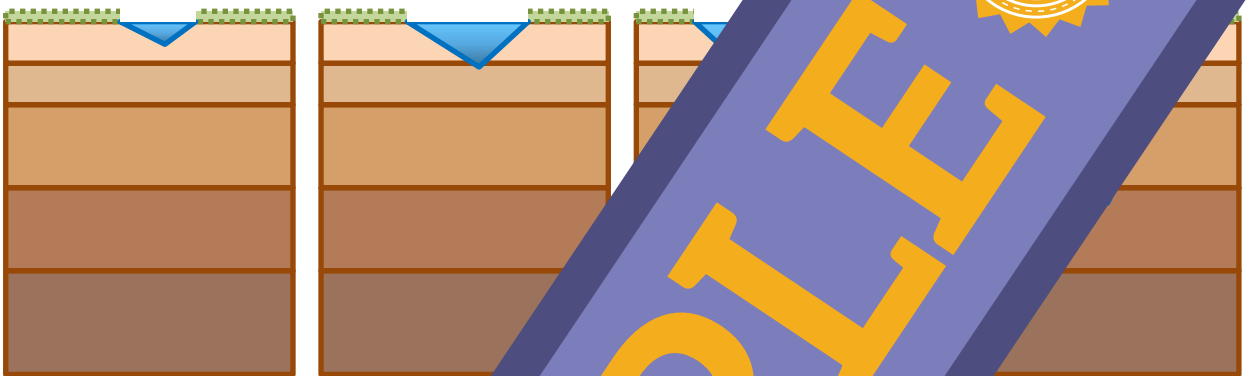
Ridiculous Ravine

A NAP Mate® Resource

Fast-flowing rivers can cut through solid rock to form deep valleys called *erosion* and usually occurs over many years.

Q1

Below is the cross section of a river. Measure the depth of the river at each point in time. Measure the surface of the water when the river is at its widest.



1700

1800

2000

Depth: _____

Width: _____

Q2

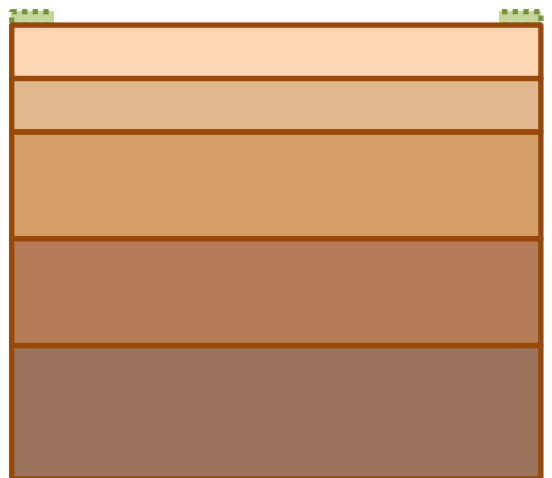
Consider the measurements you made in Q1. Describe the patterns you see in the data.

Q3

Calculate the area of the riverbed at 2000, 2100 and 2200. On the cross section below, draw the riverbed at 2100 and 2200.

