

Fibonacci numbers

LINKS TO:

Stage 3, Module 15

Learning Object 2: *Giving speeches*

Exercise 1

Answers:

- 1.1 What are the main ideas in the text? Summarise, in English, the main ideas from each paragraph.**

Paragraph 1

Leonardo of Pisa wrote about the Fibonacci numbers in 1202.

Paragraph 2

He applied maths to rabbit reproduction.

Paragraph 3

He began with one, then added another one to get two.

Paragraph 4

Then he added the last two numbers together to get three ($1 + 2 = 3$).

Paragraph 5

The pattern is repeated by adding the last two numbers of the pattern together to get the next number in the sequence.

Paragraph 6

The numbers are related to the golden ratio, and are seen in computer algorithms, as well as some natural objects.

Paragraph 7

The Fibonacci sequence can be expressed as a spiral.

Paragraph 8

Leonardo also wrote about the Mersenne Primes, perfect numbers, and the Chinese remainder theorem.

- 1.2 Were there particular words or phrases you found difficult to understand? What strategies did you use to understand these words or phrases, or to understand the text as a whole despite not being sure what some words meant?**

There are a couple of strategies that I use to understand words or phrases that are difficult. First, I look at the context to see if I can understand the word preceding or following that difficult word or phrase. For example, the word *dikembangbiakkan* appears in paragraph two. The word before it is *kelinci*, 'rabbit'. And the phrase following it is *dengan teliti*. I know *teliti* means 'thorough' or 'precise' and *dengan* means 'with'. As 'with precise' does not make sense, I conclude that the word *dengan* is added to turn the word following it into the adverb 'precisely'. However, I still do not know what the word means. I know the word is a passive verb because it has a *di~* prefix, so I look up the word *kembangbiakkan* in the online dictionary but come up with no result. I then look up a dictionary and realise that the base word is a phrase *kembangbiak* or *kembang biak*, which means 'to reproduce'.

- 1.3 What natural objects reflect the Fibonacci sequence?**

Natural objects that reflect the Fibonacci sequence include artichokes, ferns, shells and branching trees.

- 1.4 Calculate the next four Fibonacci numbers after 34.**

55, 89, 144, 233

- 1.5 What other mathematical problems did Leonardo of Pisa write about?**

Leonardo of Pisa also wrote about the Mersenne Primes, perfect numbers and the Chinese remainder theorem.

Exercise 2

2.1 What are the main ideas in the text? Summarise, in English, the main ideas from each paragraph.

Paragraph 1

Fibonacci, Goldbach and Euler are the author's favourite mathematicians.

Paragraph 2

Goldbach and Euler met while they were at St Petersburg Academy. They wrote to each other about the Goldbach conjecture.

Paragraph 3

Goldbach's conjecture is: Is every even number greater than 2 the sum of two primes?

Paragraph 4

Euler is famous for discovering the largest Mersenne Prime known at the time: $2^{31} - 1$.

Paragraph 5

A Mersenne Prime is a positive number one less than a power of two.

Paragraph 6

Mersenne Primes are used for codes. There may be an infinite number of Mersenne Primes.

Paragraphs 7 & 8

Anyone can join the Great Internet Mersenne Prime Search (GIMPS). A new Mersenne Prime was discovered in 1996 that is almost as long as the novel, *War and Peace*. It is $2^{1,398,269} - 1$.

2.2 Were there particular words or phrases you found difficult to understand? What strategies did you use to understand these words or phrases, or to understand the text as a whole despite not being sure what some words meant?

There are a couple of strategies that I use to understand words or phrases that are difficult. First, I look at the context to see if I can understand the word preceding or following that difficult word or phrase. For example, the word *bilangan* appears several times

in the passage. I understand that the word *bilang* is colloquial for *mengatakan*, which means 'to say'. I also understand that in Indonesian, the *~an* suffix is sometimes added to words to make nouns. However, I think if *bilangan* means 'what is being said', and some of the words preceding or following it are *prima* (*bilangan prima*), *genap* (*bilangan genap*) or *dua* (*dua bilangan*), the whole passage will not make sense. As I cannot figure out what the word means after all this, I consult the dictionary and find that the meaning is 'numbers'.

2.3 What other unsolved scientific, mathematical, medical or intellectual problems are you aware of? Describe at least one that you know something about. What strategies are researchers using to attempt to 'solve' the problem you identified?

One of my best friends has cystic fibrosis. Cystic fibrosis (CF) is an incurable genetic disorder, caused by a defect in the cystic fibrosis transmembrane regulator (CFTR) gene. The CF gene was discovered by researchers in 1989 as a result of an international collaborative research project. The life expectancy of a person with CF is currently 37 years. (In 1938, life expectancy was one year.) CF affects a person's lungs and digestive system.

The ongoing search for a cure is focused on two main ways of treating the disease: through gene therapy and through drug therapy.

Most of the research is carried out by medical scientists in laboratory conditions. The scientists include researchers in molecular biology, immunology and medicinal chemistry. For example, one group of scientists has done experiments in which they introduce a therapeutic virus they have designed into human lung tissue to see whether it will replace the defective CFTR gene with the healthy substitute the virus carries.

Laboratory testing is followed by clinical trials in which volunteers who have CF undertake experimental treatment. The effects of the treatment are then monitored and recorded. Clinical trials are one of the main strategies that researchers are using to find a cure for CF.

Exercise 3

Sample answers:

3.1 What rights and responsibilities do you think we have in terms of bringing knowledge from one culture or country to another?

I think it is important to be sensitive to different values, attitudes and beliefs in relation to knowledge when considering exchanging knowledge between cultures.

In Australia, I know some knowledge that the Aboriginal and Torres Strait Islander peoples have is considered sacred and secret, or belongs to particular groups. For example, I have read about secret women's business, which is knowledge that can only be shared between women. I don't think it would be ethical to try to 'steal' any of this knowledge.

I think it is important to acknowledge the source or history of information or knowledge, especially if the knowledge originated in another culture. This honours the person or people who initially came up with the ideas, and demonstrates a commitment to sharing information and ideas in an open and transparent way.

One way to acknowledge the history of an idea or aspect of knowledge would be to ensure that, if you write about it, you always include the cultural history of the idea.

3.2 Write a six-line Fibonacci poem, in which the number of words in each line is determined by the Fibonacci sequence. That is, the first line should have one word, the second line 2, then 3, 5, 8 and 13.

Write your poem in Indonesian.

Satu

hari saya

akan makan sebuah

apel hijau dari sebuah pohon

yang tumbuh di kebun masa kecil saya. Kebun

tempat di mana saya belajar tersenyum dan tertawa dan menangis serta tumbuh besar.