Multiples of Ten

Introduction (for teacher's reference only):

Imagine that your students were working on the following problem:

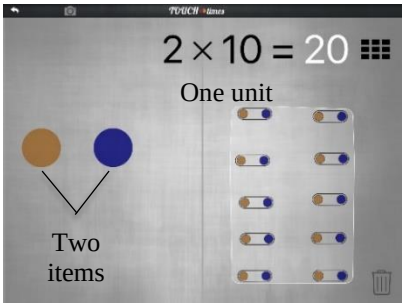
> Victoria poured some pencils on the table. She packed them into 14 bags. Each bag had 20 pencils. How many pencils are there?

You overheard this conversation:

> Tom: How do you multiply 14 by 20? The numbers are too big.
> Jane: Hmm, I would do 14 x 2, which is 28 and then add a zero.
> Tom: Are you sure you can do that?

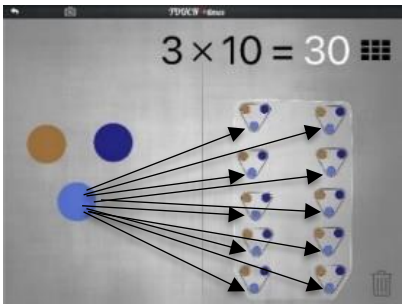
Jane was able to apply a flexible strategy to multiply by multiples of tens to calculate the product of 14 x 20. But not all students are aware or understand how the strategy works.

Thus, to help students develop a flexible strategy of multiplying by multiples of tens, we propose an important idea of multiplication, namely, ***unitising*** where multiplication is seen as an action that consider a set of countable items as a single countable item. For example, in the product 2 x 10, the first factor 2 is originally considered as two countable items (on the left) but it can be considered as <u>one unit</u> (on the right) that is being replicated 10 times, as demonstrated in Grasplify below:



Note that the annotations are added for illustration and are not features of TouchTimes.

Another important idea of multiplication is ***spreading*** where the change in one unit is spread across all other units. For example, when students press another finger on the pips side, they would be able to observe this change being spread to all the pods, where the number of pips in every pod increase by 1.



Students would need to arrange the pods into this structure on their own, to observe the 10 units more clearly.

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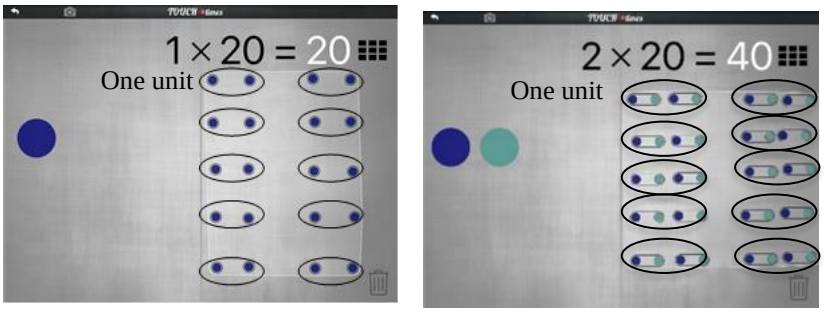
Specifically, with this task, students can experience both ideas of *unitising* and *spreading* through exploring what happens when we multiply by multiples of ten. Students will start by exploring how multiplying by 20 is related to multiplying by 10 – where we consider 2 pods as 1 unit and hence the 20 pods can be considered as 10 units. Then as we vary the number of pips, we can observe how the change is spread across all the pods.



Increasing from 1 pip to 2 pips

Consequently, this strategy can be a useful multiplication strategy to make multiplication by multiple of tens easier to calculate. For example, 9 x 30 might be difficult to calculate so instead, compute 9 x 3 first then multiply by 10. As 30 can be written as 3 x 10, which means 9 x 30 can be written as 9 x 3 x 10. It does not matter what order you multiply the factors – the product is always the same, so you can multiply 9 x 3 first and then multiply the product by 10.

