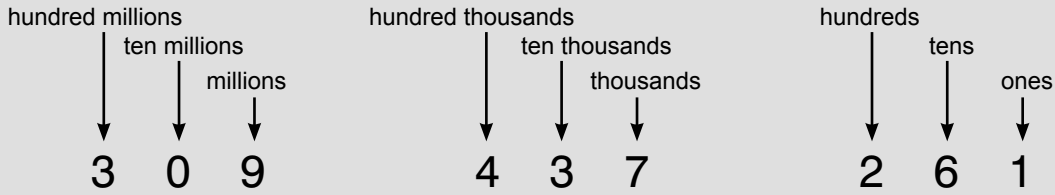


NS7-1 Place Value

The place values in 309 437 261 are:



1. Write the next three place values greater than hundred millions, from largest to smallest.

_____ *billions* _____

2. Underline the digit with the given place value.

- | | | | |
|--------------------|------------------|--------------------|-------------------|
| a) 250 329 120 | ten millions | b) 791 250 329 120 | ten billions |
| c) 791 250 329 120 | hundred millions | d) 791 250 329 120 | thousands |
| e) 791 250 329 120 | billions | f) 791 250 329 120 | hundred thousands |

3. Write the place value of the bold digit.

- | | |
|----------------------------|---------------------------------|
| a) 8 61 359 746 323 | _____ <i>ten billions</i> _____ |
| b) 861 3 59 746 323 | _____ <i>millions</i> _____ |
| c) 861 3 59 746 323 | _____ |
| d) 8 61 359 746 323 | _____ |
| e) 861 3 59 746 323 | _____ |
| f) 861 359 7 46 323 | _____ |

4. Write the number with the correct spacing, then write the place value of the digit 5.

- | | |
|---|----------------------------------|
| a) 1405897660213 = <u> 1 </u> <u> 405 </u> <u> 897 </u> <u> 660 </u> <u> 213 </u> | place value: <u> billions </u> |
| b) 76312098532 = _____ | place value: _____ |
| c) 995132498763 = _____ | place value: _____ |
| d) 3542706 = _____ | place value: _____ |
| e) 5410328 = _____ | place value: _____ |
| f) 841073521960347 = _____ | place value: _____ |

5. Write each number in expanded form. Example: 74 512 = 70 000 + 4 000 + 500 + 10 + 2

- | | | |
|------------------|-----------------|------------------|
| a) 378 403 _____ | b) 16 025 _____ | c) 721 803 _____ |
|------------------|-----------------|------------------|

6. Write the number for each expanded form. Example: 50 000 + 600 + 40 = 50 640

- | | | |
|----------------------------|-----------------|---------------------|
| a) 30 000 + 4 000 + 50 + 3 | b) 600 000 + 30 | c) 40 000 + 200 + 5 |
| _____ | _____ | _____ |

NS7-2 Order of Operations

We add and subtract the way we read: from left to right.

1. Add or subtract from left to right.

a) $7 + 3 - 2$

$= 10 - 2$

$= 8$

b) $7 - 3 + 2$

c) $8 + 4 + 2$

d) $6 + 4 - 5$

2. a) Do the addition in brackets first.

i) $(4 + 6) + 5$

$= \underline{\quad} + 5$

$= \underline{\quad}$

ii) $4 + (6 + 5)$

$= 4 + \underline{\quad}$

$= \underline{\quad}$

b) Does the answer change depending on which addition you did first?

3. a) Do the subtraction in brackets first.

i) $(7 - 4) - 2$

$= \underline{\quad} - \underline{\quad}$

$= \underline{\quad}$

ii) $7 - (4 - 2)$

$= \underline{\quad} - \underline{\quad}$

$= \underline{\quad}$

b) Does the answer change depending on which subtraction you did first?

If there are brackets in an equation, do the operations in brackets first.

Example: $7 - 3 + 2 = 4 + 2 = 6$ but $7 - (3 + 2) = 7 - 5 = 2$

4. a) Calculate each expression using the correct order of operations.

i) $(15 + 7) - 3 - 1$

ii) $15 + (7 - 3) - 1$

iii) $15 + 7 - (3 - 1)$

iv) $(15 + 7 - 3) - 1$

v) $15 + (7 - 3 - 1)$

vi) $(15 + 7) - (3 - 1)$

b) How many different answers did you get in part a)? _____

5. a) Add brackets in different ways to get as many different answers as you can.

i) $15 + 7 + 3 + 1$

ii) $15 - 7 + 3 - 1$

iii) $15 + 7 - 3 + 1$

iv) $15 - 7 - 3 - 1$

b) How many different answers did you get in part a)? i) _____ ii) _____ iii) _____ iv) _____

c) Check all that apply. The order of operations affects the answer when the expression consists of...

addition only

subtraction only

addition and subtraction

Multiplication and division are also done from left to right. If there are brackets, do the operations in brackets first. Example: $15 \div 5 \times 3 = 3 \times 3 = 9$ but $15 \div (5 \times 3) = 15 \div 15 = 1$

6. Evaluate each expression.

a) $4 \times 3 \div 6 \times 7$ b) $6 \times 4 \div 2 \div 3$ c) $30 \div 5 \div (2 \times 3)$ d) $16 \times 2 \div (4 \times 2)$

7. a) Add brackets in different ways to get as many different answers as you can.

i) $2 \times 3 \times 2 \times 5$ ii) $64 \div 8 \div 4 \div 2$ iii) $90 \div 5 \times 6 \div 3$

b) Which expression in part a) gives the same answer, no matter where you place the brackets?

8. Do the operation in brackets first.

a) $10 + (4 \times 2)$ b) $(10 + 4) \times 2$ c) $(10 + 4) \div 2$ d) $10 + (4 \div 2)$
 $= 10 + 8$
 $= 18$

e) $10 - (4 \times 2)$ f) $(10 - 4) \times 2$ g) $(10 - 4) \div 2$ h) $10 - (4 \div 2)$

9. Check all that apply. The order of operations affects the answer when the expression combines...

- | | |
|---|--|
| <input type="checkbox"/> addition and multiplication | <input type="checkbox"/> addition and division |
| <input type="checkbox"/> subtraction and multiplication | <input type="checkbox"/> subtraction and division |
| <input type="checkbox"/> addition and subtraction | <input type="checkbox"/> multiplication and division |

Mathematicians have ordered the operations to avoid writing brackets all the time. The order is:

1. Operations in brackets.
2. Multiplication and division, from left to right.
3. Addition and subtraction, from left to right.

