

Bedtime Math Getting Up to Speed

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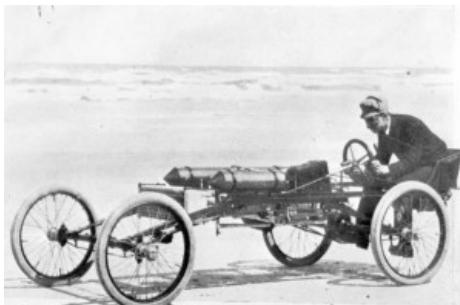


Photo: Richard H. LeSesne via Wikimedia

When you learn to drive a car, you find out fast that you can't just drive as fast as you want. Every road has a speed limit, and you're supposed to drive no faster than that number of miles per hour. Not everyone follows the rules, of course, so someone had to be the first person to get a speeding ticket, and that guy was [Walter Arnold](#). He was driving only 8 miles per hour, but this being the year 1896, the automobile was very new technology with equally new drivers, so the speed limit was only 2 mph. It's hard to imagine a road with a 2mph speed limit today...at that point we'd probably just get out and walk. But three years later, a taxi driver in New York City was arrested for speeding at 12 mph down Lexington Avenue. These guys were probably also the first people ever to try to talk their way out of a ticket, but certainly not the last.

Wee ones: If Walter Arnold was going 8 mph in a 2 mph zone, how many mph was he over the speed limit?

Little kids: How many times the speed limit was Walter Arnold driving? *Bonus:* If 78 mph is fast highway driving today, and 8 mph was fast in 1896, how much faster is fast today?

Big kids: If your family is driving to the beach 141 miles away, what speed would you need to average to get there in exactly 3 hours?

Bonus: You can take a more direct route – only 117 miles to the beach – but the speed limit is only 40 mph. Assuming you obey the law, will that route get you building sandcastles sooner?

The sky's the limit: If you drive 70 miles an hour past a policeman, and by the time he peels out into the road at 88 mph to chase you, you're 1/10 of a mile past him, how far from his starting point will you both have driven when he catches up to you?

Answers:

Wee ones: 6 mph over the speed limit.

Little kids: 4 times as fast as the limit. *Bonus:* 70 mph more.

Big kids: 47 mph. *Bonus:* Yes, but just barely! At that speed you could drive 120 miles in the full 3 hours.

The sky's the limit: The cop will catch you at time t , at which the distance you drive + 1/10 mile will equal the distance he drove. Using algebra,

$$88t = 70t + 1/10, \text{ or } 880t = 700t + 1.$$

That means $180t=1$ hour, so t is $1/180$ th of an hour ($1/3$ of a minute). At that speed, the cop will drive $88/180$ ths of a mile, or $44/90$ ths of a mile – just shy of $1/2$ a mile.

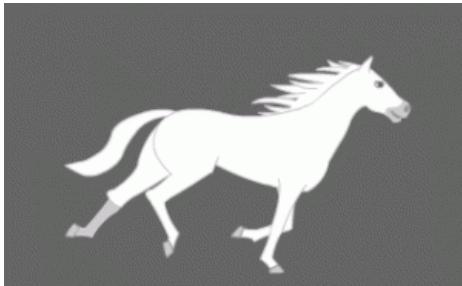




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Bedtime Math Freeze Frame

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When we watch TV or videos, the scene looks as real as if we're seeing it in person. But what we're actually watching is thousands of still photos, or "frames." They're shown incredibly fast, at 24 frames per second, to look like natural, continuous motion to us. When we watch a slow-motion replay, the frames flash by at a slower rate, so we have more time to see what really happened during that football game. Cartoon animation works the same way: artists draw 24 different frames for each *second* of the show, or over a thousand frames per minute. That's a ton of work for a 10-minute *Ninjago* episode. To see how this works, you can make your own cartoon: draw the same drawing over and over on multiple pages, with a small change on each, then flip through the stack to see your creations come to life!

Wee ones: If you and your friend each draw 4 drawings to make a flipbook, how many pages will your flipbook have?

Little kids: If it takes 6 frames for your cartoon dog to wag his tail to the left and another 8 frames to wag to the right, how many frames do you need to draw? *Bonus:* How many more frames do you need to fill 1 second (24 frames total)?

Big kids: How many drawings does a 20-second animation require? (Reminder: 1 second needs 24 drawings.) *Bonus:* Drawing these frames is hard work: for some famous movies, each animator can draw only about 60 frames per week. At that rate, how long would it take an animator to draw those 20 seconds of the movie?

Answers:

Wee ones: 8 pages.

Little kids: 14 frames. *Bonus*: 10 more frames.

Big kids: 480 drawings. *Bonus*: 8 weeks!





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Bedtime Math Cubic Food, by the Cubic Foot

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Photo: Flickr user laughlin (via Wikimedia)

When food shows up in a crazy shape, will it still taste good? It's hard not to wonder when someone hands you a [cube-shaped watermelon](#). Someone figured out that if you put a plastic box around a growing watermelon, it will eventually fill the box as a square-cornered fruit itself. While this fruit might look like fun, the price tag definitely isn't: 1 cube watermelon can sell for more than \$75! Luckily you can grow your own, as explained in this link. One good thing about this shape is that you can fit a lot more cube watermelons than round watermelons inside the same amount of garden space. And if they turn out to taste good, too, that's a real bargain.

Wee ones: How many flat sides does a cube watermelon have?

Little kids: Round watermelons have no corners, but cube watermelons do. How many corners does 1 cube watermelon have?

Bonus: How many corners do 3 cube watermelons have?

Big kids: You can fit 4 times as many cube watermelons in a garden space as round watermelons. If you can grow 15 round watermelons in your garden, how many cube watermelons could you plant instead?

Bonus: If you can fit a layer of 12 cubes in your truck to take them to the market to sell, how many layers high do you have to stack them?

The sky's the limit: If a cube watermelon is an exact 9-inch cube, and its rind is 1 inch thick all around, how many cubic inches of

watermelon rind do you have to throw away?

Answers:

Wee ones: 6 sides.

Little kids: 8 corners. *Bonus:* 24 corners.

Big kids: 60 cube watermelons. *Bonus:* 5 layers high.

The sky's the limit: 386 cubic inches. The watermelon is 729 cubic inches in total, and the watermelon flesh inside is a 7-inch cube, or 343 cubic inches. The difference between the two gives you the rind: 386 cubic inches.





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Bedtime Math High Five - or Fifty

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Photo: Amelia Nielsen

As we continue our countdown to the [Bedtime Math book launch](#) - 5 days! – we’re thinking about animals that have *five* legs. An obvious favorite is the starfish, our prickly scratchy friend from the ocean floor. The thing is, there are over 1,800 types of starfish, or “species,” and they don’t have to have just 5 legs – they can have anywhere from 5 to 50. Even with all those legs, if a starfish loses one, it can just grow a new leg through regeneration. When you start with 40 or 50 legs, it’s hard to imagine you’d notice you’re missing one, but apparently these guys keep count.

Wee ones (counting on fingers): If you have a 5-legged starfish and she loses 3 of them, how many legs does she have till the other ones grow back?

Little kids: If you have 2 5-legged starfish and 1 12-legged starfish, how many legs do they have all together? *Bonus:* If you have a bunch of pet starfish with either 8 legs or 12 legs, how many of each type do you have if they have 28 legs all together?

Big kids: If you get 52 starfish as pets to keep in the bathtub, and each starfish needs 3 cups of water to avoid overcrowding, how much water do you need in the tub? *Bonus:* If instead you stick them all on your 4 bedroom walls as decoration, with the same number of stars on each, how many starfish end up on each wall?

Answers:

Wee ones: 2 legs.

Little kids: 22 legs. *Bonus:* 1 12-legged starfish and 2 8-legged ones.

Big kids: 156 cups of water. *Bonus:* 13 starfish per wall.



Bedtime Math More Hands for the Band

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Still via ThePianoGuys on YouTube

Have you ever played a musical instrument? A piano, a xylophone, maybe a pair of maracas? Now, have you ever tried to play more than one of those at once? It's hard, but some talented people can do it: maybe you've seen someone play the guitar while blowing into a harmonica and tapping a pedal on a bass drum. Then there's the other crazy situation, where more than one *person* plays on the same *instrument* at the same time. You can have two people sit and play on the two ends of a piano (called a duet). The guys [in this video](#) took that even farther: they have 5 people playing the same piano! They did it by plucking the strings instead of plunking the keys, and they do it beautifully. But it's clear that when either the instruments or the people are outnumbered, making music gets way more complicated.

Wee ones: If you can beat 2 drums with 2 maracas and blow into a harmonica all at once, how many instruments are you playing?

Little kids: If those 5 guys playing that piano all used both hands, how many hands were playing? *Bonus:* If 2 people play a duet on the piano keys, like they're supposed to, and both use both hands, how many fingers are playing?

Big kids: If you can strum 2 47-string harps at the same time, one with each hand, how many strings are you playing at once? *Bonus:* If you

and 2 other people play together on just 1 of those harps, and you take 19 strings to yourself, how many strings does each other player get if they split the remaining strings evenly?

The sky's the limit: You and 3 friends all cram together on the piano bench to play the piano, which has 88 keys in total. If you divide the keyboard such that you get 4 times as many keys as friend A, A gets half as many as friend B, and friend C gets the same number of keys as friend A, how many piano keys do you get to play?

Answers:

Wee ones: 5 instruments.

Little kids: 10 hands. Bonus: 20 fingers.

Big kids: 94 strings. Bonus: 14 apiece, since you've left them with 28.

The sky's the limit: You get 44 keys. You can put everyone's keys in terms of friend A – for instance, B has twice as many as A. With simple algebra:

$$U + A + B + C = 4A + A + 2A + A = 88$$

Adding that all up, you get $8A=88$. $A=11$, so you get 4 times that, or 44 keys.

And a big thank-you to Catherine M. for inspiring us with this video!





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Bedtime Math Whaling Away

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Photo: Gabriel Barathieu via Wikimedia

Contrary to what Dad says after you explain how your bike ended up on the roof of the house, he hasn't really "heard it all." In fact, no one has heard it all. We people can hear only a certain range of sounds, or frequencies. Some animals, like [bats](#), make sounds that are too high for us to hear, while others such as [elephants](#) make sounds too low for our ears to pick up. Meanwhile, whales hear so well that they can [sing to each other](#) over hundreds, even thousands of miles of water. Well, okay, they're not actually singing, but their sounds have rhythm and melody similar to human music. Some people listen to whale songs just because they sound nice. But marine scientists try to eavesdrop on these underwater divas to understand their language. Or maybe they're just trying to pick up some pointers for singing in the shower.

Wee ones: If a whale is singing a 9-minute song, and he has already sung for 3 minutes, how many more minutes are left in the song?

Little kids: Sound travels about 1 mile in 1 second underwater. About how long will it take a whale song to travel 10 miles? *Bonus:* Sound travels much slower through air than through water – only 1 mile every 5 seconds. How far would the song travel on land in the time it would travel 10 miles through water?

Big kids: Whale songs apparently string together repeated "themes," which are 3 minutes long. If there are 3 themes in a particular whale song, each repeated 3 times, how long is the song? *Bonus:* With more ships traveling the oceans, it becomes harder for whales to hear each other. If a whale has to sing a 20-minute song over and over for 6 hours each day, 4 days in a row, how many times does she sing that

same song?

Answers:

Wee ones: 6 minutes remain in the song.

Little kids: It will take 10 seconds. *Bonus*: 2 miles.

Big kids: 27 minutes, since you have 3 themes x 3 minutes x 3 times around. *Bonus*: She sings the song 72 times, since she sings it 3 times per hour.



Bedtime Math Eight is Enough

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Photo: David Adam Kess via Wikimedia

The countdown is on: only **8 more days** till the big [Bedtime Math book](#) comes out! And that has us thinking about the number 8 and how special it is. It's definitely special to all those animals out there who have 8 legs, from spiders and scorpions to lobsters and crabs to octopus and shrimp.

So what's it like to have 8 legs? How do you walk when you have to keep track of that many feet? For us humans it's easy to walk: if we number our feet 1 and 2, walking is just 1,2,1,2. For a horse it's a little trickier: with front feet 1 and 2 and back feet 3 and 4, a horse's steps are 1,4,2,3, then 1 again. But in what order does a crab or spider use its feet? Let's find out how all these animals keep from tripping over themselves.

Wee ones: If a horse's steps are 1, 4, 2, then 3, and so far the horse has stepped 1,4,2,3,1,4, which foot takes the next step?

Little kids: If a crab steps with all 8 legs in a certain order before repeating the pattern, how many total steps has it taken when every leg has stepped twice? *Bonus:* If the crab then takes a 3rd step with 6 of its legs, now how many steps has it taken?

Big kids: In this [home video](#) of a crab walking sideways, it looks like the feet on one side step in the order 1,3,2,4. If the 4 legs on the other side follow the same order but a split-second later, the pattern is 1,5,3,7,2,6,4,8. Which leg will take the 37th step? *Bonus:* Leg number 6 takes the 6th step in this order; then the 14th step, then the

22nd, and so on. After the first round of steps, when will that 6th leg take a step that also ends in a 6?

Answers:

Wee ones: Foot #2 is next in the pattern.

Little kids: 16 steps. Bonus: 22 steps.

Big kids: Leg #2. 32 is the largest multiple of 8 less than 37, which means 4 full rounds of steps...then the crab takes 5 more steps, and leg #2 is 5th in the pattern. Bonus: 46 steps. At that point the crab has taken 5 full rounds of steps, bringing it to 40, plus 6 more to get to leg #6.



Bedtime Math Dad Tails

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Photo: Nick Hobgood via Wikimedia

It's Father's Day today, a day when we celebrate our dads for all the awesome stuff they do for us. In doing so, we really should remember all dads, including one of the most noble groups of fathers out there: seahorses. Usually it's the mom who lays the eggs or gives birth to the kittens or pups, and then feeds and cares for them. But seahorse dads get very involved. The mom lays the eggs right into a pouch on the dad's tummy, and he carries the eggs until they hatch into miniature seahorses. Seahorses are tiny — some grow to be only [0.6 inches tall](#) (just over half an inch), and the largest are only 14 inches. But they're big eaters: They have no teeth and no stomachs, so the food they eat passes through their stomachs very quickly, and they have to eat almost constantly. And that sounds a lot like a few dads we know.

Wee ones: If 2 daddy seahorses are each carrying 6 eggs, how many are they carrying altogether?

Little kids: Thanks to their curly shape, seahorses are among the slowest swimmers in the ocean, with some managing only [5 miles per hour](#). If you can swim 15 miles per hour, how many more miles can you swim in an hour? *Bonus:* How many more can you swim in 2 hours?

Big kids: If a seahorse eats 3,000 brine shrimp per day, how many shrimp is that per week? *Bonus:* That said, a real horse is way bigger than a seahorse (and eats a lot more, too). If seahorses can grow to up to 14 inches long and your regular horse is 7 feet long, how many times as long is the real horse?

The sky's the limit: If you have a whole bunch of seahorses and real horses as pets, and together they have 24 more horse feet than horse snouts and 2/3 as many horse tails as horsefeet, how many of each kind of pet horse do you have? (Reminder: seahorses have fins, but no legs. But everyone has a tail and snout!).

Answers:

Wee ones: 12 eggs total.

Little kids: 10 miles more. *Bonus:* 20 more miles.

Big kids: 21,000 shrimp. *Bonus:* 6 times as long, since it's 84 inches.

The sky's the limit: You have 30 seahorses and 18 real horses. The number of snouts equals the number of tails (one per pet), so there are 24 more feet than tails, and that number is also 1 1/2 times the number of tails. In algebra, $t + 24 = 3/2 t$, so $24 = 1/2 t$ and hence $t=48$. Now you see you have 48 tails, which means 48 pets with 48 snouts. There are 24 more feet than snouts, or 72 feet, which means 18 real horses. You have 48 pets in total, so that leaves you with 30 seahorses.





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Bedtime Math Booking Down the Hall

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Still via Seattle Public Library on YouTube

Have you ever played dominoes? They're the little rectangular tiles with two sets of dots, which you match to line up end to end. But you can also stand them on end in a long row so when you knock the first one over, it knocks down the next, then the next, until you get a rippling wave of falling tiles. The thing is, you can create this "domino effect" using bigger items – like books. As you see in [this video](#), the Seattle Public Library set a new world record by lining up 2,131 books around and around the tables, chairs, shelves and fountains. And guess what – you can do this, too! Grab as many books as you can from around the house and stand them on end in a line, close enough so that each one will reach the next one and knock it over. Make wavy lines and spirals, have the line split into 3 or 4, and then give that first one a shove and watch the action!

Wee ones: Only hard books can stand up on end, of course. If you start with 4 board books and 5 hardcover books, how many books do you have for your domino chain?

Little kids: If you line up 10 books each spaced 1 foot from the next, how long is the chain from the 1st standing book to the 10th? (Think carefully...) *Bonus:* If that 10th book knocks down 2 different rows that each have 10 books themselves, how many books do you have in your Y-shaped domino chain?

Big kids: If you line up 70 books that then kick off 4 new rows of 70 books – one through the den, one under the kitchen table, and so on – how many books have you used? *Bonus:* If the books have to be 8

inches apart, how long is the chain from the 1st book to that 70th book? (Hint: you might want to turn those inches into fractions of a foot.)

Answers:

Wee ones: 9 books.

Little kids: It's only 9 feet, because 10 books have 9 spaces between them (this is called the "fencepost problem.") *Bonus:* 30 books in total.

Big kids: 350 books. *Bonus:* 46 feet. Again, you have only 69 gaps between books, not 70. 8 inches equals $\frac{2}{3}$ of a foot, so you have $\frac{2}{3}$ of 69 feet, or 46 feet.

And a big thank-you to Laurel P. for sending us this awesome video!



Bedtime Math Star (and Stripe) Student

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Photo: Michael Dorausch via Wikimedia

Have you ever gotten a grade at school that was lower than you thought it should be? Well, a high-school kid named Robert Heft felt that way at one point, but it all worked out in the end: his school project became our [50-star flag!](#) In 1958 the United States had only 48 states, but Alaska and Hawaii were on deck to become the 49th and 50th. Mr. Heft spent a weekend designing a flag with 50 stars for a school assignment, but his teacher told him it wasn't very exciting – adding that he could earn a higher grade only if he got Congress to accept his version of the flag. So that's exactly what Mr. Heft did: he sent it to his representative in Congress (part of the U.S. government). The rep got Congress to vote it in, and when Alaska and Hawaii became new states, Heft's flag was ready for the occasion. Today on Flag Day we're still flying Mr. Heft's flag – and we're still doing school projects, because you never know where they can go.

