1. Recall that multiplication is a short form for addition.

$3 \times 4 = 4 + 4 + 4$ $\quad 5 \times 7 = 7 + 7 + 7 + 7 + 7$ $\quad 2 \times 9 = 9 + 9$

Write each product as sum, as in a):

a) $3 \times \frac{1}{4} = \frac{1}{4} + \frac{1}{4} + \frac{1}{4}$ b) $2 \times \frac{3}{7} =$ c) $4 \times \frac{5}{11} =$

2. Write each sum as a product:

a) $\frac{1}{2} + \frac{1}{2} + \frac{1}{2} =$ b) $\frac{5}{9} + \frac{5}{9} =$ c) $\frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} =$

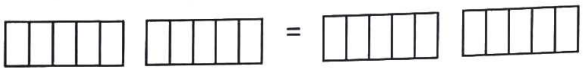
Indira multiplies $3 \times \frac{3}{4}$ by making a model with grids and counters,

$3 \times \frac{3}{4}$ →  $\quad 3 \times \frac{3}{4} = \frac{9}{4} = 2\frac{1}{4}$

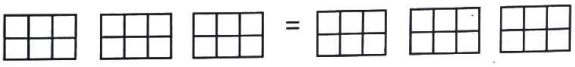
She makes 3 models of $\frac{3}{4}$. *She rearrange the counters to show the answer.*

3. Find the products using Indira's method:

answers

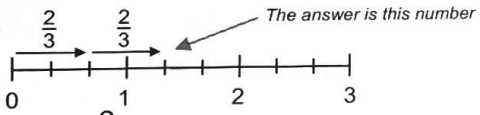
a) $2 \times \frac{3}{5} =$ 

b) $4 \times \frac{2}{3} =$ 

c) $3 \times \frac{5}{6} =$ 

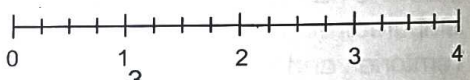
4. Find the products by representing the multiplication on a number line as in a):

a)



$2 \times \frac{2}{3} =$

b)



$4 \times \frac{3}{4} =$

5. Find the products by first writing each product as a sum:

a) $2 \times \frac{3}{5} =$ b) $3 \times \frac{3}{4} =$ c) $2 \times \frac{4}{7} =$

d) $5 \times \frac{4}{11} =$ e) $6 \times \frac{3}{7} =$

6. Look at your answers in Question 5. Note that …

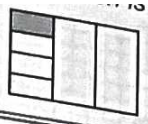
i) *the numerator of the answer is equal to the whole number times the numerator of the original fraction and…*

ii) *the denominator of the answer is equal to the denominator of the original fraction.*

Use this rule to find the products below. Simplify your answer. (Show your work in your notebook.)

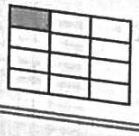
a) $3 \times \frac{4}{6} = \frac{12}{6} = 2$ b) $8 \times \frac{3}{4} =$ c) $5 \times \frac{4}{10} =$ d) $3 \times \frac{6}{9} =$ e) $12 \times \frac{2}{8} =$





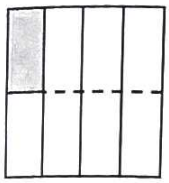
$\frac{1}{4}$ of $\frac{1}{3}$?

Extend the lines to find out:
$\frac{1}{4}$ of $\frac{1}{3} = \frac{1}{12}$



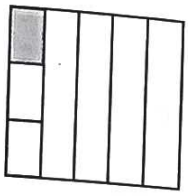
1. Extend the horizontal line in each picture to find the answer; then write a fraction statement of each figure using the word "of":

a)

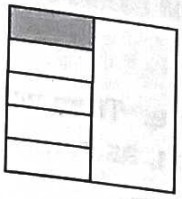


$\frac{1}{2}$ of $\frac{1}{4} = \frac{1}{8}$

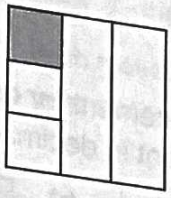
b)



c)



d)



e)

2. Notice that the amounts in Question 1 can be found by multiplying the numerators and denominators of the fractions:

$\frac{1}{2}$ of $\frac{1}{4} = \frac{1\times1}{2\times4} = \frac{1}{8}$ $\quad$ $\frac{1}{5}$ of $\frac{1}{3} = \frac{1\times1}{5\times3}$ $\quad$ $\frac{1}{6}$ of $\frac{1}{2} = \frac{1\times1}{6\times2}$ $\quad$ (Can you explain why this works?)

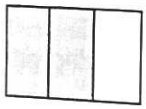
Find the following amounts by multiplying:

a) $\frac{1}{2}$ of $\frac{1}{5}$ =

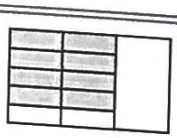
b) $\frac{1}{2}$ of $\frac{1}{7}$ =

c) $\frac{1}{3}$ of $\frac{1}{6}$ =

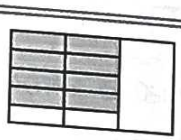
d) $\frac{1}{5}$ of $\frac{1}{7}$ =



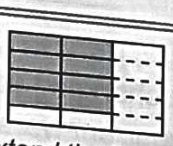
Here is $\frac{2}{3}$ of a rectangle



Here is $\frac{4}{5}$ of $\frac{2}{3}$



How much is $\frac{4}{5}$ of $\frac{2}{3}$?