1600 Depth: _____

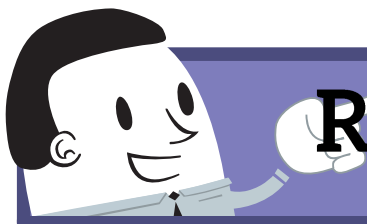
1600 Width: _____



2100



SAMPLE



Ridiculous Ravine

A NAP Mate® Resource

Q4

Do you think the river will continue to grow according to this



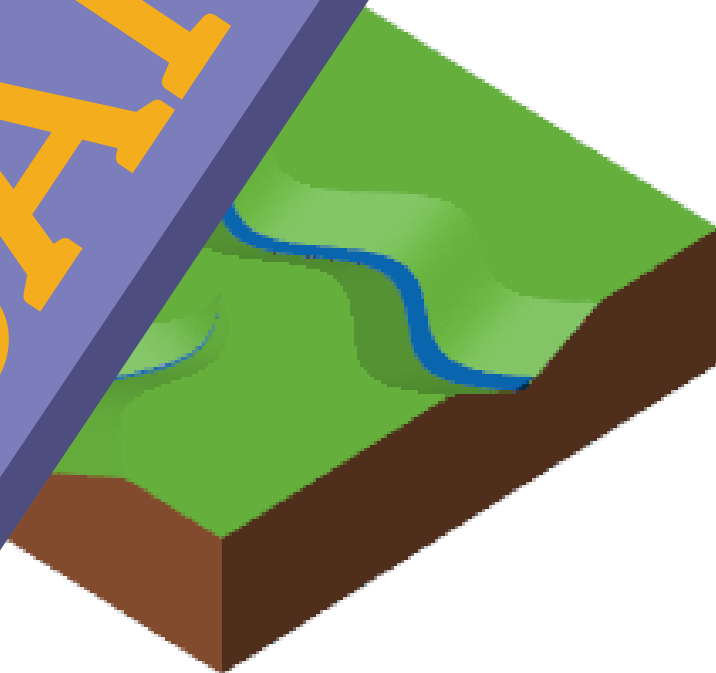
Q5

If you were only considering river depth, what time using this pattern? Would the river disappear in

Q6

Is it possible to use the pattern to predict what happened in the past?

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Mighty Minds Lesson Installs

'Fundamentals' Lesson



Firstly, thank you for your support of Mighty Minds and our resources. We are proud to provide quality resources that are both educational and engaging, and we hope you enjoy using our works.

To assist you in using this resource, we have compiled some information for you.

About this resource

This Mighty Minds 'Fundamentals' Lesson focuses on a specific skill (in this case, Maps and Plans) and presents this skill through a theme from the Australian Curriculum (in this case, Geography). This lesson is also targeted at a certain skill level (in this case, Year 5) and is designed for completing work that is suited to them.

How to use this resource

Our 'Fundamentals' Lessons are split into two parts: a Teacher's Copy and a Student Workbook. Each contain different types of resources.

The student workbook contains:

- The main title page; and
- The blank student worksheet.

The teacher resources include:

- This set of instructions for how to use the resource;
- The Teacher's Copy of the lesson, which includes the lesson plan, the lesson content, and any resources that will be needed to teach the lesson;
- The Item Description, which includes the lesson's aims, the lesson's objectives, and any extension ideas;
- The student model responses, which are provided as examples of student responses on the student worksheets to ensure that answers are clear and easy to understand;
- The teacher's copy of the student model responses, which provides a more detailed explanation of the model responses for each question;
- The final version of the student worksheet, which includes the student model responses and the teacher's copy of the student model responses.

We also provide a Student Workbook (the first set of pages) for the students. If students are using the Student Workbook, you may also like to provide them with the student answer key.

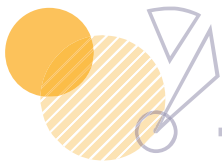


Contacting us

We would love to hear from you. If you have any feedback or suggestions, please email us. If you suggest changes to any lesson, we will send you the revised lesson – free of charge.

You can contact us at resources@mightyminds.com.au and we'll get back to you as soon as we can.





Number Patterns



Number patterns involve a sequence of numbers, in either ascending or descending order, where each number follows the same rule. Students will often be asked to identify the rule for a given sequence, which involves them first working out the rule that

Addition and Subtraction Sequences

These are the most simple type of sequence, where each number is calculated by either adding or subtracting a value from the previous number. To identify the rule for a given sequence, the first step should always be to check the difference between consecutive numbers. If the difference is the same between each number, then the rule is either

3, 10

This pattern is ascending and each number is calculated by adding 7 to the previous number in the sequence. The next number in the sequence is 17. Example:

This pattern is descending and each number is calculated by subtracting 4 from the previous number in the sequence. The next number in the sequence is 19. Example: $23 - 4 = 19$.

Multiplication and Division Sequences

These sequences are slightly more complex than addition and subtraction sequences, as each number is calculated by multiplying or dividing the previous number by a constant value. To identify the rule for a given sequence, the first step should always be to check the ratio between consecutive numbers. If the ratio is the same between each number, then the rule is either

This pattern is ascending and each number is calculated by multiplying the previous number by 3. The next number in the sequence is 27. Example:

3, 14

This pattern is descending and each number is calculated by dividing the previous number by 2. The next number in the sequence is 3.5. Example:

These sequences are more complex than addition, subtraction, multiplication and division sequences, but do not abide by addition, subtraction, multiplication or division. It is important to familiarise students with them.