Wee ones: If you're adding the bottom row of 6 stars and you've already sewn 3 stars on, how many do you need to finish the row?

Little kids: The American flag is almost 2 times as long (fly) as it is wide (hoist). If your flag is 5 feet wide, about how *long* should it be?

Bonus: Mr. Heft put the stars in 5 rows of 6 stars alternating with 4 rows of 5 stars. How many stars do the 6-star rows have in total?

Big kids: 26 of the 50 United States lie east of the Mississippi River. If you made a flag for only the states west of the Mississippi, how many stars would it have? *Bonus:* There are 5 points on each star on the flag. How many star points does it have in total?

Answers:

Wee ones: 3 more stars.

Little kids: 10 feet long. *Bonus:* 30 stars.

Big kids: 24 stars. *Bonus:* 250 points.

Bedtime Math Scrapping the Sky

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Photo by Irene Sait via Wikimedia

People have been [getting taller](#) over the centuries. So it makes sense that the world's buildings are going in the same direction: every few years we get a new "tallest building." The current winner, the [Burj Khalifa](#) skyscraper in Dubai, stands at a dizzying height of 2,722 feet, with 163 floors. Completed in 2010, it's so tall that the sunset happens at different times depending on where you are in the building. You can watch the sunset from the ground level, and then 3 minutes later you can see it again from the top floor, if you make it in time. But it might not be the world's tallest building for long. There are plans to build a whopping 220-floor building next year in the Chinese city of Changsha. Called [Sky City](#), it will rise to a height of 2,749 feet, and even more incredible, engineers are planning to build it in only 7 months!

Wee ones: If it took 5 years to build the Burj Khalifa, but will take only 1 year to build Sky City, how many more years did it take to build the Burj?

Little kids: If the Burj's elevators are broken and it takes you 2 minutes to climb 1 flight of stairs, how long will 100 flights of stairs take? *Bonus:* In China, engineers built a 30-story skyscraper in just 15 days. To finish the building on schedule, how many floors on

average did they have to build each day?

Big kids: How much taller will the 2,749-foot Sky City be than the 2,722 Burj? *Bonus:* Sunset at the top of the Burj Khalifa happens 3 minutes later than at the bottom. If you leave the 1st floor as soon as the sun sets, and the elevators fly at 2 floors per second without stopping, can you get to the 163rd floor in time to see the sunset again?

The sky's the limit: If you ride a Burj elevator up from the 14th floor at 3 seconds per floor, and a friend rides down from the 139th floor at 2 seconds per floor, at which floor will you cross and get to wave to each other?

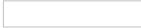
Answers:

Wee ones: 4 years longer to build the Burj.

Little kids: 200 minutes (over 3 hours!). *Bonus:* 2 floors per day.

Big kids: 27 feet taller. *Bonus:* Yes! You're rising 162 floors, which will take 81 seconds – far less than 3 minutes, which is 180 seconds.

The sky's the limit: At the 64th floor. In 6 seconds, you'll travel 2 floors and your friend will travel 3 floors, so you travel $\frac{2}{5}$ of the distance and your friend goes $\frac{3}{5}$...to see this using algebra, if you travel f floors, $2f+3f=$ the total distance. Since the two of you are covering 125 floors in total, you'll rise 50 floors from the 14th floor, to the 64th, and your friend will drop 75 floors from the 139th, also reaching the 64th.



Bedtime Math Rocking Out

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Photo: Rob Lavinsky via Wikimedia Commons

When you see a plain old brown or gray rock on the ground, you don't think much of it. But some rocks, when cut carefully and polished smooth, become the glittering jewels we use in jewelry. [Corundum](#) is one of those secretly magical rocks. It's a hard, kind of boring-looking mineral made of aluminum and oxygen, but if you cut it on exact angles and polish it, you can turn that chunk into a shining red ruby. Other elements like copper or iron can give it other colors like blue and purple, and when polished up, those gemstones are called sapphires. Some corundum can't be made to shine, but since it is so hard, it is crushed to make gritty sandpaper for sanding wood and emery boards for smoothing fingernails – all from the same material as rubies. So remember, the next dull, dirty rock you kick aside could turn into some future jewelry!

Wee ones: If you find 7 pieces of corundum and polish 4 of them into glittering jewels, how many rocks do you have left to work on?

Little kids: If it takes 4 hours of cutting and polishing to turn a piece of corundum into a gem, how many hours of work to make a ring with 3 sapphires? *Bonus:* If after some practice you can get a shining gem in just 3 hours, how many hours can you save making that 3-sapphire ring?

Big kids: Since you can turn it into jewels, corundum can be worth a lot of money to you. If it takes 7 hours to polish down corundum into 4 rubies, and the machine costs \$50 per hour to run but you can sell each ruby for \$400, how much profit can you make? (“Profit” is the money left from the sale after paying for the cost of the machine.) *Bonus:* If it takes 4 hours on the same machine to polish a different chunk of corundum to make 5 sapphires each worth \$300, on which project will you make more profit in total?

Answers:

Wee ones: 3 pieces of corundum.

Little kids: 12 hours. *Bonus:* 3 hours, since you saved 1 hour 3 times (or alternatively, 9 hours instead of 12).

Big kids: \$1250, since you’ll earn \$1600 but spend \$350 on the machine. *Bonus:* The sapphires will make more money: they sell for only \$1500 but cost only \$200 to make, leaving you with \$1300.



Bedtime Math Lend Me an Ear

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Photo by Jonathunder via Wikimedia

There are a lot of foods we eat in nice neat rows. We cut our waffles along the squares, we slice brownies into rectangles, and so on. But some food actually grows in neat little rows in nature, like corn. Today is Corn on the Cob Day, a time to ponder this colorful food that sports lines of tasty little bumps – a perfect fit for our teeth, which also grow in a row. You can cook corn many different tasty ways: popped, grilled, steamed or creamed. Besides being a great vehicle for butter and salt, corn is also an ingredient in some surprising products like [fireworks](#), [rubber tires](#), and [soap](#). And we haven't even mentioned yummy cornbread yet. Of course, when you go to slice it, be sure to cut it in nice neat rows.

Wee ones: If you need 2 of those spiky corn holders for each cob of corn, how many corn holders do you need for 5 ears?

Little kids: If there are 6 ears of corn on each plant, how many ears of corn are there on 10 plants? *Bonus:* If these were human ears, how many humans would it take to have the same number of ears?

Big kids: If an ear of corn has 12 rows with 20 kernels in each, how many kernels do you get to eat off that ear? *Bonus:* If your mouth can chomp 8 kernels at a time, how many bites till you polish off that ear?

The sky's the limit: Indian corn takes corn to a whole new level of color: the kernels are all different colors, including white, yellow, red and brown. If an ear has 12 rows of 20 kernels each, and there are

twice as many yellow as red, 3 times as many brown as red, and 40 fewer white than yellow, how many white kernels does it have?

Answers:

Wee ones: 10 corn holders.

Little kids: 60 ears of corn. Bonus: 30 humans (each human has 2 ears) – and we'd look pretty funny that way.

Big kids: 240 kernels. Bonus: It will take 30 bites.

The sky's the limit: Let's write this out in algebra...what do we know about these kernels? Let's call the number of red, yellow, brown and white kernels r, y, b, and w respectively:

$$r+y+b+w=240$$

$$r+2r+3r+(2r-40)=240$$

So $8r-40=240$, which means $8r=280$ and hence there are 35 red kernels. That means 70 yellow and 30 white. To check the answer, that also means 105 brown, and $35+70+30+105$ does come out to 240 kernels.



Bedtime Math Pajama Party

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Photo: Laura Overdeck

Do you ever get to wear your pajamas to school? Way more interesting than wearing them to bed, right? Well guess what, Bedtime Math fans: you now have another place to wear your PJs. From June 24-29, the week our book comes out, we're throwing a , where you can go to your nearest bookstore or library in your PJs to play fun, free math games. Build your own stuffed-animal zip line, make your own mystery clock, and take home some Bedtime Math party favors. Check out the list [here](#) to find the party nearest you! And of course, you can also pre-order your book [here](#).

While we're talking about pajama parties, let's discuss how pajamas work. You might have a matching set with fairies, Superman, or soccer balls on them, but you can always mix and match tops and bottoms if one half gets lost in the laundry. Throw in one or two pairs of fuzzy slippers to choose from, and the combos multiply out fast.

Wee ones: If you have 3 full sets of pajamas, each with a top and bottom, how many pieces do you have in total?

Little kids: If you go through 3 sets of pajamas each year – a fleecy winter set, a spring/fall set and a summer set – how many sets have you had over the last 4 years? *Bonus:* If you decide to mix and match all the tops and bottoms from this year, how many different PJ outfits can you make?

Big kids: If your peace-sign pajamas have 18 little peace signs on each pant leg, 13 on the front of the top and 11 on the back, how many peace signs do they have in total? *Bonus:* If your brother's Angry Birds pajamas have $\frac{2}{3}$ as many birds on them, how many Angry Birds are there on that set?

Answers:

Wee ones: 6 pieces.

Little kids: 12 total sets. *Bonus:* 9 sets, since each of the 3 tops has 3 choices of bottoms.

Big kids: 60 peace signs. *Bonus:* 40 Angry Birds.





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Bedtime Math Real-Life Sidewalk Wheelies

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Still via BBCNews

Have you ever seen a car driving so fast – either in a movie or real life – that as it drives around the corner it tilts up on two wheels? That is so totally not a safe way to drive a car, but now some people are driving like that on purpose. It's called "sidewalk skiing," and it's all the rage in the country of Saudi Arabia. As you can see in [this crazy video](#), the cars lurch to one side then the other to get themselves up on two wheels, then all the riders in the car move around to balance their weight so the car stays balanced, while the driver steers to keep the car on its side. They seem to be going straight enough and fast enough to drive on a regular street, so maybe this isn't a bad way to drive after all. However, you need other people in the car to balance it, so this will only work for carpool time.

Wee ones: If a 4-wheeled car starts skiing with just 2 wheels on the ground, how many wheels are up in the air?

Little kids: If 6 cars go out to sidewalk-ski, how many wheels are driving on the ground? *Bonus:* How many wheels do they all have in total?

Big kids: If you need to drive 62 miles an hour to tilt the car onto two wheels, and you're going only 47 miles an hour, how much faster do you need to drive to do the stunt? *Bonus:* If you have 4 riders who each weigh 190 pounds, how many pounds of weight do you have handy to balance the car?

The sky's the limit: The center of mass for a bunch of things on a straight line is the point where if you multiply each thing's weight times its distance from the center, the total for all things on one side adds up to the total for all the things on the other side. If you have 3 riders in the car, A B and C, who weigh 140 pounds, 150 pounds and 200 pounds, plus their 40-pound pet dog, and they can each sit either 1 foot or 2 feet from the center of mass, who has to sit on which side and how far away to balance each other out?

Answers:

Wee ones: 2 wheels in the air.

Little kids: 12 wheels. *Bonus:* 24 wheels.

Big kids: 15 miles an hour faster. *Bonus:* 760 pounds.

The sky's the limit: There are a few ways to balance it out. It balances if you put B, the 150-pounder, 2 feet to the left of center, the dog 1 foot to the left of center, and the other two riders 1 foot to the right of center (presumably one sitting in the other's lap). The 150 weight times 2-foot distance gives you 300, and the dog 1 foot from center adds 40, yielding 340. If you seat the 140-pounder A and the 200-pounder C 1 foot to the right of center, they add 140 and 200, which also totals to 340. Another way is if the 200-pounder C and the 40-pound dog sit on to the left of center, with C 2 feet away and the dog 1 foot away. On the other side, the 150-pounder B would be 2 feet from center and the 140-pounder A would be 1 foot. Then both sides total 440.





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Bedtime Math Spilling the Secret

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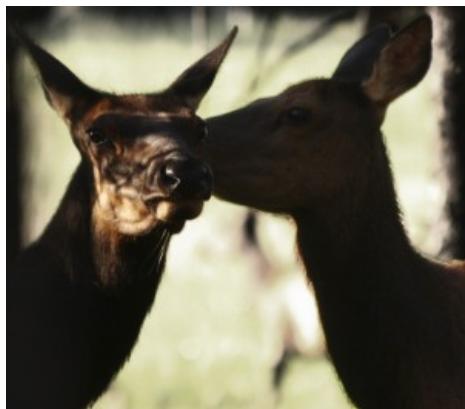


Photo: Rennett Stowe via wikipedia

Do you know what a secret is? It's a piece of information that you aren't supposed to share with anyone else. It might be something only you know, or it might be a story from someone else who whispered it to you and asked you to keep it secret. The thing is, a lot of people aren't so good at keeping secrets. They say, "Oh, I'll just tell my one friend and tell *her* not to tell anyone..." thinking it can't be so bad if only one more person knows. The problem is, that friend might decide to tell one friend and swear *that* person to secrecy, and then that person might do the same thing, and pretty soon 15 or 20 people know even though no one was supposed to talk about it! When you do the math, you see that just a few blabbermouths can spread a secret fast.

Wee ones: If a friend shares a secret with you and 2 other friends, how many people now know the secret?

Little kids: If you tell a secret to 2 friends, who each tell 2 people, who each tell 2 people themselves, how many people other than you have heard the secret? **Bonus:** If it takes just 15 minutes each round for the secret to get passed on, how soon after you tell the first friend has everyone heard the secret?

Big kids: Suppose a friend tells 3 people a secret. If each new person

tells 3 more people apiece, how many rounds of telling until a whole classroom of 30 kids hears it? (Include the friend telling 3 as the first round – and assume it's always new people hearing it.) *Bonus:* How many in total will have heard it after 2 more rounds?

Answers:

Wee ones: 4 in total, including the friend who started it.

Little kids: 14 people: the 2 friends tell 4 more, who tell a total of 8 more. *Bonus:* 30 minutes: 15 from your 2 friends to the 4, then 15 more minutes from the 4 friends to the 8.

Big kids: Just 3 rounds. The 1st round adds 3, the 2nd round adds 9 (for a total of 12), then the 3rd round adds 27 for a total of 39, which is more than enough. *Bonus:* A total of 363 will know it – more than 10 times as many. The 4th round adds 81 more, for a total of 120, and the next round adds 243, for a total of 363.





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Bedtime Math National Doughnut Day

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Photo: Bill Jardon

You really have to wonder how bagels feel about doughnuts. Let's face it: no matter how much we love an onion or pumpernickel bagel, who's going to choose that over a powdered doughnut or a chocolate-glazed with sprinkles? It does go to show that the messier the food, the yummier it probably is. Well, today we honor these tasty treats with [National Doughnut Day](#), founded in 1938 by The Salvation Army charity to honor women who served them to soldiers. National Doughnut Day always lands on the first Friday of June, and many stores offer free doughnuts for the occasion. The question is, are they also offering free doughnut holes - and when you have to pay for them, which one is the better deal?

Wee ones: You order 2 chocolate donuts, 3 glazed, and 2 powdered to share with your friends (or at least that's what you're telling us). How many donuts do you order?

Little kids: If you buy 8 donuts plus the holes that popped out of them, how many separate pieces do you have in the bag? *Bonus:* If 5 of those donuts and their holes are powdered and the rest are cinnamon, how many cinnamon pieces do you have?

Big kids: If you can buy donuts only in bags of 5 or boxes of 12 and you need to feed 33 people, what number of boxes and bags will leave you with the fewest number of donuts leftover? (Assume 1 donut per person.) *Bonus:* Suppose 12 donut holes cost \$1.80 and a normal donut costs \$0.80 (80 cents). If 4 donut holes weigh the same

as 1 donut, which one gets you the most donut for your dollar?

The sky's the limit: If you buy a dozen donuts, including 6 chocolate, 3 powdered, 2 cinnamon and a jelly donut, and you grab 2 without looking, what are your chances of ending up with 1 powdered and 1 chocolate?

Answers:

Wee ones: 7 donuts.

Little kids: 16 donut pieces. Bonus: 6 cinnamon donut items.

Big kids: 2 boxes and 2 bags. 2 boxes will yield 24, so you still need 9 more donuts. The 2 bags will give you 10 donuts, so you'll have 1 leftover. Bonus: If 12 donut holes cost \$1.80, then 4 of them cost 1/3 of that, or 60 cents. So that's a better deal than 80 cents for the equivalent regular donut.

The sky's the limit: You have a 3/11 chance of that combo. You can pick either a chocolate and then a powdered, which would be a 6/12 chance times a 3/11 chance (since there are now only 11 in the bag), or you can do the reverse, with a 3/12 chance of a powdered followed by 6/11 chance of chocolate. Multiplying that out, we get:
 $(6/12 \times 3/11) + (3/12 \times 6/11) = 18/132 + 18/132 = 18/66$, which reduces to 3/11.





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Bedtime Math Slip 'n Slide

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Photo: Mike Gifford via wikipedia

You don't have to be a fish to enjoy a speedy ride on the water.

Whether it's an inner tube ride at an amusement park or a slip 'n slide mat on the grass, the waterslide is a pretty awesome idea. The [first park waterslide ever](#), built in 1923, was supposedly made of wood.

People would ride down the ramp on sleds and skim across the water for up to 100 feet. Since then, we've gone bigger and better:

the [longest waterslide in the world](#) was built just this year on a cattle ranch in New Zealand. Using a construction excavator, a couple of shovels, duct tape, tent pegs and plastic matting, a bunch of guys [dug a giant trench](#) into a steep countryside slope. It took them 2 months to finish the waterslide, and some 2,000 brave souls tried it out in its first 2 days running. Whether you dig your own slide or ride one at a waterpark, you're gonna get wet – so remember to change out of your underwear and into a swimsuit.

Wee ones: If a water park has 3 body waterslides, 2 inner tube slides, and 1 family rafting slide, how many waterslides are there in total?

