MY DREAM TOWN (LEVEL 3)

Description	Learners understand the concept of decimal numbers and learn how to add, subtract and multiply them. They use these concepts to design their dream towns!
Leading question	What will it take to design my dream town on a fixed budget?
Subjects covered	Math, Art and Design
Total time required	40-60 min a day for 4 days
Resources required	Chart paper, colour, paper, pencil/ pen, cardboard *(optional)*
Learning outcomes:	By the end of this project, learners will be able to: Knowledge-Based Outcomes: 1. Convert fractions into decimals pictorially and numerically. 2. Add decimal numbers to each other and whole numbers. 3. Subtract decimal numbers from each other and whole numbers. 4. Multiply decimal numbers with each other, and with whole numbers. 21st Century Skill Outcomes: 1. Demonstrate creativity while designing the different blocks and roads in the town, and while making a model. 2. Collaborate effectively while receiving and incorporating feedback on the town design. 3. Think critically while adjusting the town design based on budgetary constraints. 4. Communicate effectively while presenting the town model.
Previous Learning	Adding, subtracting and multiplying whole numbers Representing fractions pictorially and numerically
Supervision required	Medium

Day 1 -

Today, you will learn how to express fractions as decimals and start designing your dream town.
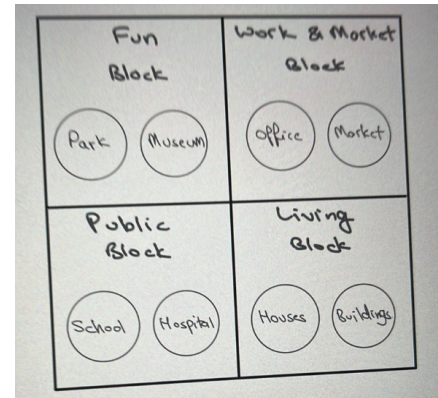
Time	Activity and Description
10 minutes	**Town Planning** Which city/ town/ village do you live in? - What would you do to improve it? - What more do people **need** in your town? (a bigger hospital, a railway station, a big school etc) - What more do people **want** in your town? (big parks to play in, a lake, a skating rink etc) The **Leading Question** that you will answer in this project is: What does it take to design my dream town on a fixed budget?

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- To answer this question, you will think about how you can improve the facilities that exist in the city/ town/ village we come from, and then design your dream towns! Finally, you will make models of your dream towns!
- You have a budget of $12,000 to do this.

*Note: Distribute a print of a 25 x 25 grid (**Appendix 1**) to each learner or group of learners. Inform them that the grid is the plot on which they will design their towns. Alternatively, ask them to neatly draw a 25 x 25 grid on paper using a ruler and pencil.*

To make it easy for us to plan out the town, we can divide it into four parts or blocks:

- Public block, which will include facilities such as schools, hospitals and railway stations.
    - Every model should have these basic facilities: a school, a hospital, and a railway/ bus station
- Fun block, which will include facilities such as parks and museums.
- Work and market block, which will include offices, banks, and markets.
- Living block, which will include houses and buildings in which people will live.

Tip: To challenge learners, suggest that they can plan their dream towns in different shapes like a circle, triangle or trapezium.
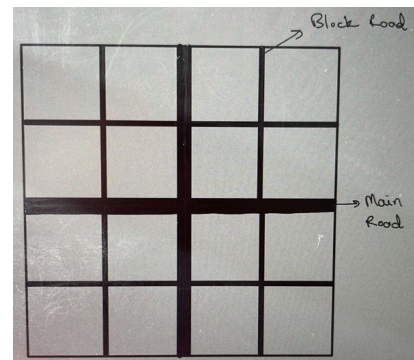
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Introduction to Decimal Numbers
Next, we will plan roads in our towns! Towns usually have two types of roads:

- **Main roads** that are used to travel from one block to another. These are the widest roads.
- **Block roads** that are used to travel to different places within a block. These are narrower than main roads.

Main roads in our town must be 2.25 squares wide and block roads must be 1.75 squares wide. Have you seen such numbers before? Where?

Such numbers that have a dot and more numbers after it are called **decimal numbers**. Decimal numbers are actually fractions, and show parts of things, like breaking a chocolate bar into smaller pieces.