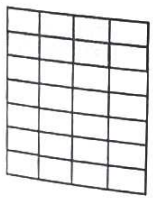


Extend the lines to find out:
$\frac{4}{5}$ of $\frac{2}{3} = \frac{8}{15}$

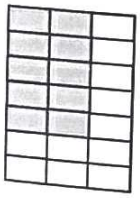
Notice:
$\frac{4}{5}$ of $\frac{2}{3} = \frac{4\times2}{5\times3} = \frac{8}{15}$

3. Write a fraction statement for each figure:

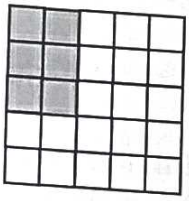
a)



b)



c)



$\frac{2}{7}$ of $\frac{3}{4}$ =

4. Find the following amounts by multiplying the numerator and denominator of the fractions:

a) $\frac{2}{3}$ of $\frac{4}{7}$ =

b) $\frac{1}{2}$ of $\frac{3}{5}$ =

c) $\frac{3}{4}$ of $\frac{5}{7}$ =

The word "of" in mathematics can be interpreted to mean multiplication. For instance, 2 groups of 6 can be written 2×6.
Similarly $\frac{1}{2}$ group of 6 (or $\frac{1}{2}$ of 6) can be written $\frac{1}{2} \times 6$. $\frac{2}{3}$ of 6 is 4. But notice also: $\frac{2}{3} \times 6 = \frac{2}{3} + \frac{2}{3} + \frac{2}{3} + \frac{2}{3} + \frac{2}{3} + \frac{2}{3} = \frac{12}{3} = 4$.

5. Multiply the following fractions in your notebook. (Reduce your answers to lowest terms.)

a) $\frac{2}{3} \times \frac{3}{5}$

b) $\frac{3}{4} \times \frac{5}{7}$

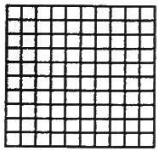
c) $\frac{1}{3} \times \frac{4}{5}$

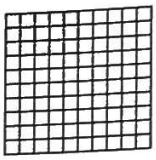
d) $\frac{4}{6} \times \frac{8}{7}$

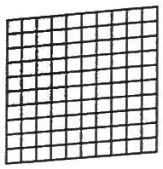
e) $\frac{3}{7} \times \frac{8}{9}$

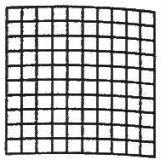
NS8-76: Multiplying Decimals by Decimals

1. Write a fraction statement for each figure:

a) 

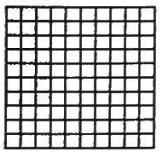
b) 

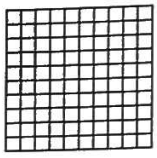
c) 

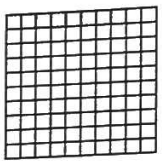
d) 

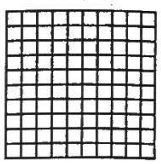
$\frac{7}{10}$ of $\frac{2}{10} = \frac{14}{100}$

2. Write a fraction statement for each figure. Then write a multiplication statement. Then write an equivalent statement in decimal notation, as in a):

a) 

b) 

c) 

d) 

$\frac{7}{10}$ of $\frac{3}{10} = \frac{21}{100}$

$\frac{7}{10} \times \frac{3}{10} = \frac{21}{100}$

$.7 \times .3 = .21$

3. Find each product by first changing each decimal to a fraction and using the rule for multiplying fractions. Then change your answers back into a decimal:

a) $.3 \times .7 = \frac{3}{10} \times \frac{7}{10} = \frac{21}{100} = .21$

b) $.5 \times .4 =$

c) $.2 \times .8 =$

d) $.3 \times .6 =$

e) $.5 \times .9 =$

f) $.4 \times .3 =$

g) $.23 \times .5 =$

h) $.05 \times .4 =$

Look at your answers in Question 3. Notice that the number of decimal places in each answer is always the same as the total number of decimal places in the two numbers being multiplied. This suggests a fast way of multiplying decimals:

Example: .28 × .4	**Step 1**	**Step 2**
	Multiply the decimals as if they were whole numbers: $28 \times 4 = 112$	.28 has two decimal places, .4 has one decimal place. So the product should have 2 + 1 = 3 decimals places: $.28 \times .4 = .112$

4. Using the rule given above, multiply the following decimals in your notebook:

a) $.5 \times .8$ b) $.7 \times .9$ c) $.2 \times .6$ d) $.15 \times .8$ e) $.26 \times .3$

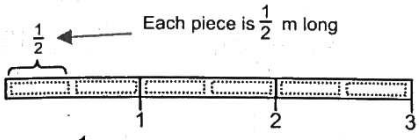
f) $.4 \times .67$ g) $.32 \times .9$ h) $.04 \times .7$ i) $.2 \times .7$ j) $.8 \times .46$

NS8-77: Multiplying and Dividing by Fractions

N

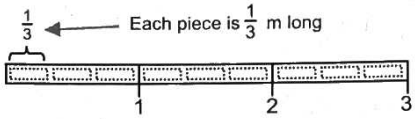
1.