Little kids: The [Mammoth water coaster](#) in Indiana is the official longest slide in the world. It's 7 stories tall from its highest to lowest point, and covers 3 acres! If they can fit 3 6-passenger rafts on the slide at any time without them crashing into each other, what's the maximum number of riders on the slide at once? **Bonus:** On some fast waterslides you can zoom at up to 35 mph. If a car travels 65 mph on the highway, how much faster would you have to slide to keep up

with the car?

Big kids: At a water park, it can take 45 minutes to stand in line for a waterslide, and just 4 minutes to ride to the bottom. If you've been at the park for an hour and 20 minutes, and you've been continuously waiting for and riding that slide, how many more minutes till you start your second ride? *Bonus:* If you're at the park for 6 hours, how many times can you ride the slide?

Answers:

Wee ones: 6 slides in total.

Little kids: 18 riders. *Bonus:* 30 miles per hour faster.

Big kids: 14 more minutes. *Bonus:* 7 rides. You have 360 minutes, and the 7 waits and rides will take 343 minutes, not leaving enough time to fit in another.



Bedtime Math Dog-Tired? Take the Train.

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Image via lifewithdogs.tv

Most pet-owners are quick to tell you their dog or cat or bird or pot-bellied pig is very smart. They're usually right, too – animals can be incredibly quick learners, and many have a great sense of direction for finding their way home. Even more interesting, some animals learn to travel like people to get places: There are [a few dogs](#) in the Russian city of Moscow who know how to ride the train! No one is sure exactly how the pups know when to get on and off at their regular stops, but somehow they do it. So if you're ever lost on the Moscow Metro, a canine could point you the right way. Just remember to throw that dog a bone for the ride.

Wee ones: If your dog wants to ride 3 miles from the center of town, and then switches trains and rides another 2 miles, how many miles will your doggie ride?

Little kids: If there are 15 open seats on the train car, and 9 dogs get on and take seats as if they're people, how many open seats are left? *Bonus:* If the dogs wait 14 minutes for the train, then take 3 minutes to get on, and then take a 6-minute ride, how long does their whole trip take?

Big kids: The dogs can wait 19 minutes for the speedy Express train or just 13 minutes for the slower Local – but the Express takes 22 minutes to arrive at their station while the Local takes 31. Which one will get the dogs home earlier, and by how many minutes? *Bonus:* A dog waits 8 minutes for her train and the ride home normally takes 3

times as long as that. If the train then drives at 1/2 its normal speed, how long in total till the dog gets home?

Answers:

Wee ones: 5 miles.

Little kids: 6 remaining seats. *Bonus:* 23 minutes.

Big kids: The Express will arrive 3 minutes earlier – in 41 minutes vs. 44. *Bonus:* 56 minutes, because the ride now takes 48 minutes instead of 24 (plus the 8-minute wait).



Bedtime Math Cross-Country Choo-Choo

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Photo via Nana Patriot on kidsarepatriots2.ning.com

Back in the 1800's, the fastest way to travel was by train, pulled by steam locomotive – but only between cities that were connected by tracks. There was no easy route across the U.S., as some stretches of mountain and desert were crossable only by horse-drawn wagon. Some people actually sailed all the way around South America instead. Either way the trip took weeks and cost a small fortune (\$1,000, which was a lot back then). So imagine the excitement when two railroads connected their tracks to make one continuous train track from coast to coast. The Central Pacific company built eastward from California, while the Union Pacific built westward from the Missouri River. They met in Utah in May 1869, and [on this day in 1876](#) the first train ever to cross the country reached San Francisco in just under 84 hours. Now we can fly it by plane in 6 hours, but compared to horse-drawn buggies, that train flew like lightning.

Wee ones: If a train has a locomotive, 4 passenger cars and a caboose, how many cars does it have?

Little kids: If the trip took 84 hours, how many more hours did it take than our 6-hour flight today? *Bonus:* If the track was completed in 1869 and the first train crossed it in 1876, how many years later was that?

Big kids: If that trip took 84 hours and we now fly it in 6, how many times as fast do we make the trip today? *Bonus:* The first trip by train took just under 84 hours. How many days of straight running did that

take? (Your answer will involve a simple fraction...)

The sky's the limit: Because the Union Pacific was coming from Omaha, Nebraska over easy plains while the Central Pacific had to blast through mountains, Union Pacific built many more miles of track. If for the first 4 months the CP built half as fast as the UP, but for the last month the CP matched the UP and they built at the same rate, how much of the 1600-mile track did each one build?

Answers:

Wee ones: 6 cars in total.

Little kids: 78 hours. Bonus: 7 years later.

Big kids: 14 times as fast. Bonus: 3 ½ days (because a half day, 12 hours, goes in 7 times).

The sky's the limit: The UP built 4 months' worth of track plus another month, for 5 months in total, but the CP built only 2 months worth followed by 1 month, for 3 months' total. So of the 8 month-long chunks of track, the UP built 5. So they built $\frac{5}{8}$ ths of 1600 miles, or 1000 miles, while the CP built the remaining 600 miles. (For the history buffs, the [actual numbers](#) are 1,086 for the UP and 690 for the CP.)





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Bedtime Math When You Know You've Seen It All

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Still via Fox Sports

You might feel like your life is pretty different now from two years ago, and really different from four years ago. Well, imagine how much your life changes when you've lived for 111 years! Bernando LaPallo, who is [111 years old](#), made the weekend news because he watched the Yankees play in the third stadium they've built. He's seen them play in all three, because he was born in 1902, a year before they moved to New York as the Highlanders. Bernando has been around longer than a lot of other things, including airplanes, computers, washing machines, and spaceships. As we look at how crazily life has changed for Bernando over the decades, you start to realize that if *you* make it to 111, life will look completely different yet again.

Wee ones: The Wright Brothers' first airplane flight ever took place just one year after Bernando was born, along with the first Crayola crayons ever made. In what year did these things happen?

Little kids: The first canned tuna and the first gas station [both showed up](#) when Bernando was 5 years old. In what year did those happen? *Bonus:* Then how old are these inventions today?

Big kids: The chocolate chip will turn 100 years old [in 2030](#). How old

was Bernando when they were invented? *Bonus:* In what year will you turn 111?

Answers:

Wee ones: In 1903.

Little kids: In 1907. *Bonus:* 106 years old.

Big kids: 28 years old, since they were invented in 1930. *Bonus:* Different for everyone...take your birth year and add 111 to it.





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Bedtime Math I Love My Dentist Day

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Photo: Marc Rein

June 2 is "[I Love My Dentist](#)" Day in the U.S. You're probably wondering why dentists have their own special day. Wehhhhhlll...when people don't take good care of their teeth, the things dentists have to do to fix those teeth don't feel so good, like drilling a cavity or pulling out a bad tooth. But hey, what's it like for the *dentist*? Here the dentist is sticking his or her hands into your slimy mouth just to help you out – the least we can all do is say thank you with a special holiday. And if you take really good care of your teeth, your dentist won't have to do much at your check-ups anyway. The real question is, how many teeth do you even have handy for the dentist to check up on? If you've been losing your baby teeth, the answer might change every time you go.

Wee ones: If you lost 3 teeth last month and 2 teeth this month, how many teeth have you lost?

Little kids: If you have 10 teeth on the bottom row and 10 teeth on top, how many teeth do you have? *Bonus:* If you lose your first 3 teeth and only 2 grown-up teeth have grown in to replace them, how many teeth are in your mouth?

Big kids: People start off by growing 20 baby teeth, lose them all, and (most) end up with 32 teeth as adults. How many teeth in total do you grow in your lifetime? *Bonus:* If you brush your teeth twice a day to keep away the cavities, how many times do you brush your teeth in a

year? (You can assume it's not a leap year.)

The sky's the limit: If you lose your first tooth on what we'll call Day 1, then lose your second one 3 days later, then the next one 5 days later, and continue making jumps equal to the next odd number...on what day will you lose your 18th tooth? (Hint: If you can figure out a pattern, you can save yourself a lot of work.)

Answers:

Wee ones: 5 teeth.

Little kids: 20 teeth. Bonus: 19 teeth, since you dropped to 17 and then added 2.

Big kids: 52 teeth in total. Bonus: 730 times. Wow!

The sky's the limit: Each day will be the square of the number tooth it is – day 4 for the second tooth, day 9 for the 3rd tooth...so the 18th tooth will come out on day 324.





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Bedtime Math Number Cruncher

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Photo: David Monniaux via Wikimedia Commons

Have you ever used a calculator? It's an amazing invention: you punch in numbers you want to add, multiply or do anything else to, and the calculator gets the answer far faster than your brain ever could. Well, before electricity or batteries, it wasn't quite so easy – until 1642, when Blaise Pascal, a famous French mathematician, invented the [mechanical calculator](#). As you see in the photo, it was a big clunky box, and instead of buttons it had a row of circular dials. To add two numbers, you “dialed” the first number, then the second, and a little window above the dial showed you the sum. If you wanted to add really big numbers – which you probably did, or you wouldn't be using a calculator in the first place – you used each dial for a different decimal place. So for 352 you'd dial a 3 on the first wheel, a 5 on the second wheel and a 2 on the third. It took almost as long as doing the math itself! But Pascal's calculator paved the way for other calculators – and our small, speedy electronic ones today.

Wee ones (counting on fingers): The first version of Pascal's calculator had 5 dials, while the fancier models had 10. How many more dials did the fancier version have?

Little kids: These wheelie calculators definitely took longer to give you an answer than an electronic one. If it takes 14 seconds to add two numbers on Pascal's machine but only 2 seconds to punch into the calculator on your parent's phone, how many seconds faster is the phone? *Bonus:* If there are 5 wheels and all 10 digits on each wheel, how many little digits do the dials show?

Big kids: Pascal was born in 1623 and invented the mechanical

calculator in 1642. How old was he when he invented it? *Bonus:* It wasn't until 1851 that mechanical calculators became more common in the form of the "Arithmometer," which was sturdier, cheaper, smaller, and easier to use than Pascal's. How many years later was the Arithmometer invented?

Answers:

Wee ones: 5 dials.

Little kids: 12 seconds faster. *Bonus:* 50 digits.

Big kids: Only 19 years old! *Bonus:* 209 years.





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Bedtime Math Light Show

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Photo: Still from video on guardian.co.uk

At night, big cities twinkle with all kinds of lights: street lamps, spotlights, and rows of white dots on skyscrapers. But when the lights shine in all kinds of crazy colors and designs, the scene becomes a lot more exciting. That's what they do in Sydney, Australia every year, in a celebration called Vivid Sydney. The city aims colored lights at the buildings, including the giant white wing-shaped roof of the Opera House, making bright stripes, squares, spirals, and more. [This video](#) shows the light designs changing throughout the night (fortunately they sped up the video, so you can watch 12 hours of light designs in just 2 minutes!). Someone had to do a lot of math and engineering to get those patterns to look right. You can try it yourself: if you take a flashlight and cover the end with heavy tape that has shapes cut out of it, you can shine designs on your own ceiling!

Wee ones: If you cover a flashlight with tape that has a little triangle cut out, and a friend shines it on you, as you back away from the flashlight will the triangle shining on your clothes get bigger or smaller?

Little kids: The white roof wings in the video get decorated with lots of designs. If one design puts a purple triangle, blue triangle and red triangle on each roof wing, how many do you see on 5 wings? *Bonus:* If each roof wing then gets 5 psychedelic zigzag stripes, how many stripes do you see?

Big kids: One of the coolest designs stretches giant Slinky-like spirals across each roof. If each loop makes the spiral 8 feet longer, how long

is a spiral of 20 loops? *Bonus:* If the roof pieces span 248 feet altogether, how many Slinky loops can they fit?

The sky's the limit: In one design the roof gets covered with orange squares. If a roof piece holds 8 rows of 8 squares, each square 7 feet wide, and suddenly the squares become 8-foot-wide circles, which set of shapes covers more roof area with orange light?

Answers:

Wee ones: Bigger. As you stand farther away, the light has more of a chance to spread wider.

Little kids: 15 triangles, since there are 3 on each. *Bonus:* 25 stripes.

Big kids: 160 feet. *Bonus:* 31 loops.

The sky's the limit: A 7-foot square covers 49 square feet of area, while a circle 8 feet wide has a radius of 4 and therefore covers an area of $\pi \times 4 \times 4$, or 16 π . Even without multiplying out, we can tell that the circles will take more room: if π equaled just 3 the circle area would be 48, so since π is roughly 3 1/7 we know we've cleared 49.

And a thank-you to Laurel P. for sharing this spellbinding video with us!



Bedtime Math Don't Let the Bed Bugs Bite!

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Photo from the Collection of the Liberty Hall Museum, Union, New Jersey

When you're in bed, you probably sleep on top of a nice bouncy mattress, filled with some combination of foam, springs, maybe a poofy pillow-top layer. Well, in the old days beds were nothing like that. A bed frame was a wooden rectangle with ropes stretched across both the length and width to hold you up. You then stuffed lots of feathers underneath them to fill the frame if you were rich, but if you weren't you stuffed hay, which was itchy and scratchy and full of bugs. Since the ropes stretched while you rolled around, every night you had to tighten them. And that's where we get the saying, "Good night, sleep tight, don't let the bed bugs bite!"

Wee ones: If you have 6 pieces of rope stretched across your bed and 3 more running from head to foot, how many rope pieces do you have to tighten at night?

Little kids: If the ropes make 6 rows with 3 square spaces in each, how many square spaces do they make? *Bonus:* If you have 12 square spaces left to stuff feathers through and you need 2 bags of feathers for each, how many more bags of feathers do you need?

Big kids: On some frames the ropes are wrapped around pegs along the top edge. If the pegs are 6 inches apart and there are 10 pegs down the long side, starting 6 inches from each corner, how long is the bed? *Bonus:* If you have 7 ropes running across and 3 ropes down – again spaced from the edges – how many total spaces do you have

to stuff hay through, including spaces along the wood frame?

The sky's the limit: If you have a total of 20 pegs, again where there are none at the corners, and the right side matches the left and the headboard matches the footboard, what's the greatest number of square spaces you can make by stretching rope across those pegs?

Answers:

Wee ones: 9 rope pieces.

Little kids: 18 spaces. *Bonus:* 24 bags.

Big kids: The 10 pegs make 11 spaces, so the bed is 66 inches long (5 1/2 feet). *Bonus:* The 7 ropes create 8 rows of spaces, and the 3 ropes create 4 columns, so they form 32 square spaces.

The sky's the limit: This is similar to perimeter and area: for any given perimeter (distance around) you get the greatest area by forming a square. In this case, you form the most “area” (spaces) by putting the same number of pegs along the length as the width. If you have 5 pegs along each edge, that stretches 5 ropes across and 5 down, creating 6 rows of 6 squares each for 36 squares in total. The opposite extreme is to have 1 peg at each end and 9 along each edge, which gives you only 10 rows of 2 spaces each, or 20.

And a big thank-you to Lorraine and Bill at [Liberty Hall Museum](#) for the great bed bug facts!





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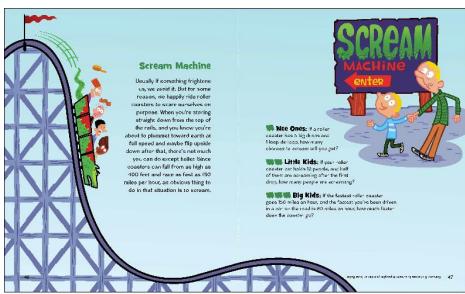
Bedtime Math Sneak Peek at the Upcoming Bedtime Math Book!

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That's right, we're finally launching our first book, [*Bedtime Math!*](#)

Published by Macmillan and illustrated by the renowned Jim Paillot, the book contains all-new crazy math problems just like our daily riddles here, and illustrated in full color (with glow-in-the-dark stars on the cover, too!). The book will be out June 25, and one of the greatest things you can do for our movement is order a copy and tell your friends. Not only will you love it, but the proceeds help fund our free programming — we're a nonprofit — and a big opening week of sales will get lots of attention and help us make math a fun part of kids' lives. [Click here to pre-order](#) for all the little people in your life! Thanks and enjoy!

Since you are our loyal fans, here's a sneak preview of one of our favorites from the book...



Usually if something frightens us, we avoid it. But for some reason, we happily ride roller coasters to scare ourselves on purpose. When you're staring straight down from the top of the rails, and you know you're about to plummet toward Earth at full speed and maybe flip upside-down after that, there's not much you can do except holler. Since coasters can fall from as high as 400 feet and race as fast as 150 miles per hour, an obvious thing to do in that situation is to scream.

Wee ones: If a roller coaster has 5 giant drops and 1 loop-de-loop, how many chances to scream will you get?

Little kids: If your roller coaster car holds 12 people, and half of them are screaming after the first drop, how many people are screaming? *Bonus:* If you can stuff 8 more people in that car and only half of them are screamers, now how many screamers are there?

Big kids: If the fastest roller coaster goes 150 miles an hour, and the fastest you've been driven in a car on the road is 80 miles an hour, how much faster does the coaster go? *Bonus:* If the coaster runs $\frac{2}{3}$ as fast as its top speed down the second drop, and then only $\frac{3}{4}$ of that second speed on the 3rd drop, how fast do you zoom on the 3rd drop?

Answers:

Wee ones: 6 chances to scream.

Little kids: 6 people. *Bonus:* 10 screamers, since you added 4 more.

Big kids: 70 miles an hour. *Bonus:* 75 miles an hour, since you go 100 miles an hour on the second drop.



Bedtime Math May Your Ears Hang Low

bedtimemath.org



Photo: cutestpaw.com

Did you know that your ears and nose never stop growing? If you don't believe it, just check out your Grandpa's nose next to your own. Your ears and nose are partly made of a rubbery material called cartilage. Cartilage is like clay or plastic: it holds its shape without collapsing, but it can change and [it does keep growing](#). Some ocean animals like sharks have skeletons made entirely of cartilage to help them swim faster. Since we humans don't live underwater, our legs need strong bones to hold us up – but our noses and ears don't. So those parts will grow for the rest of our lives even though our bones stop. Good thing we can't live for 300 years, or we'd be tripping over our noses.

Wee ones: You and Grandpa are eating lunch. How many noses and ears are at the table?

