TI-30XB MultiView™
Making Predictions

This Unit includes:

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- Teacher PowerPoint — PPT
- Worksheets 1 & 2 — W
- Student Assessment Task — AT
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- Solutions to Assessment Task — ATS

Curriculum Links
TI-30XB MultiView™: Making Predictions

C

Year 7 Algebra, Function and Pattern

Statement of Learning Opportunities

- Define variables, explore and interpret mathematical expressions
- Read and interpret symbolic representations of practical situations and explain their meaning using suitable diagrams and materials
- Use variables and constants to represent formulas and simple algebraic relationships and interpret these in context
- Develop simple algebraic relationships for practical problems using suitable diagrams and materials, and evaluate them for various values of the variables involved
- Explore and interpret functions described graphically, and make predictions from these graphs

Key Ideas

- Data can be collected from a relatively small sample size, that can be used to make predictions
- Calculators have statistical functions that calculate the line-of-best-fit
- The formula for a line-of-best-fit can be used to make predictions

Key Vocabulary

Independent variable, dependent variable, bi-variate data, graph axes, line-of-good-fit, line-of-best-fit

Lesson Overview

i) Students will conduct several class experiments that generate data that has a strong linear relationship. Experiments may include:
   - Sending a hand squeeze around a group
   - Testing the strength of spaghetti across a gap

ii) Model the graphing of this data, and estimating a line of 'good' fit

iii) Model input of the data into the TI-30XB calculator

iv) Use the calculator features that allow them to determine the line of 'best' fit

v) Compare their line of 'good' fit against what the calculator predicts is the line of 'best' fit

vi) Use the calculator features that identify the equation of the line, allowing predictions to be made

vii) Graphing this data will give a sense of pattern present in a data set

viii) After graphing the data (by hand or on a spreadsheet), students will use calculator features that allow them to check their line of 'good' fit against what the calculator predicts is the line of 'best' fit

Equipment

Worksheets 1 to 3 (can be done in parts)

- TI-30XB MultiView™ calculator or other calculator capable of following features:
  - Function tables
  - List formulas

- Stopwatch or use online stopwatch from:
  http://www.online-stopwatch.com/full-screen-stopwatch

- Counters
- A3-sized grid to model graphing with counters or tea towel with a grid, masking tape and marker pen to draw a scale
- Foam cups (2 per group)
- 10 kg of 100 mm nails 3/8″ nuts or bolts (for the class)
- 1 packet of spaghetti (for the class)
- Spreadsheet (for extension task)

Indicators of Success

- Enter data into a calculator
- Graph bi-variate data
- Use statistical mode on calculator to find the coefficients for line-of-best-fit
- Interpret the coefficients to describe the function to suit the context
- Plot line-of-best-fit onto a graph of the data
- Use the formula for line-of-best-fit to make predictions for more extreme sets of data

Teachers Explanatory Notes
TI-30XB MultiView™: Making Predictions

T

This unit is designed to fit in with the study of Algebra at Year 7, in particular, the collection of experimental data that is linear in nature. Graphing this data by hand, and then using the statistical functions on the calculator helps to develop students' sense of linear algebra arising from practical contexts.

1. Students will use the steps contained in Worksheet 1 to guide their usage of the calculator for later worksheets. The associated PowerPoint also guides the students through the hand squeeze task, including recording the data, constructing a line of best fit and formulating an equation. PPT
2. Hand out **Worksheet 1**, *(you can reduce some of the pages that need photocopying if you use the PowerPoint as a guide)* and invite one or two students to read out context of the data in the grey box. Ensure students understand the context. W1
3. Ask the class how we can make sense of data, to see if we can detect a pattern.
4. Ask students to scale the blank graph in Worksheet 1, following the instructions that will ensure the example data is able to be graphed. Model how to graph the data by beaming the blank graph onto a whiteboard (see PowerPoint slides), and inviting different students to graph different points of data. Emphasise that the time given is recorded to two decimal places, but on the graph we have to estimate the time, as best we can. PPT

