Eureka Math™ Homework Helper

2015–2016

Grade 3
Module 3
Lessons 1–21

Eureka Math, A Story of Units®

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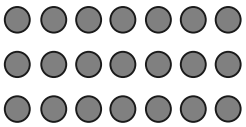
G3-M3-Lesson 1

1. Write two multiplication facts for each array.

This array shows 3 rows of 7 dots, or 3 sevens. 3 sevens can be written as $3 \times 7 = 21$. I can also write it as $7 \times 3 = 21$ using the commutative property.



$\underline{21} = \underline{3} \times \underline{7}$

$\underline{21} = \underline{7} \times \underline{3}$

2. Match the expressions.

a. 4×7

b. 3 sixes

6 threes

7×4

The commutative property says that even if the order of the factors changes, the product stays the same!

3. Complete the equations.

a. $7 \times \underline{2} = \underline{7} \times 2$

$= \underline{14}$

This equation shows that both sides equal the same amount. Since the factors 7 and 2 are already given, I just have to fill in the unknowns with the correct factors to show that each side equals 14.

b. 6 twos + 2 twos = $\underline{8} \times \underline{2}$

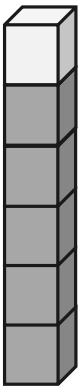
$= \underline{16}$

This equation shows the break apart and distribute strategy that I learned in Module 1. 6 twos + 2 twos = 8 twos, or 8×2. Since I know $2 \times 8 = 16$, I also know $8 \times 2 = 16$ using commutativity. Using commutativity as a strategy allows me to know many more facts than the ones I've practiced before.

G3-M3-Lesson 2

1. Each  has a value of 8.

I know each block has a value of 8, so this tower shows 6 eights.



Unit form: 6 eights = **5** eights + **1** eight

= 40 + **8**

= **48**

The shaded and unshaded blocks show 6 eights broken into 5 eights and 1 eight. These two smaller facts will help me solve the larger fact.

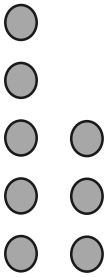
Facts: **6** × **8** = **48**

8 × **6** = **48**

Using commutativity, I can solve 2 multiplication facts, 6 × 8 and 8 × 6, which both equal 48.

2. There are 7 blades on each pinwheel. How many total blades are on 8 pinwheels? Use a fives fact to solve.

I need to find the value of 8 × 7, or 8 sevens. I can draw a picture. Each dot has a value of 7. I can use my familiar fives facts to break up 8 sevens as 5 sevens and 3 sevens.



5 ***sevens***

$5 \times 7 = 35$

3 ***sevens***

$3 \times 7 = 21$

$8 \times 7 = (5 \times 7) + (3 \times 7)$

$= 35 + 21$

$= 56$

This is how I write the larger fact as the sum of two smaller facts. I can add their products to find the answer to the larger fact. $8 \times 7 = 56$

There are 56 blades on 8 pinwheels.

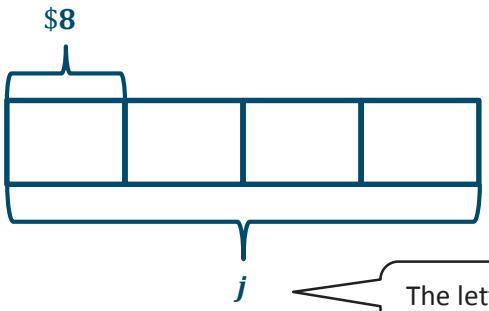
G3-M3-Lesson 3

1. Each equation contains a letter representing the unknown. Find the value of the unknown.

$9 \div 3 = c$	$c =$ **3**
$4 \times a = 20$	$a =$ **5**

I can think of this problem as division, $20 \div 4$, to find the unknown factor.

2. Brian buys 4 journals at the store for $\$8$ each. What is the total amount Brian spends on 4 journals? Use the letter j to represent the total amount Brian spends, and then solve the problem.



I can draw a tape diagram to help me solve this problem. From the diagram, I can see that I know the number of groups, 4, and the size of each group, $\$8$, but I don't know the whole.

The letter j helps me label the unknown, which represents how much money Brian spends on 4 journals.

$4 \times \$8 = j$

$j = \$32$

Brian spends $\$32$ on 4 journals.

The only thing different about using a letter to solve is that I use the letter to label the unknowns in the tape diagram and in the equation. Other than that, it doesn't change the way I solve. I found the value of j is $\$32$.

G3-M3-Lesson 4

1. Use number bonds to help you skip-count by six by either making a ten or adding to the ones.

$60 + 6 =$ **66**

$66 + 6 =$ **70** $+$ **2** $=$ **72**

4 **2**

$72 + 6 =$ **70** $+$ **8** $=$ **78**

70 **2**

I can break apart an addend to make a ten. For example, I see that 66 just needs 4 more to make 70. So I can break 6 into 4 and 2. Then $66 + 4 = 70$, plus 2 makes 72. It's much easier to add from a ten. Once I get really good at this, it'll make adding with mental math simple.

2. Count by six to fill in the blanks below.

6, **12**, **18**, **24**

I can skip-count to see that 4 sixes make 24.

Complete the multiplication equation that represents your count-by.

$6 \times$ **4** $=$ **24**

4 sixes make 24, so $6 \times 4 = 24$.

Complete the division equation that represents your count-by.

24 $\div 6 =$ **4**

I'll use a related division fact. $6 \times 4 = 24$, so $24 \div 6 = 4$.

3. Count by six to solve $36 \div 6$. Show your work below.

6, 12, 18, 24, 30, 36

$36 \div 6 = 6$

I'll skip-count by six until I get to 36. Then I can count to find the number of sixes it takes to make 36. It takes 6 sixes, so $36 \div 6 = 6$.

G3-M3-Lesson 5

1. Use number bonds to help you skip-count by seven by either making a ten or adding to the ones.

$70 + 7 =$ **77**

$77 + 7 =$ **80** $+$ **4** $=$ **84**

3 **4**

$84 + 7 =$ **90** $+$ **1** $=$ **91**

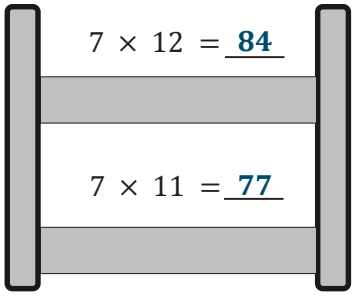
6 **1**

I can break apart an addend to make a ten. For example, I see that 77 just needs 3 more to make 80. So I can break 7 into 3 and 4. Then $77 + 3 = 80$, plus 4 makes 84. It's much easier to add from a ten. Once I get really good at this, it'll make adding with mental math simple.

