

## Grade 4: Number Stories

Number Stories is a lesson structure in the Success Academy conceptual math curriculum. It is based on the [Cognitively Guided Instruction](#) model. Number Stories teaches students to unpack and solve complex, unfamiliar problems to develop mathematical thinking and problem-solving skills, explain their thinking and construct mathematical arguments, build an understanding of grade-level conjectures and concepts, and apply concepts, strategies, and models learned in math and mini-lessons to novel contexts.

In Grade 4, students encounter a variety of problem types during Number Stories. The Number Stories block happens 2-3 times per week for approximately 40 minutes.

- **Prove it!**: These problems present students with a statement they must agree or disagree with and then they work to support their mathematical conclusions with a poster presentation.
- **Math Puzzles**: Students explore and solve engaging mathematical puzzles.
- **Design the Question**: When faced with these problems, students write a story that matches a given equation or model.
- **Challenge Problems**: These complex problems give students additional opportunities to practice and reinforce mathematical thinking.

### **Prove It!**

**1** Prove it! The idea that scholars will agree or disagree with is, "To multiply a whole number by ten, you can simply put a zero at the end of the original number, and you'll have the product."

**2** Prove it!" The idea that scholars will agree or disagree with is, "There are zero hundreds in 2032."

**3** Prove it! The idea that scholars will agree or disagree with is, "I would rather have a million pennies than a hundred hundred-dollar bills."

**4** Prove it! The idea that scholars will agree or disagree with is, "The number 1 is both a prime number and a square number."

- 1 is technically a square number. It's neither prime nor composite.

**5** Prove it! The idea that scholars will agree or disagree with is, " $45 + 16$  is the same as  $40 + 10$  plus  $5 + 6$ . So,  $45 \times 16$  is the same as  $40 \times 10$  plus  $5 \times 6$ ."

**6** Prove it! The idea that scholars will agree or disagree with is, "The perimeter of a square with whole-number side lengths is always a composite number."

- This idea is true. We can find the perimeter of a square by multiplying the side length by 4. So, the perimeter is divisible by 4, making it a composite number.

**7** Prove it! The idea that scholars will agree or disagree with is, "If we compare two fractions, the one with the smaller denominator is a bigger fraction."

- Scholars must not overgeneralize this idea that they developed in Grade 3! Scholars must recognize that this only holds true if the numerators are the same.

## Math Puzzles

**8** The puzzle that scholars will solve is: "Tom asked his granny how old she was. She told him: "I have 6 children and there are 4 years between each one and the next. I had my first child when I was 19. Now the youngest one is 19 herself. That's all I'm telling you!" How old is Tom's granny?"

- Solution: She is 58 years old.

**9** The puzzle that scholars will solve is: "Yolanda is twice as old as Zachary was when Yolanda was Zachary's age. When Zachary is as old as Yolanda is now, the sum of their ages will be 63. How old are Yolanda and Zachary?"

- Solution: Yolanda is 28 and Zachary is 21.

**10** The puzzle that scholars will solve is: "Mrs. Mess went grocery shopping. The bill was seventy dollars. She gave the cashier what she thought were two \$50 bills, but accidentally gave him two \$100 bills. The cashier was sleepy and didn't notice, so he gave Mrs. Mess what he thought were three \$10 bills, but accidentally gave her three \$50 bills. Who ended up better off than they should?"

- Solution: Mrs. Mess ended up better off than she should: she paid \$200 (2x100) and got back \$150 (3x50), so she only paid \$50 (200-150) instead of \$70.

**11** The puzzle that scholars will solve is: "A 5-digit number has the sum of all five digits equal to 5."

- The digit in the ten thousands place is equal to the number of zeros in the number.
- The digit in the thousands place is equal to the number of ones in the number.
- The digit in the hundreds place is equal to the number of twos in the number.
- The digit in the tens place is equal to the number of threes in the number.
- The digit in the ones place is equal to the number of fours in the number.
- What is the number?

- Solution: 21,200

**12** The puzzle that scholars will solve is: "A bridge will collapse in 17 minutes. 4 people (A, B, C, and D) want to cross it before it collapses. Only 2 people can cross the bridge at a time. They must cross with a flashlight, but they only have one flashlight among the 4 of them. The fastest each person can cross the bridge is shown in the table below."

Person	Time to Cross (min.)
A	1
B	2
C	5
D	10

How do they all cross before the bridge collapses?