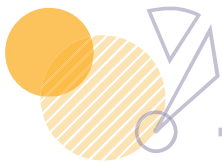
1, 4, 9, 16, 25, 36, 49, 64

This pattern is calculated by squaring each consecutive integer. The numbers in this sequence are $1^2 (1 \times 1) = 1$, $2^2 (2 \times 2) = 4$, $3^2 (3 \times 3) = 9$...



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Cube Numbers

1, 8, 27, 64, 125, 216, 343

Numbers in this sequence are calculated by cubing each number in this series are calculated thus: $1^3 (1 \times 1 \times 1) = 1$

Complex Sequences

Complex sequences involve a rule that requires taking a number in the sequence from the previous. For example:

5

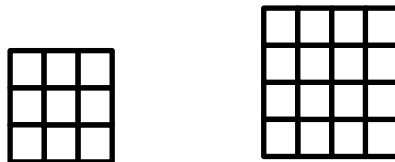
Each number in this sequence is calculated by multiplying the previous number by 2 then subtracting 1. Complex sequences are often very difficult to work out. One way of working out a complex sequence is to list the ways a number can be calculated from the first number, then seeing if any of these ways can be used to calculate the next number. For example, in the sequence above, 5 can be calculated in the following ways:

- $3 + 2 = 5$
- $3 + 3 - 1 = 5$
- $3 / 3 + 5 = 5$
- $3^2 - 4 = 5$
- $3 \times 2 - 1 = 5$

When applying the rule to a number in the sequence, only the last rule produces the right answer.

Diagrammatic Patterns

A diagrammatic pattern is a sequence of diagrams, each diagram changes (often by increasing or decreasing) according to a certain rule. Consider the following sequence of diagrams:



Each diagram in the sequence is increasing its size by increasing the length of each side by one unit. The number of boxes increases according to a square number pattern (see page 10). A strategy for solving diagrammatic patterns is to use a strategy to colour the part of the diagram that has changed from the previous diagram. Often, diagrammatic patterns are related to numerical patterns, so the number of constituents (in this cases the number of small squares), can help determine the next diagram in the series.





Item Description

Please note: any activity that is not completed during class time is undertaken at a later date.



'Nature's Patterns', 'Fossilised Fossils' and 'Ravine'.

Activity Description:

- In this activity, students are required to interpret data presented in pictorial and diagrammatic forms.
 - In the first activity, 'Nature's Patterns', students are required to interpret data presented on a number line. This activity is designed to enhance students' ability to identify different types of patterns.
 - In the second activity, 'Fossilised Fossils', students are required to identify addition and subtraction patterns. Students are also required to calculate the area of a rectangle and the perimeter of a square.
 - In the final activity, 'Ravine', students are required to measure depth and width of a ravine and to comment on the patterns of growth.

Purpose:

- Interpret and extend addition and subtraction facts involving fractions and multiplication and division facts involving integers.

Skills:

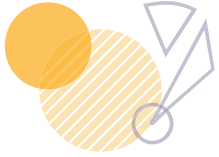
- Identifying patterns in a sequence of pictures/ illustrations (α5)
- Identifying patterns in a sequence of tables or diagrams or maps or graphs (α6)
- Identifying patterns in a sequence of numbers (β49)
- Identifying patterns in a sequence of numbers (β35)
- Identifying patterns in a sequence of numbers (β5)
- Presenting/ arranging/ displaying (π20)
- Working with or without calculators (Φ16)
- Following a progression of steps to achieve the required answer (Φ37)

Time Allocation:

This lesson is designed to take approximately one hour to complete – 20 minutes per activity.

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Item Description – continued

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'Nature's Patterns', 'Fossilised F

Ravine

• **Teaching Notes:**

- Students should understand the basic multiplication and division sequences before beginning.
- Students should complete each activity as a class.
- Students will require a calculator.
- If students are struggling with patterns, refer them back to revision of the principles behind patterns.
- As an extension to activities, explore 'special sequences', such as cube numbers, and their real life.
- Activities one and two explore the nature of patterns. An extension to either activity is to explore patterns can be seen in real life.

• **Follow Up/ Class Discussion:**

- What are some patterns in nature? Where might an entire species relocate?
- What do students think about patterns?
- What do they think about patterns? Why are humans so close to the surface?
- What are some patterns in the world?



