MA.4.AR.1.1

Overarching Standard: ***MA.4.AR.1*** Represent and solve problems involving the four operations with whole numbers and fractions.

Benchmark of Focus

MA.4.AR.1.1: Solve real-world problems involving multiplication and division of whole numbers including problems in which remainders must be interpreted within the context.

Examples: A group of 243 students is taking a field trip and traveling in vans. If each van can hold 8 students, then the group would need 31 vans for their field trip because 243 divided by 8 gives 30 with a remainder of 3.

Benchmark Clarifications

Clarification 1: Problems involving multiplication include multiplicative comparisons. Refer to Situations Involving Operations with Numbers (Appendix A).

Clarification 2: Depending on the context, the solution of a division problem with a remainder may be the whole number part of the quotient, the whole number part of the quotient with the remainder, the whole number part of the quotient plus 1, or the remainder.

Clarification 3: Multiplication is limited to products of up to 3 digits by 2 digits. Division is limited to up to 4 digits divided by 1 digit.

Related Benchmark/Horizontal Alignment

- MA.4.NSO.2.2/2.3/2.4/2.5
- MA.4.M.1.2
- MA.4.M.2.1
- MA.4.GR.1.3
- MA.4.GR.2.1/2.2

Vertical Alignment

Previous Benchmarks	Next Benchmarks
MA.3.AR.1.2	MA.5.AR.1.1

Terms from the K-12 Glossary

- Equation
- Expression

Purpose and Instructional Strategies

The purpose of this benchmark is to have students to solve problems involving multiplication and division by using and discussing various approaches. This work builds on problem solvingusing the four operations from Grade 3 (MA.3.AR.1.2).

- Students should use estimation, and this can include using compatible numbers(numbers that sum to 10 or 100) and rounding.
- Instruction should include allowing students many opportunities to solve multiplicative

comparison situations.

- Students should have experience solving problems that require students to interpret the remainder to fit the situation. Students may have to round up to the next whole number, drop the remainder, use the remainder as a fraction or decimal, or use only the remainder as determined.
    - Add 1 to the quotient
        - Thirty students are going on a field trip. They want to put 4 people in each car so that people can sit comfortably. How many cars will be needed?
        - Solution: Divide 30 by 4. The answer is 7 r2.
        - The answer shows that 7 cars will be needed, but 2 people still need to go to a car.
        - Therefore, they will need 8 cars.
    - Use only the remainder
        - Gerardo has 19 dollars in his pocket. He wants to give the same amount of money to 4 friends. The rest of the money, if any, will go to his sister to buy toys. How much money will go to his sister if Gerardo wants to give away everything he has?
        - Solution: Divide 19 by 4. The answer is 4 r3.
        - The remainder is 3, so 3 dollars will go to his sister.
    - Drop the remainder
        - Alicia has 48 dollars in her pocket. She wants to buy meals for 5 friends. If each meal costs 10 dollars, will Darlene be able to keep all her friends happy?
        - Solution: Divide 48 by 10. The answer is 4 r8.
        - Alicia can only buy 4 complete meals. Therefore, she cannot buy one for each of her 5 friends.

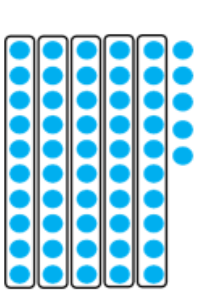
Common Misconceptions or Errors

- Students apply a procedure that results in remainders that are expressed as *r* for all situations, even for those in which the result does not make sense. For example, when a student is asked to solve the following problem, the student responds to the problem— there are 52 students in a class field trip. They plan to have 10 students in each van. How many vans will they need so that everyone can participate? And the student answers "5*r*2 vans." The student does not understand that the two remaining students need another van to go on the field trip.
- Students may not understand that the remainder represents a portion of something, rather than a whole number. Referring back to the previous example students may think *r*2 means two additional vans rather than a portion of an additional van.
- Students may have trouble seeing a remainder as a fraction. For example, $7 \div 3 = 2r1$ means that $7 \div 3 = 2\frac{1}{3}$. If 7 cupcakes are divided among 3 people, then each person will get 2 and $\frac{1}{3}$ cupcakes.

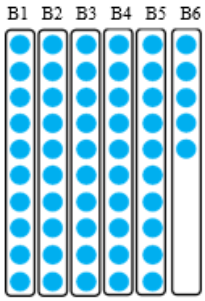
Strategies to Support Tiered Instruction

- Instruction includes opportunities to engage in guided practice completing real-world problems involving remainders. Students use models to understand how to interpret the remainder in situations in which they will need to "add 1 to the quotient," "use only the remainder," "drop the remainder" or "treat the remainder as a fraction."
    - For example, the teacher displays and read the following problem aloud: "There are 55 pencils that need to be sorted into boxes. 10 pencils can go into each box. How many boxes are needed so all the pencils can be put into boxes?" The teacher uses models or drawings to represent the problem and guided questioning to encourage students to identify that

they will need to add one to the quotient as their solution. If students state that they will need 5r5 boxes, the teacher refers to the models to prompt students that a sixth box is needed for the remaining five pencils. If students state that they will need 5 more boxes since the remainder is 5, the teacher reminds students through guided questioning that the remainder of 5 represents 5 remaining pencils and only 1 more box is needed (i.e., "add 1 to the quotient"). This is repeated with similar real-world problems.

