**BASELINE (‘BUSINESS AS USUAL’) COHORT**

**SUGGESTED LESSON IDEAS**

**NOTES**

These lesson ideas are designed by the research team with the support of the project’s Steering Committee which is made up of Headteachers, Deputy Headteachers and Maths Co-ordinators of primary schools across Berkshire, Buckinghamshire, Hampshire and Oxfordshire. The lessons are designed not to be too labour intensive for teachers to prepare and deliver while still helping pupils to master the mathematical concept(s) in question.

These weekly lesson ideas are merely meant to be a rough guideline, and not meant to be prescriptive. We fully acknowledge that different schools and classes have different ways of doing things. Thus, you are encouraged to use the suggested lesson ideas below as a basis for you to build your own more-detailed plan and resources to suit the learning needs of pupils in your class. That said, from the research perspective, it can be very useful for teachers in the same cohort to teach in the similar way during the three-week period for the sake of cohort-wide consistency and to ensure the study is a fair test.

As some Year 4 classes in this study are mixed age classes (e.g. Year 3/4 or Year 4/5), differentiation could be done by offering pupils different levels of support while the same tasks are offered to all pupils, for example.

Please mark children’s work and comment them as you would normally. (Your marking and comment are not the focus of our research.)

For more information about the project and its Steering Committee, please visit <https://www.mathsthroughstories.org/research-project-2.html>

If you have any question or would like clarification about any of these lesson plans, please contact Dr. Natthapoj Vincent Trakulphadetkrai directly at n.trakulphadetkrai@reading.ac.uk.

**WEEK 1 (MON 27/01/20 – FRI 31/01/20)**

**TARGET MULTIPLICATIVE FACTS:** REVISION OF THE 2, 5 AND 10 MULTIPLICATION TABLES

**TARGET APPLICATION:** MULTIPLICATION AS REPEATED ADDITION (GROUPS OF OBJECTS)

**Statutory requirements:** Pupils should be taught to recall multiplication […] facts for multiplication tables up to 12 × 12; to solve problems involving multiplying

**For any references highlighted in green, refer to the corresponding PowerPoint**

**For any references highlighted in pink, refer to the corresponding worksheet**

**See the Resources webpage for more information**

<https://www.mathsthroughstories.org/research-project-resources.html>

**Lesson 1**

*Suggested initial teaching input (15 mins)*

* On the screen, teacher to display the following word problem *“If there are 10 towns, and each town has 2 hospitals. How many hospitals are there altogether?”*, and ask pupils to work in pairs to solve the problem (first by using concrete resources like counters or Unifix cubes, and later on their mini whiteboard).
* Later, ask pupils to share their answers (and the strategies they used to solve the problem). Highlight that while some pupils simply multiplied 10 by 2, others added ten 2s together; thus, multiplication can also be thought of as *repeated addition*.
* Draw pupils’ attention to the original word problem and ask pupils to now represent that problem as both multiplication (10 x 2) and repeated addition (2+2+2+2+2+2+2+2+2+2) on their mini whiteboard. (If necessary, explain why in this *specific* context, it would not be appropriate to represent the problem as 10+10.)
* Then, ask pupils to independently have a go at representing the next word problem as multiplication and repeated addition using counters or Unifix cubes and then on their mini whiteboard: *“James eats two oranges every day. How many oranges does he eat in five days?”*

*Suggested activity (20 mins)*

On the screen, display the following word problems and ask pupils to represent each problem as repeated addition and then as multiplication; as well as to provide the correct answer in their book. To save time, teachers may also want to present the questions below on a sheet of paper, so pupils could simply provide their answers on the paper and stick it in their book:

* **Batteries come in packs of five. How many batteries are there in six packs?**

**[Example: ‘5+5+5+5+5+5 = 6x5 = 30’. Delete this before showing it to pupils on the screen.]**

* **Rebecca has two pet rabbits. Each rabbit eats eight carrots. How many carrots are eaten altogether?**
* **There are ten pots of pencils in a Year 4 class. Each pot contains six pencils. How many pencils are there altogether?**
* **Harry eats five pieces of fruit every day. How many pieces of fruit does he eat in five days?**
* **Ten children at a party have seven scoops of ice cream each. How many scoops of ice cream do they eat altogether?**
* **Cassie reads two pages of her book each night. How many pages will she have read after nine nights?**

As an extension, pupils could be asked to pose their own word problems like the above examples. Ask them to use multiplication table facts from the 2x, 5x and 10x tables.