SAMPLE

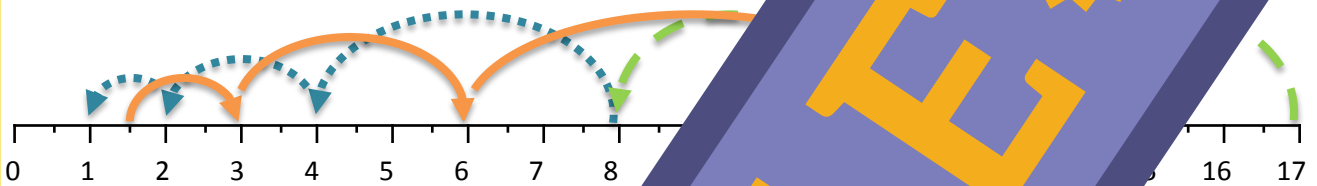




Nature's Patterns

A NAP Mate® Resource

As the Earth's surface changes, animals are sometimes forced to survive. Sometimes, some animals of the same species stay together. Over a very long period of time, if these groups stay separate, they can become two different and unique species.



Q1

The number line above represents the distance from the valley. The groups of animals are from a certain valley. Fill in the blanks with the words provided.

Each year, the tree frogs move the same distance from the valley. The tree frog moves three kilometres each year. This is an addition sequence.



Each year, the mice move a smaller distance from the valley. Their distance from the valley could be described as away from the valley.



Each year, the eagles move towards the valley. Their distance from the valley could be described as towards the valley.

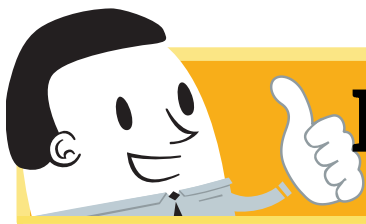
the	towards	three	an addition
a	a smaller	away from	a division



was not used to complete any of the sentences. Describe the movement using the sentence below.

Each year, the mice move the same number of kilometres away from the valley.

Each year, the eagles move 1.5 kilometres each year, draw their movement on the number line at the top of the page, starting from the valley.



Nature's Patterns

A NAP Mate® Resource

Q4

If each arrow represents one year of movement, how many years will it take for the frogs to reach the valley from their current location?

8km from valley / 3km per year

$8 / 3 \text{ years} = 2 \text{ and } 2/3 \text{ years} = 2 \text{ years and 8 months}$

Q5

If the mice continue to move following the same pattern, how far from the valley will they be in five years time?

384km from the valley in five years time

Q6

Why might the mice be moving away from the valley?

The mice might be moving away from the valley because there are predators which are moving towards the valley, as evidenced by the eagle's shadow on the ground.



Nature's Patterns

Question One:

Students were required to interpret a number line marked with species. The number line represented the distance of each species from the valley. They were required to fill blanks in sentences describing the information.

Model Response:

Each year, the tree frogs move the same number of kilometres away from the valley. The tree frog moves three kilometres each year. This is an addition sequence.

Each year, the mice move a greater distance from the valley. Their distance from the valley could be described as a subtraction sequence.

Each year, the eagles move a greater distance from the valley. Their distance from the valley could be described as a multiplication sequence.

Question Two:

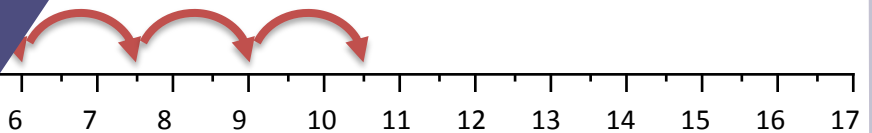
Students were then required to interpret the information and complete the sentences. The correct answers were not been used to complete any of the sentences. The correct answers were required to complete a sentence describing the information.

Model Response:

Each year, the snakes move a greater distance from the valley. They move 10 kilometres away from the valley.

Q

Students were then required to interpret the information and complete the sentences. They were told that the correct answers were not been used to complete any of the sentences. The correct answers were required to complete a sentence describing the information.



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Question Four:

Students were required to calculate how many years and months it would take for the frogs to reach the valley from their current location. The frogs' distance from the valley follows a subtraction pattern: decreasing by 3km each year.

