

ADDING FRACTIONS Teacher Notes

References

Foundation	N3.1 Fractions
Foundation Plus	N6.1 Adding and subtracting fractions
Higher	N2.1 Adding and subtracting fractions
Higher Plus	N1.5 Fraction calculations

Introduction

This activity offers an innovative way to explore fraction concepts, particularly equivalence and the addition of fractions.

Resources:

The TI-Nspire document *AddingFractions.tns*, presents an animation of two user-defined fractions being added together. There are no student notes for this activity.

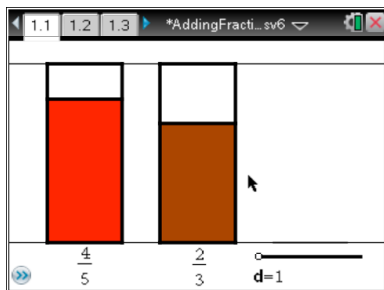
TI-Nspire skills students will need

- Transferring a document to the handheld.
- Opening a document on the handheld.
- Grabbing and dragging a point on the screen.
- Moving to a new page.
- Basic ability to enter calculations.

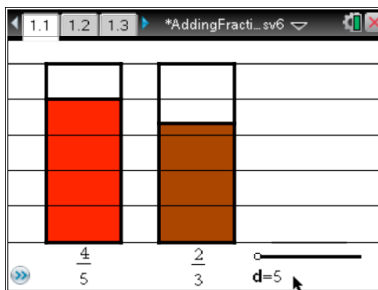
The activity

This activity is designed primarily for whole-class teaching using the TI-Nspire Teacher Software projected onto a screen. However, students are also able to produce the animation using the TI-Nspire document on their handhelds.

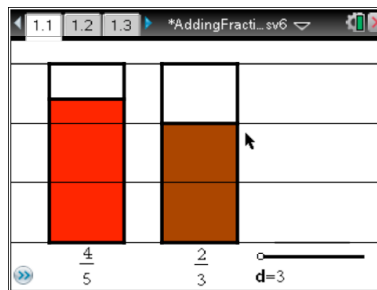
Later in these notes you will find a suggested way of using it in the classroom



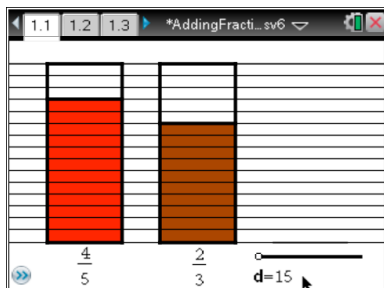
Two fractions are to be added together.



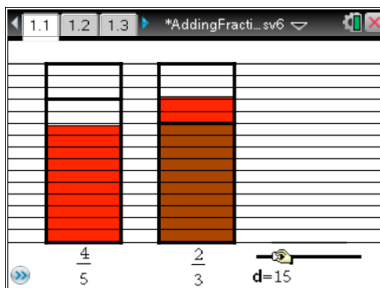
We can check it really is 4/5...



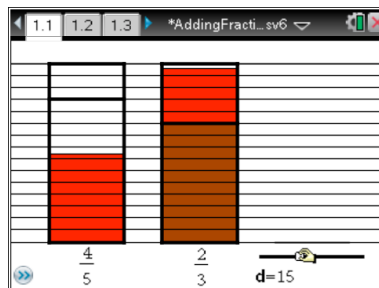
... and the other is certainly 2/3...



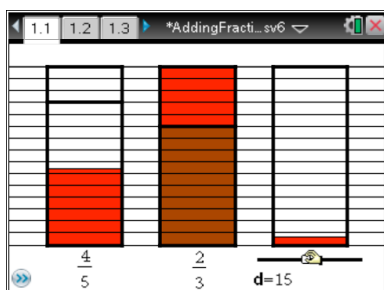
... and they are equivalent to $12/15$ and $10/15$.



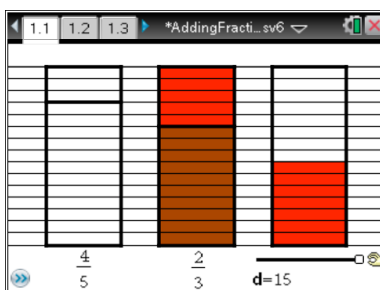
Dragging the point "pours" one fraction into the other.



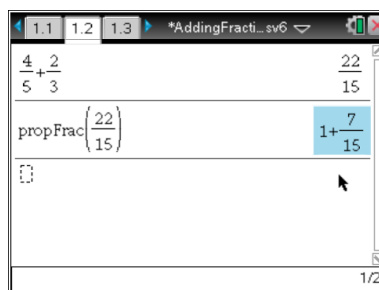
What will happen when it's full?



We can carry on pouring until it's all transferred.



So that's one full bar and $7/15$.