*Suggested plenary activity (5 mins)*

During the plenary, display the following reasoning question on the screen and ask pupils to discuss it with their partner:

**Is it correct to represent the following word problem with 5+5: *‘There are five schools. In each school, there are two teachers. How many teachers are there altogether?’* Explain your answer.**

[Incorrect as the repeated addition should have been 2+2+2+2+2 as there are five lots of two.]

**Lesson 2**

*Mental starter (5 mins)*

As a class, practise recalling the 2x table facts by first allowing time for pupils to work in pairs to work out the 2x table facts on their mini whiteboards. (Please feel free to varying the teaching approach here to include other strategies as appropriate e.g. the use of a counting bead or a counting stick, etc.) Later, teacher to ask quick fire questions about the table facts (e.g. ‘What is 2 times 8?’).

*Suggested initial teaching input (15 mins)*

* Ask pupils to remind you what they have learned yesterday in their maths lesson.
* Then, teacher to display the following number sentence on the screen: “10 x 5”, and ask pupils to represent this multiplication sentence as repeated addition on their mini whiteboard.
* Then, give pupils enough time to discuss with their talking partner what could be a word problem for that number sentence. Later, invite pupils to share the word problems that they come up.
* Emphasise that there is no one correct word problem to represent 10 x 5, and that there are many different possible word problems to represent that number sentence.
* Also emphasise the fact that in the context of ‘groups of objects’-type word problems, it is very important that pupils remember to include the word ‘each’ to indicate how many objects are there in *each* group.
* Then, display the following reasoning questions in turn on the screen and ask pupils to discuss with their partner:

**Is *'If Jim has 5 sweets and his mum gives him 2 more sweets. How many sweets are there altogether?'* a word problem for 5 x 2? Explain your answer.**

[No as the given word problem is about addition (“more of the same objects”) and not about “groups of objects”. Invite pupils to give you an appropriate word problem to represent 5 x 2.]

**Is *'There are 2 piles of sweets, and there are 5 sweets in each pile. How many sweets are there altogether?'* a word problem for 2 x 5 or 5 x 2? Explain your answer.**

[Either is fine: commutative property]

***Is ‘'There are 10 schools, and there are 5 teachers. How many teachers are there altogether?'* a word problem for 10 x 5? Explain your answer.**

[No as the given word problem does not indicate that EACH school has 5 teachers. It just says “there are 5 teachers”.]

*Suggested activity (20 mins)*

* Pupils to pose (and solve) their own ten word problems in their book. (While floating, teacher to check if the pupils are on the right track and to address any misconception there and then.)
* Pupils should be encouraged to use numbers from the 2, 5, and 10 multiplication tables to help them pose their word problems.
* Later, pupils to read out their questions to their neighbouring peer for them to solve.

*Suggested plenary activity (5 mins)*

Invite a few volunteers to read out one word problem each for the rest of the class to solve on their mini whiteboard.

**Lesson 3**

*Mental starter (5 mins)*

As a class, practise recalling the 5x table facts by first allowing time for pupils to work in pairs to work out the 5x table facts on their mini whiteboards. (Please feel free to varying the teaching approach here to include other strategies as appropriate e.g. the use of a counting bead or a counting stick, etc.) Later, teacher to ask quick fire questions about the table facts.

*Suggested initial teaching input (20 mins)*

* Ask pupils to remind you what they have learned yesterday in their maths lesson.
* Then, teacher to display the following word problem on screen: *‘There are 2 piles of sweets, and there are 5 sweets in each pile. How many sweets are there altogether?’.*
* Ask pupils to work in pairs to discuss and show how this word problem could be shown *visually*. Discuss what the term ‘visually’ means.
* Invite pupils to share their visual representation of the given word problem.
* Highlight that while some pupils drew a pictorial representation of the problem (e.g. a drawing of two piles of five sweets), others used other objects to represent the problem (e.g. two groups of five circles; bar modelling, etc.). Emphasise that there is no one correct way to visualise the given word problem, but also discuss why the latter could be more useful (e.g. much quicker than having to spend so much time having to draw to likeness).
* Then, display the following reasoning questions in turn on the screen and ask pupils to discuss with their partner:

**Is an image of 2 groups of 7 sweets a pictorial representation of 2 x 5? Explain your answer.**

[No as there should be only 5 sweets in each of the two groups, not 7.]