Model Response:

$8\text{km from valley} / 3\text{km per year}$
 $8 / 3 \text{ years} = 2 \text{ and } 2/3 \text{ years} = 2 \text{ years and 8 months}$

Question Five:

Students were required to calculate how many years it would take for the mice to reach the valley, assuming they continue to move according to the pattern. In 12 years time,

Model Response:

$12 \times 2 = 24$
 $24 \times 2 = 48$
 $48 \times 2 = 96$
 $96 \times 2 = 192$
 $192 \times 2 = 384\text{km}$

Question Six:

Students were asked to explain why the mice are moving away from the valley. The picture provided shows the mice are moving away from the valley.

Model Response:

The mice are moving away from the valley to avoid the eagles which are moving towards the valley.





Fossilised Fraction

A NAP Mate® Resource

Fossils are the remains of prehistoric plants or animals. They are found in rock, which can be analysed to determine how old the fossil is.

Q1

Fill in the blanks in the patterns below. Convert each answer to a mixed number and draw each fossil at the correct depth in the rock below.



Mathematical patterns for fossil placement:

- Pattern 1: $\frac{4}{5}$ → $\frac{3}{5}$ → $2\frac{2}{5}$ → $\frac{1}{5}$
- Pattern 2: $\frac{1}{3}$ → $4\frac{1}{3}$ → $\frac{2}{3}$ (with a dinosaur skull fossil icon)
- Pattern 3: $6\frac{1}{8}$ → $7\frac{7}{8}$ → $5\frac{5}{8}$
- Pattern 4: $\frac{2}{3}$ → $3\frac{2}{3}$ → $7\frac{1}{9}$ (with a snail fossil icon)
- Pattern 5: $\frac{3}{4}$ → $1\frac{1}{2}$ → $\frac{1}{4}$ (with a fern fossil icon)



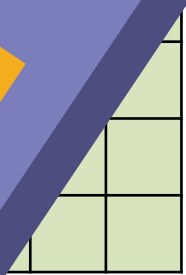
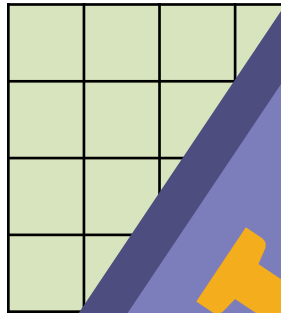
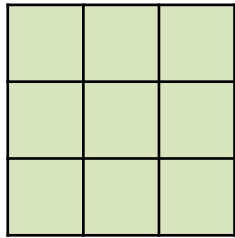
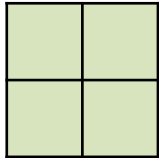


Fossilised Fractions

A NAP Mate® Resource

Q2

Because it is very difficult to study large areas of land, scientists use small sample squares to study. Calculate the size of each sample square.



4 m²

9 m²

25 m²

Q3

Counting up each small square to find the area, but using width x height is much quicker. Write the area of each square in the pattern.

$6 \times 6 = 6^2 = 36\text{m}^2$

$7 \times 7 = 7^2 = 49\text{m}^2$

$8 \times 8 = 8^2 = 64\text{m}^2$

Q4

Scientists use small sample squares to estimate information about the total area. Use the information below to fill in the blanks.

Total grid area: $3 \times 3 = 9\text{m}^2$

Fossils in sample area: 7 fossils

Average fossils per metre²: $7/9 = 0.78$ fossils per metre²

Estimated fossils in 100m²: $0.78 \times 100 = 78$ fossils

Estimated fossils in 3500m² $0.78 \times 3500 = 2730$ fossils



Fossilized Fractions

Question One:

Students were required to calculate missing numbers in addition and subtraction series of fossilized fractions. Some fractions needed to be changed to have the same denominator in each series.

Model Response:

Human Skull:

*Based on given numbers, pattern is increasing by $2\frac{2}{5}$ each step.
Missing number = 2 and $2\frac{2}{5}$*

Dinosaur Skull:

*Based on given numbers, pattern is increasing by $3\frac{1}{2}$ each step.
Missing number = 3 and $3\frac{1}{2}$*

Leaf:

*Based on given numbers, pattern is increasing by $1\frac{1}{3}$ each step.
Missing number = 1 and $1\frac{1}{3}$*

Shell:

*Based on given numbers, pattern is increasing by $1\frac{8}{9}$ each step.
Missing number = 1 and $1\frac{8}{9}$*

Trilobite:

*Based on given numbers, pattern is increasing by $\frac{3}{4}$ each step.
Missing number = $\frac{3}{4}$*

Students were required to calculate missing numbers in addition and subtraction series of fossilized fractions. Some fractions needed to be changed to have the same denominator in each series. Answers to depths in metres and plot each fossil at the correct depth. Model response is shown on the following page.