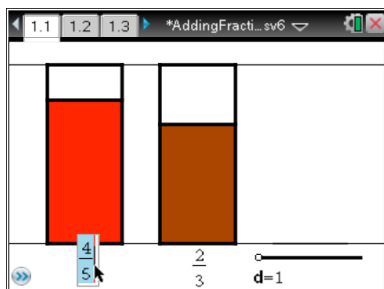


Let's check that ...
yes: $4/5 + 2/3 = 1 + 7/15$

How to

The following sections describe the simple processes needed to use the animation. It is assumed you will be using the TI-Nspire Teacher Software, but key presses for the handheld are given in brackets.

How to change the fractions

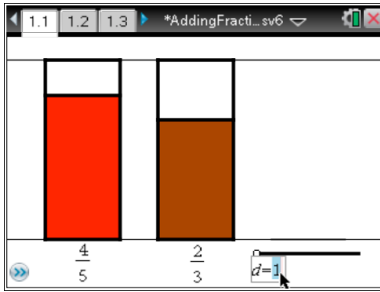


- Move the pointer to the fraction that you wish to change.
(Use the Touchpad at the top of the keyboard).
 - Click twice to edit the fraction.
(Press either **enter** twice or **↵** twice.)
 - Fractions can be edited by deleting the whole fraction and entering the new one.
(Press **del** **2** **÷** **5**, for example.)
- Alternatively edit the numerator and denominator separately.
(Press **←** and then **▲** or **▼** to switch between them.)
- Press return/enter to finish.
(Press **enter**.)

If you somehow lose the fraction altogether, simply use the Undo function.

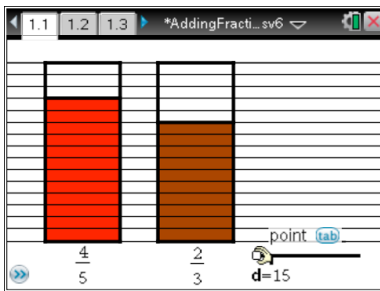
(Press **ctrl** **Z** or **ctrl** **esc**.)

How to change the number of divisions



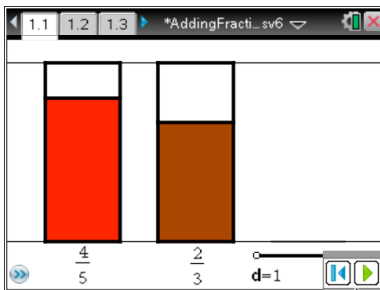
The bars can be divided into up to 32 equal parts by changing the value of d . Move to $d=1$ and edit the value as described above. For example, by changing the value of d to 5, both bars are split into five equal parts, and it is then possible to 'read' the first fraction visually. By changing the value of d to 3, it is possible to 'read' the second fraction visually. But by changing the value of d to 15 it is possible to read both fractions visually.

How to use the slider to add the fractions



Move to the white point on the slider and the cursor changes to an open hand. Close the hand by clicking and holding on it—you can then drag the point to the right.

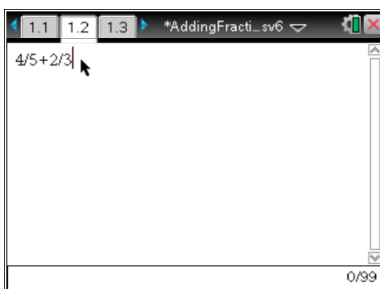
(Press and hold or press **ctrl** . Then press **▶**.)



As the point moves along the slider, the red part in the first bar decreases while the red part in the second bar increases by the same amount. When the point reaches the other end of the slider, the first bar is empty and the second bar contains a shaded area representing the total. A third bar appears if the resulting fraction exceeds 1.

Should you wish to change from manual control to an automatic repeating animation this can be achieved by pointing to the white dot, right-clicking and using the second option from the Attributes menu. When you change the animation speed to 1 or more, the animation control box appears as shown here.

How to enter fractions on the calculator page

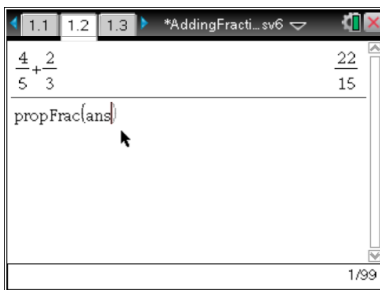


Move to page 1.2 either by clicking on its thumbnail on the left of the window or the tab at the top of the screen.

(Press **ctrl** **▶**.)

The simplest way to enter the sum of two fractions is to type, for example, $4/5+2/3$ and press enter/return.

(Press **4** **÷** **5** **+** **2** **÷** **3** **enter**.)



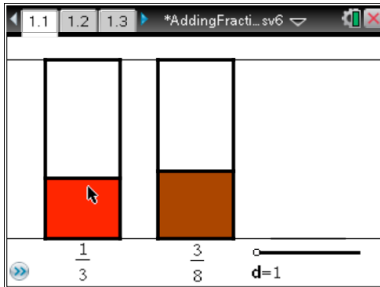
By default TI-Nspire shows the result of such a calculation as an improper fraction. However, the built-in function, **propFrac** will convert results to proper fractions.