**Is an image of 5 groups of 2 sweets a pictorial representation of 2 x 5 or 5 x 2? Explain your answer.**

[Either is fine: commutative property]

*Suggested activity (20 mins)*

* In their book, pupils to come up with visual representation of the word problems that they have come up with yesterday. (While floating, teacher to check if the pupils are on the right track and to address any misconception there and then.)
* Once the task is completed, pupils to swap their work with that of their neighbouring peer to check one another’s visual representation for accuracy.

*Suggested plenary activity (5 mins)*

On the screen, display visual representation of a few multiplication facts (e.g. 10 groups of 2 dots; 5 groups of 7 stars; 2 groups of 8 triangles) for pupils to translate them to multiplication number sentences and find the answers.

**Lesson 4**

*Mental starter (5 mins)*

As a class, practise recalling the 10x table facts by first allowing time for pupils to work in pairs to work out the 10x table facts on their mini whiteboards. (Please feel free to varying the teaching approach here to include other strategies as appropriate e.g. the use of a counting bead or a counting stick, etc.) Later, teacher to ask quick fire questions about the table facts. *Ask pupils if they notice any relationship between the 5x and 10x table facts. (Here, it could be useful to have the 5x and 10x table facts displayed alongside each other. This could be done so on the screen or a working wall so pupils would find it easier to establish the relationship between these two multiplication tables.)*

*Suggested initial teaching input (15 mins)*

Ask pupils to remind you what they have learned yesterday in their maths lesson.

On the screen, display the following statement: “8 is a multiple of 2”. Ask pupils to discuss in pairs what they think this statement means (specifically what does ‘a multiple’ mean?). Then, establish that ‘a multiple’ is what we get after multiplying a whole number (or an 'integer') with another integer. Later, demonstrate that when 2 times 4, we get 8. Therefore, 8 is a multiple of 2.

Then, on the screen, display the following statement: “8 is a multiple of 5”. Ask pupils to discuss in pairs whether they agree or disagree with this statement and why. Later, try to demonstrate that there is no whole number / integer that when it is multiplied by 5 will get 8. Therefore, 8 is not a multiple of 5.

On the screen, display the following set of numbers: 10, 12, 15, 17, 18, 20, and 25. Then, draw a circle in the middle of a rectangle, and label the circle as ‘multiples of 2’. Then:

* Ask pupils: *Is 10 a multiple of 2? How do you know?* Then,drag it into the circle labelled ’multiples of 2’.
* Ask pupils: *Is 15 a multiple of 2? How do you know?* Then,drag it into the area outside the circle. Explain any number that is not a multiple of 2 would need to go there.
* Repeat with the other numbers.

*Suggested activity (20 mins)*

In their book, pupils to draw a circle in the middle of a rectangle, and label the circle as ‘multiples of 2’. Then, each pupil to come up with ten random numbers from 2 to 30 and to assign them either in the circle or the area outside the circle. Teachers may find it useful to have this rectangle with a circle inside printed ready for SEND children. (While floating, teacher to check if the pupils are on the right track and to address any misconception there and then.)

Once pupils are familiar with the task and have completed the task, ask them to draw another circle in another rectangle. Then, ask them to give their neighbouring peer another ten random numbers from 2 to 30 so their peer can assign them in either in the circle or the area outside the circle.

*Suggested plenary activity (5 mins)*

Display, the following reasoning questions in turn on the screen and ask pupils to discuss with their partner:

**Someone said 12 is a multiple of 2. Is that person correct? Explain your answer.**

[Correct as when 2 is multiplied by a whole number or an ‘integer’ (i.e. 6), it gets 12.]

**Someone said 19 is not a multiple of 2. Is that person correct? Explain your answer.**

[Correct as there is no whole number / integer that can multiply 2 to get 19.]

**Lesson 5**

*Mental starter (5 mins)*

As a class, practise recalling the 2x, 5x and 10x table facts. Teacher to ask quick fire questions about the tables facts. Pupils to independently write their answer on their mini whiteboards.

*Suggested initial teaching input (15 mins)*

Ask pupils to remind you what they have learned yesterday in their maths lesson.

Then explain to them that today’s focus will be similar to yesterday except instead of thinking about just just the 2x table facts, we will also be thinking about the 5x and 10x table facts.

On the screen, display the following set of numbers: 24, 35, 42, 46, 50, 95, 102, 105, 120 and 125. Draw three intersecting sets labelled ‘multiples of 2’, ‘multiples of 5’ and ‘multiples of 10’. Then:

* Ask children: *Is 35 a multiple of 2? How do you know? A multiple of 5? A multiple of 10?* Drag it into the set labelled ’multiples of 5’.
* Repeat with 24, 42 and 95.
* *Is 50 a multiple of 2? 5? 10? So where shall we put that number?* Discuss how you can put it in the overlapping parts of the three sets so it can be in all three sets at once.
* Repeat with the other numbers.