Example:	$3 \times 5 + 3 \times 6 = (3 \times 5) + (3 \times 6)$	but	$3 \times (5 + 3) \times 6$
	$= 15 + 18$		$= 3 \times 8 \times 6$
	$= 33$		$= 24 \times 6$
			$= 144$

10. Evaluate each expression. Use the correct order of operations.

a) $4 \times 2 - 7$ b) $2 + 4 \div 2$ c) $6 - 2 \times 3$ d) $20 \div 2 + 8$
e) $4 + 3 \times 6 - 5$ f) $6 + 6 \div 3 - 7$ g) $4 \times 3 \div 6 + 5$ h) $3 \times 7 - 6 \div 2$
i) $4 \div (2 - 1)$ j) $(5 - 1) \times 3$ k) $20 - (14 - 7)$ l) $(12 - 4) \div 4$

11. Turn the written instructions into mathematical expressions.

a) Add 8 and 3.

Then subtract 4.

Then multiply by 3.

$$\underline{(8 + 3 - 4) \times 3}$$

b) Subtract 6 from 9.

Then multiply by 2.

Then add 4.

c) Multiply 6 and 5.

Then subtract from 40.

Then add 5.

BONUS ►

d) Divide 4 by 2.

Then add 10.

Then subtract 4.

e) Divide 6 by 3.

Then add 5.

Then subtract 3.

Divide 8 by 4 and then add 2.

Add 5 and 3 together.

Multiply the two results.

12. Write the mathematical expressions in words.

a) $(6 + 2) \times 3$ Add 6 and 2. Then multiply by 3.

b) $(6 + 1) \times 2$ _____

c) $4 \times (3 - 1 + 5)$ _____

d) $(5 - 2) \times (4 + 17)$

e) $(24 - 2 \times 6) \div 4$

f) $24 - 2 \times 6 \div 4$

13. a) Add brackets in different ways to get as many different answers as you can.

i) $3 + 1 \times 7 - 2$

ii) $16 - 4 \times 2 + 8$

iii) $16 \div 4 \times 2 + 8$

b) How many different answers did you get in part a)? i) _____ ii) _____ iii) _____

14. a) Calculate the expression in the box. Which expression without brackets gives the same answer?

i) $\boxed{8 - (5 + 2)} = 8 - 5 - 2$ or $8 - 5 + 2$

ii) $\boxed{7 - (3 - 2)} = 7 - 3 - 2$ or $7 - 3 + 2$

iii) $\boxed{7 + (5 - 2)} = 7 + 5 - 2$ or $7 + 5 + 2$

iv) $\boxed{6 + (2 + 4)} = 6 + 2 + 4$ or $6 + 2 - 4$

15. How would you write the expressions below without brackets? Justify your answer.

a) $24 \div (6 \times 2)$

b) $5 \times 8 \div (4 \div 2)$

c) $5 \times 8 \div (4 \times 2)$

16. a) The expressions on the left have brackets and the expressions on the right do not.

Calculate the expressions, then match by the same answer.

$4 \times 6 \div (3 \times 2)$

$4 \times 6 \times 2 + 4 \times 3 \times 2$

$4 \times (6 + 3) \times 2$

$4 \times 3 + 4 \times 2 + 6 \times 3 + 6 \times 2$

$(4 + 6) \times (3 + 2)$

$4 \times 6 \div 3 \div 2$

b) Which expression with brackets from part a) needs the most writing to write without brackets and still get the same answer? _____

NS7-3 Equations

A **numeric expression** is a combination of numbers, operation signs, and sometimes brackets, that represents a quantity. Example: These expressions all represent 10:

$7 + 3$

$12 - 2$

$100 \div 10$

$(4 + 1) \times 2$

1. Calculate each expression.

a) $1 + 3 + 4$ _____ b) 3×4 _____ c) $2 \times 2 \times 2$ _____ d) $5 + 2$ _____

An **equation** is a mathematical statement that has two expressions representing the same quantity separated by an equal sign. Example: $12 - 2 = 100 \div 10$

2. a) Circle two expressions in Question 1 that represent the same quantity.

b) Write an equation using those two expressions.

_____ = _____

3. Verify that each equation is true.

a) $(4 + 3) \times 2 = 5 \times 3 - 1$ b) $3 \times 4 \times 5 = 6 \times 10$ c) $1 + 2 + 3 + 4 + 5 + 6 = 7 \times 3$

$(4 + 3) \times 2$ and $5 \times 3 - 1$

$= 7 \times 2$ $= 15 - 1$

$= 14$ $= 14$

4. Verify that each equation is true.

a) $5 + 12 = (5 + 1) + (12 - 1)$ b) $5 + 12 = (5 + 2) + (12 - 2)$ c) $5 + 12 = (5 + 3) + (5 - 3)$

5. Rewrite each pair of equations as a single equation by leaving out the number on the right.

a) $(5 + 4) + (6 - 4) = 11$ $5 + 6 = 11$ b) $(7 - 2) + (4 + 2) = 11$ $7 + 4 = 11$

_____ $(5 + 4) + (6 - 4) = 5 + 6$

c) $(8 + 2) + (7 - 2) = 15$ $8 + 7 = 15$ d) $(8 - 5) + (9 + 5) = 17$ $8 + 9 = 17$

6. Write the correct number to make the equation true. Verify your answer by calculating both sides.

a) $(12 - 3) + (8 + \overset{3}{\underline{\quad}}) = 12 + 8$ b) $(11 + 7) + (9 - \underline{\quad}) = 11 + 9$ c) $(8 - 2) + (5 + \underline{\quad}) = 8 + 5$