James divides a 3 m ribbon into $\frac{1}{2}$ m sized pieces.



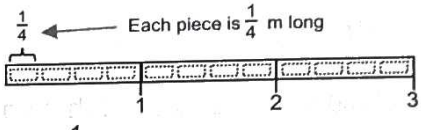
Two $\frac{1}{2}$ metre pieces fit into each metre, so... $3 \div \frac{1}{2} = 3 \times \mathbf{2}$

Kelly divides the same ribbon into $\frac{1}{3}$ m sized pieces.



Three $\frac{1}{3}$ metre pieces fit into each metre, so... $3 \div \frac{1}{3} = 3 \times \mathbf{3}$

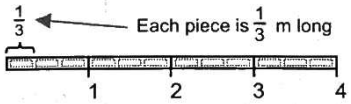
Kirk divides the same ribbon into $\frac{1}{4}$ m sized pieces.

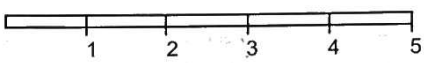


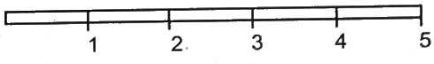
Four $\frac{1}{4}$ metre pieces fit into each metre, so... $3 \div \frac{1}{4} = 3 \times \mathbf{4}$

Find the following quotients by using a model:

a) $4 \div \frac{1}{3} = \underline{4} \times \underline{3} = \underline{12}$ b) $5 \div \frac{1}{2} = \_\_\_ \times \_\_\_ = \_\_$ c) $5 \div \frac{1}{3} = \_\_\_ \times \_\_\_ = \_\_$







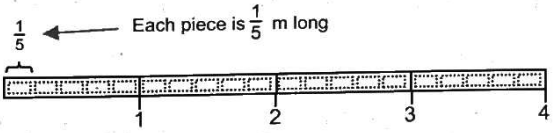
2. In general, $a \div \frac{1}{b} = a \times b$. In your notebook, use this rule to find each quotient:

a) $10 \div \frac{1}{3}$ b) $9 \div \frac{1}{5}$ c) $8 \div \frac{1}{4}$ d) $7 \div \frac{1}{7}$ e) $8 \div \frac{1}{6}$ f) $6 \div \frac{1}{6}$

3. Gerome wants to divide a 4 m ribbon into $\frac{2}{5}$ sized pieces:

Step 1:

He knows that 20 fifth ($\frac{1}{5}$) sized pieces fit into 4 m since $4 \times 5 = 20$:

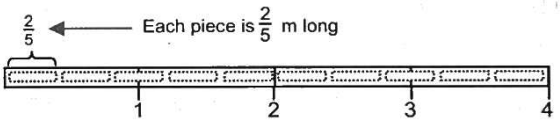


Step 2:

But $\frac{2}{5}$ m is twice as long as $\frac{1}{5}$ m.

So Gerome divides his answer from Step 1 by 2:

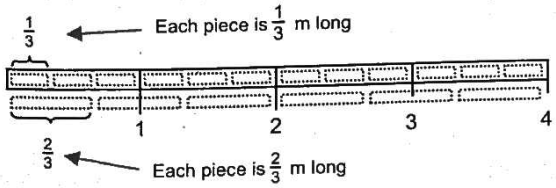
$(4 \times 5) \div 2 = 10$ two-fifth sized pieces will fit into 4m.

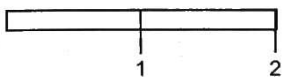


Find the following quotients and complete the model provided, as in a):

a) $4 \div \frac{1}{3} = \underline{4} \times \underline{3} = \underline{12}$ b) $2 \div \frac{1}{5} = \_\_\_ \times \_\_\_ = \_\_\_$ c) $3 \div \frac{1}{4} = \_\_\_ \times \_\_\_ = \_\_\_$

So $4 \div \frac{2}{3} = \underline{12} \div \underline{2} = \underline{6}$ So $2 \div \frac{2}{5} = \_\_\_ \div \_\_\_ = \_\_\_$ So $3 \div \frac{3}{4} = \_\_\_ \div \_\_\_ = \_\_\_$





4. Find the quotients:

a) $4 \div \frac{2}{5} = (\underline{4} \times \underline{5}) \div \underline{2}$
$= \underline{10}$

b) $6 \div \frac{2}{5} = (\_\_\_ \times \_\_\_) \div \_\_\_$
$= \_\_\_$

c) $2 \div \frac{3}{7} = (\_\_\_ \times \_\_\_) \div \_\_\_$