*Note: Explain the use of decimal numbers in daily life using the examples of length and temperature (**Appendix 2**).*

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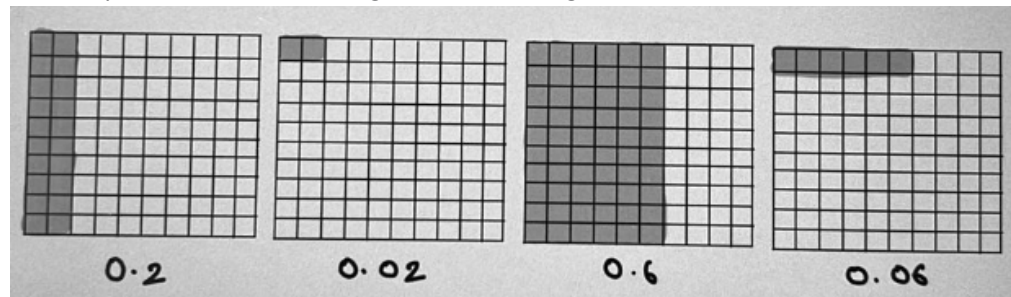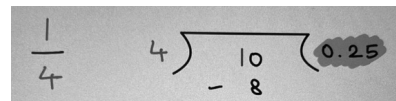|	
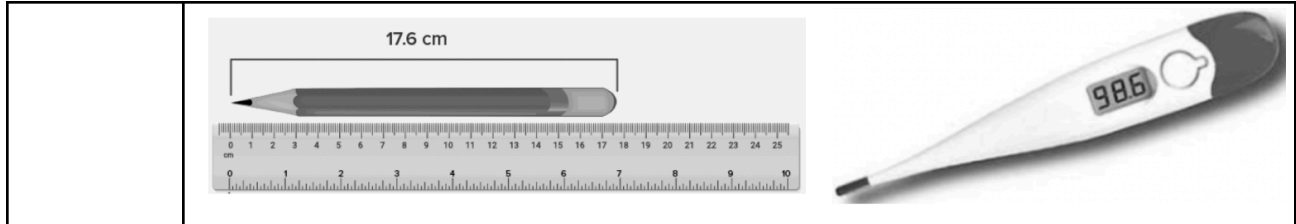
10 minutes	**Fractions to Decimals (When Denominator is 10)**
	Let us find out how to write fractions in decimal numbers.
	
	Note: *As shown, draw a 10 x 10 grid, a strip of 10 blocks, and a single block on the board.*
	  - *Ask learners that if the block shows 1, how much do the strip and the grid show?*
	  - *Explain that the strip shows 10 and the grid shows 100.*
	  - *Now, ask learners if the grid shows 1, what fraction of the grid do the strip and the unit block show?*
	  - *Explain that the strip shows ten out of one hundred which can be simplified to one out of ten or*
	  - $\frac{1}{10}$ *and the unit block shows* $\frac{1}{100}$.
	  - *Inform learners fractions can also be written as decimals, and that using decimals,* $\frac{1}{10}$ *is written as 0.1 and* $\frac{1}{100}$ *is written as 0.01.*
	  - *Explain that if the denominator of a fraction is a multiple of 10, we need to count the number of zeros and place a decimal as many digits before the numerator.*
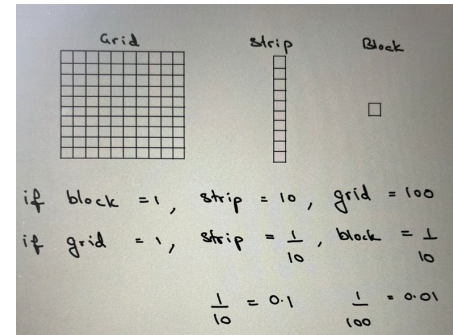	
	Draw a 10 x 10 grid in their notebooks, shade $\frac{2}{100}, \frac{20}{100}, \frac{6}{100}, \frac{60}{100}$.
	Once done, write the fractions as decimals.
	
	Note: *Explain the answers using the shown image.*

(image on right: grid/strip/block diagram)

if block =1, strip = 10, grid = 100
if grid = 1, strip = $\frac{1}{10}$, block = $\frac{1}{10}$
$\frac{1}{10}$ = 0.1 $\frac{1}{100}$ = 0.01

10 minutes	**Fractions to Decimals (When Denominator is Not 10)** Draw the fraction $\frac{1}{4}$ of a pizza. How will you write this fraction in decimals?

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	It is easy to write a fraction as a decimal number if the denominator is 10. But what is the denominator is a different number? **Note:** *Explain the division method to write a fraction as a decimal, using the example converting $\frac{1}{4}$ to 0.25, as shown.* Convert these fractions into decimal numbers: 1. $\frac{1}{2}$ or half of a glass 2. $\frac{1}{5}$th of a doughnut 3. $\frac{3}{4}$th of a lemon *Answers: $\frac{1}{2}$ = 0.5, $\frac{1}{5}$ = 0.2, $\frac{3}{4}$ = 0.75* **Tip:** *To challenge learners, ask them to convert $\frac{1}{3}$ and $\frac{1}{6}$ into decimal numbers.*
At-home activities	Learners design roads on their plots, following the rule of: - Main roads = 2.25 squares wide (squares on the 25 x 25 grid) - Block roads = 1.75 squares wide (squares on the 25 x 25 grid)

Day 2

Today, you will add details to your town designs and check if you are within the budget or not.