*Suggested activity (20 mins)*

* As a class, play the ‘2x, 5x and 10x Tables Bingo’ game where pupils to fill their own 2x5 grid with ten numbers that are multiples of 2, 5 and 10, and the biggest number could only be 120 (10 x 12). Ask pupils to check all of their ten numbers that they are indeed multiples of 2, 5 and 10 – ask pupils how they could check that their numbers are appropriate. Then, teacher to call out random multiples of 2, 5 and 10 until a winner is found (i.e. the person who is the first to have all the numbers as called out by the teacher on their bingo card). Play one more round of the game.
* Once pupils are familiar with the rules, ask them to play with people at their table – where each team member would take turn being the person calling out the numbers.

*Suggested plenary activity (5 mins)*

On the screen, display the following reasoning questions in turn and ask pupils to discuss with their partner:

**Someone said 35 is a multiple of both 2 and 5. Is that person correct? Explain your answer.**

[Not correct as there is no whole number / an integer that can multiply 2 to get 35.]

**Someone said 40 is a multiple of both 5 and 10. Is that person correct? Explain your answer.**

[Correct as either 5 or 10 can be multiplied by a whole number / an integer to get 40.]

**Someone said 30 is a multiple of 5 and 10 only. Is that person correct? Explain your answer.**

[Not correct as 30 is also a multiple of 2.]

**Someone said 22 is not a multiple of 5. Is that person correct? Explain your answer.**

[Correct as there is no whole number / integer that can multiply 5 to get 22.]

**WEEK 2 (MON 03/02/20 – FRI 07/02/20)**

**TARGET MULTIPLICATIVE FACTS:** REVISION OF THE 3, 4, 6 AND 8 MULTIPLICATION TABLES

**TARGET APPLICATIONS:** MULTIPLICATION AS ARRAYS (AREA OF RECTANGULAR SHAPES)

**Statutory requirements:** Pupils should be taught to find the area of rectilinear shapes by counting squares

**For any references highlighted in green, refer to the corresponding PowerPoint**

**For any references highlighted in pink, refer to the corresponding worksheet**

**See the Resources webpage for more information**

<https://www.mathsthroughstories.org/research-project-resources.html>

**Lesson 6**

*Mental starter (5 mins)*

As a class, practise recalling the 3x table facts by first allowing time for pupils to work in pairs to work out the 3x table facts on their mini whiteboards. (Please feel free to varying the teaching approach here to include other strategies as appropriate e.g. the use of a counting bead or a counting stick, etc.) Later, teacher to ask quick fire questions about the table facts.

*Suggested initial teaching input (10 mins)*

* State that the focus this week will be on ‘area’ – invite pupils to discuss with their talking partner of what they think area means (e.g. “Area is the amount of space covered by a figure.”) and how it is different from perimeter (if they have already learned about perimeter).
* On the screen, show an image of a rectangle made up of an array of 3 x 6 unit squares. Ask pupils to work with their talking partner to identify the length and width of the rectangle (i.e. the length is 3 unit squares and the width is 6 unit squares). Then, ask them to work out the area of the said rectangle (i.e. by simply counting the number of squares = 18 square units).
* Take time to explain that each square is called a *‘unit square’* (i.e. “a square with sides measuring 1 unit”), while *‘square units’* is a unit of measurement.

*Suggested activity (25 mins)*

On the screen, display details of the following task:

On grid paper, create the following rectangles with the following dimensions and find the area of each of them:

* + **A 3 x 5 unit square rectangle**
	+ **A 3 x 8 unit square rectangle**
	+ **A 6 x 4 unit square rectangle**
	+ **A 4 x 8 unit square rectangle**
	+ **A 8 x 5 unit square rectangle**
	+ **A 8 x 7 unit square rectangle**

(Feel free to create some ready-drawn rectangles for SEND children.)

As an extension, pupils can use a ruler to draw rectangles of different sizes (of their choosing) in their book and to ask their neighbouring peer to work out the area of these rectangles. For dimensions, pupils should be encouraged to use numbers from the 3, 4, 6 and 8 multiplication tables – regardless of their ability levels.