$= 9 + 11$ $= 20$

$= 20$ ← equal →

7. Verify that each equation is true.

a) $(9 + 2) - (4 + 2) = 9 - 4$

b) $(10 - 3) - (7 - 3) = 10 - 7$

c) $(8 - 3) - (6 - 3) = 8 - 6$

8. Write the correct number to make the equation true. Verify your answers.

a) $(12 - 3) + (8 + \underline{\quad}) = 12 + 8$

b) $(12 - 5) - (8 - \underline{\quad}) = 12 - 8$

c) $(15 + 2) - (8 + \underline{\quad}) = 15 - 8$

d) $(11 + 7) + (9 - \underline{\quad}) = 11 + 9$

9. Write the correct operation to make the equation true. Verify your answers.

a) $(13 - 3) + (7 \bigcirc 3) = 13 + 7$

b) $(8 + 2) + (7 \bigcirc 2) = 8 + 7$

c) $(6 + 5) - (4 \bigcirc 5) = 6 - 4$

d) $(9 - 3) - (5 \bigcirc 3) = 9 - 5$

10. a) Write the correct operation and number to make the statement true.

i) $(26 + 3) + (35 \underline{- 3}) = 26 + 35$

ii) $(18 + 4) - (7 \underline{\quad}) = 18 - 7$

iii) $(17 - 4) + (26 \underline{\quad}) = 17 + 26$

iv) $(24 - 3) - (9 \underline{\quad}) = 24 - 9$

v) $(134 \underline{\quad}) - (38 + 7) = 134 - 38$

vi) $(287 \underline{\quad}) + (41 + 6) = 287 + 41$

b) Choose one of the equations you made and verify that it is true by calculating both sides.

BONUS ► Add brackets where necessary to the following equations to make them true.

a) $3 + 1 \times 7 - 2 = 20$

b) $3 + 1 \times 7 - 2 = 26$

c) $3 + 1 \times 7 - 2 = 8$

d) $6 - 3 \times 2 = 6$

e) $16 \div 2 \times 2 = 4$

f) $4 + 8 \div 2 = 6$

g) $8 - 4 \times 2 + 5 = 28$

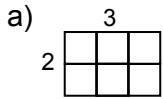
h) $8 - 4 \times 2 + 5 = 13$

i) $5 \times 4 - 3 + 2 = 7$

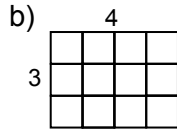
NS7-4 Properties of Operations

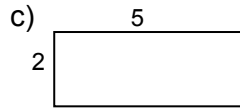
The area of a rectangle is the number of square units that cover it.

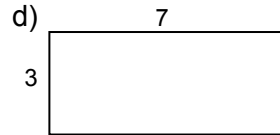
1. Find the area of each rectangle.

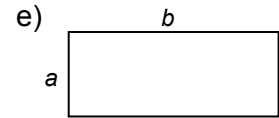


$2 \times 3 = 6$

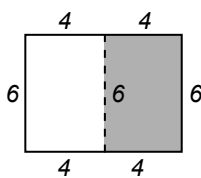
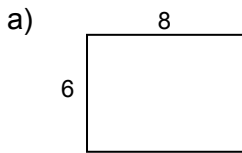




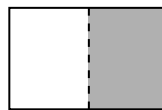
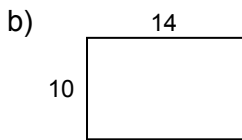
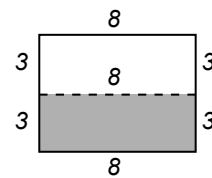




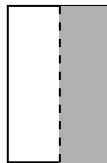
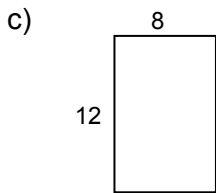
2. A rectangle is cut in half in two different ways. How long are the resulting sides?



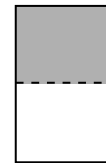
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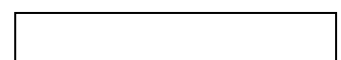
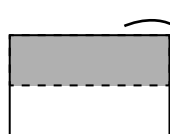
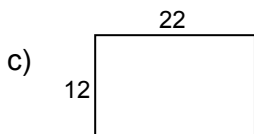
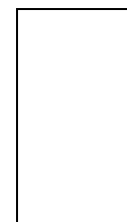
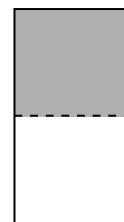
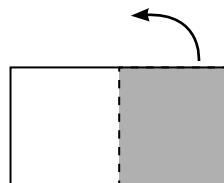
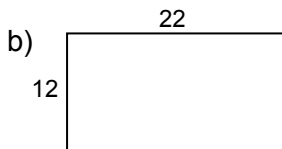
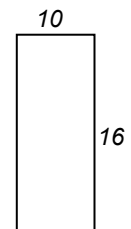
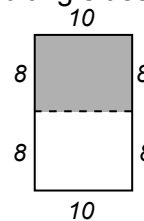
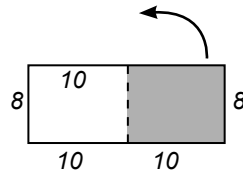
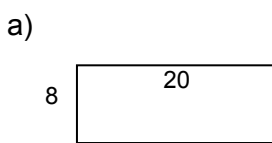
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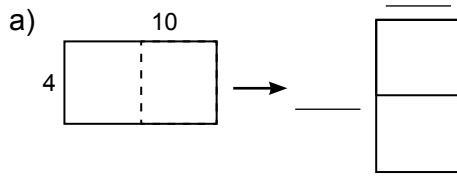
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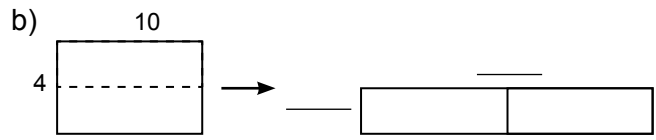
3. A rectangle is cut in half and rearranged. How long are the resulting sides?