Time	Activity and Description
15 minutes	**Adding Facilities to Blocks** Think about what facilities you would like to include in each block based on what people may **want** or **need**: - Public block *(Remind learners of the basic facilities to include: a school, a hospital, and a railway/ bus station, a municipality building)* - Work and market block - Living block - Fun block Be as specific as possible by thinking about aspects such as: - How many floors will each building have? - How many squares of land will each facility take? Now, think about ways in which their town can be environmentally friendly. For example, what can you do to make their town waste-free? Once done, draw these facilities in each block on your plots.
15 minutes	**Adding and Multiplying Decimal Numbers** Now that you have decided what your town will look like, let us find out how much it will cost to build it!

Note: Share the rates for carrying out different activities. Explain that rates are per square on the plot.

Activity	Rate (per square)
Building Roads	*$20.25*
Constructing buildings	*$120.75*
Adding each extra floor to a building	*$80.25*
Landscaping (for parks/ gardens/ other areas)	*$15.5*
Making a lake	*$95.75*
Other activities (such as farms)	*$30.5*

How will you find out whether your dream town is within budget or not?

To find out whether or not you are within the budget, you need to
- calculate the cost of each facility that you have included,
- add all costs, and
- check if the sum is equal to or less than $ 12,000.

Let us take an example to understand this.
- Suppose you have built roads on 9 squares and a garden on 5 squares.

Multiplying Decimals
Note: As shown, explain how to multiply decimals to calculate the cost of building a road on 9 squares of land.
Explain how to choose how many digits to place the decimal symbol before.

Now, calculate the cost of the garden *($82.5)*.

Adding Decimals
Note: As shown, using the same example as above, explain how to add decimals to calculate the total cost of building a road and a garden.
Explain how to arrange digits one below the other while carrying out decimal addition.
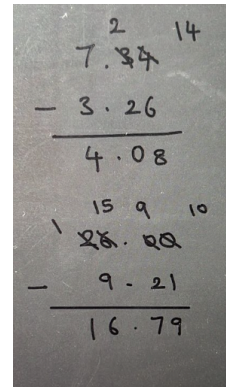

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	Finally, calculate the total cost of building a road on 20 squares and a garden on 15 squares ($405 + $232.5 = $637.5). **Tip:** *To challenge learners, ask them to find the cost of building a 3-storey building on 6 squares.*
10 minutes	**Checking Against Budget** Now, calculate the costs of different facilities in one block. **Note:** *Share the format below with them to help them organise their calculations. If needed, support groups using the sample calculations in the table.*

Block	Facility	Cost
Public Block	- Roads	- Cost of roads: No. of squares = 25 Rate per square = ₹20.25 Total cost = ₹20.25 x 25 = ₹506.25
	- Bus Station	- Cost of bus station: No. of squares = 5 Rate per square = ₹120.75 Total cost = ₹120.75 x 5 x 1 = ₹603.75
	- Hospital	- Cost of hospital No. of squares = 3 Rate per square = ₹120.75 No. of floors = 2 Rate per extra floor per square = ₹80.25 Total cost = ₹120.75 x 3 + ₹80.25 x 1 x 3 (1 extra floor) = ₹603
	- School	- Cost of school No. of squares = 4 Rate per square = ₹120.75 No. of floors = 3 Rate per extra floor per square = ₹80.25 Total cost = ₹120.75 x 4 + ₹80.25 x 2 x 4 (2 extra floors) = ₹1125
Living Block		
Work and Market Block		

	Fun Block		
At-home activities	- Calculate the cost of constructing all the facilities in the other block and check it is within $12,000 or does it exceed it. - Show your plan to an elder and seek their feedback on the facilities included in each block. Once done, revise your plan based on the feedback.		

Day 3 –

Today, you will revise your designs to align them with the budget, get feedback from peers, and start making your own models.

Time	Activity and Description

15 minutes	**Subtracting Decimal Numbers**
	Is your total cost greater or less than $12,000?
	    - If it is less than $12,000, think about what you can add to make your dream town even better!
	    - If it is greater than $12,000, you may need to remove some portions, such as floors from some buildings.
	    - Once done, you need to subtract the reduced cost to check if you are now within the budget or not.
	    - To do this, you need to know how to subtract decimal numbers.
	