2. Count by seven to fill in the blanks. Then use the multiplication equation to write the related division fact directly to its right.

84 $7 \times 12 =$ **84** **84** $\div 7 =$ **12**

77 $7 \times 11 =$ **77** **77** $\div 7 = 11$



I "climb" the ladder counting by sevens. The count-by helps me find the products of the multiplication facts. First I find the answer to the fact on the bottom rung. I record the answer in the equation and to the left of the ladder. Then I add seven to my answer to find the next number in my count-by. The next number in my count-by is the product of the next fact up on the ladder!

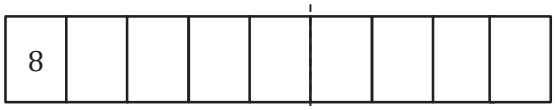
Once I find the product of a fact by skip-counting, I can write the related division fact. The total, or the product of the multiplication fact, gets divided by 7. The quotient represents the number of sevens I skip-counted.

G3-M3-Lesson 6

1. Label the tape diagram. Then, fill in the blanks below to make the statements true.

$9 \times 8 =$

$(5 \times 8) =$ **40** $(\underline{\ 4\ } \times 8) = 32$



$9 \times 8 = (5 + \underline{\ 4\ }) \times 8$

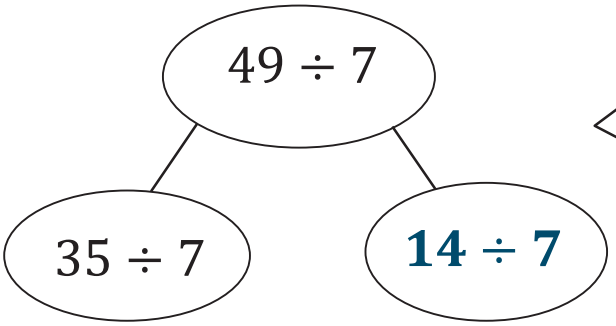
$= (5 \times 8) + (\underline{\ 4\ } \times 8)$

$= 40 + \underline{\ 32\ }$

$= \underline{\ 72\ }$

I can think of 9×8 as 9 eights and break apart the 9 eights into 5 eights and 4 eights. 5 eights equals 40, and 4 eights equals 32. When I add those numbers, I find that 9 eights, or 9×8, equals 72.

2. Break apart 49 to solve $49 \div 7$.



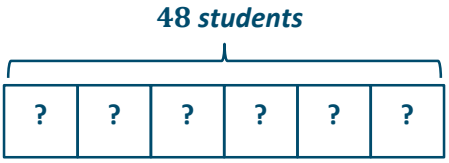
I can use the break apart and distribute strategy to break 49 apart into 35 and 14. Those are numbers that are easier for me to divide by 7. I know that $35 \div 7 = 5$, and $14 \div 7 = 2$, so $49 \div 7$ equals $5 + 2$, which is 7.

$49 \div 7 = (35 \div 7) + (\underline{\ 14\ } \div 7)$

$= 5 + \underline{\ 2\ }$

$= \underline{\ 7\ }$

3. 48 third graders sit in 6 equal rows in the auditorium. How many students sit in each row? Show your thinking.

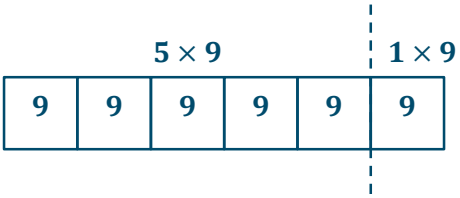


$48 \div 6 = 8$

There are 8 students in each row.

I can draw a tape diagram to break 48 into 6 equal groups. I can also think "6 times what equals 48?" I know that there are 8 students in each row.

4. Ronaldo solves 6×9 by thinking of it as $(5 \times 9) + 9$. Is he correct? Explain Ronaldo's strategy.

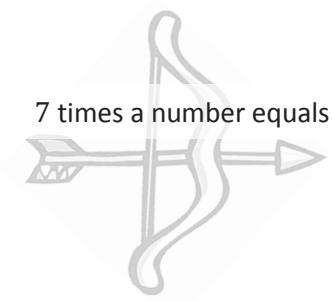


Yes, Ronaldo is correct. He knows that 6×9 is the same as 6 nines. 6 nines is the same as 5 nines plus 1 nine, so $6 \times 9 = (5 \times 9) + 9$.

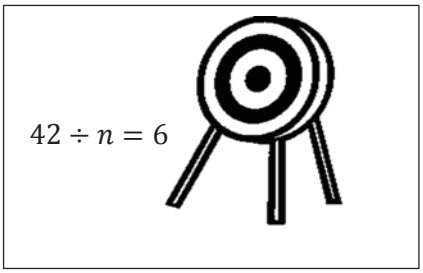
I can use the break apart and distribute strategy to split 6 nines into 5 nines + 1 nine. That's how I know that $6 \times 9 = (5 \times 9) + 9$.

G3-M3-Lesson 7

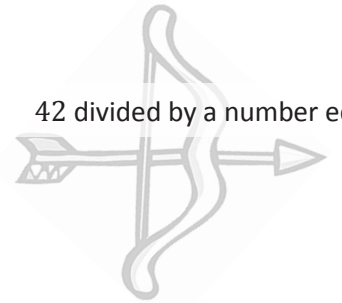
1. Match the words on the arrow to the correct equation on the target.



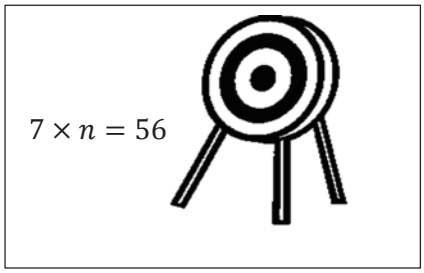
7 times a number equals 56



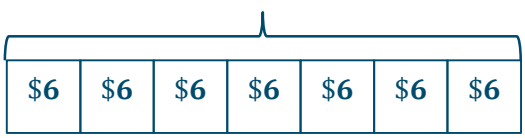
The equations use n to represent the unknown number. When I read the words on the left carefully, I can pick out the correct equation on the right.