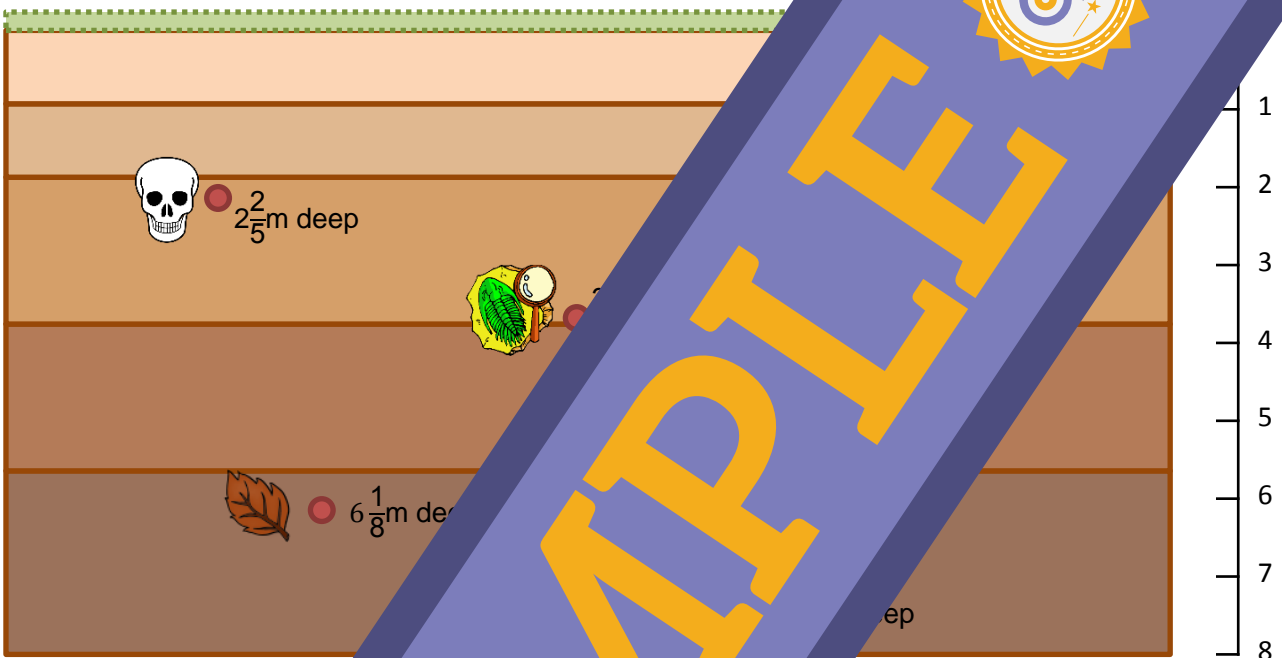
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Model Response:



Question Two:

Students were required to find the area of different sample spaces. They may have done this by counting unit squares, or by measuring length and width and calculating area based on these.

Model Response:

2 x 2 = 4
3 x 3 = 9

Write the next three squares following the pattern. Students should know the sequence $1^2, 2^2, 3^2, 4^2 \dots n^2$.

This answer guide is continued on the next page...



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Question Four:

Students were provided with a 3 x 3 metre sample square which was required to calculate the average rate of fossils per square metre. The information provided.

