Growing Staircases

A. This is a staircase that goes up three steps.
How many blocks are needed for the first step?

How many blocks are needed for the second step?

How many blocks are needed for the third step?
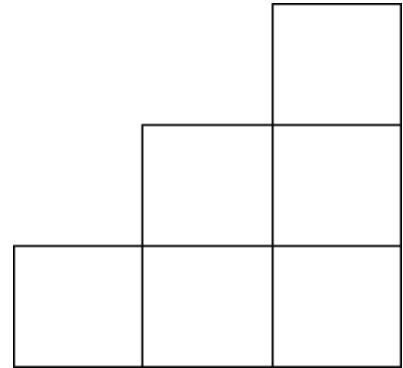
How many blocks in all are needed to make this staircase of three steps? Explain how you know.

Draw the blocks in the diagram to make the fourth step.

How many blocks in all are needed to make a staircase with five steps?

How many blocks does it take to build just the twelfth step?

How many blocks in all are needed to make a staircase of ten steps?

A staircase has 105 blocks. How many stairs does it have?
Explain your answers.

B. How many blocks are needed to make just the one hundredth step? Explain how you know.
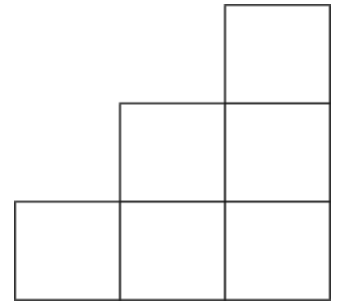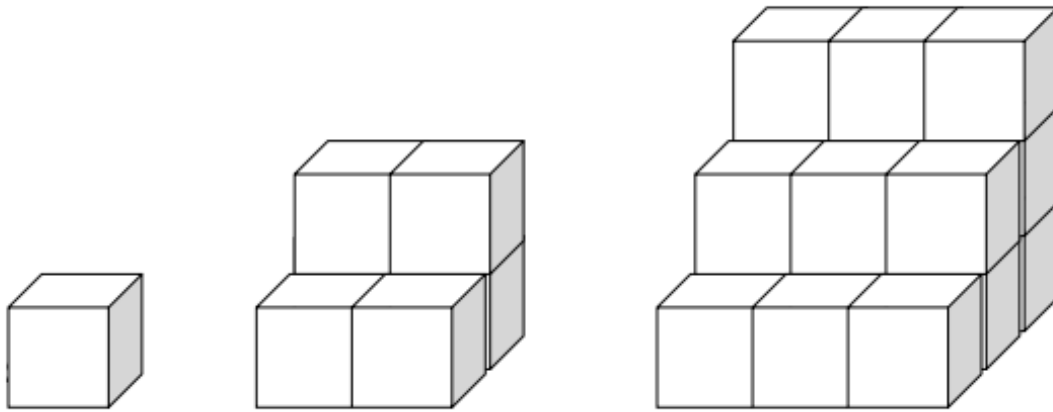

Write a rule to find the number of blocks needed for the nth step. Explain your rule.

Write a rule to find the total number of blocks needed to make a staircase with n number of steps. Explain your rule.

Write a rule that, given y number of blocks, you can use to determine how many steps are in the staircase. Explain your rule.

C. This set of staircases grows at a different rate.

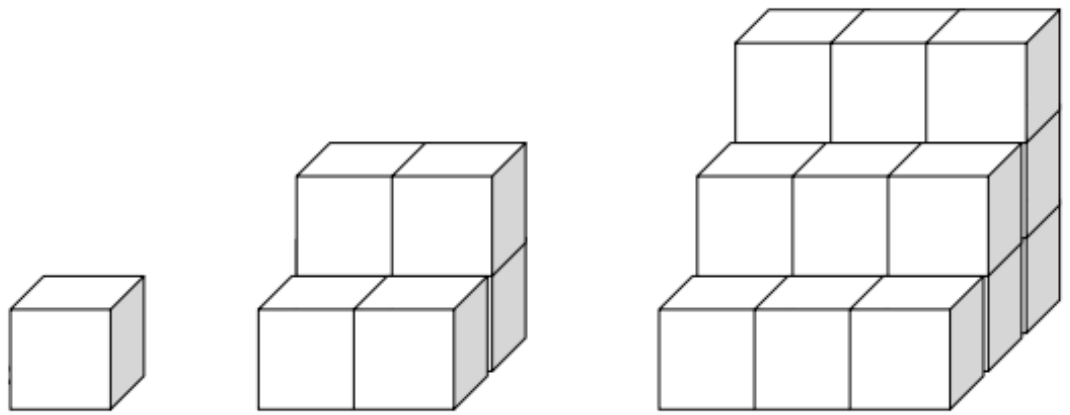How many blocks in all are needed to make a staircase with five steps?

How many blocks make up the top step of a staircase with n steps?

How many blocks make up the first level (the base) of a staircase with n steps?

Given a staircase with 30 steps, explain a process you might follow to determine the number of blocks necessary to build the staircase.

Explain your answers.

D.

Using the pattern shown above, find a general (closed) formula to find the number of blocks needed to build a staircase with n stairs.
Justify why your formula works.