42 divided by a number equals 6



2. Ari sells 7 boxes of pens at the school store.
   a. Each box of pens costs $\$6$. Draw a tape diagram, and label the total amount of money Ari makes as m dollars. Write an equation, and solve for m.



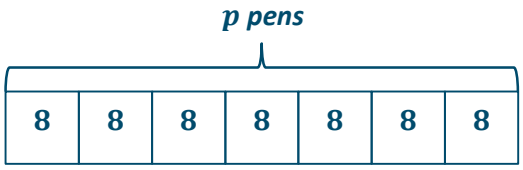
$7 \times 6 = m$

$m = 42$

Ari makes $42 selling pens.

I'm using the letter m to represent how much money Ari makes. Once I find the value of m, then I know how much money Ari earns selling pens.

b. Each box contains 8 pens. Draw a tape diagram, and label the total number of pens as p. Write an equation, and solve for p.



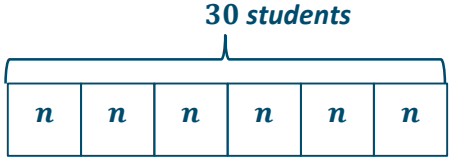
$7 \times 8 = p$

$p = 56$

Ari sells 56 pens.

I can still use a tape diagram to show the 7 boxes of pens that Ari sells, but this time I'll use the letter p to represent the total number of pens. Since there are 8 pens in each box, I know that the value of p is 56.

3. Mr. Lucas divides 30 students into 6 equal groups for a project. Draw a tape diagram, and label the number of students in each group as n. Write an equation, and solve for n.



$30 \div 6 = n$

$6 \times n = 30$

$n = 5$

There are 5 students in each group.

I know that 30 students are split into 6 equal groups, so I have to solve $30 \div 6$ to figure out how many students are in each group. I'll use the letter n to represent the unknown. To solve, I can think about this as division or as an unknown factor problem.

G3-M3-Lesson 8

1. Solve.

a. $9 - (6 + 3) =$ **0**

I know the parentheses mean that I have to add $6 + 3$ first. Then I can subtract that sum from 9.

b. $(9 - 6) + 3 =$ **6**

I know the parentheses mean that I have to subtract $9 - 6$ first. Then I can add 3. The numbers in parts (a) and (b) are the same, but the answers are different because of where the parentheses are placed.

2. Use parentheses to make the equations true.

a. $13 = 3 + (5 \times 2)$

I can put parentheses around 5×2. That means I first multiply 5×2, which equals 10, and then add 3 to get 13.

b. $16 = (3 + 5) \times 2$

I can put parentheses around $3 + 5$. That means I first add $3 + 5$, which equals 8, and then multiply by 2 to get 16.

3. Determine if the equation is true or false.

a. $(4 + 5) \times 2 = 18$	***True***
b. $5 = 3 + (12 \div 3)$	***False***

I know part (a) is true because I can add $4 + 5$, which equals 9. Then I can multiply 9×2 to get 18.

I know part (b) is false because I can divide 12 by 3, which equals 4. Then I can add $4 + 3$. $4 + 3$ equals 7, not 5.

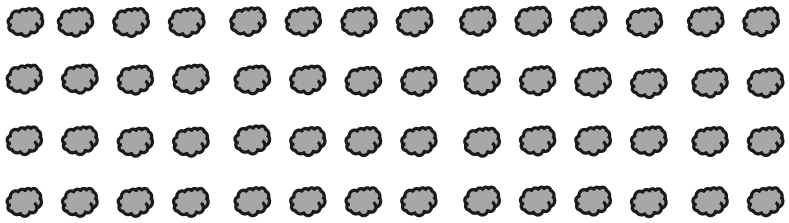
4. Julie says that the answer to $16 + 10 - 3$ is 23 no matter where she puts the parentheses. Do you agree?

$(16 + 10) - 3 = 23$ $16 + (10 - 3) = 23$

I agree with Julie. I put parentheses around $16 + 10$, and when I solved the equation, I got 23 because $26 - 3 = 23$. Then I moved the parentheses and put them around $10 - 3$. When I subtracted $10 - 3$ first, I still got 23 because $16 + 7 = 23$. Even though I moved the parentheses, the answer didn't change!

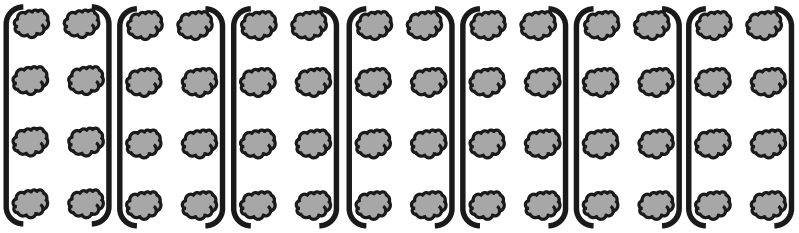
G3-M3-Lesson 9

1. Use the array to complete the equation.



a. $4 \times 14 =$ 56

I can use the array to skip-count by 4 to find the product.



b. $(4 \times$ 2 $) \times 7$
$=$ 8 $\times$ 7
$=$ 56

The array shows that there are 7 groups of 4×2.

I rewrote 14 as 2×7. Then I moved the parentheses to make the equation $(4 \times 2) \times 7$. I can multiply 4×2 to get 8. Then I can multiply 8×7 to get 56. Rewriting 14 as 2×7 made the problem easier to solve!

2. Place parentheses in the equations to simplify and solve.

$3 \times 21 = 3 \times (3 \times 7)$
$= (3 \times 3) \times 7$
$=$ 9 $\times 7$
$=$ 63

I can put the parentheses around 3×3 and then multiply. 3×3 equals 9. Now I can solve the easier multiplication fact, 9×7.