*Suggested plenary activity (5 mins)*

Display the following reasoning questions in turn on the screen and ask pupils to discuss with their partner:

*Show a rectangle of 6 x 8 unit squares. Below the rectangle, insert the following statement:* ***“Someone said that the area of this rectangle is 42 square units. True or false? Explain your answer.”***

*[False as the correct area is 48 square units.]*

*Show a rectangle of 3 x 8 unit squares and another of 4 x 6 unit squares. Below the rectangles, insert the following statement:* **“The 3 x 8 array has a larger area than the 4 x 6 array. True or false? Explain your answer.”**

[False as 3 x 8 equals 24, and 6 x 4 also equals 24.]

**Lesson 7**

*Mental starter (5 mins)*

As a class, practise recalling the 6x table facts by first allowing time for pupils to work in pairs to work out the 6x table facts on their mini whiteboards. (Please feel free to varying the teaching approach here to include other strategies as appropriate e.g. the use of a counting bead or a counting stick, etc.) Later, teacher to ask quick fire questions about the table facts. *Ask pupils if they notice any relationship between the 3x and 6x table facts. (Here, it could be useful to have the 3x and 6x table facts displayed alongside each other. This could be done so on the screen or a working wall so pupils would find it easier to establish the relationship between these two multiplication tables.)*

*Suggested initial teaching input (15 mins)*

* Ask pupils to remind you what they have learned yesterday in their maths lesson.
* On the screen, show a rectangle that is 12-square long and 8-square wide. Ask pupils to brainstorm with their partners to come up with a way to work out the surface area of the shape without having to count every single unit square as this would be time-consuming. (Hints could include getting pupils to see that they are essentially looking at *an* *array* of squares.)
* From there, introduce pupils to the formula to find surface area of a rectangle (i.e. *length x width*).
* Proceed to prove that the area of the 12 x 8 rectangle is 96 square which is the total number of all the unit squares if one was to count all the unit squares.

*First suggested activity (15 mins)*

On the screen, display details of the following task:

On a sheet on blank paper, user a ruler to create the following rectangles with the following dimensions and find the area of each of them using the formula. Remember to also write the dimensions along the length and width of each rectangle.

* + a 3cm x 9cm rectangle
	+ a 3cm x 11cm rectangle
	+ a 4cm x 3cm rectangle
	+ a 4cm x 8cm rectangle
	+ a 6cm x 12cm rectangle
	+ a 6cm x 9cm rectangle
	+ a 8cm x 8cm rectangle
	+ a 8cm x 5cm rectangle

Please ensure that the pupils use blank paper as opposed to grid/graph paper as the former would mean pupils are less tempted to relying on counting the squares on grid paper to work out the surface areas. (Also either introduce or remind pupils that their answers must be accompanied by *cm2*)

*Second suggested activity (15 mins)*

* Pupils are then encouraged to use a ruler to create their own rectangles of different sizes on a sheet of blank A4 paper (i.e. not in their book as the pages sometime contain grids and hence squares).
* Pupils are then asked to find surface area of their peers’ shapes.
* For dimensions, pupils should be encouraged to use numbers from the 3, 4, 6 and 8 multiplication tables – regardless of their ability levels.
* Remind pupils that their answers must be accompanied by *cm2* if the dimensions are in cm.

*Suggested plenary activity (5 mins)*

Invite a few pupils to share their rectangles with the rest of the class and ask the rest of the class to work out the rectangles’ areas on their mini whiteboard.

**Lesson 8**

*Mental starter (5 mins)*

As a class, practise recalling the 4x table facts by first allowing time for pupils to work in pairs to work out the 4x table facts on their mini whiteboards. (Please feel free to varying the teaching approach here to include other strategies as appropriate e.g. the use of a counting bead or a counting stick, etc.) Later, teacher to ask quick fire questions about the table facts.

*Suggested initial teaching input (10 mins)*

* Ask pupils to remind you what they have learned yesterday in their maths lesson.
* Then, show on the screen a composite shape made up of two different rectangles (e.g. a ‘T’ shape). For this example, unit squares should still be visible. Proceed to demonstrate how to work out the total area of the shape (i.e. by working out the area of the two separate rectangles before adding them up).
* Repeat with another example but *without* the unit squares being made visible (i.e. pupils should just see the outline of the shapes with width and length information (in cm) displayed next to the shape so that pupils are encouraged to use their multiplication facts to work out the areas instead of relying on counting the unit squares.