Little kids: Say your nose could grow 2 millimeters longer per year (a millimeter is about 1/25 of an inch). How many years would it take for your nose to grow 12 millimeters? *Bonus:* How many millimeters would your nose grow in 20 years?

Big kids: Say your nose grows at twice the speed of your ears. If your nose grows 1/2 inch in 10 years, how much does each of your ears grow in 20 years? *Bonus:* If for some horrifying reason your nose could grow a whole 1/2 inch every year, and your nose is 4 1/2 feet off the ground right now, how long till your nose can touch the ground?

The sky's the limit: Say you have a pile of things on the table and all of them can be sensed – you can at least see, hear or smell each one. If all you know about the objects is:

- 1 can be seen but not heard
- 3 can be heard but not smelled
- 2 can be smelled but not seen
- 3 can be seen *and* heard
- 4 can be heard *and* smelled

...what is the smallest number of total objects you can have, and what's the largest?

Answers:

Wee ones: 6 body parts: your 2 ears, Grandpa's 2 ears, your nose and Grandpa's nose.

Little kids: Just 6 years. But that would be half an inch, so luckily our noses don't grow that fast! *Bonus:* 40 millimeters.

Big kids: The same amount, 1/2 inch – because it's half the speed but twice the time. *Bonus:* Your nose is 54 inches off the ground, so it will take 108 years to grow that distance. You're safe for now.

The sky's the limit: For the minimum, the first three groups are all non-overlapping, because the seen and not heard can't overlap with the not-seen or the heard; the heard but not smelled can't overlap with the not heard or the smelled; and so on. However, the 3 seen and heard *can* overlap completely with the three heard but not smelled (it doesn't say whether they're seen or not). So that adds zero new. Of the 4 heard and smelled, 2 of them could be the smelled and not seen objects, but that still leaves 2 extra. Together with the 6 in the first three categories, the minimum is 8. For the *maximum*, you can't just add them all. The 7 in the last two categories can all be heard. If the 3 seen and heard are smelled, they completely overlap with the 4 below them. If they can't be smelled, they overlap completely with the 3 heard but not smelled. So that fourth category can never add new objects. The biggest total is 10.





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Bedtime Math Reflecting on Memorials

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Photo: Delaywaves via Wikimedia

Today is Memorial Day, when the U.S. remembers and honors all the soldiers who have fought to protect America. One of the most famous memorials to them is the World War II Memorial in Washington, DC, smack in the middle of one of the coolest arrangements of monuments anywhere. It sits at the end of a 2,000-foot-long reflecting pool for the Lincoln Memorial, so if you stand at the World War II memorial, you see the Lincoln reflected in the water. But if you're standing at the Lincoln looking down the pool the other way, it reflects the Washington Monument, a tall spike (an "obelisk") towering 555 feet high from back behind the World War II. The pool is only 18 inches deep, making it the perfect size to be the world's largest kiddie pool, but don't try to go swimming in it. It's just there to help us reflect on our history.

Wee ones: D.C. has many memorials and monuments. If you visit 7 sites and 4 of them have reflecting pools, how many sites don't have a pool?

Little kids: If the pool is about 2,000 feet long and the Washington Monument is about 500 feet tall, about how many of those tall Monuments could you lay end to end in the pool? *Bonus:* If you're 3 feet tall and you stand in the 1 1/2 foot-deep pool, how much of you

sticks up above the water?

Big kids: If you stand so that the Washington Monument's reflection appears to stretch for 3/4 the length of the pool, how long is the reflection? *Bonus:* The Monument is about another 1,000 feet back from the end of the pool. If the pool extended all the way to the Monument and the Monument's reflection grew by 1,000 feet, how many feet longer than its height would its reflection be? (Reminder: the Monument is 555 feet tall.)

Answers:

Wee ones: 3 without pools.

Little kids: 4 of them. *Bonus:* 1 1/2 feet of you.

Big kids: 1,500 feet. *Bonus:* The reflection would now be 2,500 feet tall, so 1,945 feet longer than the Monument itself.





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Bedtime Math Hungry Cars, Hungry People

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Photo: Carey Akin via Wikimedia Commons

Want to see a car drive faster than 200 miles per hour? Then head to Indianapolis for the Indy 500, one of the most famous car races in the world. [More than 100,000 people](#) watch the race in person every year. If you put all of those spectators' seats in a row, they'd stretch for 99 miles. To feed all those race fans, you'll find more than 40 ice cream stands and 35 pretzel vendors at the track. More than 10,000 pounds of hamburger are sold at the track on race day, requiring enough ketchup to fill 10 bathtubs. Never mind feeding the 34 cars driving in the race.

Wee ones: If you filled all the bathtubs in your house with ketchup, how many more would you have to fill for everyone's burgers at the Indy 500?

Little kids: The race is called the Indy 500 because the city of Indianapolis is nicknamed “Indy” and cars have to drive 500 miles to finish the race. How long would it take a car going 100 miles per hour to travel all 500 miles? *Bonus:* The first Indy 500 race was in 1911. How many years ago was that? (Hint: you can break this into pieces by figuring out the years to 2011, then 2011 to now.)

Big kids: 33 cars will race this year. If each one burns 20 gallons of gasoline in the race, how much gasoline do they use all together?

Bonus: The racetrack is 2 1/2 miles long. How many laps around the track do the cars have to drive to reach 500 miles?

The sky's the limit: If the fastest racecar drives $\frac{1}{4}$ faster than the slowest car, how many times will the fastest car pass the slowest one after driving 20 laps?

Answers:

Wee ones: Different for everyone...subtract your number of bathtubs from 10.

Little kids: 5 hours. *Bonus:* 102 years ago.

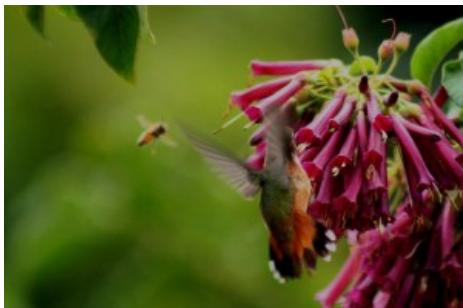
Big kids: 660 gallons. *Bonus:* 200 laps, since it will take 2 laps to drive 5 miles.

The sky's the limit: The fast car's speed is $\frac{5}{4}$ of the slow car's speed, so it will drive $1\frac{1}{4}$ laps ($\frac{5}{4}$ laps) in the time the slow car finishes one lap. The fast car will then hit $2\frac{1}{2}$, $3\frac{3}{4}$, and 5 laps on the slow car's complete laps, so it will pass the slow car every 5 laps. It will pass the slow car for the 4th time on the 20th lap.



Bedtime Math Tiny Turbo-Bird

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Bee hummingbird and a bee (Photo: Brocken Inaglory on Wikimedia)

The world's tiniest bird is only as big as a large insect – and it's named after a bug, too. It's the bee hummingbird. Other than its size, though, this creature doesn't look or act like a bee at all. Instead of yellow and black, bee hummingbirds have shiny blue-green, gray, and pink feathers. And the only things they sting are flowers: the birds stick their needlelike beaks into the centers of flowers to get to the nectar, which is their favorite thing to drink. From beak to tail, bee hummingbirds are [just 2 inches long](#) and weigh only as much as a penny! Their nests are so small that you could use them as bowls on a dollhouse table...just be sure to put some flowers in there, too.

Wee ones: If bee hummingbirds are only 2 inches long, and your hand is 6 inches long, how many birds could you line up end to end on your hand?

Little kids: You can tell a boy bee hummingbird from a girl one because the males (boys) have blue spots on their wings. If in a flock of bee hummingbirds there are 14 blue-spotted wings in total, how many male birds are there? *Bonus:* If out of 11 bee hummingbirds there are 6 blue-spotted wings, how many birds are *female*?

Big kids: Bee hummingbirds flap their wings 80 times per second – too fast for the human eye to see. If slower hummingbirds flap 5 times per second, how many times as fast do bee hummingbirds flap?

Bonus: A bee hummingbird moves so fast that it can visit more than 1,500 flowers a day. If a family of 5 birds each visit 1,500 flowers a

day, how many flowers do they visit in total?

Answers:

Wee ones: 3 bee hummingbirds.

Little kids: 7 male birds. *Bonus*: 8 females, because there are 3 males.

Big kids: 16 times as fast. *Bonus*: 7,500 flowers.





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Bedtime Math Howling at the Moon

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Photo: Retron via wikimedia

There's a full moon tonight, and a full moon makes many of us think of wolves howling at the moon. But the truth is, that isn't what wolves are howling at. Wolves use howls to [locate other wolves](#) in their pack.

They also howl to keep away other packs of wolves. So why did we ever think it had to do with the moon? One theory is that wolves howl more when the moon is full because they can see each other better. Also, for the thousands of years we didn't yet have electricity and lamps, we humans tended to be out and about more on nights when the moon was full because we could see better ourselves, so we were more likely to see and hear the howling those nights. Either way, those wolves always seem to make a racket right when we're trying to sleep.

Wee ones: If you hear 2 wolves howling and then 3 other wolves join in, how many wolves are howling now?

Little kids: Wolves can hold their howl for a good half minute, to give other wolves in the pack enough time to find them. If you can howl for 21 seconds but a wolf can last for 29 seconds, for how much longer than you can the wolf howl? **Bonus:** If a wolf can howl only 20 seconds and a fellow wolf needs him to howl 3 times to find him, for how many seconds in total does the wolf need to howl?

Big kids: Wolves can cover great distances, up to 9 miles in a single

day. If a wolf keeps up that pace for a whole week, how many miles does he travel? *Bonus:* If a wolf travels 8 miles a day for a week, then cuts his pace in half for a second week, how many miles does he travel in total?

The sky's the limit: Sound travels 1 mile every 5 seconds. If a wolf's howl echoes off a cliff towards you, and at that moment you're 4 miles from the cliff and driving toward it at 90 miles an hour, what fraction of a mile have you traveled by the time you hear the echo?

Answers:

Wee ones: 5 wolves.

Little kids: 8 seconds longer. *Bonus:* 60 seconds (1 minute).

Big kids: 63 miles. *Bonus:* 84 miles: 56 the first week, 28 the second.

The sky's the limit: $\frac{4}{9}$ of a mile. Sound travels 1 mile every 5 seconds, whereas you're traveling $1\frac{1}{2}$ miles every 60 seconds; $\frac{1}{12}$ of that comes to $\frac{1}{8}$ of a mile in 5 seconds. So the sound is traveling 8 times as fast as you, and when you meet it will have covered $\frac{8}{9}$ of the distance and you will have covered $\frac{1}{9}$. So you will travel $\frac{4}{9}$ of a mile.

To show this with algebra: if d is the distance you travel, $d+8d=4$ miles, so $9d=4$ and $d=\frac{4}{9}$.



Bedtime Math Next Floor: Space!

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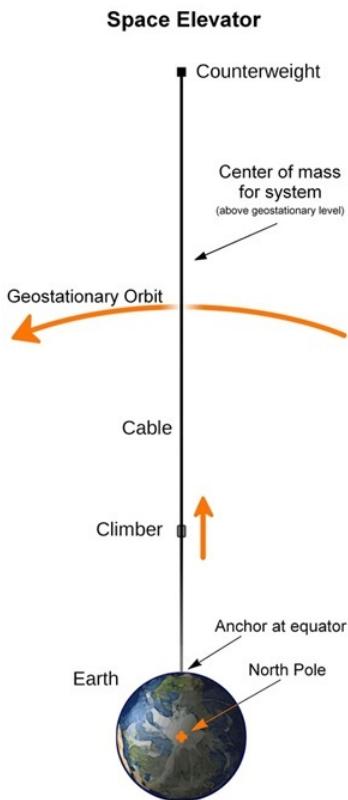


Image: Skyway via Wikimedia Commons

Elevator rides are fun to begin with, especially when you jump right when it's slowing down and you fly up higher than usual. But how would you like to take an elevator into space? Scientists think [it may be possible](#). Basically it would use a very long rope attached to the ground here on Earth, with a "counterweight" of over 100,000 pounds at the other end way up in space. That weight would keep the rope tight because as Earth spins, it would sling the weight around, just like when you twirl a yo-yo around your head and the string stays tight. The counterweight would circle Earth in "geostationary orbit," meaning it

would stay above the same spot on Earth so you don't have a crazy elevator ride on an angle. It all depends on finding a strong enough material for that cable – but as soon as we do, we're pressing Up for the next ride.

Wee ones: If someday we build 4 space elevators, then 1 goes out of service for repairs, how many elevators are left running?

Little kids: The super-strong cable for the space elevator would be about 24,000 miles long. To compare, Earth is about 25,000 miles around. How many miles longer would the cable have to be to wrap all the way around Earth? (Hint: just think in chunks of a thousand.) *Bonus:* How much cable would you need to build 2 elevators?

Big kids: 100,000 pounds is a lot of weight. If a big car weighs about 4,000 pounds, how many cars would you have to strap together in space as the counterweight? *Bonus:* If the space elevator travels 240 miles an hour, how long would it take you to ride the 24,000 miles from the ground up to the top in space?

Answers:

Wee ones: 3 elevators left.

Little kids: 1,000 miles longer (1 thousand). *Bonus:* 48,000 miles (48 thousand).

Big kids: 25 cars. *Bonus:* 100 hours.





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Bedtime Math How to Look Like a Math Whiz

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$$\begin{aligned}1 \times 8 + 1 &= 9 \\12 \times 8 + 2 &= 98 \\123 \times 8 + 3 &= 987 \\1234 \times 8 + 4 &= 9876 \\12345 \times 8 + 5 &= 98765 \\123456 \times 8 + 6 &= 987654 \\1234567 \times 8 + 7 &= 9876543 \\12345678 \times 8 + 8 &= 98765432 \\123456789 \times 8 + 9 &= 987654321\end{aligned}$$

Source: Andi Howard

Numbers are very regular and make beautiful patterns, and if you know those patterns, you can do some pretty cool tricks. Some tricks let you add and multiply big numbers in your head. It's easy to multiply a big number by 11, and to square numbers ending in 5 (to square a number means to multiply it by itself). As this video on [vedic math](#) shows, you can even multiply big numbers by other big numbers in your head. Today we'll show you some of the coolest number tricks out there, so you can wow your family and friends!

Wee ones: A fun trick is to figure out whether you can cut a number into 3 equal pieces (called dividing). If its digits add up to something divisible by 3, then the original number is divisible, too! Is 141 divisible by 3?

Little kids: To multiply a 2-digit number by 11, you just add its two digits and stick the answer in between the 2 digits. So for example, 32 times 11 is 352 (because 3+2=5). Quick, can you multiply 43 x 11?

Bonus: To multiply a big number by 5, you cut it in half and tack on a zero. Quick, what's 24 x 5?

Big kids: That works in the opposite direction, too: to divide by 5, you chop a zero off and then double what's left. Quick, what's 620 divided by 5? *Bonus:* To get the square of any 2-digit number that ends in 5, you take the first digit, multiply it by the next digit up, and then tack on 25 to the end. So for example, 35x35 is 1225, because 3x4=12, and then you tack on 25. Quick, what's 55x55?

Answers:

Wee ones: Yes, because $1+4+1=6$, and if you hold up 6 fingers, you see that you can group them into sets of 3.

Little kids: 473. *Bonus:* 120, because half of 24 is 12.

Big kids: 124, since that's 62×2 . A great way to figure out the tip at restaurants. *Bonus:* 3025, since 5×6 is 30, then tack on a 25.

And a big thank-you to Talie B. for sharing that video!



Bedtime Math Flipping Coins with Mickey

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Photo: Laura Overdeck

You probably think toys today are really cool compared to the bummer ones your parents must have had. Well, even though your parents lived in caves and ate dirt for dinner, we all had some cool toys ourselves – like the Mickey Mouse coin sorter, shown here. This toy hails from decades ago, or at least that's when I got mine (let's not focus on which decade...), and is both piggy bank and marvel of machinery. When you stick a coin into the slot at the top right, if it's a quarter it's heavy enough to tip the first red seesaw and fall into Mickey's right arm. If it's a nickel, it shoots straight through to his left arm. Pennies and dimes are narrower so they fall through a hole in that seesaw, then either tip or shoot through the bottom seesaw into the correct leg. So smart and simple, all without batteries, lasers or digital screens. Even without electricity or blinking lights, the money still adds up.

Wee ones: If you stick 2 quarters, 3 dimes, 2 nickels and a penny into Mickey, how many coins did you sort?

Little kids: If Mickey has 4 coins in each arm and 4 coins in each leg – 4 quarters, 4 dimes, 4 nickels, 4 pennies – how many coins is he holding? *Bonus:* How many seesaw tips did those coins make happen? (Again, quarters and pennies each tip one seesaw; dimes and nickels shoot through.)

Big kids: If you put 5 of each type of coin into Mickey, how much money is that, in cents? *Bonus:* If you swap out all the pennies and replace them with 5 extra quarters, now how much money do you have?

The sky's the limit: If you put in 82 cents and exactly 4 seesaw tips happened, how many combination of coins could you have put in?

Answers:

Wee ones: 8 coins.

Little kids: 16 coins. *Bonus:* 8 tips.

Big kids: 205 cents or \$2.05, since it's 5 times 41 cents.

Bonus: \$3.25.

The sky's the limit: 4 possibilities. You had to have put in 2 quarters (one tip each) plus 2 pennies for 2 more tips, so nickels or dimes make up the remaining 30 cents. Possible combinations are 3 dimes 0 nickels, 2 dimes 2 nickels, 1 dime 4 nickels, and 0 dimes 6 nickels, always with 2 quarters and 2 pennies.





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Bedtime Math On the Block

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We aren't talking about building blocks here, or street blocks: we're talking about the auction block. Sometimes when lots of grown-ups (or kids) want to buy the same item, the seller can put it up for "auction." All the interested buyers decide what they're willing to pay – they "bid" – and the highest bidder wins the item and has to pay that amount. In a live auction, bidders call out higher and higher numbers and the last one standing wins it...so sometimes people get competitive and get stuck paying a *lot* more than they planned. In a "sealed auction," you just put your bid in an envelope and all envelopes are opened at once; the high bid wins and that's it, no second chances. As we'll see here, there are other ways to run auctions – and maybe to score an awesome deal.

Wee ones: If someone bids \$3 for a 1960's Raggedy Ann doll, and you bid \$3 more than that, how much will you have to pay?