3. Solve. Then, match the related facts.

a. $24 \times 3 =$ **72** $=$ $9 \times (3 \times 2)$

b. $27 \times 2 =$ **54** $=$ $8 \times (3 \times 3)$

I can think of 27 as 9×3. Then, I can move the parentheses to make the new expression $9 \times (3 \times 2)$. $3 \times 2 = 6$, and $9 \times 6 = 54$, so $27 \times 2 = 54$.

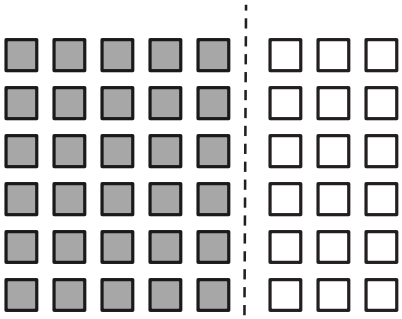
I can think of 24 as 8×3. Then, I can move the parentheses to make the new expression $8 \times (3 \times 3)$. $3 \times 3 = 9$, and $8 \times 9 = 72$, so $24 \times 3 = 72$.

G3-M3-Lesson 10

1. Label the array. Then, fill in the blanks to make the statements true.

$8 \times 6 = 6 \times 8 =$ **48**

$(6 \times 5) =$ **30** $(6 \times$ **3** $) =$ **18**

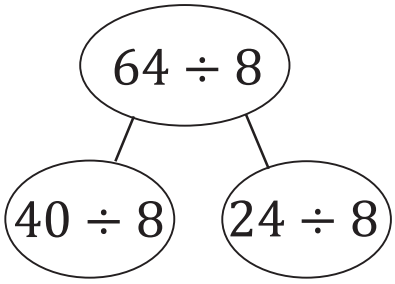


I can use the array to help me fill in the blanks. The array shows 8 broken into 5 and 3. The shaded part shows $6 \times 5 = 30$, and the unshaded part shows $6 \times 3 = 18$. I can add the products of the smaller arrays to find the total for the entire array. $30 + 18 = 48$, so $8 \times 6 = 48$.

$8 \times 6 = 6 \times (5 +$ **3** $)$
$= (6 \times 5) + (6 \times$ **3** $)$
$= 30 +$ **18**
$=$ **48**

The equations show the same work that I just did with the array.

2. Break apart and distribute to solve $64 \div 8$.



I can use a number bond instead of an array to show how to break apart $64 \div 8$.

$64 \div 8 = (40 \div 8) + ($ **24** $\div 8)$

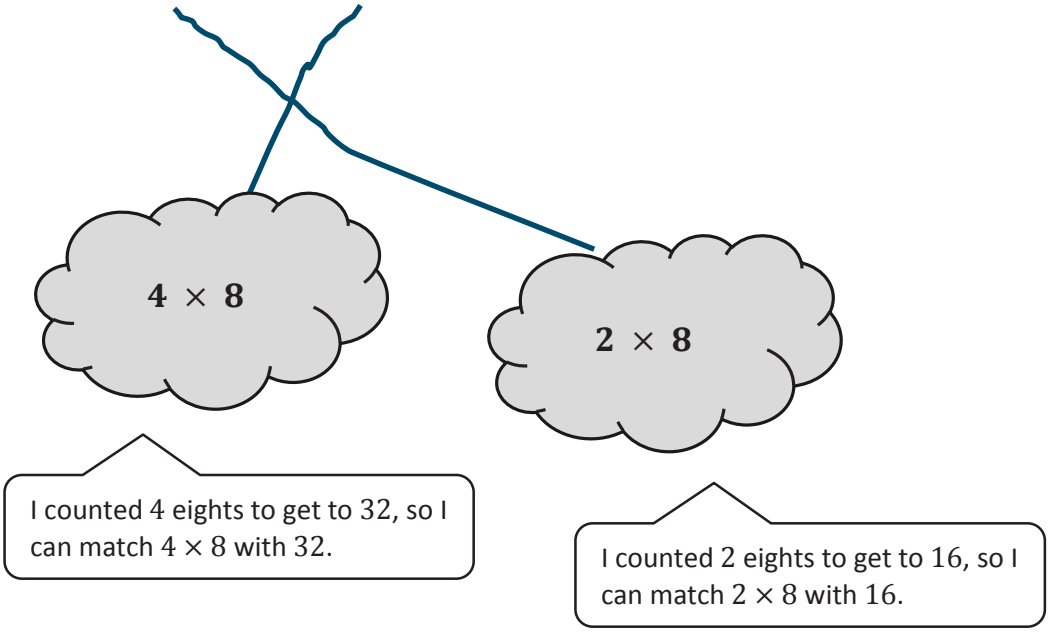
$= 5 +$ **3**

$=$ **8**

By breaking 64 apart as 40 and 24, I can solve the easier division facts $40 \div 8$ and $24 \div 8$. Then I can add the quotients to solve $64 \div 8$.

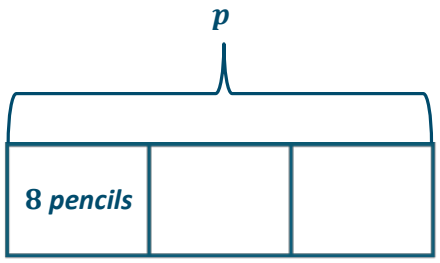
3. Count by 8. Then, match each multiplication problem with its value.

8 , 16 , 24 , 32 , 40



G3-M3-Lesson 11

1. There are 8 pencils in one box. Corey buys 3 boxes. He gives an equal number of pencils to 4 friends. How many pencils does each friend receive?

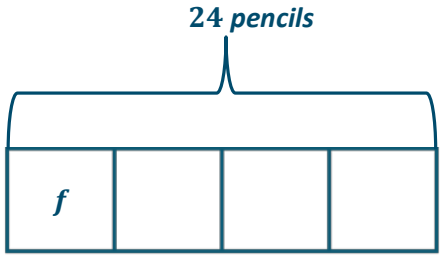


I can draw a tape diagram to help me solve. I know the number of groups is 3, and the size of each group is 8. I need to solve for the total number of pencils. I can use the letter p to represent the unknown.

$3 \times 8 = p$

$p = 24$

I can multiply 3×8 to find the total number of pencils Corey buys. Now I need to figure out how many pencils each friend gets.



I can draw a tape diagram with 4 units to represent the 4 friends. I know that the total is 24 pencils. I need to solve for the size of each group. I can use the letter f to represent the unknown.