4. A rectangle is cut in half and rearranged. Make another product with the same answer to complete the equation.

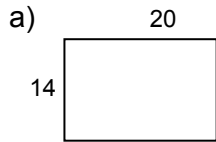


$$4 \times 10 = \underline{\quad} \times \underline{\quad}$$



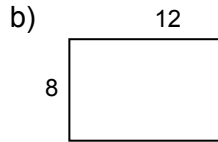
$$4 \times 10 = \underline{\quad} \times \underline{\quad}$$

5. Imagine cutting the rectangle in half and rearranging. Make two more products with the same answer.



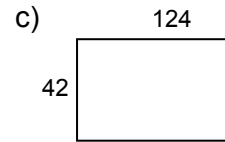
$$20 \times 14 = \underline{\quad} \times \underline{\quad}$$

$$= \underline{\quad} \times \underline{\quad}$$



$$8 \times 12 = \underline{\quad} \times \underline{\quad}$$

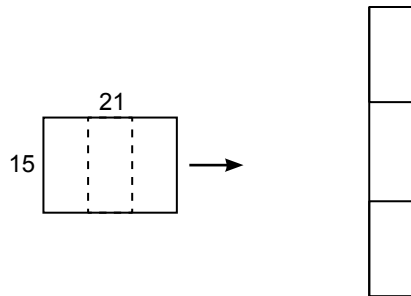
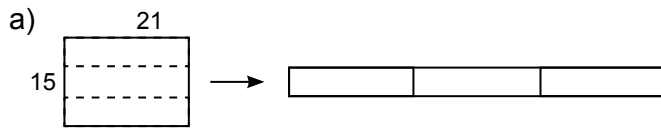
$$= \underline{\quad} \times \underline{\quad}$$



$$124 \times 42 = \underline{\quad} \times \underline{\quad}$$

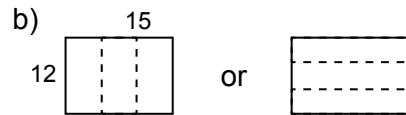
$$= \underline{\quad} \times \underline{\quad}$$

6. Cut the rectangle in thirds and rearrange. Make two more products with the same answer.



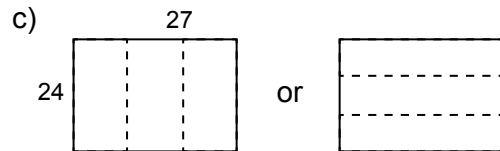
$$15 \times 21 = \underline{\quad} \times \underline{\quad}$$

$$= \underline{\quad} \times \underline{\quad}$$



$$12 \times 15 = \underline{\quad} \times \underline{\quad}$$

$$= \underline{\quad} \times \underline{\quad}$$



$$24 \times 27 = \underline{\quad} \times \underline{\quad}$$

$$= \underline{\quad} \times \underline{\quad}$$

7. Draw rectangles to show why:

a) $5 \times 6 = 10 \times 3$

b) $5 \times 9 = 15 \times 3$

c) $5 \times 12 = 20 \times 3$

8. Write the correct number to make the equation true.

a) $5 \times 6 = (5 \times 2) \times (6 \div \underline{\quad})$

b) $5 \times 9 = (5 \times 3) \times (9 \div \underline{\quad})$

c) $5 \times 12 = (5 \times 4) \times (12 \div \underline{\quad})$

d) $4 \times 6 = (4 \times 3) \times (6 \div \underline{\quad})$

e) $15 \times 16 = (15 \times 4) \times (16 \div \underline{\quad})$

f) $8 \times 8 = (8 \times 2) \times (8 \div \underline{\quad})$

9. Write the correct operation. Then verify your answers in your notebook, by calculating both sides.

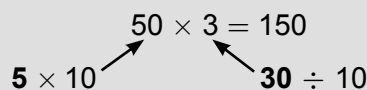
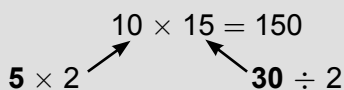
a) $3 \times 4 = (3 \times 2) \times (4 \bigcirc 2)$

b) $4 \times 15 = (4 \times 3) \times (15 \bigcirc 3)$

c) $9 \times 21 = (9 \times 7) \times (21 \bigcirc 7)$

Start with any multiplication statement. To find another multiplication statement with the same answer **multiply one factor and divide the other by the same number.**

Example: $5 \times 30 = 150$



10. Write the correct operation and number. Then verify your answers in your notebook.

a) $5 \times 18 = (5 \times 2) \times (18 \underline{\div} \underline{2})$

b) $7 \times 60 = (7 \times 10) \times (60 \underline{\quad})$

c) $8 \times 25 = (8 \times 5) \times (25 \underline{\quad})$

11. Explain why these problems have the same answer. Then choose the easiest one and solve it.

25×16

50×8

100×4

12. Multiply.

a) Since $3 \times 5 = 15$, then $6 \times 5 = \underline{\quad}$

b) Since $4 \times 3 = 12$, then $8 \times 3 = \underline{\quad}$

c) Since $9 \times 8 = 72$, then $9 \times 16 = \underline{\quad}$

d) Since $7 \times 9 = 63$, then $14 \times 9 = \underline{\quad}$

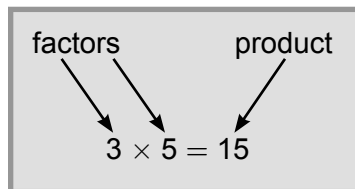
13. Multiply one factor by 5 and find the products.

a) $2 \times 3 = 6$ so $\underline{\quad} \times 3 = \underline{\quad}$

b) $3 \times 5 = 15$ so $\underline{\quad} \times 5 = \underline{\quad}$

c) $4 \times 5 = 20$ so $4 \times \underline{\quad} = \underline{\quad}$

d) $2 \times 6 = 12$ so $2 \times \underline{\quad} = \underline{\quad}$



When you multiply one factor by 5, what happens to the product? _____

14. Fill in the blanks with the correct operation and number.

a) $5 \times 8 = 40$

b) $5 \times 9 = 45$

c) $3 \times 6 = 18$

so $15 \times 8 = 40 \underline{\times} \underline{3}$

so $5 \times 18 = 45 \underline{\quad}$

so $21 \times 6 = 18 \underline{\quad}$

15. Write the equivalent division statement for each multiplication statement.

$6 \times 5 = 30$ so $\underline{30} \div \underline{6} = 5$

$(6 \times 2) \times 5 = 30 \times 2$ so $(\underline{30 \times 2}) \div (\underline{6 \times 2}) = 5$