Little kids: Live bidding goes up in "increments," or jumps of a certain size. If an old-fashioned Mickey Mouse coin sorter has a current bid of \$25 with increments of \$5, how much will the next bid be? *Bonus:* If the increments after that become \$10, what will be the next bid after that?

Big kids: If there's a sealed auction for the first American Girl doll ever, and the 3 bids are \$54, \$12 more than that, and then \$25 more than the middle bid, what's the winning bid? *Bonus:* In a "Dutch auction," the auctioneer calls out prices that get *lower* until the first person who's willing to pay calls out. If bidding starts at \$90 with \$2 increments for each drop in price, and you have \$75 on you, how many prices do you have to skip before you can bid?

Answers:

Wee ones: \$6.

Little kids: \$30. *Bonus:* \$40.

Big kids: \$91, since the middle bid is \$66. *Bonus:* 8 prices to skip.

The price has to drop to \$74, which is \$16 lower, requiring 7 drops in prices that you skip along with the original \$90 bid.



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Bedtime Math Behind Bars

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Have you ever looked at a toy, book, or box of cereal and noticed a little rectangle of black stripes, with little numbers under it? That's called a bar code, and that symbol tells the scanner at the store which thing you're buying, so the store can charge you. Every item has to have its own number so prices don't get mixed up. And each digit has its own combo of 2 or 3 thin and thick bars, which the scanner can see and count up. Now there are QR codes which show a square full of teenier squares, and smartphones can snap a photo of them. But stripey ones really set the bar.

Wee ones: If a bar code has 5 numbers in the first half and 5 in the second half, how many numbers does it have in total?

Little kids: If the digit 8 is shown using 2 fat bars and a 3 uses 1 fat bar and 1 thin, how many bars does the code 33333 88888 have?

Bonus: If a 4 needs 3 bars, how many bars for the code 43434 34343?

Big kids: If an 8 uses 2 fat bars and a 9 uses 1 fat and 2 thin, how many 8s are there in a code with 12 thin bars and 14 fat ones, if the code contains only 8s and 9s? *Bonus:* What if the same bar code has 4 0s in the mix, where each 0 uses 2 thin bars – now how many 8s?

The sky's the limit: If 10-digit codes can run from 00000 00000 to 99999 99999, how many codes have only odd digits for the first 5 digits?

Answers:

Wee ones: 10 digits total.

Little kids: 20 stripes, since it uses 10 digits each using 2 stripes.

Bonus: Now you have 25 stripes.

Big kids: There are enough thin bars for 6 9s, which use up 6 fat bars. That leaves only 8 fat bars for 4 8s. Bonus: The 0s use up 8 thin bars, leaving only 4 unclaimed thin ones, so now there are only 2 9s. That now leaves 12 fat bars for 6 8s.

The sky's the limit: An odd first digit knocks out half the codes, and the next knocks out half of the remaining codes, and so on. So only 1/32 of the 10,000,000,000 codes are possible. That cuts you to 5 billion, then 2.5 billion, then 1.25 billion, then 625 million, then 312.5 million, or 312,500,000. The other approach is that the first odd digit enables 5 families of codes, times 5 for each digit that follows...giving you $5 \times 5 \times 5 \times 5 \times 10 \times 10 \times 10 \times 10 \times 10$.





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Bedtime Math Triple Crowns

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Photo: Marc Rein

Three really is a magic number, and we love it when things happen in threes. It's very exciting in sports, like when a hockey player scores three goals in one game, which is called a hat trick. An even more exciting threesome is the triplet of major US horse races: the Kentucky Derby, the Preakness Stakes, which happens tonight, and the Belmont Stakes. When the same horse wins all three of those races in the same year, it's called a Triple Crown. This almost never happens: only [11 horses](#) have ever managed to do it, and the most recent did so in 1978! But every year since Sir Barton won all three in 1919, we wait with bated breath to see if the Derby winner can at least win the Preakness and set the stage for a triple crown...and tonight it's Orb's big chance.

Wee ones: If a horse wins the first 2 of the 3 major races, how many races does the horse have left to win to score a Triple Crown?

Little kids: Starting in 2002, 5 horses have won the first 2 races but not the third, including I'll Have Another last year. How many years from 2002 through 2012 have we not had a double winner? *Bonus:* From 2002 to 2012, how many major races were run in total?

Big kids: The last horse to get a Triple Crown was Affirmed in 1978. How many years ago was that? *Bonus:* If 20 horses ran in each race, and each time they all had the same chance of winning, what are the chances of the Derby winner winning the Triple Crown?

Answers:

Wee ones: 1 more race.

Little kids: That span includes 11 seasons, not 10 (this is the “fencepost problem” where you have to count both ends), so there have been 6 years with no double winner. *Bonus:* 33 races in those 11 years.

Big kids: 35 years. *Bonus:* 1 in 400. The winner of the first has a 1/20th chance the second time, and then faces those chances again. (Just to clarify, the chances of a specific horse winning all three are 1 in 8000, whereas the chances of *any* horse winning all three are 1 in 400.)





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Bedtime Math Mirror Image

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Photo: Andi Howard

It's very cool that some letters and numbers look the same when we flip them upside-down. An 8 is a great example of that, as is a capital H. But other letters get a little more complicated, since there are two ways to flip them upside-down, and sometimes they will look the same only if you flip the correct way. Some letters and numbers have mirror symmetry: if you stand them up on a mirror, they basically look the same upside-down on the mirror as they do standing up. A capital B or E works that way. But the letter N doesn't – it will look backwards. That's because letters like N have rotational symmetry: if you spin them around so they're upside down, they look the same. That won't work on a B or E, as this time they'll look backwards. The letter H will look right either way since it has both kinds of symmetry. Check out the alphabet, and see how many words you can write that work either way.

Wee ones: Can the letter S look the same upside down? Which way do you have to flip it?

Little kids: If you write your name in all capitals and stand it on a mirror, how many of the letters will still look correct? *Bonus:* How about if you spin your name halfway around on a piece of paper? Now how many letters still look right?

Big kids: Which uppercase letters of the alphabet look the same either flipped or spun upside down? *Bonus:* How many letters in the alphabet look the same standing on their mirror image?

Answers:

Wee ones: Yes, if you spin it around. Standing the S on a mirror won't work!

Little kids: Different for everyone...see if you can figure it out without a mirror! *Bonus:* Different for everyone again.

Big kids: Not many...by our count there are only 4 of them: H, I, O, and X. *Bonus:* All of those, plus B, C, D, E, and K (if written a certain way).





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Bedtime Math Give Me a Sign

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Photo: smallbitsandpieces at blogspot

Billboards are those big rectangular signs along the side of the highway, usually trying to talk you into buying something. Since they're a good 50 feet above you, these signs are even bigger than they look – they're 20, 30, or even over 40 feet wide. The size depends on the speed of the traffic: the faster you're driving, the easier it has to be for people to read it, so the bigger the letters and pictures need to be. The signs along slower streets in town, called "[posters](#)," are 22 feet wide, but the big "bulletins" along the highway are up to 48 feet wide. Now we have digital billboards that light up like a computer screen and change the picture every few seconds, showing drivers even more things they should buy. Either one works, as long as we read it quickly: the more important thing as a driver is to keep your eyes on the road.

Wee ones: Which one is wider, a 20-foot-wide poster or a 40-foot-wide billboard?

Little kids: If a billboard is 10 feet tall and the bottom is 50 feet off the ground, how many more of those same signs could you stack edge to edge below it? *Bonus:* If you want to climb up to that 50-foot sign but all you have is an 8-foot ladder, how many more feet does your ladder have to reach?

Big kids: If an adult's face is 9 inches tall, and all objects on a billboard are 12 times life size, how tall is a face shown on a billboard? *Bonus:* These giant highway signs are about as big as a house. If the front of a house has a 15-foot-wide kitchen, a 6-foot-wide hallway, and an 18-foot-wide living room, which one is wider, the

house or a 48-foot-wide highway billboard?

The sky's the limit: Suppose as a prank you decide to climb up a billboard at night and wrap a string of lights around the edge. If you need exactly 82 feet of strung lights to cover all four sides, and the area of the billboard (length times width) is 400, what are the width and height of the billboard?

Answers:

Wee ones: The billboard is the bigger number.

Little kids: 5 more of those signs. *Bonus:* 42 more feet.

Big kids: 108 inches, or 9 feet! *Bonus:* The billboard would be wider if leaned up against the house – 48 feet vs. 39.

The sky's the limit: It's 25 by 16 feet. We know that the width and height have to add to 41, since those two sides will use up half the lights. Those same two numbers also multiply out to 400. You can use trial and error to test the factors of 400 numbers: 40 by 10 doesn't work, nor does 20 by 20, but 16 by 25 does. Expressing this using algebra:

$$w + h = 41, \text{ so } h = 41 - w$$

$$w \times h = 400. \text{ Replacing } h, \text{ you get}$$

$$w \times (41-w) = 400$$

$$41w - w^2 = 400, \text{ or } w^2 - 41w + 400 = 0$$

...and then you still need trial and error to break it down into $(w-25) \times (w-16) = 0$. So $w=16$ or 25 .



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Bedtime Math Jailbreak

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Photo: Diana Pecina

Groundhogs usually don't do anything exciting. They're the round, brown, kind of boring animals waddling alongside highways and across our backyards. So you can imagine everyone's surprise last week when a [groundhog](#) came barreling into a kids' baseball practice in New Jersey and started chasing after the kids, even though he himself was only the size of a soccer ball. When the coach ran over to fend him off, the groundhog started chasing the *coach*, who dove into his car for safety. To make sure the animal didn't bite anyone, the police captured the groundhog with a loop, but he broke the rope. Then after being caught again and caged in an animal shelter, he broke out of *there*. That's one groundhog who doesn't want to be in captivity – or who just really wants to play baseball.

Wee ones: If there are 9 kids practicing baseball and the groundhog joins in the game, now how many players are there including him?

Little kids: If you have 9 kids and a groundhog running around the field, how many little feet are on the move? *Bonus:* If you can sprint (run your fastest) 100 feet but the groundhog can make it only 70 feet, by how far can you outrun the groundhog?

Big kids: The coach estimated that the terrifying groundhog weighed 20 pounds. How much more do you weigh? *Bonus:* If you have 9 kids averaging 50 pounds each, how much more does the baseball team weigh than the feisty groundhog?

Answers:

Wee ones: 10 “players” total.

Little kids: 22 feet: 18 people feet and 4 groundhog feet. *Bonus*: 30 feet farther.

Big kids: Different for everyone...subtract 20 from your weight in pounds. *Bonus*: 430 pounds more (450 minus the 20).



Bedtime Math Sticky Fingers

bedtimemath.org



Source: Wikipedia via Wikimedia

If you've ever looked closely at your own fingertips, you've probably noticed that the skin is grooved with very, very thin lines in a spirally pattern. That's your fingerprint, and it is your very own: every single person has his or her own special pattern. There are [six basic styles](#) of fingerprints, though: loop from right, loop from left, arch, whorl, double loop, and "eclectic," which basically covers all the weird remaining ones that don't have a name. These grooves in our fingers help us grip objects — but as a special bonus, fingerprints also leave tracks showing exactly whose fingers they are. You can use your fingerprints on scanners to get permission to open doors, but your fingerprints can also show that you were the thief who opened the cookie jar. Just one more good reason to wash your hands.

Wee ones: There are 6 types of fingerprints, but half of those involve "loops." How many loopy fingerprint types are there?

Little kids: If you have messy chocolate all over one hand, and you fully touch the table with that hand 3 times, how many total fingerprint marks do you leave on the table? *Bonus:* If 2 friends each have both hands covered with chocolate and they each rest all 10 fingers on the table, now how many total fingerprints are there?

Big kids: One way to see your fingerprint is to press your finger on an ink pad, then on a fresh empty balloon, and then blow up the balloon to watch the design stretch out. If your fingerprint covers a space that

gets 5 times as tall and 5 times as wide when you inflate the balloon, how many of your original fingerprint could fit in that new space? *Bonus:* If that area now doubles in each direction, now how many times as big is it relative to your original fingerprint?

The sky's the limit: Suppose your class at school has 12 boys and 12 girls, all with loop, arch or whorl fingerprints. If half the boys and 2/3 of the girls have loopy fingerprints, and half the remaining kids have arch fingerprints but that includes 3 more boys than girls, how many girls have whorls?

Answers:

Wee ones: 3 loopy types.

Little kids: 15 fingerprints. *Bonus:* 35 fingerprints, since the friends added 20.

Big kids: 25 fingerprints. *Bonus:* 100 times as big.

The sky's the limit: 6 boys and 8 girls have loops, leaving 6 boys and 4 girls with other types. Half, or 5 in total, have arches, but if that includes 3 more boys than girls, then only 1 girl has arches (along with 4 boys). That leaves 3 girls with whorls.



Bedtime Math Water Shooter

bedtimemath.org



Photo: Brigitte Rodriguez via Wikimedia Commons

It's pretty exciting when a volcano explodes and shoots red-hot lava, which is melted rock. Well, nature does this with water, too. A geyser is a rare underground spring that sometimes bursts up through the ground. One of the most famous geysers is [Old Faithful](#) in Yellowstone National Park. It gets its name because it is very predictable: it erupts every 91 minutes, shooting hot water and steam up to 185 feet in the air for as long as 5 minutes at a time. In the old days, people tried to use Old Faithful to wash their clothes, but found that it was too powerful and the blasting water tore everything to shreds. Because of changes in the earth, the length of each eruption and the amount of water that comes out have both changed, too. But Old Faithful still deserves its name, as it still shoots boiling water high into the air about every hour and a half – whether you're waiting to do laundry or not.

Wee ones: If you can spray water out of your mouth for a whole minute straight, but Old Faithful can blast water for 5 minutes straight, how much longer than you can Old Faithful spray?

Little kids: Is 185 feet about as tall as a person, a building, or a mountain? *Bonus:* If the last eruption ended at 3:10 pm, at what time will you see the next one if it's 91 minutes later? (Reminder: there are

60 minutes in an hour.)

Big kids: For a sense of how tall 185 feet is, you can compare it to other tall things, like a house. If each story adds 10 feet of height and so does the roof, about how many houses with 2 stories and a roof do you have to stack to match Old Faithful? *Bonus:* You can also compare to an American football field, which is 120 yards long. About what fraction of a football field standing on end would the highest eruption match? (Reminder: a yard equals 3 feet.)

Answers:

Wee ones: 4 minutes longer.

Little kids: About as tall as a building with 18 floors. *Bonus:* 4:41 pm.

Big kids: Each house is 30 feet tall, so you'd need about 6 houses, which stack to 180 feet. *Bonus:* A football field is 360 feet high, so 185 feet is about half a football field.



Bedtime Math Cicadian Rhythms

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Photo: William H. Majoros via wikipedia

Okay, let's get this straight once and for all. We've heard that cicadas, those fat grasshoppers that make that loud, high-pitched chirping noise, come around every 17 years. We've also heard there's another type that shows up every 13 years. And the fact is, we feel like we see or hear a couple of them *every year*. It turns out the [17-year cicada](#) lives in the Northeast U.S. and the 13-year is its Southern cousin. This year is apparently the big year for the 17-year cicada crowd to come out from underground, lay eggs, and then disappear. If you live in the Northeast and listen carefully while outdoors, you'll hear the loud, whirring sound they make. Apparently their 90-decibel shriek is as loud as a subway — of course, as [one person](#) pointed out, if you'd been stuck underground for 17 years, you'd be screaming, too.

Wee ones: A cicada is an insect and therefore has 6 legs. How many more legs does it have than a person?

Little kids: Were you around when the cicadas last showed up 17 years ago? *Bonus:* How old will you be when the 17-year cicadas come again?

Big kids: In what calendar year will the 17-year cicadas return again? *Bonus:* Cicadas come out when the weather reaches 64 degrees. If it's 49 degrees out where you are, how much warmer would it have to be?

The sky's the limit: If the 17-year cicada shows up, and then 3 years later the 13-year cicada shows up, how many years after that will they *both* show up the same year?

Answers:

Wee ones: 4 more legs.

Little kids: Different for everyone...see if your age is less than

17! Bonus: Add 17 to your age today.

Big kids: In 2030. Bonus: 15 degrees warmer.

The sky's the limit: Every cycle of the 13-year cicada leaves the 17-year cicada behind by another 4 years. So to start, the 17-year has 14 years to wait. The next time the 13-year shows up, the 17-year is just 1 year behind. Counting from there, it will then be 5 years behind, then 9, 13, and finally 17 years behind, which means they both show up that year. That makes 5 cycles of the 13-year cicada, or 65 years.





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Bedtime Math From Soup to Nuts

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Photo: Laura Overdeck

Soup is good for you, but it should also be fun to eat. That's why alphabet soup, soup with little o's, etc. are all great options. Even better is when your soup is looking back at you. Maybe you've tried those Campbell's soups with noodles shaped like princesses, Phineas and Ferb, or Scooby Doo. Did you ever wonder exactly how many of each character end up in the can? Or whether it's equal? Did some character not get his fair share of noodles? And what are your chances of getting your favorite character with each bite? It's time to run some numbers.

Wee ones: If you eat 3 Cinderella noodles, 2 Snow Whites and 2 Ariels, how many princess soup noodles did you eat?

Little kids: If your Cars soup has 22 Maters but twice as many Lightning McQueens, how many Lightnings are in there? *Bonus:* How many Maters and Lightnings all together?

Big kids: These soups each seem to have 6 types of noodles. If Campbell's makes 6 different soups in this series, how many different kinds of noodles do they have to make? *Bonus:* If you're eating soup from just one can, and with each spoonful you pick up either 1 or 2 noodles, how many total different spoonful combos can you scoop?

Answers:

Wee ones: 7 noodles.

Little kids: 44 Lightning noodles. Bonus: 66 noodles altogether.

Big kids: 36 different noodles. Bonus: You have 27 types of spoon arrangements: 6 1-noodle possibilities and 21 2-noodle possibilities.