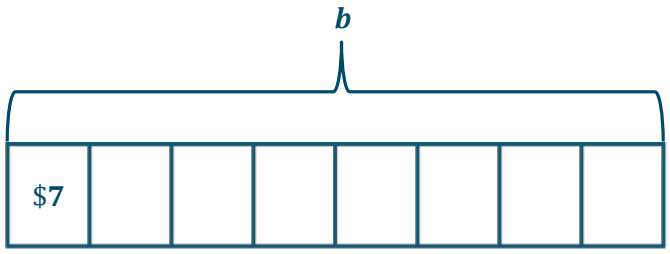
$24 \div 4 = f$

$f = 6$

I can divide 24 by 4 to find the number of pencils each friend gets.

Each friend receives 6 pencils.

2. Lilly makes $7 each hour she babysits. She babysits for 8 hours. Lilly uses her babysitting money to buy a toy. After buying the toy, she has $39 left. How much money did Lilly spend on the toy?



I can draw a tape diagram to help me solve. I know the number of groups is 8, and the size of each group is $7. I need to solve for the total amount of money. I can use the letter b to represent the unknown.

$8 \times \$7 = b$

$b = \$56$

I can multiply $8 \times \$7$ to find the total amount of money Lilly earns babysitting. Now I need to figure out how much money she spent on the toy.

I can draw a tape diagram with two parts and a total of $56. One part represents the amount of money Lilly has left, $39. The other part is the unknown and represents the amount of money Lilly spent on the toy. I can use the letter c to represent the unknown.

$\$56 - \$39 = c$

I can subtract $\$56 - \$39$ to find the amount of money Lilly spent on the toy.

$\$57 - \$40 = \$17$

$c = \$17$

I can use compensation to subtract using mental math. I do that by adding 1 to each number, which makes it easier for me to solve.

$$\begin{array}{r} {}^{4}\,{}^{16} \\ \$\ \cancel{5}\ \cancel{6} \\ -\$\ 3\ 9 \\ \hline \$\ 1\ 7 \end{array}$$

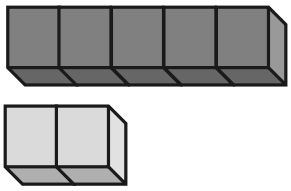
Or I can use the standard algorithm for subtraction.

Lilly spent $17 on the toy.

G3-M3-Lesson 12

1. Each  has a value of 9. Find the value of each row. Then, add the rows to find the total.

$7 \times 9 =$ **63**



$5 \times 9 = 45$

2 $\times 9 =$ **18**

I know each cube has a value of 9. The 2 rows of cubes show 7 nines broken up as 5 nines and 2 nines. It is the break apart and distribute strategy using the familiar fives fact.

$7 \times 9 = (5 +$ **2** $) \times 9$

$= (5 \times 9) +$ (**2** $\times 9)$

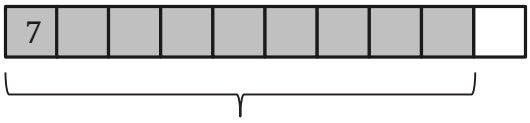
$= 45 +$ **18**

$=$ **63**

To add 45 and 18, I'll simplify by taking 2 from 45. I'll add the 2 to 18 to make 20. Then I can think of the problem as $43 + 20$.

2. Find the total value of the shaded blocks.

$9 \times 7 =$



This shows a different way to solve. I can think of 7 nines as 9 sevens. 9 is closer to 10 than it is to 5. So instead of using a fives fact, I can use a tens fact to solve. I take the product of 10 sevens and subtract 1 seven.

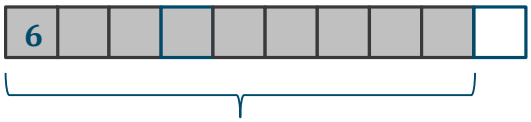
9 sevens = 10 sevens – 1 seven

$=$ **70** -7

$=$ **63**

This strategy made the math simpler and more efficient. I can do $70 - 7$ quickly in my head!

3. James buys a pack of baseball cards. He counts 9 rows of 6 cards. He thinks of 10 sixes to find the total number of cards. Show the strategy that James might have used to find the total number of baseball cards.



9 *sixes* $= 10$ *sixes* $- 1$ *six*

$= 60 - 6$

$= 54$

James bought 54 baseball cards.

James uses the tens fact to solve for the nines fact. To solve for 9 sixes, he starts with 10 sixes and subtracts 1 six.

G3-M3-Lesson 13

1. Complete to make true statements.

   a. 10 more than 0 is **10**,
   1 less is **9**.
   $1 \times 9 =$ **9**

   These statements show a simplifying strategy for skip-counting by nine. It's a pattern of adding 10 and then subtracting 1.

   b. 10 more than 9 is **19**,
   1 less is **18**.
   $2 \times 9 =$ **18**

   I notice another pattern! I compare the digits in the ones and tens places of the multiples. I can see that from one multiple to the next, the digit in the tens place increases by 1, and the digit in the ones place decreases by 1.

   c. 10 more than 18 is **28**,
   1 less is **27**.
   $3 \times 9 =$ **27**

2.

   a. Analyze the skip-counting strategy in Problem 1. What is the pattern?

   The pattern is add 10 and then subtract 1.

   To get a nines fact, you add 10 and then subtract 1.

   b. Use the pattern to find the next 2 facts. Show your work.

   $4 \times 9 =$ **36**

   $\mathbf{27 + 10 = 37}$
   $\mathbf{37 - 1 = 36}$
   $\mathbf{4 \times 9 = 36}$

   $5 \times 9 =$ **45**

   $\mathbf{36 + 10 = 46}$
   $\mathbf{46 - 1 = 45}$
   $\mathbf{5 \times 9 = 45}$

   I can check my answers by adding the digits of each multiple. I know that multiples of 9 I've learned have a sum of digits equal to 9. If the sum isn't equal to 9, I've made a mistake. I know 36 is correct because $3 + 6 = 9$. I know 45 is correct because $4 + 5 = 9$.

G3-M3-Lesson 14

1. Tracy figures out the answer to 7×9 by putting down her right index finger (shown). What is the answer? Explain how to use Tracy's finger strategy.

