Maths Week/Pāngarau Wiki 2025

Daily Dollar/Ko te Tāra o te Rā

Bill Ellwood Memorial Series

This series is a tribute to Bill Ellwood, who wrote much of the Maths Week material from 2006 to 2019. Bill passed away in June 2021.

Set E Day 4

For students

WHAT TO DO FOR STUDENTS

1 You may work on your own or with someone else, and your teacher or someone else can help you.

2 Answer the questions.

3 Each question has a dollar value. Each day's questions total $100 in value.

4 When you have answered the questions, your teacher will give you the answers.

5 If you are right, you will get the dollar value for each question. You then you can work out how many dollars you have earned for the day.

6 Add the number of dollars you have earned each day in the Daily Dollar questions and get a total for the week. Then you can compare your total for the week with others in your class.

7 Perhaps your teacher may award a prize for the highest total for the week!

8 Good luck!

Morse Code

In the days before satellites made communication so much easier, sending messages was relatively difficult and time consuming. One method that was developed was Morse Code. The system was developed by the American inventor and painter Samuel Morse, who lived between 1791 and 1872, and used a series of dots and dashes (● and ▬) for letters of the alphabet and the digits 1 – 9. For example, A was represented by ● ▬ , S was represented by ● ● ● , and 1 was represented by ● ▬ ▬ ▬ ▬ . A maximum of five dots or dashed could be used for a character (letter or digit), and when messages were transmitted, the letters characters were separated by spaces.

Morse Code messages were sent using a special device; a picture of such a device is shown on the right. Each dot or dash was sent by pressing the lever – it would be tapped for a dot, and for a dash it would be pressed and for a held for three times as long as the time taken for a dot. The messages were transmitted as radio signals.

Question 1 ($35)

(a) Draw the different possible codes consisting of one dot or dash. How many are there?

(b) Draw the different possible codes consisting of two dots and/or dashes. How many are there? Make sure that you don't miss or repeat any.

(c) Draw the different possible codes consisting of three dots and/or dashes. How many are there?

(d) How many different possible codes consisting of no more than three dots and/or dashes are there? Hint: Look at the answers to the first three questions.

(e) How many different possible codes consisting of four dots and/or dashes are there?

(f) How many different possible codes consisting of five dots and/or dashes are there?

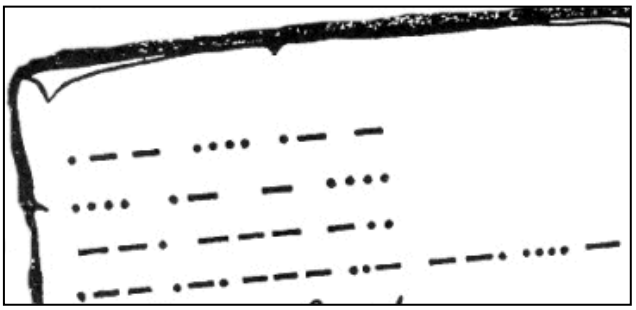
(g) How many different possible Morse Codes consisting of no more than five dots and/or dashes are there?

Some Morse Code messages

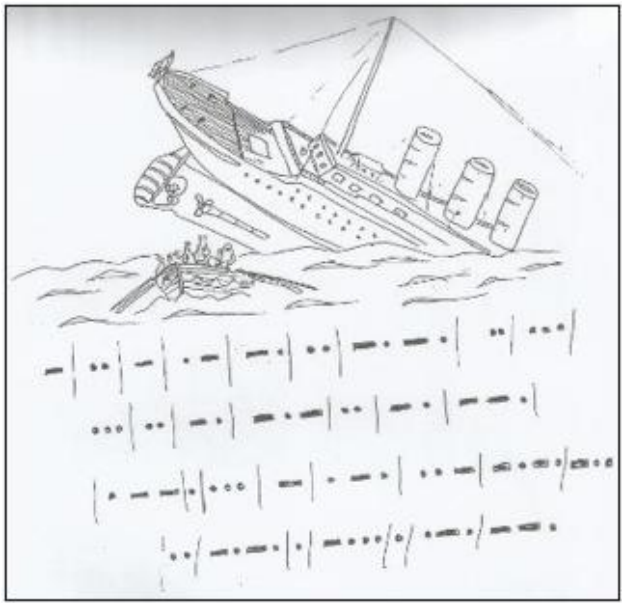
The chart on the right shows the Morse Code for each letter and digit. There are also codes for other characters such as punctuation.

Question 2 ($40)

(a) The picture on the right shows the first Morse Code message that was sent (in 1844). What does the message say?



(b) The picture on the right shows a Morse Code message sent when The Titanic sank in 1912. What does the message say?



Question 3 ($25)

(a) Suppose that a Morse Code was to be created that would accommodate the upper case (capital) letters of the alphabet, the lower case letters, the numbers 1 – 1000 and 30 special characters, each with its own code. What is the smallest number of dots and/or dashes that would be needed?

(b) The Morse Code in (a) would not be practicable. Why not?