Bedtime Math Digging Out

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Photo: Andi Howard

As long as we're talking about vehicles and water, this news story might top the tugboats. A [group of travelers in Siberia](#) reached a flooded river that they had to cross, so they got creative. They used two excavators – those earth-diggers with the giant scoop-shaped shovel at one end – to carry everyone across. As you can see in [this video](#), a handful of people at a time climbed into the shovel of one excavator, which then swung its arm out over the river. The other excavator swung its shovel out to meet the first shovel, and the riders climbed from one shovel to the other, handing over luggage as they did. Then the next group climbed in. This can't be the fastest or easiest way to travel, but at least no one fell in the river – the water in Siberia is pretty darn cold!

Wee ones: If the shovel can hold 8 people and you're 6th in line, will you get to climb in with the first group?

Little kids: If 8 people can cross the river in the shovel and half those people have luggage, but of the people who have luggage, half have 2 suitcases and the others have just 1, how many suitcases have to fit in the shovel? *Bonus:* If it takes 10 seconds for each person to climb in, 11 seconds to switch shovels, and 8 seconds to climb out, how many seconds of climbing does each passenger have to do without falling into the river?

Big kids: That looks like a long line of people waiting to cross...If the

shovel holds 8 people and there are 59 people who want to cross, what's the minimum number of groups the excavators have to ferry across? *Bonus:* If another 22 more people show up before they've finished, how many trips will it take – and can you solve that quickly without adding 59 and 22?

The sky's the limit: If each excavator can swing between shore and mid-river in 5 seconds (whether empty or full), and climbing in takes 10 seconds, the mid-river hand-off takes 20 seconds, and climbing out takes 15 seconds, how long does it take for the whole group of 59 to cross the river IF the first excavator always returns to load the next group of 8 immediately?

Answers:

Wee ones: Yes! And two more can climb in after you.

Little kids: 6 suitcases. 4 people have luggage, and 2 of them have 2 suitcases each while 2 of them have 1 apiece, making 2+4.

Bonus: 29 seconds of climbing.

Big kids: 8 trips, since the first 7 trips will take just 56 people.

Bonus: It will now take 11 trips. The 22 people will fill 2 full trips and have 6 folks left over. 5 of those will fill the 8th trip from the original group, then one poor guy will have to ride alone.

The sky's the limit: 370 seconds (or 6 minutes 10 seconds). The first group takes $10+5+20+5+15$, or 55 seconds to get across. However, each group after that adds a little less time, because when the second excavator swings back to mid-river the 1st excavator is already waiting. The 2nd excavator needs 5 seconds to swing back, 20 seconds to collect people, 5 to get to shore, and 15 to unload. So you add only 45 seconds for each of the next 7 groups. That makes the total $55 + 7 \times 45$, or 370 seconds.



Bedtime Math Work Hard, Play Hard

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Photo: Żeglarz via wikipedia

You can tell from their name what tugboats do: they tug other boats. [Tugboats](#) move ships that can't move themselves, like heavy barges, and steer big ships through crowded areas so they don't crash into each other. Tugboats can also act as icebreakers, help fight fires, and rescue sinking ships. And to top it off, they can do dance routines: today the annual "[Tugboat Ballet](#)" kicks off in Germany, in which eight tugboats swim around to waltz music blasted over loudspeakers, to show off how zippy they are. They also show off their speediness in tugboat races in cities around the world, and the New York race also features a nose-to-nose pushing contest and a line toss competition. Tugboats may not be the biggest boats out there, but it's clear they have the most fun.

Wee ones (counting on fingers): If 2 of the 8 tugboats scheduled to take part in the Tugboat Ballet break down at the last minute, how many tugboats can still do the show?

Little kids: In the nose-to-nose pushing contest, if one boat pushes the other back 14 feet, but then that boat pushes the first boat 21 feet from there, how far from the starting point do they end up? *Bonus:* A tugboat can push [up to 40 barges](#), all way bigger than itself! If each barge weighs 5 times as much as the tug, how many times its weight does a tug pulling 20 barges tow?

Big kids: In the New York City tugboat race, the tugs start next to 79th Street in Manhattan and end at a pier next to 44th Street. How many

blocks do they travel? *Bonus:* In last year's race, the first boat crossed the finish line in 5 minutes and 1 second, and the last one in 12 minutes and 48 seconds. How many total seconds passed between the first boat's finish and the last?

Answers:

Wee ones: 6 tugboats.

Little kids: 7 feet in front of it. *Bonus:* 100 times.

Big kids: 35 blocks. *Bonus:* 467 seconds (7 minutes 47 seconds).





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Bedtime Math National Inventors Month

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Photo: Laura Overdeck

May is [National Inventors Month](#), when we celebrate all the gadgets and materials that make our lives better. Whether it's the refrigerator, your light-up sneakers, or that one cool Lego piece that everyone fights over, our homes, backpacks and pockets are full of objects that at one time didn't exist but now make our lives better (most of the time). What's funny is a lot of inventions have been created [totally by accident](#), including the microwave, potato chips, and our favorite dessert around here, the warm-center chocolate cake. If you get out there and make stuff, chances are you'll eventually solve a key problem – maybe one you hadn't even thought of.

Wee ones: [Silly Putty](#) was invented by a guy trying to make rubber, except the type he created was too bouncy. If a normal rubber ball bounced 3 feet but his new stuff bounced twice as high, how high did the Silly Putty stuff bounce?

Little kids: Warm-center chocolate cake – the kind that gushes yummy chocolate sauce when you cut it with your fork – was born when chef Jean-Georges Vongerichten undercooked a cake. If you need 8 tablespoons of chopped chocolate to make 4 cakes, how many teaspoons of chocolate is that? (There are 3 teaspoons in a tablespoon.) *Bonus:* If you need half as much sugar, how many teaspoons of sugar do you need?

Big kids: [Fireworks](#) were supposedly invented 2000 years ago when

a cook mixed charcoal, sulfur, and saltpeter, which, when packed in a tube and set on fire, exploded. If you mix 3 tablespoons of charcoal, twice as much sulfur, and twice as much saltpeter as sulfur, how many tablespoons of stuff do you pack in the tube? (Note: This isn't the real recipe, but please do not try it!) *Bonus:* If each tablespoon of mixture turns into 12 sparkles in the sky, how many sparkles does your fireworks tube make?

Answers:

Wee ones: 6 feet high.

Little kids: 24 teaspoons. *Bonus:* 12 teaspoons. And see below for the original recipe...super-easy to make, and a total crowd-pleaser.

Big kids: 21 tablespoons: 3 charcoal, 6 sulfur, and 12 saltpeter. *Bonus:* 252 sparkles.

Recipe for Warm Soft Chocolate Cake

(from Chef Jean-Georges Vongerichten, via Martha Stewart's website)

8 T (1 stick) butter + more

2 t flour + more

4 oz bittersweet chocolate

2 large whole eggs

2 large egg yolks

1/4 cup sugar

- Preheat oven to 450 degrees.
- Butter and lightly flour four 4-oz molds. Tap out excess flour and set aside.
- Put butter and chocolate in double boiler (or microwave on Low) and heat till chocolate is almost completely melted. Stir till blended.
- Beat together eggs, yolks, and sugar until light and thick. Add the chocolate mixture and beat to combine. Quickly beat in flour until just combined.
- Divide batter evenly among the molds.
- Place filled molds on a baking sheet in the oven and bake until the sides have set but the centers remain soft – about 6-7 minutes for foil ramekins, 7 for ceramic ones.
- Invert each mold onto a plate, and let rest 10 sec. Unmold by lifting up one corner of the mold; the cake will fall out onto the plate. Or, if serving from ceramic, leave cake in ramekin and let

rest 10-15 minutes before serving.

- Serve with vanilla or coffee ice cream.



Bedtime Math "So Three Ducks Walk into a Hotel..."

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Photo: Peabody Hotel

It all started in the 1930's, when Frank Schutt, the manager of the [Peabody Hotel](#) in Memphis, decided to put three live ducks in the fountain in the hotel lobby for fun. Hotel guests thought it was hysterical, so the owners bumped the number up to five ducks. A few years later, a circus animal trainer trained the ducks to walk on their own up to the fountain every morning and back to their pen at night. To this day, the Peabody Ducks march to and from the fountain every day on a royal red carpet, posing for photos along the way. Hopefully they don't have to carry a suitcase, too.

Wee ones: Apparently the Peabody Hotel fountain had turtles and alligators before the ducks showed up. If the fountain had 8 turtles but now has the 5 ducks, how many more turtles were there than ducks today?

Little kids: The ducks march to the fountain at 11 am every morning and back out at 5 pm every afternoon. How many hours do they spend swimming in the fountain each day? **Bonus:** How many hours each day do they spend outside the fountain? (Reminder: a day has 24 hours.)

Big kids: These probably aren't the same 5 ducks from the 1930s. If all Peabody ducks live 8 years and can be trained when they're 1 year

old, what is the earliest year that the current ducks could have started marching? *Bonus:* If ducks started marching in 1935, what's the fewest number of sets of ducks the hotel has had to train?

The sky's the limit: The alligators that used to live in the fountain are long gone, fortunately for the ducks. But ducks would be safe with turtles. If we had 7 more ducks than turtles but 18 more turtle *feet* than duck feet, and the number of duck feet had the same two digits reversed, how many turtles and ducks would be swimming in the lobby fountain?

Answers:

Wee ones: 3 more turtles than ducks.

Little kids: 6 hours. *Bonus:* 18 hours.

Big kids: 2006 (7 years ago). *Bonus:* That was 77 years ago, so they have to have had 11 sets and are on at least their 12th set.

The sky's the limit: There are 23 ducks and 16 turtles. If the two foot-count numbers are 18 apart and the digits are reversed, then the two digits themselves are 2 apart: so it's 42, 53, something like that. But they have to be even numbers, so your only choices are 24/42, 46/64, and 68/86. 46/64 gives you animal counts that are 7 apart: 46 duck feet for 23 ducks, and 64 turtle feet for 16 turtles.



Bedtime Math Blue Sky, Blue Sea...Blue Trees?

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Photo: Ruth Woody

No, this isn't a picture out of a Dr. Seuss book: the trees in this photo really are blue. This patch of trees next to a highway in Houston has been coated with blue paint. Artist Konstantin Dimopoulos [did the project](#) to remind people that trees are disappearing from the Earth, and that life could look very different if we don't take care of our environment. The paint is safe for the trees and will eventually wash off, but until then, it's a strange sight as you drive through the city. The real question is, how long did it take to paint them?

Wee ones: If you and a friend paint a row of trees and take turns, and you paint the 2nd and 4th trees, which tree will you paint on your next turn?

Little kids: If you have an 8-foot ladder and can stand on the tippy-top, and you can reach a total of 5 feet higher than that, how high on the tree can you paint? *Bonus:* If you grab another ladder that lets you paint up to 20 feet high on the tree, how tall is the new ladder?

Big kids: If there are 80 trees in the grove and each one needs 3 one-gallon buckets of paint to coat its trunk, how many buckets of paint do you need? *Bonus:* If you pound through painting the first half of the trees at 2 hours each, but the second half you slow down and take 3

hours each, how long does it take to paint all the trees?

Answers:

Wee ones: The 6th tree.

Little kids: 13 feet. *Bonus:* It's a 15-foot ladder, since it's lifting you 7 feet higher.

Big kids: 240 buckets of paint. *Bonus:* 200 hours: 80 hours for the first 40 trees, and 120 hours for the second 40 trees.

And a big shout-out to Ruth W. for showing us these blue trees!





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Bedtime Math All Birthdays Count

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Photo: Laura Overdeck

Today is our guinea pig Hershey's first birthday! Well, okay, we don't know if it's *exactly* today, but it's the official date, since she was 5 months old when we got her last October 5. As we look at how big she's gotten, and how much smarter she is, it reminds us that any kind of pet takes a lot of tender loving care. Pets are basically warm, furry, living vacuum cleaners: they just eat. Yes, they do sleep and poop and show us some love, but their main job in life is to eat. And when you add up a whole year of eating for a pet — either yours or someone else's — the numbers can surprise you.

Wee ones: If Hershey eats 2 meals of hay each day and 2 snacks of whatever veggies are left over from lunch and dinner, how many times does she eat each day?



Photo: Laura Overdeck

Little kids: If Hershey is 1 year old and she showed up here when she was 5 months old, how long has she been living here? *Bonus:* If she and her fellow Bedtime Math guinea pig, Snickers (shown here), take 3 months to eat through a medium bag of timothy hay, how many bags of hay have we had to open since the guinea pigs showed up?

Big kids: Hershey eats about 2 tablespoons of dry food every day, too. Given that there are 16 tablespoons in a cup, what fraction of a cup does she eat in 1 week? *Bonus:* Rounding that down to 3/4 of a cup, how many cups does she eat in a 52-week year?

The sky's the limit: Hershey weighed just 10 ounces when we got her; she now weighs 2 pounds 2 ounces. If your pet dog (or a friend's dog) weighed 12 pounds as a puppy last year and now weighs 40 pounds, which fury pet grew a bigger *fraction* of his/her starting weight? (Reminder: There are 16 ounces in a pound.)

Answers:

Wee ones: 4 times a day.

Little kids: 7 months. *Bonus:* 3 bags, since they finished 2 bags in 6 months.

Big kids: 14/16, or 7/8 of a cup. *Bonus:* 39 cups, which is over 2 gallons.

The sky's the limit: Hershey grew by more. She now weighs 34 ounces, which is $3\frac{2}{5}$ times her weight a year ago, while the puppy weighs $3\frac{1}{3}$ times his starting weight. $\frac{2}{5}$ is more than $\frac{1}{3}$...to check that, you can convert each one to 15ths, which gives you $\frac{6}{15}$ vs. $\frac{5}{15}$. So Hershey grew a bigger fraction.



Bedtime Math Getting a Jump on It

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Photo: JKolstrung via wikipedia

Tonight some of the fastest horses in America will run in the Kentucky Derby, one of the three major U.S. horse races every year. Horses run really fast, reaching speeds of close to 50 miles an hour. And with that kind of running start, horses can do other stunts, too, like jumping really high and really far. In horse-jumping competitions, horses have jumped over fences [taller than 8 feet](#) and muddy ditches as long as [27 feet!](#) Of course, they do this with a jockey, which is what you call the person riding the horse through these obstacles. It's a great sport for those who think riding an 1800-pound animal at top speed while crammed on a racetrack with other fast, heavy animals isn't exciting enough.

Wee ones: If your horse can jump over objects 4 feet tall, and you're 3 feet tall, can your horse jump over you?

Little kids: If during practice you and your horse jump over 2 fences, 9 ditches and 4 rows of bushes, how many obstacles did you guys jump? *Bonus:* How many more ditches did you jump than everything else put together?

Big kids: If your horse can long-jump 16 feet, and a sandbox is 4 1/2 feet long, how many end-to-end sandboxes can your horse clear completely? *Bonus:* If your horse needs 32 feet of a running head start for each 16-foot jump, how many sandboxes can your horse jump in a 150-foot-long yard? (Assume only complete jumps with the jumpable number of sandboxes.)

Answers:

Wee ones: Yes – 4 feet is fortunately more than 3 feet!

Little kids: 15 obstacles in total. *Bonus:* 3 more ditches than other kinds of obstacles (6 in total of those).

Big kids: 3 sandboxes, since 4 sandboxes would be too far (18 feet).

Bonus: 9 sandboxes in total. Each jump requires 48 feet in total, and the yard can fit 3 rounds of this, with 3 sandboxes in each jump.

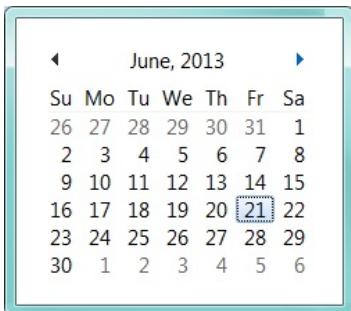




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Bedtime Math Countdown

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Source: Microsoft Explorer

It's Friday, the end of the school week, but as we head towards June we're getting close to a super-important day: the last day of school. Now let's face it, that means different things to different people ...school is cool, but it's also nice to mix things up and do something different for a couple of months. End of school means swapping out classes, homework, and time with school friends, and swapping in camp, playtime, and maybe other friends and relatives. You might be getting up later, or you might be getting up earlier. You might have different weather. The question is, how soon will all of this happen for you? Grab a calendar and let's see how close you are!

Wee ones: On a Wednesday night, how many school days have you finished that week? (You can assume no holidays.)

Little kids: Looking at a calendar, can you see how many full weeks of school you have left? *Bonus:* How many total school days do you have in those weeks?

Big kids: Find your last day of school. Without counting all of them one by one, how many calendar days from now is that? (If you're already out of school, how many days till June 21, the first day of summer this year?) *Bonus:* Again, without just counting, how many school days do you have left?

The sky's the limit: If your last day of school is always the last Friday of June, and your first day of school is always the first Wednesday of

September, what is the longest summer vacation you can have?

Answers:

Wee ones: 3 days.

Little kids: Different for everyone...check out a calendar, or use the little one here. *Bonus:* Again, different for all, but it will be the first answer times 5.

Big kids: Again, different for all...multiply full weeks by 7, then add on the stragglers. (And if you're already out of school, there are 48 days till the first day of summer – 28 more days in May and 20 in June.)

Bonus: Different for everyone...multiply the number of full weeks by 5, add the stragglers, and remember to remove holidays like Memorial Day!

The sky's the limit: You always have the 62 days of July and August, so you're just figuring out total vacation days in June and September. Also, the first day of September always falls on the same day of the week as the last day of June. So you get the most June vacation days — 6 — when June ends on a Thursday, to push the last Friday as early as possible (June 24). That also gives the latest possible first Wednesday in September (September 7), for 6 vacation days in September. So the longest vacation is $6+62+6$, or 74 days.





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Bedtime Math Don't Cave In

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Photo: Laura Overdeck

Caves might be dark, damp, and full of squeaky bats flying around, but really, they're a great place to hang out. Caves are one of nature's most fascinating sites to see. As water seeps down from the ground above, it picks up minerals called calcites. Then as it drips from the roof of the cave, the water leaves behind the calcite, which grows like candle wax into long spikes called stalactites. The drops that drip to the ground underneath the stalactite pile up calcite down there too, creating upward-growing spikes called stalagmites. One way to remember which is which: "stalactite" has a "c" for ceiling, while stalagmite has a "g" for "ground"...also, stalactites hang on "tight" to keep from falling. You don't want to try to watch them grow: they grow way more slowly than the hair on your head, which is pretty slow as is. If you visit a cave, hopefully you'll find formations already there.