Explain and justify which stages will require an odd number of blocks to build them.
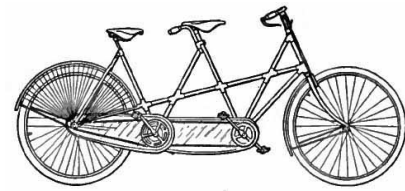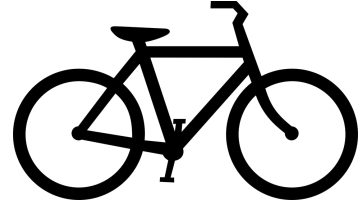
The Wheel Shop

Sunday - You go to a shop that sells tricycles. There are 18 wheels in the Wheel Shop. How many tricycles are in the shop? Explain how you know using pictures, words and numbers.

The Wheel Shop sells other kinds of vehicles. There are bicycles and go-carts in a different room of the shop. Each bicycle has only one seat and each go-cart has only one seat. There are a total of 21 seats and 54 wheels in that room. How many are bicycles and how many are go-carts? Explain how you figured it out using a model.

Monday - Three months later some vehicles have been sold and new models have been brought into the Wheel Shop. Now, there are a different number of bicycles, tandem bicycles, and tricycles in the shop. There are a total of 135 seats, 118 front handlebars (that steer the bike), and 269 wheels. How many bicycles, tandem bicycles and tricycles are there in the Wheel Shop?

Tuesday/Wednesday - In the back stockroom at the Wheel Shop, the number of seats and horns equals the number of wheels. The number of seats and handlebars equals the number of horns. Twice the number of wheels is equal to three times the number of handlebars. Determine the relationship of horns to seats.

Bonus - The repair department of the bicycle shop repairs three things - flat tires, bent handlebars and ripped seats. Today in the repair department, 25% of the bikes had flat tires only, 5% had bent handlebars only, and 10% had ripped seats only. Just 1/12th of the bikes had all three repairs to do - flat tires, bent handlebars and ripped seats. No bikes were completely fixed and there are a total of 101 repairs to be made. How many bikes are in the repair department? How many bikes need two repairs? If less than half of all the bikes have a ripped seat, what is the range of bikes that need both the tires and handlebars repaired without needing to fix the seat?
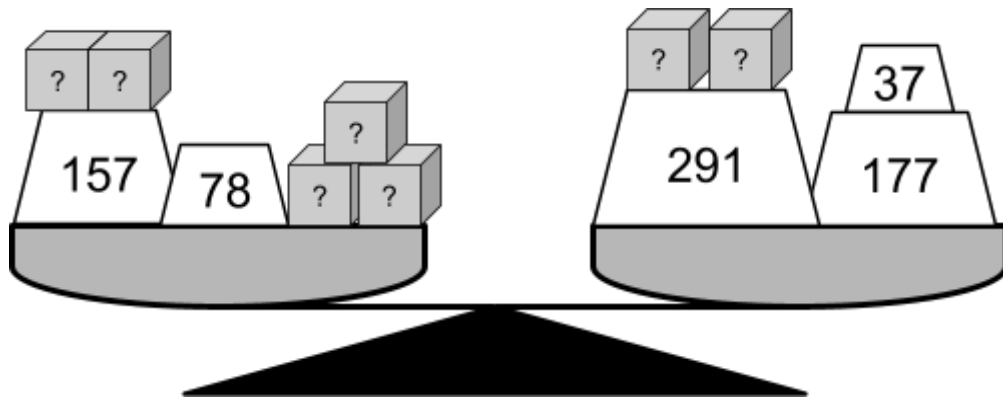
Sunday - Look at this balance scale with weights in kilograms (kg):
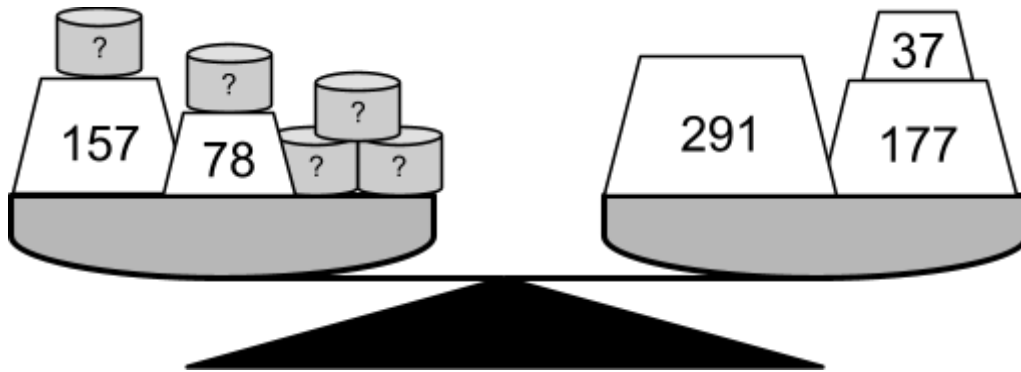
a. Write an equation that represents this scale. Show your thinking with a model.

b. Which is the weight of each cylinder?

c. Can you find the solution creating your own strategy? (do not use anything you have already used before)

Monday - Look at the scale this time:

d. Which is the weight of each cube now?

e. How does this problem relate to the one before? What strategy or shortcut you can use to make this one easier? Explain your answer with pictures.