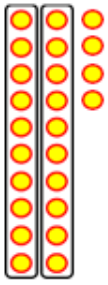


5r5

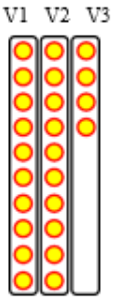


6 boxes are needed (B=box)

- Instruction includes opportunities to complete real-world problems involving remainders using manipulatives. Students use hands-on models to interpret the remainder in situations in which they will need to "add 1 to the quotient," "use only the remainder," "drop the remainder" or "treat the remainder as a fraction."
    - For example, the teacher displays and reads the following problem aloud: "There are 24 students in a class field trip. They plan to have 10 students in each van. How many vans will they need so that everyone can participate?" The teacher has students use counters or base-ten blocks to build a model of the problem and guided questioning to encourage students to identify that they will need to add 1 to the quotient as their solution. If students state that they will need 2r4 vans, the teacher refers to the models to prompt students that a third van is needed for the remaining four students. If students state that they will need 4 more vans since the remainder is 4, the teacher reminds students through guided questioning that the remainder of 4 represents 4 remaining students and only 1 more van is needed (i.e., "add 1 to the quotient"). This is repeated with similar real-world problems.



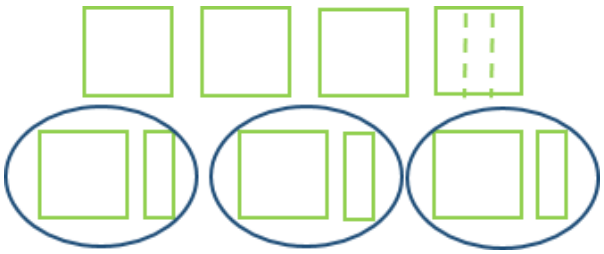
2r4



3 vans are needed so everyone can participate (v=van)

- Instruction includes opportunities to complete real-world problems involving remainders using pictorial representations to understand what the remainder is, including interpreting the remainder as a fraction.

- For example, the teacher displays and reads the following problem aloud: "Karly, Juan and Li share 4 cookies equally. How many cookies can each person eat?" The teacher uses drawings to represent the problem and guided questioning to encourage students to identify that Karly, Juan and Li are able to eat 1 whole cookie but then must split the 4th cookie into thirds so that they can each eat $1\frac{1}{3}$cookies, therefore 4 ÷ 3 = $1\frac{1}{3}$. This is repeated with similar real-world problems.



Questions to ask students:

- **(Sample problem: Lance bought a package of 26 batteries. Each remote-controlled race car takes 4 batteries.) How many race cars can be completely filled with batteries?**
- Sample answer that indicates understanding: Student uses manipulatives to solve 26 divided by 4 equals 6 with 2 batteries left over. There are 6 cars that are completely filled with batteries.

- **How many batteries are in the last car?**
- Sample answer that indicates understanding: Student uses manipulatives to solve 26 divided by 4 equals 6 with 2 batteries left over. There are 2 batteries in the last car.

- **How many race cars will have batteries?**
- Sample answer that indicates understanding: Student uses manipulatives to solve 26 divided by 4 equals 6 with 2 batteries left over. There are 7 cars with batteries.

- **How many more batteries are needed to complete the last race car?**
- Sample answer that indicates understanding: Student uses manipulatives to solve 26 divided by 4 equals 6 with 2 batteries left over. 2 more batteries are needed to complete the last race car.

Instructional Tasks

Instructional Task 1

Write an example of a word problem that will require the person solving the problem to "Add 1 to the quotient" as their solution.

Instructional Task 2

Write an example of a word problem that will require the person solving the problem to "Use only the remainder" as their solution.

Instructional Task 3

Write an example of a word problem that will require the person solving the problem to "Drop the remainder" as their solution.

Instructional Items

Instructional Item 1

Sam has $50 to spend on video games. He buys one video game for $26. With the money he has left over, how many $9 games can Sam buy?

a. 2 games
b. 3 games
c. 5 games
d. 6 games

Achievement Level Descriptors

Benchmark	Context	Assessment Limits
MA.4.AR.1.1 Solve real-world problems involving multiplication and division of whole numbers including problems in which remainders must be interpreted within the context. Example: A group of 243 students is taking a field trip and traveling in vans. If each van can hold 8 students, then the group would need 31 vans for their field trip because 243 divided by 8 equals 30 with a remainder of 3. Clarification 1: Problems involving multiplication include multiplicative comparisons. Refer to Situations Involving Operations with Numbers (Appendix A). Clarification 2: Depending on the context, the solution of a division problem with a remainder may be the whole number part of the quotient, the whole number part of the quotient with the remainder, the whole number part of the quotient plus 1, or the remainder. Clarification 3: Multiplication is limited to products of up to 3 digits by 2 digits. Division is limited to up to 4 digits divided by 1 digit.	Real-World	Multiplication will not include only factors within 12 and related division facts. Items are limited to one procedural step.

ALD 2	ALD 3	ALD 4	ALD 5
solves real-world problems involving multiplication of whole numbers up to three digits by two digits and related division factors.	solves real-world problems involving multiplication of whole numbers up to three digits by two digits and division of whole numbers up to three digits by one digit without remainders.	solves real-world problems involving multiplication and division of whole numbers, including problems in which remainders must be interpreted within the context.	identifies an error and solves real-world problems involving multiplication and division of whole numbers, including problems in which remainders must be interpreted within the context.

Additional Resources:

CPALMS Resources: https://www.cpalms.org/PreviewStandard/Preview/15361

Khan Academy: Intro to Remainders: https://goo.gl/udhZ2B

Resources/Tasks to Support Your Child at Home:
Use a story scenario with different questions to explore all the ways to interpret a remainder.

- How many complete sets?
- How many are in the last set?
- How many sets are there?
- How many more to make the last set complete?

Discuss similarities and differences of solutions. Encourage your child to draw models to show their thinking.