It can either be typed or entered from the Number/Fraction Tools menu.

(Press **menu** **2** **7** **1**.)

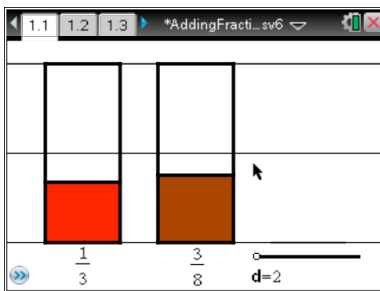
Lesson idea: equivalence leading to addition

The example below is a suggested way of working on equivalent fractions with a whole class. It could be set up solely using the TI-Nspire Teacher Software projected onto a screen, or students could also be using their own handhelds with possibilities for sharing their work using the Navigator System.



*The bar on the left is supposed to have one third shaded, and the bar on the right is supposed to have three eighths shaded...
... but I'm not really convinced.*

I wonder what happens if we change d to another number. Let's try d=2.

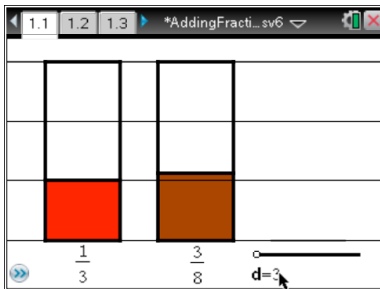


Ah...a line has appeared...

What's going on here?...

We changed d to 2... and... ..hmmm...

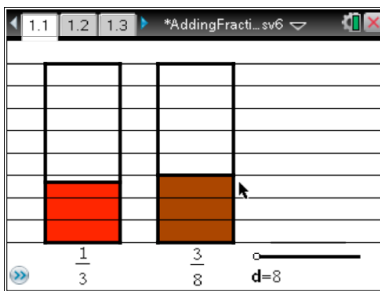
I wonder what will happen if we try d=3?.



Ah that helps! We can see that the first fraction is a third!

Now that d=3 the bar has been divided into three equal parts and one part is shaded...so it is a third!

*But I wonder how we can check that the second fraction is three eighths
Any suggestions?*

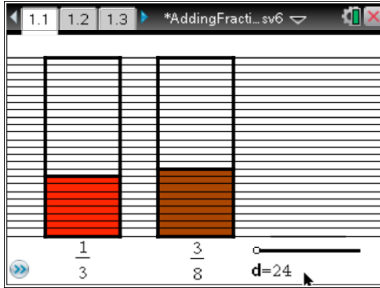


Thanks for that ... changing d to 8 divides the bars into 8 equal parts and yes, we can see that the second fraction is indeed three eighths.

That's OK so far... but I'd really like to be able to read both fraction pictures at the same time... any ideas how we could do this?

At this point in the lesson the students will have their own ideas about the possible values of d that could be tried out. Work with their ideas, especially the incorrect ones, to create a sense of why multiples of both denominators work, but other numbers do not.

Ask students to explain what they are learning, possibly by writing out an explanation of what is happening when the value of d changes



So we have decided that if we divide the bars into 24 equal parts we can read both fraction pictures at the same time.

We have eight twenty-fourths on the left and nine on the right.

Let's just check that....

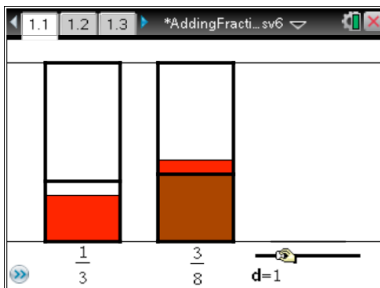


Yes, 8 divided by 24 gives us eight twenty-fourths and that is equivalent to one third.

And nine twenty-fourths and is equivalent to three eighths.

At this point it may be best to return to page 1.1 and enter a new pair of fractions to discuss together e.g. $\frac{2}{3}$ and $\frac{1}{5}$ or $\frac{1}{3}$ and $\frac{11}{12}$.

Work towards a general statement that it is *necessary* to have multiples of both denominators and *best* to have the lowest one... the lowest common denominator.

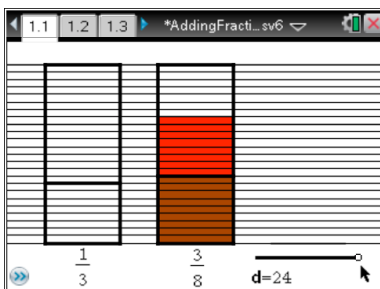


Now let's put d back to 1 and see what this white dot is for.

I'm grabbing the dot and moving it along the line to the right...

...what's going on now?

The red shading is moving from the left bar to the right bar...



.... and when it's all moved over we've added the two fractions together.

I wonder what the total is.... what fraction is that?....any suggestions?

Let's show the twenty-fourths again shall we?

It looks as if $\frac{1}{3} + \frac{3}{8} = \frac{17}{24}$.

Following this the calculation may be checked on the calculator page and further pairs of fractions added together, either working as a full class or with students working on their own handhelds.