- Solution: There are two ways to solve this puzzle:
  1. A & B cross together (2 minutes)
  2. A comes back with flashlight (2+1=3 mins)
  3. C & D cross together (3+10=13 mins)
  4. B comes back with flashlight (13+2=15 mins)
  5. A & B cross together (15+2=17 mins)

**OR**

  1. A & B cross together (2 minutes)
  2. B comes back with flashlight (2+2=4 mins)
  3. C & D cross together (4+10=14 mins)
  4. A comes back with flashlight (14+1=15 mins)
  5. A & B cross together (15+2=17 mins)

**13** The puzzle that scholars will solve is: " You have a 3-gallon jug and a 5-gallon jug. You need to measure out exactly 7 gallons of water. How can you do it?"

- Solution: Fill the 5-gallon jug, then pour it into the 3-gallon jug until the 3 gallon is full. This leaves 2 gallons in the 5-gallon jug. Now pour the 3-gallon jug out. Pour the remaining 2 gallons from the 5 gallon into the empty 3-gallon jug. Now fill the 5 gallon jug. You now have exactly 7 gallons.

## Design the Question

**14** The equation that scholars will design a question for is:  $3,000 - (4 \times 608) = n$ .

**15** The equation that scholars will design a question for is:  $(5 \times 178) + (9 \times n) = 989$ .

**16** The equation that scholars will design a question for is:  $n = (20,000 - 14,736) \div 8$

## Problems

**17** Mamadou has a collection of 413 blue marbles and 598 red marbles. How many marbles does he have?

- Type: PPW-WU
- Answer: 1,011 marbles
- Equation to Match the Story:  $413 + 598 = n$

**18** The koala is 72 centimeters tall. The zebra is three times as tall as the koala. The elephant is four times as tall as the zebra. How tall is the elephant?

- Type: M, M
- Answer: 864 centimeters
- Equation to Match the Story:  $72 \times 3 \times 4 = n$

**19** Francesca is trying to earn \$48 to buy her school uniform this year. The chart below shows how much money Francesca earns per hour doing jobs for her neighbors.

Job	Money per Hour
Mowing lawns	\$4
Babysitting	\$3
Shoveling driveways	\$4
Walking dogs	\$2

Francesca spent three hours walking dogs last weekend and wants to earn money babysitting next weekend. How many hours will she need to babysit to have enough money to buy her school uniform?

- Type: M, JCU, MD
- Answer: 14 hours
- Equation to Match the Story:  $(3 \times 2) + (n \times 3) = 48$

**20** Caleb usually eats  $1\frac{1}{4}$  waffles for breakfast. At a special brunch one day, Caleb and seven friends share twelve waffles so that each child gets exactly the same amount. At the special brunch, does Caleb eat more or less waffle than usual?

- Type: PD-ES, Compare
- Answer: More
- Number Sentence to Match the Story:  $8 \times n = 12$

**21** The capacities of different ships are shown in the table below.

Ship Type	Capacity
Small Ship	463
Cargo Ship	8,583

Cruise Ship	?
Battleship ok	17,402

A cruise ship can hold five times as many passengers as a small ship. All ships are required to have one lifeboat for every ten passengers. How many lifeboats does the cruise ship need?

- Type: M, MD (remainder)
- Answer: 232 lifeboats
- Number Sentence to Match the Story:  $(5 \times 463) / 10 = n$

**22** The designers of a playground want to build a 36 square foot sandbox. They want the sandbox to be a rectangle with whole number side lengths. What are all the different dimensions the sandbox could have?

- Type: D (factor pairs)
- Answer: Lists all factor pairs of 36
- Number Sentence to Match the Story:  $n \times m = 36$ ; Scholars are NOT expected to write this equation.

**23** A soccer team raised \$361 in September. The team raised twice as much in October as September. With the money raised in September and October, the team will purchase new soccer balls. Each ball costs \$10. How many soccer balls can the team buy?

- Type: JRU, M, MD (Remainder)
- Answer: 108 soccer balls
- Equation to Match the Story:  $(361 + 2 \times 361) / 10 = n$

**24** Baldwin High School and Angelou High School each have four grades. Baldwin High School has 978 scholars in each grade. Angelou High School has 1,372 scholars in each grade. How many more scholars attend Angelou High School than Baldwin High School?

- Type: M, M, CDU
- Answer: 1,576 more students
- Equation to Match the Story:  $(4 \times 1,372) - (4 \times 978) = n$

**25** A dog park is shaped like a regular hexagon. Each side measures 19 feet. Marcus is responsible for putting new fencing around the dog park. Fencing costs \$10 per foot. Marcus also needs to pay \$10,294 in labor and delivery costs. What is the total cost of fencing the dog park?

