TI-30XB MultiView™ Proportional Reasoning

This Unit includes:

- Teacher Notes & Lesson Overview — T
- Teacher PowerPoint — PPT
- Worksheets 1 & 2 — W
- Student Assessment Task — AT
- Solutions to Student Worksheets — WS
- Solutions to Assessment Task — ATS

To obtain the complete set of units available please email **teacher-support@list.ti.com**

TEXAS INSTRUMENTS

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Curriculum Links
TI-30XB MultiView™: Proportional Reasoning

C

Year 7 Algebra, Function and Pattern

Statement of Learning Opportunities

Students will develop their proportional reasoning skills, making use of mental computation and a calculator to make strategic decisions in solving worded problems where two attributes are in proportion to each other. A strong feature of the unit will be to use flexible approaches, and be able to:

- Explain their approach to solving an approach to a peer
- Follow the verbal explanation of a peer in solving a worded problem

Key Ideas

- Mental computation strategies can be efficient ways of solving word problems that require proportional reasoning
- Confidence in solving proportional reasoning problems using a range of strategies
- Interpret problem situations to select and use an appropriate sequence of operations, and apply suitable methods of computation
- Use technology to carry out and check calculations involving rational numbers and represent answers in numerator-denominator, mixed number or decimal form as required
- Form estimates and make approximations arising from practical situations involving calculations with whole numbers, decimals and fractions, and interpret and justify their reasoning in context
- Represent a set to set (part to part) relationship as a ratio or a subset to set (part to whole) relationship as a ratio, and express these in simplest form
- Calculate proportions of a given ratio using multiplication and division by whole numbers

Key Vocabulary

Ratio table, proportion, proportional, mental computation strategies, *'trust your head,'* automaticity, times by 10, 100, 1000, doubling, halving.

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

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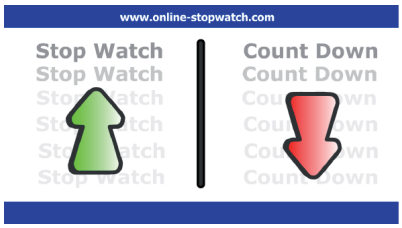
Equipment

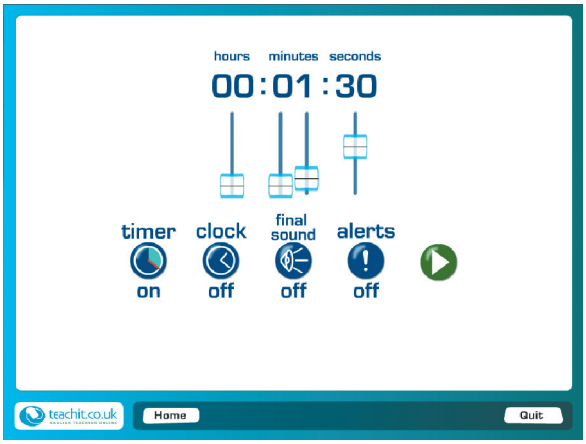
Worksheets 1 to 3 (can be done in parts)

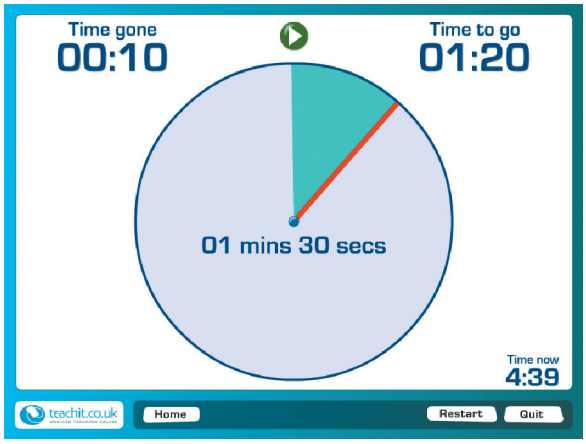
- TI-30XB MultiView™ calculator or other calculator capable of following features:
  - Function tables
  - List formulas
- Stopwatch or use online countdown timers from:

http://www.online-stopwatch.com/full-screen-stopwatch



http://www.teachit.co.uk/index.asp?CurrMenu=350





- Spreadsheet – could be used to extend more able students

Indicators of Success

- Use a calculator to complete a given ratio table that relates to a word problem
- Create a ratio table and use in conjunction with a calculator to solve a word problem
- Complete a ratio table using mental computation strategies to solve a worded problem, using a calculator to check
- Complete a ratio table using mental computation strategies to solve a worded problem, using the Store and Variable keys on a calculator to model the solution