Tracy first lowers the finger that matches the number of nines, 7. She sees that there are 6 fingers to the left of the lowered finger, which is the digit in the tens place, and that there are 3 fingers to the right of the lowered finger, which is the digit in the ones place. So, Tracy's fingers show that the product of 7×9 is 63.

In order for this strategy to work, I have to imagine that my fingers are numbered 1 through 10, with my pinky on the left being number 1 and my pinky on the right being number 10.

2. Chris writes $54 = 9 \times 6$. Is he correct? Explain 3 strategies Chris can use to check his work.

Chris can use the $9 = 10 - 1$ strategy to check his answer.

$$\begin{aligned} 9 \times 6 &= (10 \times 6) - (1 \times 6) \\ &= 60 - 6 \\ &= 54 \end{aligned}$$

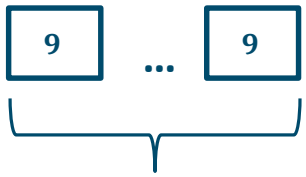
He can also check his answer by finding the sum of the digits in the product to see if it equals 9. Since $5 + 4 = 9$, his answer is correct.

A third strategy for checking his answer is to use the number of groups, 6, to find the digits in the tens place and ones place of the product. He can use $6 - 1 = 5$ to get the digit in the tens place, and $10 - 6 = 4$ to get the digit in the ones place. This strategy also shows that Chris's answer is correct.

Chris can also use the add 10, subtract 1 strategy to list all the nines facts, or he can use the break apart and distribute strategy with fives facts. For example, he can think of 9 sixes as 5 sixes + 4 sixes. There are many strategies and patterns that can help Chris check his work multiplying with nine.

G3-M3-Lesson 15

Judy wants to give each of her friends a bag of 9 marbles. She has a total of 54 marbles. She runs to give them to her friends and gets so excited that she drops and loses 2 bags. How many total marbles does she have left to give away?



54 marbles, n bags

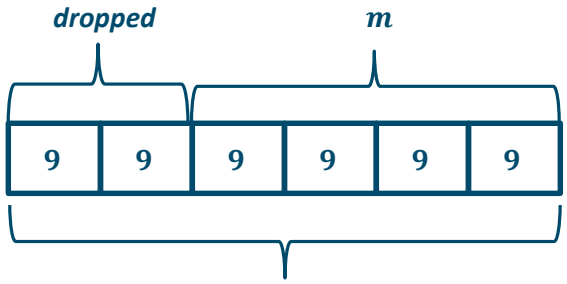
I can model the problem using a tape diagram. I know Judy has a total of 54 marbles, and each bag has 9 marbles. I don't know how many bags of marbles Judy has at first. Since I know the size of each group is 9 but I don't know the number of groups, I put a "..." in between the 2 units to show that I don't yet know how many groups, or units, to draw.

n represents the number of bags of marbles

$54 \div 9 = n$

$n = 6$

I can use the letter n to represent the unknown, which is the number of bags Judy has at first. I can find the unknown by dividing 54 by 9 to get 6 bags. But 6 bags does not answer the question, so my work on this problem is not finished.



54 marbles, 6 bags

Now I can redraw my model to show the 6 bags of marbles. I know that Judy drops and loses 2 bags. The unknown is the total number of marbles she has left to give away. I can represent this unknown with the letter m.

m represents the total number of marbles left

$4 \times 9 = m$

$m = 36$

Judy still has 36 marbles left to give away.

From my diagram, I can see that Judy has 4 bags of 9 marbles left. I can choose any of my nines strategies to help me solve 4×9. $4 \times 9 = 36$, which means there are 36 total marbles left.

I read the problem carefully and made sure to answer with the total number of marbles, not the number of bags. Putting my answer in a statement helps me check that I've answered the problem correctly.

G3-M3-Lesson 16

1. Let $g = 4$. Determine whether the equations are true or false.

a. $g \times 0 = 0$	***True***
b. $0 \div g = 4$	***False***
c. $1 \times g = 1$	***False***
d. $g \div 1 = 4$	***True***

I know this equation is false because 0 divided by any number is 0. If I put in any value for g other than 0, the answer will be 0.

I know this is false because any number times 1 equals that number, not 1. This equation would be correct if it was written as $1 \times g = 4$.

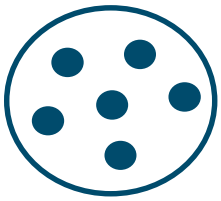
2. Elijah says that any number multiplied by 1 equals that number.

   a. Write a multiplication equation using c to represent Elijah's statement.

   $\mathbf{1 \times c = c}$

   I can also use the commutative property to write my equation as $c \times 1 = c$.

   b. Using your equation from part (a), let $c = 6$, and draw a picture to show that the new equation is true.



My picture shows 1 group multiplied by c, or 6. 1 group of 6 makes a total of 6. This works for any value, not just 6.

G3-M3-Lesson 17

1. Explain how $8 \times 7 = (5 \times 7) + (3 \times 7)$ is shown in the multiplication table.

   The multiplication table shows $5 \times 7 = 35$ and $3 \times 7 = 21$. So, $35 + 21 = 56$, which is the product of 8×7.

   This is the break apart and distribute strategy. Using that strategy, I can add the products of 2 smaller facts to find the product of a larger fact.

2. Use what you know to find the product of 3×16.

   $$\begin{aligned} 3 \times 16 &= (3 \times 8) + (3 \times 8) \\ &= 24 + 24 \\ &= 48 \end{aligned}$$

   I can also break up 3×16 as 10 threes + 6 threes, which is $30 + 18$. Or I can add 16 three times: $16 + 16 + 16$. I always want to use the most efficient strategy. This time it helped me to see the problem as double 24.