*Suggested activity (30 mins)*

Consolidate pupils’ mastery of working out surface areas of composite rectangular shapes by using the formula through working on the practice questions on the worksheets which are downloadable from the links below. Teacher to model solving the first problem so everyone is clear of what they are expected to do.

Everyone:

<https://www.math-salamanders.com/image-files/math-worksheets-4th-grade-area-perimeter-4.gif>

Extension:

<https://www.math-salamanders.com/image-files/free-4th-grade-math-worksheets-area-5.gif>

**Lesson 9**

*Mental starter (5 mins)*

As a class, practise recalling the 8x table facts by first allowing time for pupils to work in pairs to work out the 8x table facts on their mini whiteboards. (Please feel free to varying the teaching approach here to include other strategies as appropriate e.g. the use of a counting bead or a counting stick, etc.) Later, teacher to ask quick fire questions about the table facts. *Ask pupils if they notice any relationship between the 4x and 8x table facts. (Here, it could be useful to have the 4x and 8x table facts displayed alongside each other. This could be done so on the screen or a working wall so pupils would find it easier to establish the relationship between these two multiplication tables.)*

*Suggested initial teaching input (10 mins)*

* Ask pupils to remind you what they have learned yesterday in their maths lesson.
* Then, either on the screen or on the flip chart, teacher to model to the class how to pose word problems involving finding surface areas of both rectangular shapes (e.g. “If a rectangular living room is 3-metre wide and 4-metre long, how big is the floor space?”) and composite shapes made of rectangles (e.g. “The shape of a garden is a combination of two rectangles. One rectangle is 2-metre wide and 6-metre long, and the other rectangle is 4-metre wide and 5-metre long. How big is the garden’s total area?).

*First suggested activity (15 mins)*

Pupils to pose (and solve) their own word problems in their book before reading out their questions to their neighbouring peer for them to solve using the formula (i.e. multiplication). The focus here is on simple rectangular shapes. **For dimensions, pupils should be encouraged to use numbers from the 3, 4, 6 and 8 multiplication tables – regardless of their ability levels**. The units could be in either cm or m.

*Second suggested activity (15 mins)*

The same focus as the first suggested activity’s except the focus in this second suggested activity will be on composite shapes made of rectangles (i.e. pupils have to think of in which everyday context(s) would they find such composite shapes. **For dimensions, pupils should be encouraged to use numbers from the 3, 4, 6 and 8 multiplication tables – regardless of their ability levels.** The units could be in either cm or m.

*Suggested plenary activity (5 mins)*

Invite a few pupils to share their rectangles with the rest of the class and ask the rest of the class to work out the rectangles’ areas on their mini whiteboard.

**Lesson 10**

*Mental starter (5 mins)*

As a class, practise recalling the 3x, 4x, 6x and 8x table facts. Teacher to ask quick fire questions about the tables facts. Pupils to independently write their answer on their mini whiteboard.

*First suggested activity (40 mins)*

* Ask pupils to remind you what they have learned yesterday in their maths lesson.
* Consolidate pupils’ mastery of working out surface areas of rectangular shapes by working on the practice questions which are downloadable from the link below. The questions provide information on either the shapes’ width or length as well as the surface area, and pupils have to work out the missing dimension:

<https://www.mathsthroughstories.org/uploads/5/7/2/5/57253055/worksheet_consolidation_finding_area_length.pdf>

* *As an extension,* pupils are encouraged to pose (and solve) similar problems as above in their book.

*Suggested plenary activity (10 mins)*

Invite a few pupils to share their rectangles with the rest of the class and ask the rest of the class to work out the rectangles’ areas on their mini whiteboard.

**WEEK 3 (MON 10/02/20 – FRI 14/02/20)**

**TARGET MULTIPLICATIVE FACTS:** THE 7, 9, 11 AND 12 MULTIPLICATION TABLES

**TARGET APPLICATION:** MULTIPLICATION AS SCALING

**Statutory requirements:** Pupils should be taught to solve problems involving multiplying and [...] integer scaling problems […]

**For any references highlighted in green, refer to the corresponding PowerPoint**

**For any references highlighted in pink, refer to the corresponding worksheet**

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**Lesson 11**

*Mental starter (5 mins)*

As a class, working out the 7x table facts by first allowing time for pupils to work in pairs to work out the 7x table facts on their mini whiteboards. (Please feel free to varying the teaching approach here to include other strategies as appropriate e.g. the use of a counting bead or a counting stick, etc.) Later, teacher to ask quick fire questions about the table facts.