Teachers Explanatory Notes
TI-30XB MultiView™: Proportional Reasoning

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PPT

Whole class considers a simple story that generates some data to record in a ratio table (refer to PowerPoint for an example). Students are invited to consider how they might use the data generated to solve the problem contained in the story for numbers that have not yet been generated. Discussion about different strategies is essential.

After practice of initial strategies, students are shown how to use the store key sto→ along with the variable key x^{yzt}_{abc} on the TI-XB30 MultiView™ calculator to check their answers when filling in a table. Slide 6 in the PowerPoint shows this.

Ratio tables have two (or more rows) and two (or more columns) with numbers in each cell. A label is included for each row (if working across) or column (if working down)

Example of a ration table
A group of Year 7 teachers are planning to take their class camping.
Each tent can fit 14 students. How many children can fit in 16 tents?

		x 10	÷ 2	x 3	+ 1	
Tents	1 →	10 →	5 →	15 →	16	
Students	14	140	70	210	224	

Thinking out aloud…
One tent takes 14 students. Times by 10 to get 140. Halve this to get 70. Times by 3 to get 210. Add 14 (for one tent) to get 224 students fitting into the tents.

The numbers in each cell have a meaning in a real world context. Units are added to the label. Numbers and their units are separated to make it easier to manipulate numbers via mental computation.

The ratio between the numbers in the columns (rows) is the same for all columns (rows).

There is no preference which to choose as the upper or lower row (left or right column). In some scientific contexts, order is important (eg. density, speed).

There is no set way at arriving at a solution - students are free to choose a strategy that works for them, but must be prepared to orally explain their thinking, as well as actively follow the oral reasoning of a peer.

Once students have mastered the strategy of using proportional reasoning to solve worded problems, they can be further challenged by using two approaches:

- Inviting students to devise their own problems, with solutions,
- Solving a worded problem within a self-nominated time frame.

Using the *Teach-it Timer* or the *Online-Stopwatch* provides visual feedback that creates a *'sense of urgency'* for students working on mathematical questions of this nature. Giving students this experience in solving proportional reasoning problems, with and without access to a calculator helps to develop their automaticity.

Challenging students to devise a spreadsheet that solves proportional reasoning problems in a similar way to their mental strategies will strengthen their understanding. Using a calculator alongside a spreadsheet will make this task more accessible, because they can move between representations of the problems (ie. printed table, calculators steps, spreadsheet).

Inviting students to 'think out aloud' is an important part of the lesson to invest in at all stages of the lessons.

Another example for the class to work through
Soft drinks are packaged in cartons of two dozen. How many soft drinks in 19 cartons?

Thinking out aloud…
One carton has 24 soft drinks. Times by ten to get 240. Double to get 480. Take off 24 to get 456 soft drinks in 19 cartons.

	x 10	x 2	- 1	
Cartons	1 →	10 →	20 →	19 →
Soft Drinks	24	240	480	456

Using a TI-30XB calculator…

Setting up the problem: sto▸ 24 x^{yzt}_{abc}

Number of Soft Drinks
(D) = 24 x Number of Cartons (C)
which is the same as
D = 24 x C or D = 24C

Checking mental computation:
10 x^{yzt}_{abc} gives 140; 5 x^{yzt}_{abc} gives 70, 15 x^{yzt}_{abc} gives 210, 16 x^{yzt}_{abc} gives 224.

Hand out and work through worksheet 1 and then discuss with the class.

Hand out and work through worksheet 2 and then discuss with the class.

When students seem comfortable and confident with this work hand out the assessment task.

W1
W2
AT