$(6 \times 3) \times 5 = 30 \times 3$ so $(\underline{\quad}) \div (\underline{\quad}) = 5$

$(6 \times 4) \times 5 = 30 \times 4$ so $(\underline{\quad}) \div (\underline{\quad}) = 5$

16. Write the correct operation and number. $30 \div 6 = (30 \times 2) \div (6 \text{ ______})$
 $= (30 \times 3) \div (6 \text{ ______})$
 $= (30 \times 4) \div (6 \text{ ______})$

17. Fill in the blanks with the correct operation and number. Verify your answers in your notebook.

a) $12 \div 3 = (12 \times 2) \div (3 \text{ ______})$ b) $20 \div 5 = (20 \times 2) \div (5 \text{ ______})$ c) $90 \div 6 = (90 \times 5) \div (6 \text{ ______})$

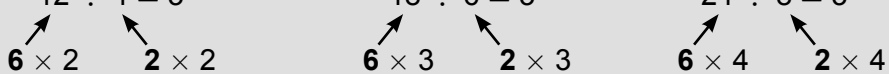
18. Explain why these problems have the same answer. Then choose the easiest one and solve it.

$35 \div 5$ $70 \div 10$ $105 \div 15$

19. Fill in the blanks to solve the problems.

a) $135 \div 5 = \text{ ______ } \div 10$ b) $120 \div 5 = \text{ ______ } \div 10$ c) $65 \div 5 = \text{ ______ } \div 10$
 $= \text{ ______ }$ $= \text{ ______ }$ $= \text{ ______ }$

Start with any division statement. To find another division statement with the same answer, **multiply both terms (the dividend and the divisor) by the same number.**

Example: $6 \div 2 = 3$ $12 \div 4 = 3$ $18 \div 6 = 3$ $24 \div 8 = 3$

 6×2 2×2 6×3 2×3 6×4 2×4

20. Write the equivalent division statement for each multiplication statement.

$12 \times 5 = 60$ so $\frac{60}{12} \div \frac{12}{12} = 5$
 $(12 \div 2) \times 5 = 60 \div 2$ so $(\frac{60 \div 2}{12 \div 2}) \div (\frac{12 \div 2}{12 \div 2}) = 5$
 $(12 \div 3) \times 5 = 60 \div 3$ so $(\text{ ______ }) \div (\text{ ______ }) = 5$
 $(12 \div 4) \times 5 = 60 \div 4$ so $(\text{ ______ }) \div (\text{ ______ }) = 5$

21. Write the correct operation and number. $60 \div 12 = (60 \div 2) \div (12 \text{ ______})$
 $= (60 \div 3) \div (12 \text{ ______})$
 $= (60 \div 4) \div (12 \text{ ______})$

22. Write the correct operation and number. Verify your answers in your notebook.

a) $20 \div 4 = (20 \div 2) \div (4 \text{ ______})$ b) $24 \div 6 = (24 \div 3) \div (6 \text{ ______})$

23. Write an operation and a number to make the equation true.


a) $9 - 5 = (9 + 2) - (5 \text{ ______})$ b) $9 + 5 = (9 + 2) + (5 \text{ ______})$ c) $18 \times 6 = (18 \times 3) \times (6 \text{ ______})$
d) $18 \div 6 = (18 \times 3) \div (6 \text{ ______})$ e) $5 \times 12 = (5 \times 3) \times (12 \text{ ______})$ f) $7 \times 9 = (\text{ ______ } 3) \times (9 \div 3)$
g) $8 + 7 = (8 - 4) + (7 \text{ ______})$ h) $30 \div 6 = (30 \div 2) \div (6 \text{ ______})$ i) $12 \times 10 = (12 \div 2) \times (10 \text{ ______})$

BONUS ▶


j) $m \div n = (m \times p) \div (n \text{ ______})$ k) $a \times d = (a \div m) \times (d \text{ ______})$ l) $r + s = (r - t) + (s \text{ ______})$


NS7-6 The Area Model for Multiplication


1. a) Write 7 as a sum of two smaller numbers in different ways.

$$7 = 1 + 6$$


$$7 = 4 + \underline{\quad}$$


$$7 = 2 + \underline{\quad}$$


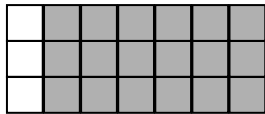
$$7 = \underline{\quad} + \underline{\quad}$$


$$7 = 3 + \underline{\quad}$$


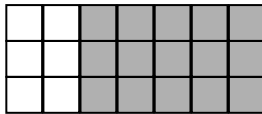
$$7 = \underline{\quad} + \underline{\quad}$$

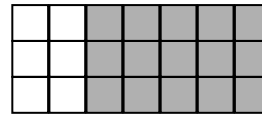

b) How are the sums on the left the same as the sums on the right?

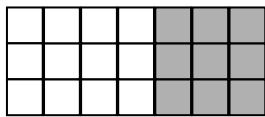
2. a) Write 3×7 as a sum of two smaller multiples of 3 in different ways.

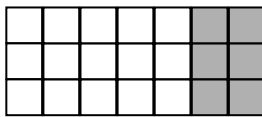


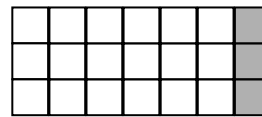
$$3 \times 7 = 3 \times 1 + 3 \times 6$$











b) How are the sums in the first row the same as the sums in the second row?