Model Response:

Total grid area: $3 \times 3 = 9\text{m}^2$

Fossils in sample area: 7 fossils

Average fossils per metre: $7 \text{ fossils} / 9$

Estimated fossils in 100m^2 : 0.78×100

Estimated fossils in 3500m^2 : 0.78×3500





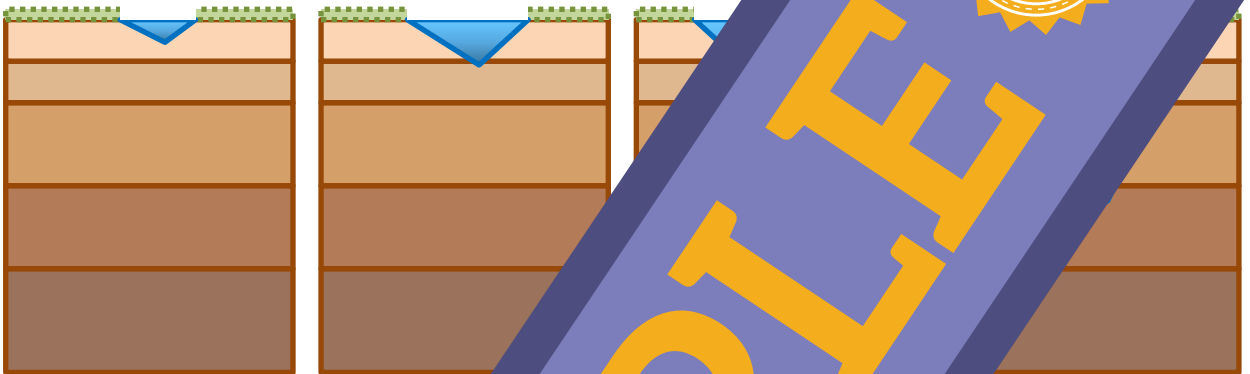
Ridiculous Ravine

A NAP Mate® Resource

Fast-flowing rivers can cut through solid rock to form deep channels called *erosion* and usually occurs over many years.

Q1

Below is the cross section of a river. Measure the depth of the river at each point in time. Measure the surface of the water when the river is at its widest.



1700

1800

2000

Depth: 3m

24m

Width: 10m

28m

Q2

Consider the measurements of the river in 1700 and 2000. Describe the patterns.

The measurements show that the river is getting deeper and 6m wider than the year before.

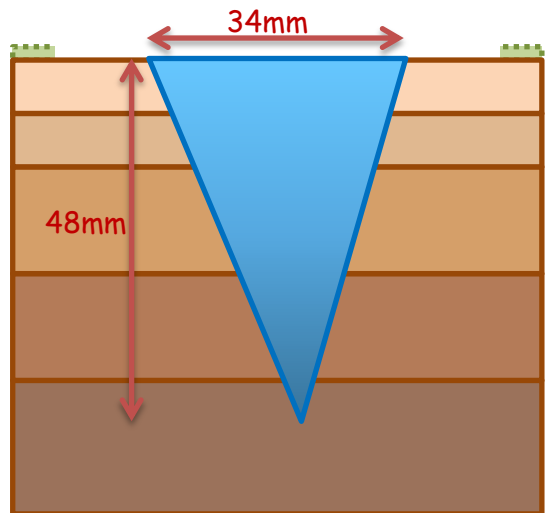
Q3

Calculate the area of the river in 2000, 2100 and 2200. On the cross section below, measure the width and depth of the river.

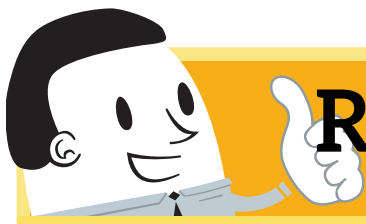
1600 Depth: _____

1600 Width: _____

2100



2100



Ridiculous Ravine

A NAP Mate® Resource

Q4 Do you think the river will continue to grow according to this

*No, as the depth is doubling every 100 years. This rate is un...
the river would become extremely deep very quickly, whi...*