   Another strategy for helping students master graphing the data is to enlarge the blank graph to A3 size and use counters to plot each data set. Alternatively, a tea-towel with a grid, using masking tape to scale each axis is an effective way of showing students how to plot the data using a kinaesthetic approach.
5. Ask students to graph the example data.
6. Using the usage notes for the calculator on Worksheet 1, support students to enter the example data using the statistical function, and to find:
   - Gradient for the equation of the 'line-of-best-fit' (a)
   - Y-intercept for the equation of the 'line-of-best-fit' (b)
   - Correlation coefficient for the data (r)
7. Conclusions & Predictions

   What do these figures mean? We can use them to help make predictions, based on our data, for how long it would take for a hand squeeze to be transferred around a larger group of people. Mention that mathematicians and scientists around the world use this method of modeling data and making predictions to help predict affects of climate change, population change, weather...

   The value for r gives us a sense of how strongly related the two variables are. It varies between -1 and +1.

A value of 0.97 means there is a very strong relationship between how many people there are in a circle and the time taken for a hand squeeze to be transferred.

The rule, based on the example data is:
Time (in seconds) = 0.33 × Number of People + 0.5

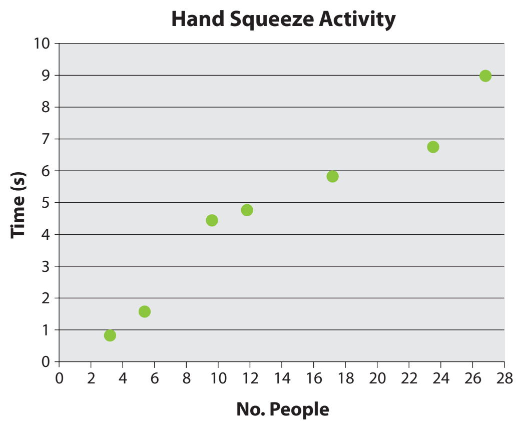
Another way of calculating approximately how long it will take a hand squeeze to be transferred around a group is:

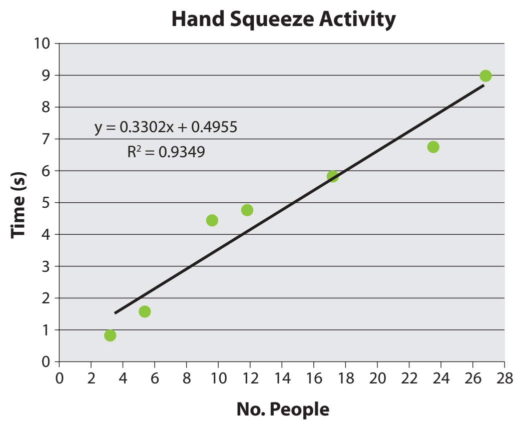
Take the number of people and divide by 3 (approximation of 0.33), and then add half a second on.

Eg. For 27,000 people (the approximate population of Alice Springs):
Time taken will be 27,000 ÷ 3 = 9000 seconds. Add the half a second on for an approximation of 9000.5 seconds. 0.5 seconds in 9000 seconds is not significant, so we can ignore it for the purposes of further calculations.

8. Collect data for the class, and repeat the process used with Worksheet 1. Students can record and graph their data on **Worksheet 2**. Solutions are provided for Worksheet 1, but Worksheet 2 is based on your own class' data.

W2





9. The task can be extended by using a spreadsheet to record and graph the data. Using the linear regression features on a spreadsheet will give identical results to those achieved using the TI-30XB MultiView™ calculator.

10. Further extensions include investigating how the time taken for a hand squeeze to be passed around is affected by other factors:

    Other situations involving hand squeezes that data could be collected and investigated includes:

    - All students facing outwards (so don't have visual feedback from other participants).
    - All students' blind-folded (or eyes shut).
    - Students receiving a squeeze on their preferred hand, and passing on the squeeze via their non-preferred hand (this will require some students facing inwards and some outwards).
    - Students receiving a squeeze on their non-preferred hand, and passing on the squeeze via their preferred hand.

    Each of the above scenarios could also be investigated with other variables such as:

    - Before and after exercise.
    - Before and after consumption of food.

    Data can be collected very quickly, and students enter the data and work through the documented process.