	Note: *Using the examples of 7.34 - 3.26 and 26 - 9.21, explain how decimal numbers are subtracted from each other, and from whole numbers.*
	
	Solve: (a) 8.19 - 1.78 (b) 19.28 - 18.15 (c) 314.21 - 121
	Answers: (a) 6.41 (b) 1.13 (c) 193.21
	
	Tip: *To challenge learners, ask them to*
	    - *subtract larger numbers from whole numbers, such as 482 - 121.9675*
	    - *subtract decimal numbers from each other with more digits after the decimal, such as 12.6745 - 9.7863*

10 minutes	**Revising Town Designs**
	Revise your town designs to align them with the budget.
	    - If exceeded, remove some portions and calculate the total cost by subtracting the cost of removed portions once again.
	    - If within budget, if you like, add some portions of your choice to your town designs, and add their costs to your total cost.

15 minutes	**Making Town Models** Use your designs to start making models of your towns on chart paper/ cardboard *(whichever is available)*.

EAA welcomes feedback on its projects in order to improve. For feedback please use this link
https://forms.gle/pVXs3vQEufuzSShs7

	You can use materials such as small coloured paper pieces or real leaves/ sticks to make grass and roads, paper/ empty matchboxes to make models of buildings **(Appendix 3)**, and matchsticks with paper stuck on them to make buildings.
At-home activities	Finish making your town models. Invite your family and friends to the next class to participate in your presentation.

Day 4 –

Today, you will present your models to your friends and family.

Time	Activity and Description
15 minutes	**Preparation for the Presentation** Include these details in your presentation: - What areas did you include in each block and why? - How much did the town cost? Could you remain within the budget? - Which was the most expensive area in the town to build? - Which was the least expensive area? - Which area in the town do you like the most? Why? - Why is it your dream town?
15 minutes	**Presentation** ***Note:*** *Ask learners to invite their friends and family to the class for the presentation.* Present your models to your friends and family! Once done, ask them for their feedback by requesting them to: - Appreciate anything they like in the design of the models; - Ask any questions that they may have; and - Share anything they think could have been done better.
10 minutes	**Reflection** Clap for yourselves for making beautiful models! Now that you have completed the project, think and share: - What does it take to design my dream town on a fixed budget (*Leading Question*)? - Do you think most urban planners and architects usually go over budget or under budget, and why? - What did you like about this project? - What could have been done better? - What did you learn during this project?

Additional enrichment activities:	- Learners can be asked to include more realistic details such as providing access to electricity, and including a water treatment plant and a sewage treatment plant. Once done, they can be asked to calculate these costs. - Learners can be asked to calculate the maintenance costs of different public facilities in the town.

| Modifications for simplification | - Learners can choose to use a smaller grid to design their towns on (such as a 15 x 15 grid) |
| | - Learners can be asked to calculate the costs of building the town without the boundary condition of a budget. |

ASSESSMENT CRITERIA

A majority of my learners were able to:

☐ Design at least 1 main road and 1 block road per block in their dream towns based on the provided widths in decimal numbers.

☐ Calculate the total cost of their dream towns by adding and multiplying decimal numbers.

☐ Align their dream towns with the budget, as needed, by subtracting decimal numbers.

☐ Design creative and environmentally friendly towns!
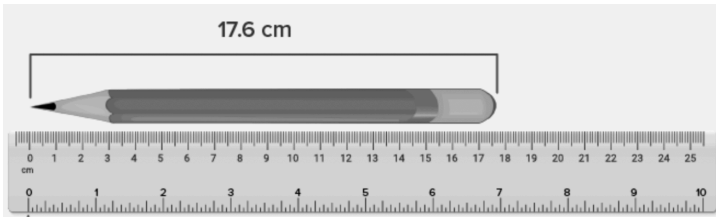
APPENDIX 1

Town Plot Plot (25 x 25)
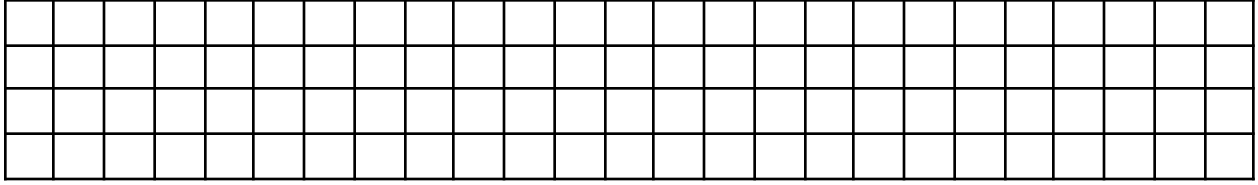
APPENDIX 2

Use of decimal numbers to measure length and temperature.

17.6 cm

98.6

APPENDIX 3

Making buildings with paper