3. a) Write 4×13 as a sum of two smaller multiples of 4 in all the ways possible.

$$4 \times 1 + 4 \times 12 = 4 + \underline{\quad}$$

$$4 \times 2 + 4 \times 11 = 8 + \underline{\quad}$$

$$4 \times 3 + 4 \times \underline{\quad} = \underline{\quad} + \underline{\quad}$$

$$4 \times 4 + 4 \times \underline{\quad} = \underline{\quad} + \underline{\quad}$$

$$4 \times 5 + 4 \times \underline{\quad} = \underline{\quad} + \underline{\quad}$$

$$4 \times 6 + 4 \times \underline{\quad} = \underline{\quad} + \underline{\quad}$$

We can stop at $4 \times 6 + 4 \times 7$ because _____.

b) What is 4×13 ? _____

Which of the sums did you use to find it? Why? _____.

c) Write 4×13 as a sum of three smaller products.

$$4 \times 13 = 4 \times \underline{\quad} + 4 \times \underline{\quad} + 4 \times \underline{\quad}$$

4. Are the two expressions equal ($=$) or not equal (\neq)? Show your work.

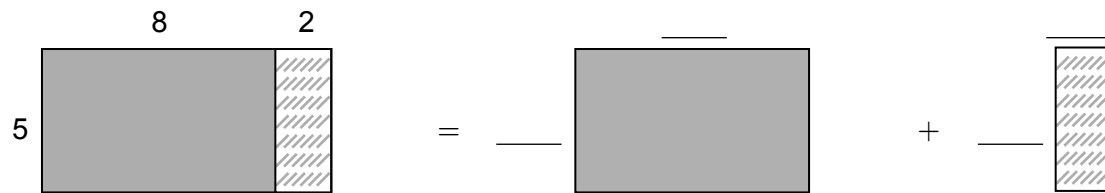
a) $4 \times (8 + 2)$ $(4 \times 8) + (4 \times 2)$

b) $4 \times (8 - 2)$ $(4 \times 8) - (4 \times 2)$

c) $4 + (8 \times 2)$ $(4 + 8) \times (4 + 2)$

d) $4 + (8 \div 2)$ $(4 + 8) \div (4 + 2)$

5. Write the dimensions of the two smaller rectangles.

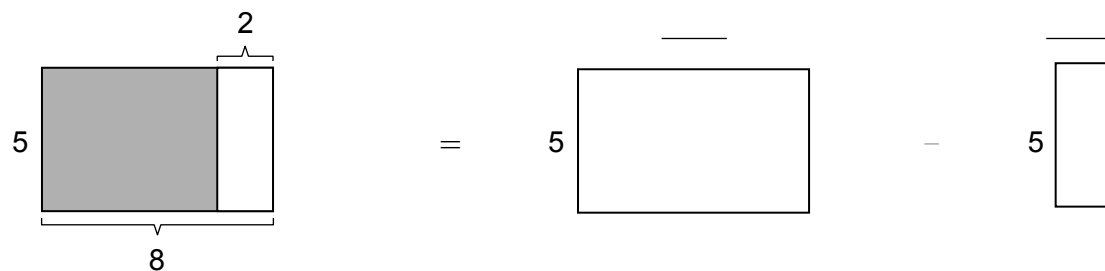


Now find the area of the large rectangle in two ways. Then write an equation.

Area = $5 \times (\underline{\quad} + \underline{\quad})$ and Area = $\underline{\quad} \times \underline{\quad} + \underline{\quad} \times \underline{\quad}$

So $\underline{\hspace{2cm}}$ = $\underline{\hspace{2cm}}$

6. Find the dimensions of the shaded part in two ways. Then write an equation.

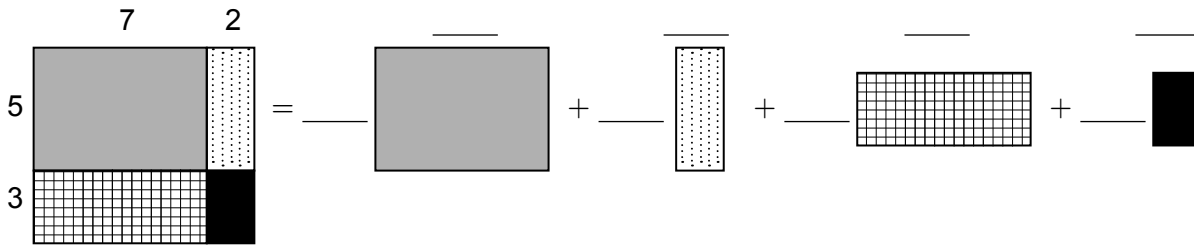


Area = $5 \times (\underline{\quad} - \underline{\quad})$ and Area = $5 \times \underline{\quad} - 5 \times \underline{\quad}$

So $\underline{\hspace{2cm}}$ = $\underline{\hspace{2cm}}$

7. Draw an area model to show that $7 \times 12 = 7 \times 10 + 7 \times 2$.

8. Write the dimensions of the four smaller rectangles. Then find the area of the large rectangle in two ways. Then write an equation.

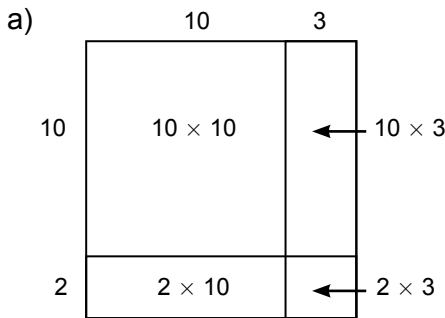


Area = (5 + 3) × (7 + 2) and

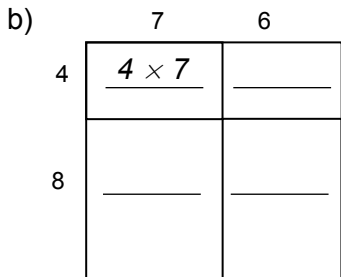
Area = 5 × 7 + 5 × 2 + 3 × 7 + 3 × 2

So 8 × 9 = 72

9. Use these pictures to write 12×13 as a sum of four smaller products.



$$\begin{aligned}
 12 \times 13 &= (10 + 2) \times (10 + 3) \\
 &= \underline{\quad} \times \underline{\quad} + \underline{\quad} \times \underline{\quad} \\
 &+ \underline{\quad} \times \underline{\quad} + \underline{\quad} \times \underline{\quad} \\
 &= \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} \\
 &= \underline{\quad}
 \end{aligned}$$



$$\begin{aligned}
 12 \times 13 &= (4 + 8) \times (7 + 6) \\
 &= \underline{\quad} \times \underline{\quad} + \underline{\quad} \times \underline{\quad} \\
 &+ \underline{\quad} \times \underline{\quad} + \underline{\quad} \times \underline{\quad} \\
 &= \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} \\
 &= \underline{\quad}
 \end{aligned}$$

- c) Did you get the same answer both ways? _____
- d) Which way made it easier to find 12×13 ? Explain. _____
- _____

NS7-7 Breaking Multiplication into Simpler Problems

Mathematicians often break problems into simpler problems.
In multiplication, this often means using multiplication by 10, 100, or 1 000.