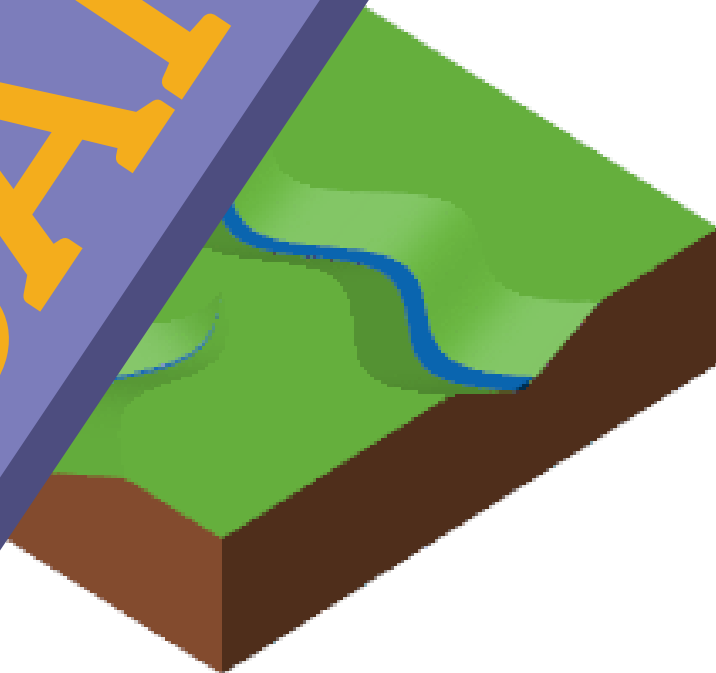
Q5 If you were only considering river depth, what would happen to the river over time using this pattern? Would the river disappear or get back in

The river would continue to become shallower...

Q6 Is it possible to use the pattern to predict what would happen in the past?

No, because the width would quickly become too narrow to flow. This is impossible.

SAMPLE



World Explorers

Question One:

Students were provided with the following cross sectional diagrams showing the depth and width of the river in each.



Students were also provided with the following data:

Model Response:

1700:

Depth: 1m

Width: 6m

1800:

Depth: 2m

Width: 3m

1900:

Depth: 4m

Width: 1.5m

2000:

Depth: 8m

Width: 0.75m

Make observations about the data and describe the pattern.

Show that each year the river is two times deeper and 6m wider than the

This answer guide is continued on the next page...



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Question Three:

Students were then asked to calculate the depth and width of the trench.

Model Response with Solutions:

2100:

$$\begin{aligned} \text{Depth} &= 24\text{m} \times 2 = 48\text{m} \\ \text{Width} &= 28\text{m} + 6\text{m} = 34\text{m} \end{aligned}$$

2200:

$$\begin{aligned} \text{Depth} &= 48\text{m} \times 2 = 96\text{m} \\ \text{Width} &= 34\text{m} + 6\text{m} = 40\text{m} \end{aligned}$$

For 1600, students needed to calculate the depth and width of the trench. To do this, students need to use the inverse operations (division).

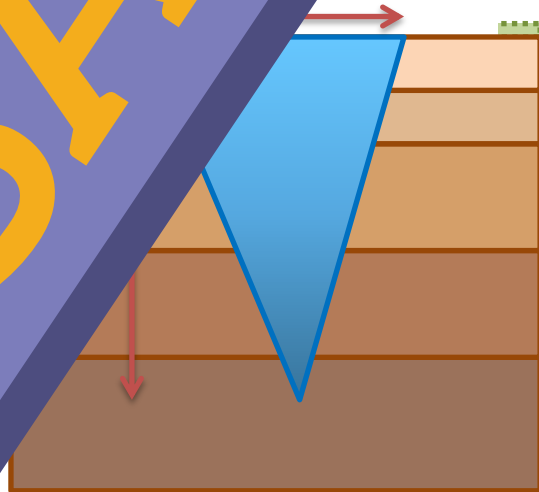
Model Response with Solutions:

1600:

$$\begin{aligned} \text{Depth} &= 3\text{m} \\ \text{Width} &= 1\text{m} \end{aligned}$$

Students were also asked to calculate the area of the cross section. Students should have converted the calculations to mm.

Model Response:



2100

This answer guide is continued on the next page...





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Question Four:

Students were asked if the river will continue to grow according to the same rate.

Model Response:

No, as the depth is doubling every 100 years, it is not possible to predict that the river would become extremely deep very quickly.

Question Five:

Students were asked what would happen to the river's depth if it were to calculate river depths in the past.

Model Response:

The river would continue to grow deeper until it reaches zero.

Question Six:

Students were asked if the river's width in the past. Students might have needed to calculate the river's width in the past. Students might determine whether it can be used to predict widths in the past. Students might determine that these calculations will lead to a negative number, which is impossible.

Model Response:

No, because a negative number, which is impossible.





End of Learning

Please

If you feel there are any issues with this booklet for you to use in your class, you may contact us via email or phone. We offer a variety of activities (whole worksheets, half worksheets, and worksheets) for

Alternative activities for the entire worksheet to be used at a later date.