3. Today in class we found that $n \times n$ is the sum of the first n odd numbers. Use this pattern to find the value of n for each equation below.

   a. $1 + 3 + 5 = n \times n$

      $9 = 3 \times 3$

   b. $1 + 3 + 5 + 7 = n \times n$

      $16 = 4 \times 4$

      The sum of the first 3 odd numbers is the same as the product of 3×3. The sum of the first 4 odd numbers is the same as the product of 4×4. The sum of the first 5 odd numbers is the same as the product of 5×5.

   c. $1 + 3 + 5 + 7 + 9 = n \times n$

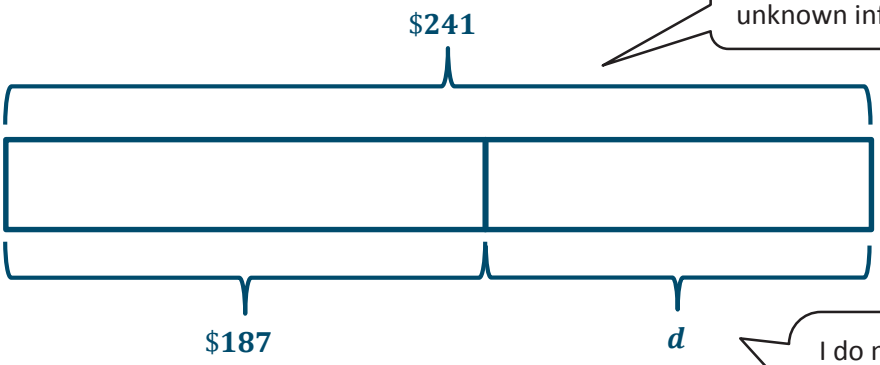
      $25 = 5 \times 5$

      Wow, it's a pattern! I know that the first 6 odd numbers will be the same as the product of 6×6 and so on.

G3-M3-Lesson 18

William has $\$187$ in the bank. He saves the same amount of money each week for 6 weeks and puts it in the bank. Now William has $\$241$ in the bank. How much money does William save each week?

I can draw a model to show the known and unknown information.



I do not know the amount of money William puts in the bank. I will label this unknown on my model using the letter d for dollars.

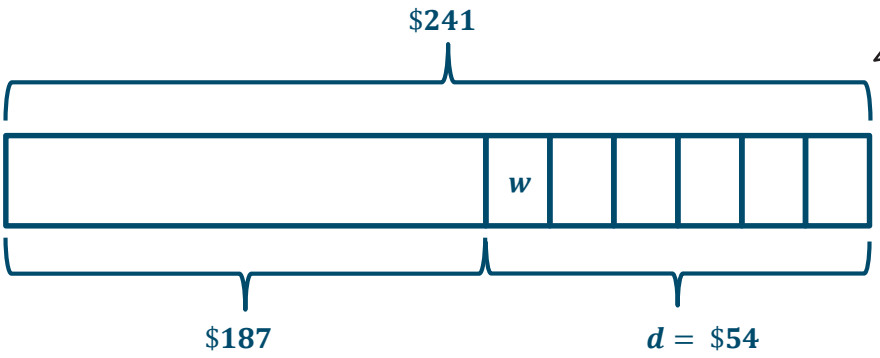
d represents the number of dollars William puts in the bank

$\$241 - \$187 = d$

$d = \$54$

I can write what d represents and then write an equation to solve for d. I can subtract the known part, $\$187$, from the whole amount, $\$241$, to find d.

This answer is reasonable because $\$187 + \$54 = \$241$. But it does not answer the question the problem asks. I'm trying to figure out how much money William saves each week, so I need to adjust my model.



I can split the $54 into 6 equal parts to show the 6 weeks. I label the unknown w to represent how much money William saves each week.

w represents the number of dollars saved each week

$\$54 \div 6 = w$

$w = \$9$

I will write what w represents and then write an equation to solve for w. I can divide $54 by 6 to get $9.

William saves $9 each week.

My answer is reasonable because $9 a week for 6 weeks is $54. That's about $50. $187 is about $190. $190 + $50 = $240, which is very close to $241. My estimate is only $1 less than my answer!

I can explain why my answer is reasonable by estimating.

G3-M3-Lesson 19

1. Use the disks to fill in the blanks in the equations.

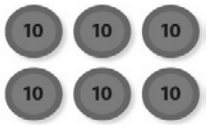
This array of disks shows 2 rows of 3 ones.

a. 

2×3 ones = ___6___ ones

$2 \times 3 =$ ___6___

This array of disks shows 2 rows of 3 tens.

b. 

2×3 tens = ___6___ tens

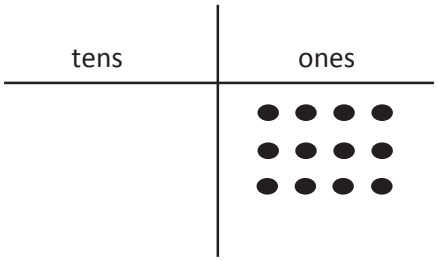
$2 \times 30 =$ ___60___

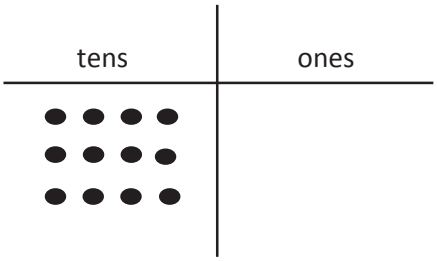
The top equations are written in unit form. The bottom equations are written in standard form. The 2 equations say the same thing.

I see that both arrays have the same number of disks. The only difference is the unit. The array on the left uses ones, and the array on the right uses tens.

I see that the difference between Problems 1 and 2 is the model. Problem 1 uses place value disks. Problem 2 uses the chip model. With both models, I'm still multiplying ones and tens.

2. Use the chart to complete the blanks in the equations.





a. 3×4 ones = __12__ ones

3×4 = __12__

b. 3×4 tens = __12__ tens

3×40 = __120__

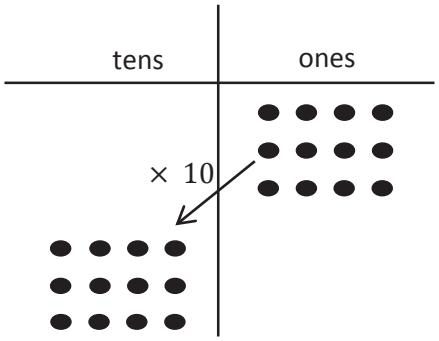
I notice the number of dots is exactly the same in both charts. The difference between the charts is that when the units change from ones to tens, the dots shift over to the tens place.

3. Match.

In order to solve a more complicated problem like this one, I can first think of it as 8 ones × 2, which is 16. Then all I need to do is move the answer over to the tens place so it becomes 16 tens. 16 tens is the same as 160.