1. Find each product.

a) $3 \times 20 = 3 \times \underline{\quad}$ tens
 $= \underline{\quad}$ tens
 $= \underline{\quad}$

b) $3 \times 200 = 3 \times \underline{\quad}$ hundreds
 $= \underline{\quad}$ hundreds
 $= \underline{\quad}$

c) $3 \times 2\,000 = \underline{\quad}$

d) $3 \times 20\,000 = \underline{\quad}$

e) $3 \times 200\,000 = \underline{\quad}$

f) $3 \times 700 = \underline{\quad}$

g) $5 \times 4\,000 = \underline{\quad}$

h) $15 \times 40\,000 = \underline{\quad}$

2. Use multiples of 10 or 100 to break each problem into simpler problems.

a) $5 \times 23 = 5 \times 20 + 5 \times \underline{\quad}$
 $= \underline{\quad} + \underline{\quad}$
 $= \underline{\quad}$

b) $2 \times 432 = 2 \times \underline{\quad} + 2 \times \underline{\quad} + 2 \times \underline{\quad}$
 $= \underline{\quad} + \underline{\quad} + \underline{\quad}$
 $= \underline{\quad}$

c) $3 \times 312 = \underline{\quad} + \underline{\quad} + \underline{\quad}$
 $= \underline{\quad} + \underline{\quad} + \underline{\quad}$
 $= \underline{\quad}$

3. Multiply in your head.

a) $3 \times 12 = \underline{\quad}$

b) $3 \times 52 = \underline{\quad}$

c) $6 \times 31 = \underline{\quad}$

d) $7 \times 21 = \underline{\quad}$

e) $5 \times 31 = \underline{\quad}$

f) $3 \times 621 = \underline{\quad}$

g) $5 \times 411 = \underline{\quad}$

h) $3 \times 632 = \underline{\quad}$

4. Use the 2 times table and the 10 times table to write the 12 times table.

	1	2	3	4	5	6	7	8	9	10
$\times 2$	2	4	6							
$\times 10$	10	20	30							
$\times 12$	12	24	36							

5. Use the 3 times table and the 20 times table to write the 23 times table.

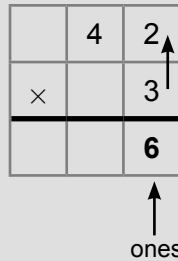
	1	2	3	4	5	6	7	8	9	10
$\times 3$	3	6	9							
$\times 20$	20	40	60							
$\times 23$	23	46								

NS7-8 Long Multiplication

How to solve $3 \times 42 = 3 \times 40 + 3 \times 2$
 $= 3 \times 4 \text{ tens} + 3 \times 2 \text{ ones}$

Step 1:

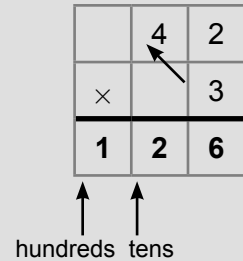
Multiply the ones digit by 3
 $(3 \times 2 \text{ ones} = 6 \text{ ones})$.



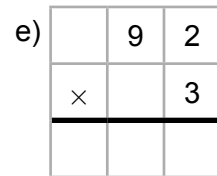
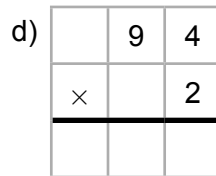
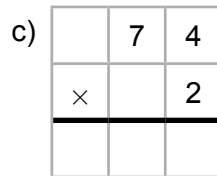
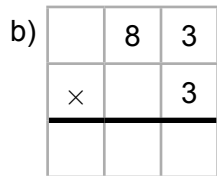
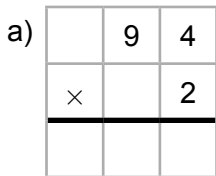
Step 2:

Multiply the tens digit by 3
 $(3 \times 4 \text{ tens} = 12 \text{ tens})$.

Regroup 10 tens as 1 hundred.



1. Use Steps 1 and 2 to find the products.



How to solve $7 \times 43 = 7 \times 40 + 7 \times 3$
 $= 7 \times 4 \text{ tens} + 7 \times 3 \text{ ones}$

Step 1:

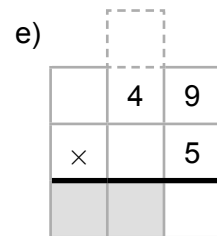
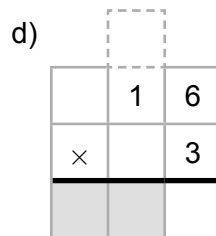
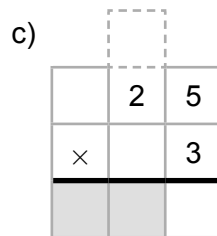
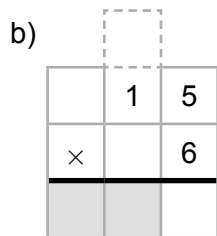
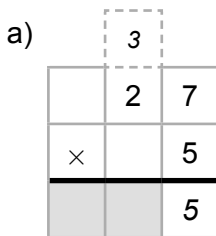
Multiply 3 ones by 7
 $(7 \times 3 = 21)$.



Step 2:

Regroup 20 ones as 2 tens.

2. Complete **Steps 1** and **2** of the multiplication.



Step 3:

Multiply 4 tens by 7
 ($7 \times 4 \text{ tens} = 28 \text{ tens}$).

		2
	4	3
×		7
<hr/>		
3	0	1

Step 4:

Add 2 tens to the result
 ($28 + 2 = 30 \text{ tens}$).