Tuesday

f. Write a word problem that you could solve with this equation:

$$135 + 223 + \bigcirc + \triangle + \triangle = 72 + \triangle + \bigcirc + \bigcirc$$

g. Use a model and a strategy with numbers to find the weight of the circles and the triangles.

These are the standings at the end of the MotoGP (motorcycle racing) championship of 2017. On the right side you can see the points that the best 3 riders received in the entire season, 18 races in all.

Pos.	Rider	Bike	Nation	Points
1	Marc MARQUEZ	Honda	SPA	298
2	Andrea DOVIZIOSO	Ducati	ITA	261
3	Maverick VIÑALES	Yamaha	SPA	230

Riders are awarded as follows:

Position in Race	1st	2nd	3rd	4th	5th
Points	25	20	16	13	11

If they were in positions behind 5th or didn't finish the race, riders didn't receive any point.

a. What is the maximum amount of winning races could Marc Marquez have? Draw one model that shows your thinking.

b. Solve using arrow way.

c. If Marc Marquez had technical problems and didn't finish 3 races, show 3 different combinations of his scoring for the whole season.

d. Maverick Viñales didn't win any races and scored in all of them. Show one combination of positions for the 18 races of the whole season.

e. After finishing this season, what is the minimum number of races that Maverick Viñales would need to end first if Marc Marquez ends all of them in 5th position?

f. Is it possible for any of the riders to make 900 points adding another season? Prove your answer with a model or numbers.

g. How many points were awarded in to all three racers in the entire season? Draw a model that explains your answer.

h. Be creative and write a question to challenge your buddies in Grade 2. Don't forget to draw a model and solve it. The best question will be solved in class on Thursday.

Ronaldo and Messi are riding their bicycles to meet between Barcelona and Madrid. The 2 cities are 632 kilometers (km) apart from each other. Ronaldo rides 47 km every day.

They will meet 8 days after riding their bikes.

Draw a tape diagram for this problem. Don't forget to label each part.

Find how many kilometers Ronaldo rode his bike using the arrow way strategy.

How far from each city do they meet? Use the compensation strategy.

Check your answer using a different strategy.

Explain which strategy is more efficient for you and why.

_____

_____

How many kilometers does Messi have to ride his bike every day? Show a model that you can use to find the answer.

Check your answer using arrow way.

How many more days would it take Messi to go to the other city than Ronaldo? Explain your answer.

Write an extra question that would make this problem more challenging. Don't forget to solve your question using RDW strategy.

Is it really challenging? Explain your answer.

_____

_____

Name: _____ Grade 2 Math Challenge - Week of February
17th

CAC cafeteria workers sold 198 lunches the first week of school. On the 2nd week, they sold 24 more than they did on the first week. On the 3rd week, they sold 12 lunches less than they sold on the 2nd week. On the 4th week, the cafeteria workers sold 29 lunches more than what they sold on the 3rd week. How many lunches were sold in all first 4 weeks of school?

Pool of Problems to add:

You saw a shirt for $97. You didn't have the cash, so you borrowed $50 from your mom and $50 from your dad = $100. You bought the shirt, and had $3 change. You gave your dad $1 and your mom $1 and kept the other $1 for yourself. Now you owe your mum $49 and your dad $49. 49+49 = 98 + your $1 = 99. Where is the missing $1?

Question

4 apples   1 pineapple   2 oranges   3 peaches   6 bananas
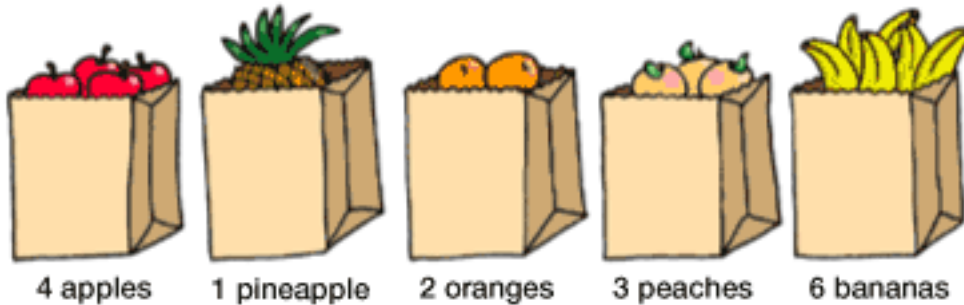
Fran, Gus, Harry, and Kim bought 3 bags of fruit each.
- Fran bought 2 bags of apples and one bag of oranges.
- Gus bought the same number of oranges as Fran, and the rest of the fruit he bought were peaches.
- Harry got the same kinds of fruit as Fran but a different number of each fruit.
- Kim chose fruit that no one else bought. She bought two kinds of fruit. She had more than 10 pieces of fruit in all.

How many pieces of fruit did each person buy?