*Suggested initial teaching input (15 mins)*

Tell pupils that over the weekend you made some brownies for one (i.e. yourself) and how yummy it was. Tell them that you used 2 cups of flour, 3 eggs, 5 tablespoons of sugar, and 7 teaspoons of cocoa powder to make the brownies. Tell them that six of your friends heard how amazing your brownies were and they are coming over this weekend to try your brownies. You need to work out enough ingredients for your six friends and you (totallinging seven people), and that you need your pupils’ help to work out how much of the different ingredients you need to buy to make enough brownies for the seven people.

Without giving them any more detail or instruction, ask them to work in pairs to work out the right amount of ingredients on their mini whiteboard. (Keep the amount of ingredients for one person on the screen.) Reconvene after 5 minutes and ask a few pairs to share their answers with the rest of the class. Ask for their reasoning as well.

Once everyone is happy with the answer, establish that what pupils have just done is solving a *scaling* problem. Ask pupils to discuss with their talking partner to come up with a definition of scaling. (Establish that when you scale something, you change the amount or size of something, and that you can either scale up or scale down things. Concerning scaling things up, establish that pupils’ knowledge of multiplication can be handy like they have used it to solve the brownies problem.)

Then, ask them to discuss with their talking partner in which other everyday situations they might come across scaling problems. They are to share ideas with the rest of the class.

*Suggested activity (25 mins)*

On the screen, display the following word problems below for pupils to solve in their book: To save time, teachers may also want to present the questions below on a sheet of paper, so pupils could simply provide their answers on the paper and stick it in their book:

* A cat weighs 3kg. A large dog weighs 7 times as much as a cat. How much does the dog weigh?
* A daisy is 8cm tall. A sunflower is 9 times taller than a daisy. How tall is the sunflower?
* Sally has 6 biscuits, and Jane has 12 times as many biscuits as Sally. How many biscuits does Jane have?
* Joy takes 11 minutes to finish her homework. Tina takes twice as long as Joy. How long does Tina take?
* Sarah takes only 12 minutes to run around a park. It takes James 5 times longer than it takes Sarah to do so. How long does it take James?
* In a classroom, there are 11 boys, and there are twice as many girls as there are boys. How many pupils are there altogether in that class?
* Sam has 9 times as many cards as James. If James has 12 cards, how many cards does Sam have, and how many more cards does Sam have than James?
* The width of Year 4A classroom is 7 metres. The width of Year 4B classroom is 3 times as long as Year 4A classroom. How much wider is Year 4B classroom than Year 4A classroom?
* There are 11 seeds in a packet. Caleb has 66 seeds. He thinks he has 8 times more than one packet. True or false? Explain your answer.
* There are 5 eggs in an egg box. Joy has 35 eggs. She thinks she has 6 times more than that one box of egg. True or false? Explain your answer.

*Suggested plenary activity (5 mins)*

Go through the last two problems together as a class to ensure everyone understands the questions and know how to solve them.

**Lesson 12**

*Mental starter (5 mins)*

As a class, working out the 9x table facts by first allowing time for pupils to work in pairs to work out the 9x table facts on their mini whiteboards. (Please feel free to varying the teaching approach here to include other strategies as appropriate e.g. the use of a counting bead or a counting stick, etc.) Later, teacher to ask quick fire questions about the table facts.

*Suggested initial teaching input (20 mins)*

Ask pupils to remind you what they have learned yesterday in their maths lesson.

Then, on the screen, display the word problem below and ask pupils to work in pairs on their mini whiteboard to solve it and explain their answer:

“Sam takes 9 minutes to finish eating his breakfast. Tim takes 3 times as long as Sam. How long does Tim take?”

Once satisfied with their answer, establish that the above problem can also be represented as a multiplication sentence or a number sentence (i.e. 9 x 3).

Then, give pupils 5 minutes to work in pairs to try to come up with a drawing or an image to visually represent that word problem. Later, invite a few pupils to share their drawings / images with the rest of the class. Comment on their ideas on what you like about them.

Establish that there is no one correct way to visually represent scaling word problems, but one simple way to do so is to use bar modelling. Introduce to pupils the bar model below and ask pupils to discuss in pairs what they think the bar model below represents and how it is related to the above word problem.

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Once pupils understand the concept behind how to use bar modelling to represent and to help solve scaling word problems, display the problem below on the screen and ask pupils to use bar modelling to solve the problem on their mini whiteboard:

“Clare’s hair is 7 inches long. Jennifer’s hair is 4 times as long as Clare. How long is Jennifer’s hair?”