3. Complete **Steps 3** and **4** of the multiplication.

a)

	2	4
×		3
<hr/>		
	7	2

b)

	3	5
×		9
<hr/>		
		5

c)

	1	5
×		5
<hr/>		
		5

d)

	7	3
×		5
<hr/>		
		5

e)

	8	9
×		5
<hr/>		
		5

4. Complete **all steps** of the multiplication.

a)

	3	5
×		9
<hr/>		

b)

	3	5
×		6
<hr/>		

c)

	1	5
×		7
<hr/>		
		5

d)

	2	5
×		8
<hr/>		

e)

	2	4
×		5
<hr/>		

5. Multiply.

a)

	4	1
×		5
<hr/>		

b)

4	3	4
×		2
<hr/>		

c)

3	1	2
×		3
<hr/>		

d)

1	2	4
×		2
<hr/>		

e)

3	2	3
×		3
<hr/>		

6. Multiply by regrouping ones as tens.

a)

2	2	7
×		3
<hr/>		

b)

1	1	6
×		5
<hr/>		

c)

2	2	4
×		3
<hr/>		

d)

1	1	9
×		5
<hr/>		

e)

3	2	8
×		3
<hr/>		

7. Multiply by regrouping when you need to.

a)

2	3	7
×		5
<hr/>		

b)

7	5	6
×		3
<hr/>		

c)

5	2	8
×		2
<hr/>		

d)

5	3	2
×		7
<hr/>		

e)

2	1	3
×		8
<hr/>		

f) 5×174

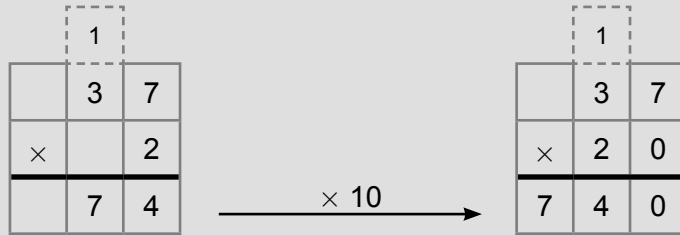
g) 7×321

h) 6×132

i) 9×532

BONUS $8 \times 31\,245$

To multiply a 2-digit number by any multiple of ten, first multiply by the number of tens, then multiply by 10. Example: to find 37×20 , find 37×2 , then multiply by 10.



8. Multiply.

a)

	6	3
×		5
<hr/>		

 →

	6	3
×	5	0
<hr/>		
		0

b)

	4	9
×		3
<hr/>		

 →

	4	9
×	3	0
<hr/>		
		0

c)

	3	5
×	8	0
<hr/>		

d)

	5	2
×	9	0
<hr/>		

e)

	3	6
×	5	0
<hr/>		

f)

	5	3
×	6	0
<hr/>		

g)

	7	9
×	3	0
<hr/>		

To multiply 2-digit numbers, split the product into a sum of two easier products. Example:

$$37 \times 25 = 37 \times \text{a multiple of ten} + 37 \times \text{a 1-digit number}$$

$$37 \times 25 = 37 \times 20 + 37 \times 5$$

$$= 740 + 185$$

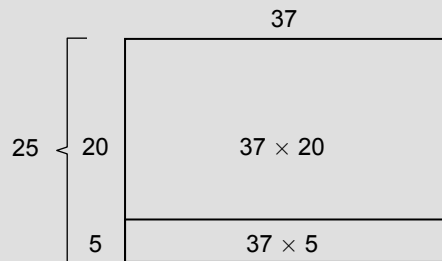
$$= 925$$

Keep track using a grid:

	3	7	
×	2	5	
<hr/>			
1	8	5	
+	7	4	0
<hr/>			
9	2	5	

← 37×5

← 37×20



Step 1: Calculate 37×5

Step 2: Calculate 37×20

Step 3: Add the results

9. Practise Step 1.

a)

	2	4
×	1	3
<hr/>		
	7	2

 = 24×3

b)

	3	3
×	3	9
<hr/>		

c)

	5	2
×	4	4
<hr/>		

d)

	1	6
×	3	5
<hr/>		

10. Practise Step 2.

a)

		1	
		3	4
×	4	3	
<hr/>			
	1	0	2

 = 34×40

b)

		1	
		6	9
×	5	2	
<hr/>			
	1	3	8

c)

		1	
		5	2
×	3	6	
<hr/>			
	3	1	2

d)

		3	
		6	7
×	2	5	
<hr/>			
	3	3	5

11. Practise Steps 1 and 2.

a)

		3	5
×	2	6	
<hr/>			

 = 35×6

			0
--	--	--	---

 = 35×20

Regrouping for 35×20
 Regrouping for 35×6

b)

		3	2
×	5	4	
<hr/>			

c)

		4	5
×	3	5	
<hr/>			

d)

		1	6
×	4	2	
<hr/>			

12. Complete the multiplication by adding the numbers in the last two rows of the chart.

a)

		1	2
		4	8
×	2	3	
<hr/>			
	1	4	4

 48×3

+	9	6	0
---	---	---	---

 + 48×20

	1	1	0	4
--	---	---	---	---

 48×23

b)

		3	1
		7	6
×	5	3	
<hr/>			
	2	2	8

+	3	8	0	0
---	---	---	---	---

c)

		3	4
		2	5
×	7	9	
<hr/>			
	2	2	5

+	1	7	5	0
---	---	---	---	---

d)

		4	1
		1	9
×	5	2	
<hr/>			
		3	8

+	9	5	0
---	---	---	---

13. Multiply.

a)

		3	7
×	2	5	
<hr/>			

+			0
---	--	--	---

b)

		6	9
×	5	3	
<hr/>			

+			0
---	--	--	---

c)

		7	4
×	5	2	
<hr/>			

+			
---	--	--	--

d)

		5	4
×	3	2	
<hr/>			

+			
---	--	--	--

e)

		8	7
×	2	3	
<hr/>			

+			
---	--	--	--

f) 35×23

g) 64×51

h) 25×43

i) 12×87

BONUS 652×473