G3-M3-Lesson 20

1. Use the chart to complete the equations. Then solve.

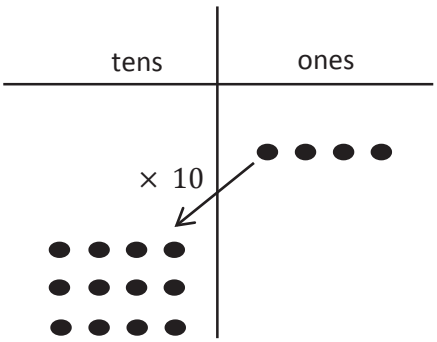


I know that parentheses change the way numbers are grouped for solving. I can see that the parentheses group 3×4 ones, so I'll do that part of the equation first. 3×4 ones $= 12$ ones. Next I'll multiply the 12 ones by 10. The equation becomes $12 \times 10 = 120$. The chip model shows how I can multiply the 3 groups of 4 ones by 10.

a. $(3 \times 4) \times 10$

$= (12 \text{ ones}) \times 10$

$= \underline{\mathbf{120}}$



I can see that here the parentheses move over and group the 4 ones × 10. I'll solve that first to get 40, or 4 tens. Then I can multiply the 4 tens by 3. So the equation becomes $3 \times 40 = 120$. The chip model shows how I multiply 4 ones by 10 first and then multiply the 4 tens by three.

b. $3 \times (4 \times 10)$

$= 3 \times (4 \text{ tens})$

$= \underline{\mathbf{120}}$

By moving the parentheses over and grouping the numbers differently, this problem becomes friendlier. 3×40 is a little easier than multiplying 12×10. This new strategy will me help find larger unknown facts later on.

2. John solves 30×3 by thinking about 10×9. Explain his strategy.

$$\begin{aligned} 30 \times 3 &= (10 \times 3) \times 3 \\ &= 10 \times (3 \times 3) \\ &= 10 \times 9 \\ &= 90 \end{aligned}$$

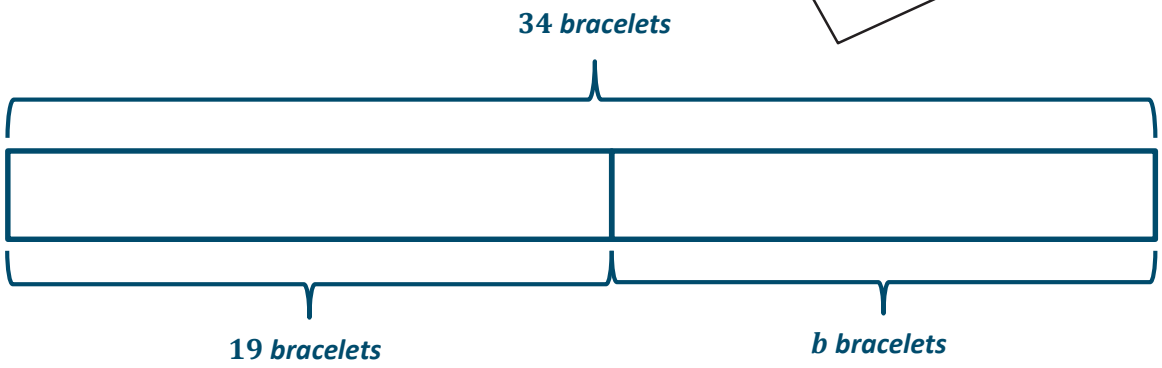
John writes 30×3 as $(10 \times 3) \times 3$. Then he moves the parentheses over to group 3×3. Solving 3×3 first makes the problem easier. Instead of 30×3, John can solve by thinking of an easier fact, 10×9.

Although it is easy to solve for 30×3, John moves the parentheses over and groups the numbers differently to make the problem a little friendlier for him. It's just another way to think about the problem.

G3-M3-Lesson 21

Jen makes 34 bracelets. She gives 19 bracelets away as gifts and sells the rest for $3 each. She would like to buy an art set that costs $55 with the money she earns. Does she have enough money to buy it? Explain why or why not.

I can draw a model to show the known and unknown information. I can see from my drawing that I need to find a missing part. I can label my missing part with a b to represent the number of bracelets Jen has left to sell.



***b* represents the number of bracelets Jen has left to sell**

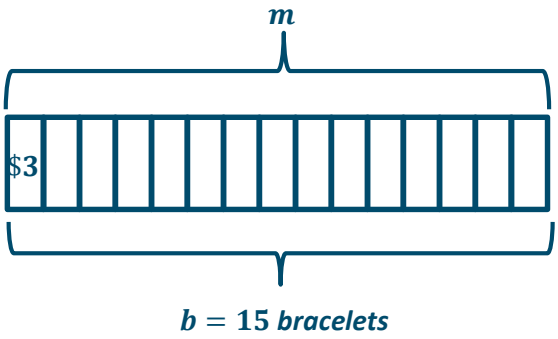
$34 - 19 = b$

$b = 15$

I can write what b represents and then write an equation to solve for b. I subtract the given part, 19, from the whole amount, 34. I can use a compensation strategy to think of $34 - 19$ as $35 - 20$ because $35 - 20$ is an easier fact to solve. Jen has 15 bracelets left.

This answer is reasonable because $19 + 15 = 34$. But it doesn't answer the question in the problem. Next, I have to figure out how much money Jen earns from selling the 15 bracelets, so I need to adjust my model.

Now that I know Jen has 15 bracelets left, I can split this part into 15 smaller equal parts. I know that she sells each bracelet for $3, so each part has a value of $3. I can also label the unknown as m to represent how much money Jen earns in total.



m represents the amount of money Jen earns

$$15 \times 3 = m$$
$$m = (10 \times 3) + (5 \times 3)$$
$$m = 30 + 15$$
$$m = 45$$

I can write what m represents and then write an equation to solve for m. I need to multiply 15 by 3, a large fact! I can use the break apart and distribute strategy to solve for 15×3. I can break up 15 threes as 10 threes and 5 threes and then find the sum of the 2 smaller facts.

Jen earns a total of $45 from selling 15 bracelets.

Jen does not have enough money to buy the art set. She is $10 short.

I am not finished answering the question until I explain why Jen does not have enough money to buy the art set.