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Task: Multiples of Ten

Part 1 - Using Grasplify, create the following products by changing the pips:

1. 1 x 20
2. 2 x 20
3. 3 x 20
4. 4 x 20
5. 5 x 20

What do you notice about the pods as you change the number of pips?

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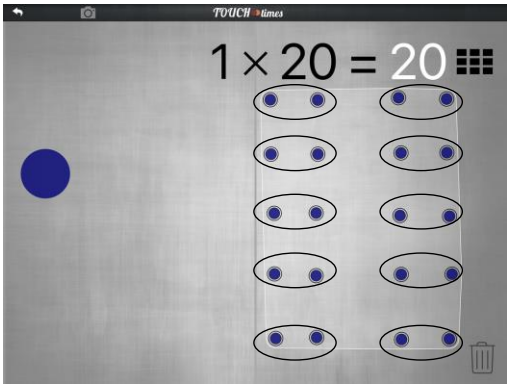
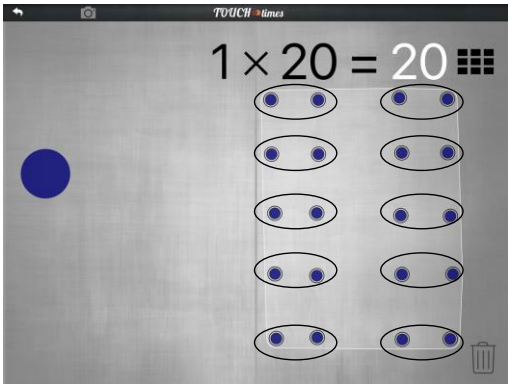
Part 2 - Using Grasplify, create 1 x 20 again and arrange your pods like the image below. If we pair up two pods to form 1 group, we get 10 groups in total. So, **1 x 20 is the same as 1 x 2 x 10** as 1 group has 2 pods and there are 10 groups.



Now, change the number of pips, use 2, 3, 4, and 5 pips. Based on what you see on your iPad, add on to the images below and write the products as multiples of 10.

		Image
1	1 x 20 = 1 x 2 x 10 = 2 x 10	

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2	2 x 20 =	
3	3 x 20 =	

If you were asked to find the product 6 x 30 by decomposing it into a multiple of 10, what could you do?

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Part 3 - Now, create 1 x 30 on Grasplify. How can you arrange the pods into 10 equal groups? How many pods are there in each group? Draw the image of your arrangement.

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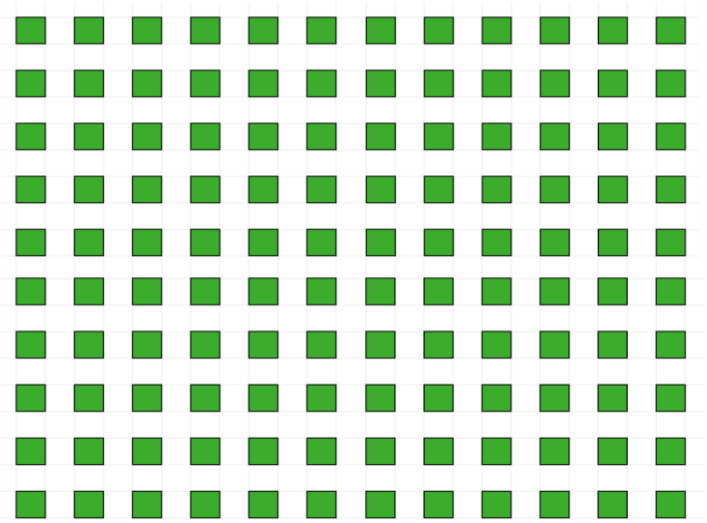
Write the following products as multiples of 10:

1. 1 x 30 =
2. 2 x 40 =
3. 3 x 50 =
4. 4 x 60 =
5. 5 x 70 =

Part 4 - Bob was playing with some unit blocks and placed them in the following arrangement. How can we find the total number of unit blocks **without** counting them one at a time?



Find the total number of unit blocks and explain your strategy in words and/or drawings.