*Suggested activity (20 mins)*

Ask pupils to refer back to the ten word problems from yesterday. For each of those questions, ask them to draw a bar model and to write a multiplication to represent and to help solve the problem.

*Suggested plenary activity (5 mins)*

As a class, go over some of the problems that pupils struggle to visually represent them using bar modelling.

**Lesson 13**

*Mental starter (5 mins)*

As a class, working out the 11x table facts by first allowing time for pupils to work in pairs to work out the 11x table facts on their mini whiteboards. (Please feel free to varying the teaching approach here to include other strategies as appropriate e.g. the use of a counting bead or a counting stick, etc.) Later, teacher to ask quick fire questions about the table facts.

*Suggested initial teaching input (10 mins)*

Ask pupils to remind you what they have learned yesterday in their maths lesson.

Then, show pupils the bar model below and ask them to work in pairs on their mini whiteboard to come up with a scaling word problem and a multiplication sentence to represent the bar model. Invite a few volunteers to read out the word problem that they come up with.

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*Suggested activity (25 mins)*

Each pupil to pose ten scaling word problems in their book and to represent each of them with a bar model and a multiplication number sentence. (Pupils are encouraged to use numbers from the 7, 9, 11 and 12 multiplication tables in their word problems.) (While floating, teacher to check if the pupils are on the right track and to address any misconception there and then.)

*Suggested plenary activity (5 mins)*

Invite a few pupils to read out their questions and for the rest of the class to solve them on their mini whiteboard.

**Lesson 14**

*Mental starter (5 mins)*

As a class, working out the 12x table facts by first allowing time for pupils to work in pairs to work out the 12x table facts on their mini whiteboards. (Please feel free to varying the teaching approach here to include other strategies as appropriate e.g. the use of a counting bead or a counting stick, etc.) Later, teacher to ask quick fire questions about the table facts.

*Suggested initial teaching input (10 mins)*

Ask pupils to remind you what they have learned yesterday in their maths lesson.

Then, stick a sheet of enlarged A3 grid / graph paper ([https://i.pinimg.com/736x/dd/d6/94/ddd6944d5648797a000595c24c973096--graph-paper-template-printable-graph-paper.jpg)](https://i.pinimg.com/736x/dd/d6/94/ddd6944d5648797a000595c24c973096--graph-paper-template-printable-graph-paper.jpg%29) on a flip chart, and shade a small ‘T’ shape like the one shown below on it:

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Then, ask pupils to work in pairs on their mini whiteboard to work out the dimensions of the shape if it is to by enlarged 9 times the size. Then, ask for a pair of pupils to come out and show their enlarged ‘T’ shape on another sheet of enlarged A3 grid / graph paper.

*Suggested activity (30 mins)*

In their book (or on sheets of grid / graph paper), pupils to design and enlarge ten composite rectangular shapes (e.g. ‘T’ and ‘H’ shapes) based on given scales e.g. 1 unit square : 7 unit squares / 1 unit square : 9 unit squares. Once done, they can colour the shapes. (While floating, teacher to check if the pupils are on the right track and to address any misconception there and then.)

*Suggested plenary activity (10 mins)*

Display the following reasoning questions on the screen and ask pupils to work in pairs on their mini whiteboard to solve the problem. After 5 minutes, invite a few volunteers to share their answers with the rest of the class.

*Question 1:*

The postcards in the art gallery measure 11cm by 12cm.

The first postcard is of a painting which is 7 times the length and width of the postcard.

The second postcard is of a painting which is 9 times bigger.

Write the measurements of each painting.

*Question 2:*

Mr Jones’ rectangular garden measures 11m by 12m. His neighbour's garden measures 77m by 96m. The neighbour says “My garden is 7 times the width and length of your garden.” True or false? Explain your answer.

**Lesson 15**

*Mental starter (5 mins)*

As a class, practise recalling the 7x, 9x, 11x and 12x table facts. Teacher to ask quick fire questions about the tables facts. Pupils to independently write their answer on their mini whiteboards.

*Suggested activity (40 mins)*

The focus of the lesson today is on giving pupils more opportunities to solve scaling word problems using this worksheet:

<https://masterthecurriculum.co.uk/wp-content/uploads/2019/06/Solve-positive-integer-scaling-problems-2.jpg>

(While floating, teacher to check if the pupils are on the right track and to address any misconception there and then.)

As an extension, pupils are again asked to try posing more of their own scaling problems.