Wee ones: If you step into a cave that has 3 stalactites and the 3 matching stalagmites below them, how many spikes do you see in total?

Little kids: As a stalactite droops and its stalagmite grows upward, they can eventually meet to form a column. If each one has grown 15 feet when they meet, how tall is the column? *Bonus:* How much had each one grown when they still had 2 feet of space between them?

Big kids: Most stalactites grow about [1/200th of an inch a year](#). How long will it take to grow half an inch? *Bonus:* Human hair grows way faster, about half an inch per month. How long would your hair grow if you skipped haircuts for that same stretch of time?

The sky's the limit: If a stalactite grows an inch every 100 years, while its stalagmite grows just 1 inch every 200 years from the ground 4 feet below, but the stalactite gets a head start of 600 years, how high off the ground will they meet?

Answers:

Wee ones: 6 spikes in total.

Little kids: 30 feet. *Bonus:* Each one has 1 more foot to go, so each has grown 14 feet.

Big kids: 100 years. *Bonus:* That's 1,200 months, so 600 inches – which is 50 feet of hair!

The sky's the limit: The two spikes have to cover a 48-inch gap. In 600 years the stalactite shrinks the gap by 6 inches, to 42 inches. Since the stalactite grows twice as fast, it will cover twice as much distance as the stalagmite, so it will grow 2/3 of the gap and the stalagmite will grow 1/3 of it. The stalagmite will have grown 14 inches off the ground when they meet.



Bedtime Math Boogie Like a Bee

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Photo: Alan Kolnik

They say April showers bring May flowers, and where there are flowers there are bees. Bees collect pollen from those blooming flowers to make honey. But how do they tell each other where to find faraway fresh flowers? Well, they can't talk, so they dance. When a bee finds a field of flowers, she rushes back to the hive and gives directions to the other bees by doing the "[waggle dance](#)." The bee runs around in a figure 8, and the angle of that 8 shows the other bees where the flowers are. Straight up and down the side of the hive means the flowers are in the direction of the sun; if the bee tilts 15 degrees to the left, that tells the other bees to fly out of the hive 15 degrees to the left of the sun. The length of time of the dance shows how far to fly, too. Works just as well as GPS — though it's hard to imagine dancing to tell someone where the grocery store is.

Wee ones: If a bee goes out to find flowers and collects pollen from 4 roses, 3 tulips and a daisy, how many total flowers did she visit?

Little kids: Bees work way hard to make honey: to make 1 pound of honey, bees have to collect pollen from over [2 million flowers!](#) How many flowers do they need to visit to make 6 pounds of honey? *Bonus:* A bee visits between 50 and 100 flowers every time it leaves the hive. If one bee always visits 50 flowers per trip, after 2

trips how many flowers has she visited?

Big kids: That bee's day isn't done yet. Over the course of a full day, a bee visits about 2,000 flowers. If that one bee visits 50 flowers on every trip, how many trips does she need to make to visit 2,000 flowers? *Bonus:* How many bees would have to work together to make the 1 pound of honey in that one day? (Reminder: that pound requires 2 million flowers.)

Answers:

Wee ones: 8 flowers.

Little kids: 12 million flowers. *Bonus:* 100 flowers.

Big kids: 40 trips. *Bonus:* 1,000 bees.



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Bedtime Math An Eye for Color

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Photo: Laura Overdeck

You probably know that you can mix any color using red, yellow and/or blue paint. But on digital screens, colors are combinations of red, *green* and blue. How does that work? Any color on your screen combines anywhere from zero to 255 “parts” of each of those three colors. All zeroes gives you black (no light), and all 255’s gives you white (full white). Mixing just red and blue does give you bright purple, but red and green together give you *yellow*. Weird!! For a fun experiment, open a photo of yourself in a program like mspaint and click on your eye with the color-grabber tool...you can find out exactly what color your eyes are, as a RGB (red green blue) code. Try your hair, skin and clothes, too, and find out how you’d paint yourself on a digital screen.

Wee ones: If your eye color is 21 on blue but 1 point more than that on green, how much green do your eyes have?

Little kids: Colors with 3 equal RGB numbers make all the different shades of grey (okay parents, no jokes here...). If your eyes are RGB 72 78 72, how much does the green have to drop to give you all 72’s for pure grey? *Bonus:* What if you’re 72 85 72?

Big kids: If your purple shirt comes out RGB 80 40 80, but your blue jeans come out 55 55 80, how many total points do you have to change the first codes to make the other? *Bonus:* Having exactly 1/2 as much green as red (with no blue) makes a nice orange. If you want the lightest possible shade of that balance, what will the RGB code be? (Reminder: Bigger numbers make brighter, lighter colors.)

The sky's the limit: If your eye color's 3 whole numbers are such that the red and green are equal and multiply out exactly to the blue color, what's the lightest shade of blue your eyes can be?

Answers:

Wee ones: 22 on green.

Little kids: 6 points down. Bonus: 13 points down.

Big kids: 40 points: 25-point change in the red, 15-point change in the green. Bonus: The brightest color will put red at 254 (the biggest even number), so green will be 127.

The sky's the limit: The biggest perfect square less than 255 is 225. So the blue is 225 and the red and green are each 15.

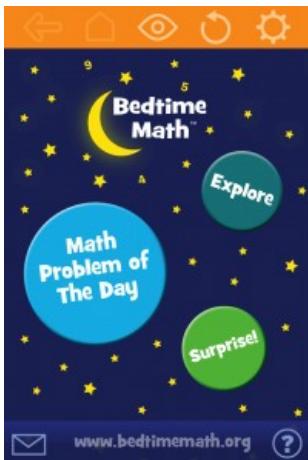




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Bedtime Math The Bedtime Math App is Here!

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We have mega-exciting news here: the new app is up in the App Store. With an average rating of 5 stars, we've reached the top 20 free education apps on iTunes, and were also rated the ["Best Free App of the Day on iOS"](#) by Top-Kid-Apps.com. Yeah! Get your daily bedtime math problems plus the full archive, all in full color with hidden clickable answers, swooshing stars and more. It's our grand finale for Math Awareness Month. [Download it here](#), and if you like it please give it a high rating in the App Store! Thanks and enjoy!



Bedtime Math Larger than Life

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Photo: Laura Overdeck

Do you like stuffed animals? What kinds do you have — maybe a teddy bear, or furry dog, or a cute bunny? Toy stuffed animals are fun because they can be any color we want: orange birds, blue turtles, whatever. But have you ever wondered what it would be like if your stuffed animals all suddenly became those animals for *real*? How much bigger would they be, and would they all fit in your room? Let's run the numbers and see how tough it might be to stuff everyone onto your bed...never mind feeding them all.

Wee ones: Who has more legs, your 4-legged purple bunny rabbit or your 8-legged pink octopus?

Little kids: Your toy giraffe might be your tallest stuffed animal at 2 feet, but real ones are about 18 feet tall. How many feet would your toy giraffe have to grow to match the real one? *Bonus:* Black bears can stand up to 79 inches tall. If your teddy bear is 8 inches tall, how much taller would the real thing be?

Big kids: A real bunny rabbit can weigh around 4 pounds. If your stuffed animal bunny weighs just 8 ounces, how many ounces heavier would a real one be? (Reminder: A pound has 16 ounces.) *Bonus:* If your 3 stuffed animal doggies and 2 bunnies weigh 24 ounces in total, and the real versions all together would weigh 60 times as much, how

many pounds would they weigh all together? (Hint: This is easiest to solve in pounds...)

Answers:

Wee ones: The 8-legged octopus.

Little kids: 16 more feet. *Bonus:* 71 inches.

Big kids: 56 ounces heavier. *Bonus:* They weigh 1 1/2 pounds in total, so 60 times as much is 90 pounds.





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Bedtime Math Happy Birthday, iTunes!

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Photo: Andi Howard

Today is the 10th birthday of iTunes, the online store that lets you buy songs, movies, apps for your smartphone, videos...all kinds of stuff that you can enjoy on your phone or computer. Before iTunes, the only way we old-timers could buy songs was on something you could hold in your hand, like a CD, a tape cassette or a vinyl record. Or you could get songs electronically from various illegal websites, which was exciting but felt icky. So the idea that you could get onto your computer, buy any song you wanted (legally), and get it within seconds was mindblowing. iTunes opened with [just 200,000 songs](#) on it, all priced at 99 cents, and within just one week they had 1 million song downloads. As of today, iTunes has sold over 15 *billion* song downloads from a collection of 26 million different songs. Let's just say, it takes far more than one person to listen to it all.

Wee ones: The 1 millionth song was downloaded that first week in 2003, and the billionth song was downloaded in 2006. How many years later was that?

Little kids: If you download 24 songs and split them into 2 equal groups, called playlists, how many songs are in each group? *Bonus:* If it takes you 10 seconds to download a 2-minute song, how much longer does it take to play it than to buy it? (Reminder: a minute has 60 seconds.)

Big kids: If the 200,000 songs on iTunes that first week got

downloaded a total of 1 million times, on average how many times did each song get downloaded? *Bonus:* It took only until September 8 that first year for the 10 millionth song download. How many days was that from April 28? (Reminder: April and June each have 30 days; May, July and August each have 31.)

Answers:

Wee ones: 3 years later.

Little kids: 12 songs in each. *Bonus:* 110 seconds longer.

Big kids: 5 times per song. *Bonus:* It took 133 days: 3 days until May 1, plus 31, 30, 31 and 31 to get to September 1, plus another 7 days.



Bedtime Math Penny Pincher

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Photo: Laura Overdeck

Have you ever visited a tourist spot — a special place that lots of people come to visit — and seen one of these machines? It's called a penny press or penny pincher. It takes your penny and rolls it between heavy metal wheels that squash it flat, stamping a picture of that special place on it. You stick the penny and a few coins in the slots, push them in, and then choose your design. As you turn the crank and the gears squash your penny, it gets molded into that design — here's one from the Alamo in Texas (below). Penny pressing usually costs a few quarters, plus remember, you spent the *penny*, too...you won't be able to buy anything with that pointy copper oval after that. But you won't want to give it up anyway.

Wee ones: If you have to put 3 quarters into the machine with your penny, how many coins do you need in order to penny-pinch?





Photo: Laura Overdeck

Little kids: If the penny pincher needs just 1 quarter and your penny, how many cents does it gobble up to start? *Bonus:* If you have 3 dimes in total and you trade them for a quarter and a bunch of pennies, how many extra cents will you have left after pressing your penny? (Reminder: a quarter equals 25 cents.)

Big kids: If the penny pincher wants 61 cents in total, what's the fewest number of coins it needs to do the project? (Other reminders: a nickel is 5 cents and a dime is 10 cents. Assume a quarter is the largest coin it takes.) *Bonus:* If like most presses the machine wants 3 quarters, how many pennies does it need to press to earn a round number of dollars?

Answers:

Wee ones: 4 coins in total.

Little kids: 26 cents. *Bonus:* 4 coins left, since you'll need 26 of your 30 cents.

Big kids: 4 coins: 2 quarters, a dime, and the penny. *Bonus:* It needs to press 4 pennies (what's with all the 4's today?) as that will earn it \$3.00.



Bedtime Math Give Me a B! (B!)

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Photo: SriMesh via Wikimedia Commons

If you've ever watched or attended a major sports event, you might have noticed a bunch of people — some guys, but mostly girls — dressed up in the team colors and standing on the sidelines yelling. They're called cheerleaders because, you guessed it, they lead the crowd in cheers, since usually the crowd can't get organized on their own. Cheerleading can go way beyond rhyming, stomping and clapping, though: cheerleaders also do backflips, stack themselves on top of each other in human pyramids, and throw each other in the air. If you want to see their craziest stunts, look up the Cheerleading and Dance Worlds cheerleading competition which runs this weekend. You'll find out that when they call a person a "flyer," they aren't kidding!

Wee ones: If the cheerleaders spell out "Let's Go!" with each person yelling 1 letter in order, which cheerleader will yell the letter T?

Little kids: In the ["basket toss,"](#) the "flyer" — the person thrown in the air — falls and lands on the stretched-out arms of two rows of cheerleaders facing each other and holding hands. If there are 6 people in each row plus the flyer, how many people does the stunt use in total? *Bonus:* "Bases" are the strongest cheerleaders who help hold up others standing on their backs or shoulders. If you have 7 bases on hands and knees in a line, and each possible pair next to each other has a cheerleader standing with one foot on each base's back, how many people are in the stunt?

Big kids: In the competition, squads can have up to [36 members](#) for

some age levels. If you have 36 members and 1/3 of them are guys, how many are girls? *Bonus:* Your routine can't take more than 2 minutes 30 seconds. If it takes your squad the first 5 seconds to line up, the last 5 seconds to do the final pose, and 7 seconds for each stunt, how many stunts can your squad fit into your routine?

The sky's the limit: There's more than one way to stack a human pyramid. For starters, you can stack 1 person on top of 2, who in turn stack on top of 3 (6 total), on top of another row of 4 (10 total) and so on. If instead the pyramid shapes grow from 1 person, to 4 in total, to 9 in total, to 16 in total...given that pattern, how many people are stacked if the bottom row of the pyramid had 13 people?

Answers:

Wee ones: The 3rd cheerleader.

Little kids: 13 people. *Bonus:* 13 people, again: you can get 6 cheerleaders into the top row.

Big kids: 24 girls. *Bonus:* 20 stunts, since you have 140 seconds to do them.

The sky's the limit: Each pyramid adds a new row with the next odd number of people (1 on top of 3, on top of 5, on top of 7...). When you add the rows, the totals are all perfect squares. 13 on the bottom will be 3 rows taller than the 16-pyramid, which means you'll have 49 people in total.



Bedtime Math Pink Moon

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Photo: Craig Deakin via wikipedia

Hey, there's a Pink Moon tonight! That is, there's a *full* moon, which happens when the Moon is exactly on the opposite side of Earth from the Sun (the exact moment was three seconds before we posted this, in fact). But tonight's moon won't actually look pink, as much of a bummer as that is. The name refers to the pink moss that grows throughout the northeastern U.S. at this time of year. Long ago Native Americans gave each full moon of the year a [specific name](#) to help them track the seasons, and the April full moon was named after this pink spring moss. June's full moon is called the Strawberry Moon to mark strawberry season, and July's is called the Full Buck Moon for the new antlers that male deer (bucks) grow over the summer. To top it off, a rare *blue* moon – two full moons in the same calendar month – can also happen, which totally confuses things. It's probably easier just to check the calendar for today's date.

Wee ones (counting on fingers): If it's 5 PM now and the moon won't rise until 8 PM where you live, how many hours until you can see today's full moon?

Little kids: If there's a full moon on the 2nd day of the month and a second one, a blue moon, on the 31st day, how many days after the first full moon did the second one happen? *Bonus:* The March full

moon is called the Worm Moon. How many months later is the Harvest Moon (September)?

Big kids: Full moons are actually about 29 1/2 days apart. If we had a full moon on May 3 at 10 pm, at what date and time would the next full moon occur? (Reminder: May has 31 days.) *Bonus:* If the moon stayed on that exact schedule, when would the next *blue moon* happen after that? (Reminder to get started: June has 30 days, and July has 31 days.)

Answers:

Wee ones: 3 hours from now.

Little kids: 29 days. *Bonus:* 6 months later (March to September).

Big kids: June 2 at 10 am. June 1 is 29 days later, then the extra 12 hours bump it to the next day. *Bonus:* End of July. The next full moon will be July 1 at 10 pm, and the one after that will be July 31 at 10 am.





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Bedtime Math Pick a Pack of Prickly Pear

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Photo: Laura Overdeck

If you've ever tried to touch a cactus, it probably wasn't so easy, given all those spiky prickles. Those prickles are actually the cactus' leaves, and they're skinny so they have [less area](#) to dry out in the sun, because cacti live in very hot places. But despite the spikes, you can *eat* some kinds of cactus, like the prickly pear plant shown here. The little flowers sprouting from the edges of some of those paddles will turn into fruit, called a prickly pear [fig](#). You can eat that fruit, and you can also eat the paddles themselves. But the paddles and the figs are covered with really teeny prickles, too, so you have to peel them carefully...beware when taking a bite out of cactus, or it might take a bite out of you.

Wee ones: If one prickly pear paddle has 6 flowers and half of them turn into fruit, how many prickly pears will you get?

Little kids: If a prickly pear paddle has flowers numbered 1 through 9, and birds eat the multiples of 2 and then you pick all the multiples of 3, which flowers are left to turn into fruit? *Bonus:* If in picking each of those fruits you get 4 prickles stuck in you, how many prickles do you have to pluck out of you afterwards?

Big kids: That cactus has a lot of paddles and prickles, all growing

from thick, woody, dried-out branches growing out of the center trunk.

If the 4 branches each have 6 sets of 5 paddles, how many funny flat paddles are there? *Bonus:* If each paddle has 20 prickles on each of its 2 sides, how many prickles does this plant have in total?

The sky's the limit: Suppose every prickly pear paddle has either 16 or 25 prickles on its sunny side, and 15, 24 or 36 prickles on its shady side – and that the number of fruits growing on a paddle is the biggest number that divides into both prickle numbers (called the largest common factor). What is the prickle count and fruit count of the paddle type with the most fruit?

Answers:

Wee ones: 3 prickly pear fruits.

Little kids: Only flowers 1, 5 and 7 are left. *Bonus:* 12 prickles, from the 3 fruits.

Big kids: 120 paddles. *Bonus:* 4,800 prickles!

The sky's the limit: If you combine 16 with the 3 shady-side numbers, its biggest common factor is with 24 – they're both divisible by 8. If you combine 25 with each of those numbers, its biggest common factor is with 15, and it's just 5. So the best combo is 16 with 24, giving you 8 fruits and 40 prickles.





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Bedtime Math Car Wash of Doom, and Getting in Gear

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It's another two-fer Tuesday – and that means it's time for "[Car Wash of Doom](#)," our fourth Bedtime Math video. In this episode, our hero Kevin tries to work at a car wash, but as you can guess from the title, it doesn't go so well. [Click here](#) to watch! Just one more way to get jazzed about math here at Bedtime Math.