- Type: M, PPW-WU
- Answer: \$11,434
- Equation to Match the Story:  $(6 \times 19 \times 10) + 10,294 = n$

**26** Sylvia is making a quilt by sewing together squares of fabric. She has 64 squares, and is going to sew them together in an array. What are all the different ways she could arrange the fabric squares?

- Type: D (factor pairs)
- Answer: lists all factor pairs of 64
- Equation to Match the Story:  $n \times m = 64$ ; Scholars are NOT expected to write this equation.

**27** Mr. Carlton had three boxes with 289 prizes in each. During the school day, he visited 15 classrooms and gave out 23 prizes in each classroom. How many prizes does he have left?

- Type: M, M, SRU
- Answer: 522 prizes
- Equation to Match the Story:  $(3 \times 289) - (15 \times 23) = n$

## Challenge Problems

**28** Challenge Problem: Brandon wants to go on a trip that will cost \$3,175. He will use \$2,815 from his savings, and will earn the rest of the money by tutoring younger children. He earns \$20 per hour for tutoring. How many hours will Brandon need to tutor in order to afford the trip?

- Type: JCU, MD
- Answer: 18 hours
- Number Sentence to Match the Story:  $2,815 + (n \times 20) = 3,175$

**29** Challenge Problem: The table below shows the items the hardware store has on its shelves.

Item	Amount
Round-head Screws	1,234
Flat-head Screws	10,089
Bolts	986

How many more screws are there than bolts? What is your answer rounded to the nearest ten?

- Type: CDU, PPW-WU
- Answer: 10,337 more screws; 10,340
- Equation to Match the Story:  $(1,234 + 10,089) - 986 = n$

**30** Challenge Problem: A zoo is planning to construct a building for a new exhibit. The exhibit will include 586 moths and 1,798 butterflies. One hundred insects can fit in each room. How many rooms should be in the building?

- Type: PPW-WU, MD (Remainder)
- Answer: 24 rooms
- Equation to Match the Story:  $(586 + 1,798) / 100 = n$

**31** Challenge Problem: On Saturday, a baker baked 12 cakes. That was six times as many cakes as he baked on Sunday. The baker used  $\frac{3}{4}$  cup of oil for each cake. How much oil did the baker use over the weekend?

- Type: PD, JRU, M-MG
- Answer:  $10 \frac{1}{2}$  cups of oil
- Equation to Match the Story:  $(12 + 12/6) \times \frac{3}{4} = n$ ; Scholars are NOT expected to write this equation.

**32** Challenge Problem: Lyzzah earned \$392 from her summer job. Asher earned four times as much as Lyzzah. Meanwhile, Mamadou worked for 23 hours and earned eighteen dollars per hour. How much more did Asher earn than Mamadou?

- Type: M, M, CDU
- Answer: \$1,154
- Equation to Match the Story:  $(392 \times 4) - (23 \times 18) = n$

**33** Challenge Problem: The table below shows the number of school supplies Mr. Gonzalez has.

Supply	Glue Sticks	Staplers	Pencils	Markers	Pens
Amount	9,488	2,103	7,185	4,512	5,311

First, he divides the pencils equally between the five grades in his school. Then, he divides the first grade pencils equally among the three first grade classrooms. How many pencils does each first grade classroom get?

- Type: PD, PD
- Answer: 479 pencils
- Equation to Match the Story:  $7,185 / 5 / 3 = n$

**33** Challenge Problem: There were 3,529 people at a play. Of those people, 1,364 were children and the rest were adults. The adults were distributed evenly throughout five different seating sections. How many adults were seated in each section?

- Type: PPW-PU, PD
- Answer: 433 adults
- Number Sentence to Match the Story:  $(5 \times n) + 1364 = 3529$

**35** Challenge Problem: Hannah bought 3 boxes of strawberries with the same number of strawberries in each box. She and her friends ate 74 strawberries. Now there are 37 strawberries left. How many strawberries were in each box that Hannah bought?

- Type: SSU, PD
- Answer: 37 strawberries
- Equation to Match the Story:  $3 \times n - 74 = 37$

**36** Challenge Problem: Briyana is preparing brunch for her cousins and siblings. She baked 4 doughnuts, exactly enough for each of her cousins and siblings to eat half a doughnut. She has 5 cousins. How many siblings does she have?

- Type: PPW-WU, MD-MG
- Answer: 3 siblings
- Equation to Match the Story:  $(5 + n) \times 1/2 = 4$

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