Of course, as a kid you can't drive a real car, but there are toy ones that drive themselves just as well. In a wind-up car, the little handle you twist turns a gear inside that's connected to a spring. When you let go, the spring wants to snap back, which makes the gear turn, which makes all the wheels on the floor turn. A pullback car uses the same idea: you just roll the car backward, and the car wheels do the job of turning that gear. And how come just a few twists make the wheels turn so many times? Because when you turn a big gear with lots of teeth that's touching a small gear with very few teeth, one turn of that big gear makes the little gear turn *many* times – and makes your car harder to run after.



Photo: Laura Overdeck

Wee ones: Which one has more wheels on the floor, a toy car with 4 wheels or a truck with 6 wheels?

Little kids: If each twist of the wind-up handle makes the wheels roll 5 times, how many times will the wheels turn after 2 twists?

Bonus: How about 4 twists?

Big kids: If a big gear with 48 teeth turns an interlocking little gear with only 6 teeth, how many times will the little gear go round for each turn of the big gear? *Bonus:* If the axle with the little gear has its own 48-tooth gear turning another 6-tooth gear, how many times will that last little gear turn for each turn of the first big gear?

Answers:

Wee ones: The 6-wheeled truck has more.

Little kids: 10 turns. *Bonus:* 20 turns.

Big kids: 8 times. *Bonus:* 64 times, because the second big gear will turn 8 times and each of those turns will make the last gear turn 8 times itself.





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Bedtime Math Seeing Double -- or Triple

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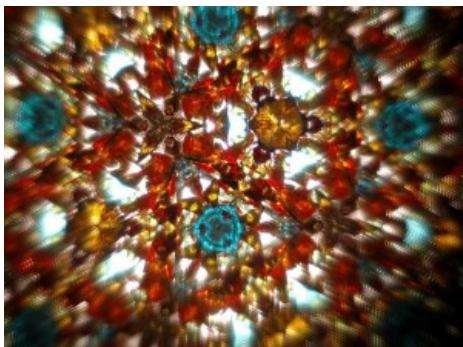


Photo: H. Pellikka via Wikimedia Commons

When you peer through the end of a kaleidoscope and start spinning it, what exactly is going on in there? How do those crazy wallpaper patterns show up? If you've ever stood in front of those sets of three mirrors in a department store, where you can try on a shirt and somehow see the back of yourself to look at it, that's what makes a kaleidoscope work. Inside a kaleidoscope tube are three equal mirrors making a long triangular tunnel, at the end of which is a thin, clear case full of colorful clear glass bits. As you turn the end and the glass bits tumble, the mirrors reflect the design over and over onto each other. Suddenly one little random patch of colors becomes an amazing pattern. If the store mirrors could make the clothes do that, shopping would be a lot more interesting.

Wee ones: If you stand in front of the 3 department store mirrors and you show up once in each mirror, how many of you do other people see when they walk up?

Little kids: In most kaleidoscopes the mirrors make an “equilateral” triangle, where all three sides are the same length and all three corners have the same 60-degree angle, shaped like a V. By contrast, a 90-degree angle, or “right angle,” is shaped like an L. How many degrees wider is a right angle than a 60-degree angle? *Bonus:* How many degrees do the 3 angles of a kaleidoscope triangle add up to? (Hint: to add numbers that all have one 0 on the end, you can take the zeros off, add what's left and then put the zero back on.)

Big kids: The small, bead-filled triangle in the middle creates 3 identical triangles around it, which form a bigger triangle. If each of those 4 triangles reflects itself, and each of those *new* ones reflects itself twice more, how many triangles do you see in total? *Bonus:* If there are 7 blue beads in the design in the middle, how many blue beads do you see in total (in the middle plus all the reflections)?

Answers:

Wee ones: 4 of you – the real you, plus 1 in each mirror.

Little kids: 30 degrees bigger. *Bonus:* They add up to 180 degrees, which is true of any triangle no matter how oddly shaped.

Big kids: 16 triangles in total. *Bonus:* 112 blue beads.





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Bedtime Math Space Chase

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Rick Sternbach/Keck Institute for Space Studies

Image: Keck Institute for Space Studies via huffingtonpost.com

It's one thing to dig around in the backyard looking for cool rocks. It's a whole other story to send a rocket into outer space to grab asteroids. That's exactly what America's space agency NASA wants to do in its [Asteroid Capture and Return](#) mission. The idea is for a spacecraft to fly millions of miles to the Asteroid Belt — the ring of rocks that orbit between Mars and Jupiter — capture a 25-foot rock, bring it back, and drop it into the same orbit as our Moon, so astronauts can catch it and study it. Not only do asteroids hold clues about our solar system, but they might also have useful materials in them, like iron and titanium...if this crazy plan works, we could mine asteroids for metals. A lot more work than hunting around the backyard, but a lot more magical, too.

Wee ones: If you fly into space and catch every other asteroid you see, and so far you've caught the 1st, 3rd and 5th asteroids you've seen, will you catch the 8th one?

Little kids: Asteroids orbit the sun in a rough circle between [Mars](#) and [Jupiter](#). Mars is closer to the Sun than Jupiter...if one of those orbits is about 140 million miles from the sun and one is about 780 million miles, which one is Mars' orbit? *Bonus:* If the project starts in 2014 and the rocket is ready for launch 5 years later, in what year will the rocket launch?

Big kids: The deadline for the mission to be done is 2025. If starting in 2014 the craft takes just 2 years to build, then once launched the craft takes 1 year longer to reach the asteroid as to come back, in what year does the spacecraft catch the asteroid? *Bonus:* If the asteroid

we want is exactly halfway between Mars' and Jupiter's orbits, how far from the Sun is that? (Again, Mars averages about 140 million miles out, and Jupiter about 780 million miles.)

The sky's the limit, literally: If Earth and our target asteroid are right now as close together as possible in their orbits, and the asteroid takes 7 Earth-years to orbit the Sun in the same direction as Earth, how many months from now will they again be as close together as possible?

Answers:

Wee ones: No – you'll catch the 7th and 9th instead.

Little kids: Mars is the 140 million mile orbit. *Bonus:* In 2019.

Big kids: In 2021. The craft will be ready in 2016, leaving 9 years for the trip, so the first leg will take 5 years to reach the asteroid (vs. 4 to return). *Bonus:* 460 million miles.

The sky's the limit: 1 1/6 years, or 14 months. Earth will pass the asteroid 6 equally spaced times over the 7 years, with the 6th happening at their starting points. So, although the asteroid will have done 1/7 of its trip when Earth first passes the original starting point, it will be 1/6 of the way around by the time Earth passes the rock.



Bedtime Math Umbrellas for All

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Photo: Yamada Kazuyuki via Wikimedia Commons

They say “April showers bring May flowers,” at least in some places, so keep your umbrella handy – and maybe a pet-sized one for your dog, too, as shown here. But are umbrellas supposed to shield you from the rain or the sun? Umbrellas first popped up — or popped open – [thousands of years ago](#) in Egypt and China, where the heat drove people to block the sunshine. In fact, another word for umbrella, *parasol*, means “against the sun.” But when the umbrella was brought to soggy England in the 1700’s, it was an instant hit because of the rain. Sure enough, the French word for umbrella, *parapluie*, means “against the rain.” So when your dog asks for an umbrella, say yes: he probably needs one no matter what the weather is.

Wee ones: If you and your 2 dogs go out for a walk and each of you has your own umbrella, how many umbrellas is that?

Little kids: If you have 2 umbrellas of the same circular width, but one is divided into 8 equal sections and the other has 10 equal sections, which umbrella has *bigger* sections? *Bonus:* If each rib of the 8-rib umbrella has 2 stick pieces hinged together plus a 3rd small stick supporting it, how many pieces in all does the umbrella frame have?

Big kids: If your umbrella catches $\frac{1}{4}$ teaspoon of rain every second, how much rain does your umbrella catch in 1 minute? (Reminder: A minute has 60 seconds.) *Bonus:* If you want to tilt all that rain into a glass because you're thirsty, how long would it take to fill a 10-ounce glass? (Another reminder: There are 3 teaspoons in a tablespoon, and 2 tablespoons in an ounce.)

Answers:

Wee ones: 3 umbrellas.

Little kids: The one with 8 sections. *Bonus:* 24 sticks.

Big kids: 15 teaspoons. *Bonus:* Your umbrella catches 5 tablespoons per minute, and your glass needs 20 tablespoons, so it will take you 4 minutes.





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Bedtime Math Eggheads

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Photo: Sandy LaPiccola

When people have a lot of free time on their hands, sometimes they come up with strange ways to keep busy – like breaking the world record for smashing eggs with their forehead. That's what Scott Damerow did last week, when he successfully [smashed 142 eggs with his head](#) in just 1 minute. Wow! As you can see from [the video](#), this is messy business, but he must have decided it was worth the fame. The thing is, it does take a lot of effort. An eggshell is very strong: you have to put [over 5 1/2 pounds](#) of pressure on the side to break it, and it can handle up to [40 pounds](#) if you press the ends or evenly across the whole shell. Scott might not have made much more than a mess, but clearly he did a lot of work.

Wee ones: If you are baking with 6 eggs and crack 4 of them with your head, how many are left to crack the normal way?

Little kids: 142 eggs is a lot...what would be the next even number of eggs he could have cracked? *Bonus:* What's the next multiple of 10?

Big kids: Scott smashed these eggs in 1 minute. How many more did he crack than if he'd just puttered along smashing 1 egg per second?

Bonus: How many more than if he'd smashed 2 eggs per second?

The sky's the limit: Scott could always try to break his own record and aim for a cool number, like the next prime number or the next multiple of 25. Which one would be higher? (Reminder: a prime number is divisible only by itself and 1.)

Answers:

Wee ones: 2 eggs left.

Little kids: 144 eggs. *Bonus:* 150 eggs.

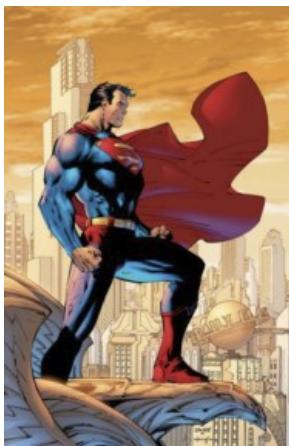
Big kids: 82 more eggs. *Bonus:* 22 more eggs.

The sky's the limit: The next prime number is 149 (143 is divisible by 11 and 13, while 145 is a multiple of 5 and 147 is divisible by 7). But the next multiple of 25 is 150, so that would be the tougher target.



Bedtime Math What It Takes to Be Superman

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Source: graphicshunt.com

You've probably heard of many superheroes: Batman, Spiderman, and so on. But the granddaddy of them all may be Superman, who first showed up in a comic book on [this day in 1938](#). You may also know the famous words about him: "Faster than a speeding bullet, more powerful than a locomotive, able to leap tall buildings in a single bound. Look! Up in the sky! It's a bird, it's a plane! It's...!" So what exactly does all of that mean? Let's put some numbers to Superman's amazingness and find out exactly what he can do.

Wee ones: If Superman could leap over your house, 3 other houses and your school in a single bound, how many tall buildings did he leap in a single bound?

Little kids: The strength of a locomotive, or train engine, is measured in "[horsepower](#)," where one horsepower is the force needed to move 33,000 pounds one foot in one minute. If a large locomotive can supply 8,000 horsepower but Superman works at 10,000 horsepower, how much stronger is Superman? *Bonus:* If you actually rounded up 10,000 horses to pull that train as hard as Superman, how many horse legs would that be?

Big kids: People mistake Superman for a bird or a plane because he

can fly just as high. The [bar-headed goose](#) can fly as high as 21,000 feet, but commercial planes fly at a maximum of 45,000 feet. How much higher does the plane fly than the bird? *Bonus:* If Superman prefers to fly exactly halfway between those two so he doesn't crash into anyone, how high does he like to fly?

Answers:

Wee ones: 5 buildings.

Little kids: 2,000 horsepower stronger. *Bonus:* 40,000 legs.

Big kids: 24,000 feet higher. *Bonus:* 33,000 feet.



Bedtime Math Stone-Faced

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Photo: Sfmon79 via Wikimedia Commons

Mount Rushmore is one of the coolest sites in the U.S. It's a giant sculpture of four great presidents from history – George Washington, Thomas Jefferson, Teddy Roosevelt and Abraham Lincoln – carved into the side of a South Dakota mountain. Mind you, these are 60-foot-tall heads in a mountain hundreds of feet tall, so chipping these faces out of rock was no easy task. [Every day from 1927 to 1941](#), over 400 men and women worked as everything from drillers to carvers to cooks, with many swinging from steel cables to do their work. 90% of the sculpture was done by blasting rock away with dynamite, then the carving was finished by hand with tools (though unbelievably, no lives were lost). Thanks to money running out the sculpture was never finished, but we can still tell which guys are being honored.

Wee ones: If you know the names of 3 of the 4 presidents on Mount Rushmore, how many more presidents' names do you need to learn?

Little kids: If you earned \$8 per day working on Mount Rushmore, how much would you earn over a 2-day period? *Bonus:* Workers had to climb 700 stairs every morning to punch the clock. How many steps did they have to walk to go up and back? (Hint: think in hundreds).

Big kids: The whole face of the mountain is 500 feet tall, with the presidents' heads reaching to the top. If their heads are 60 feet tall, how high off the ground are their chins? *Bonus:* People worked on

the sculpture from October 1927 to October 1941! How many years did the project take?

The sky's the limit: Tourists would often ask the workers if they could buy a chunk of granite (the type of rock being chipped off the mountain) as a souvenir. They'd offer \$2 to start, but sometimes workers could get them up to \$6. If a worker made \$98 in one day selling small \$2 rocks and big \$6 rocks, and sold 4 times as many small rocks as big rocks, how many of each rock size did he sell?

Answers:

Wee ones: 1 more name.

Little kids: \$16. Bonus: 1,400 (fourteen hundred) steps.

Big kids: 440 feet. Bonus: 14 years.

The sky's the limit: He sold 7 big rocks and 28 small ones. A little algebra shows us why: if he sold s small rocks and b big rocks, we know that $s=4b$ (4 times as many small rocks). As for how much money he made:

$$2s+6b=98$$

Substituting b for s, we get:

$$2(4b)+6b=98, \text{ or } 14b=98$$

So $b=7$, giving us 7 big rocks and 28 small rocks.





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Bedtime Math Think Big

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Today is another two-fer Tuesday with another **mini math video!** In episode 3, "[Everything's Bigger at Costco](#)," our Bedtime Math hero Kevin tries to work at Costco, where they sell everything from nuts to jelly beans to paper towels in huge packages to save people money. The problem is, Kevin gets a little carried away as he tries to stir up some excitement...find out how wrong things can go [here!](#)

So how does buying things in large amounts save you money? Partly because it takes workers less time to pack the same amount. If it takes 2 minutes to pack a couple of paper towel rolls but only *twice* as long to pack five times as many, the paper towel folks don't have to pay workers for as much time.



Photo: Laura Overdeck

This basic idea has a grown-up name – “economies of scale” – and it’s the reason stores like Costco can sell stuff for less money per chunk of stuff. When they do that for stuff we love, like chocolate chips or our favorite spaghetti sauce, bigger is definitely better.

Wee ones: If a bulk store sells orange juice in boxes of 4 one-gallon cartons and you buy 2 boxes, how many gallons of orange juice did you buy?

Little kids: If your favorite cereal normally costs \$3 per box, but at a bulk store you can get a pack of 3 boxes for just \$6, how much less do you spend on each box? *Bonus:* If a box normally has 8 servings in it, how many servings do you get in the big 3-box pack?

Big kids: One of the yummiest items at Costco is the 5-pound bag of chocolate chips. If 1 cup of chips weighs 5 ounces, how many 1-cup batches of chocolate chip cookies can you make from that bag? (Reminder: there are 16 ounces in a pound.) *Bonus:* If you bake cookies once every 2 weeks, how long will that bag of chocolate chips last you – assuming you don't snack on them in between?

Answers:

Wee ones: 8 gallons.

Little kids: You save \$1 per box, because the bulk cereal costs just \$2 per box. *Bonus:* 24 servings.

Big kids: 16 batches. *Bonus:* 32 weeks – over 7 months!



Bedtime Math Chargogg-a-what?

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If you've wondered what place name in America is the [longest](#), there's a clear winner.

Chargoggagoggmanchauggagoggchaubunagungamogg is the 44-letter name of a lake in Massachusetts.

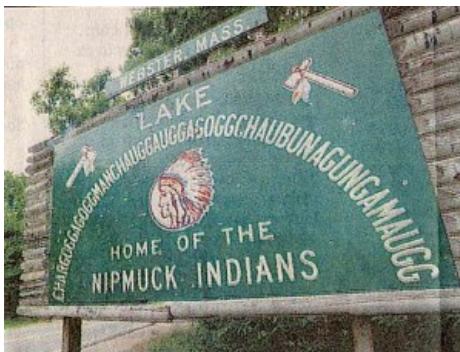


Photo via askville.amazon.com

Named by the Nipmuck Indians, it means something like "You fish on your side, I'll fish on my side, and no one fishes in the middle." Most people agree that that's what it means, but no one seems to agree on how to *spell* it. Even on the [town's website](#), the spelling of the name doesn't match the lake's road sign pictured on that same page, and apparently they're both wrong. Maybe that's why people just call it Lake Webster, but that isn't as exciting when the real name is the longest lake name in the world – though not the overall longest place name.

Wee ones: How many letters are in your town's name? Count them up with a grown-up!

Little

kids: Chargoggagoggmanchauggagoggchaubunagungamogg has 14 syllables, or unbroken pieces of sound – it takes a long time to say. How many more syllables does it have than your first name?

Bonus: Even crazier is that the name has 15 letter g's in it. If you had to mix that many g's into your first name, how many letters would your name have – and how would you say it?

Big kids: A town in North Wales called Llanfairpwllgwyngyllgogerychwyrndrobwllllantysiliogogogoch probably has the longest place name in the [world](#), with 58 letters. That's Welsh for "St. Mary's Church in the hollow of the white hazel near the rapid whirlpool of Llantysilio of the red cave." How many more letters does it have than that crazy lake name? *Bonus:* The town name has 11 L's. If you swap the town's 11 l's with the lake's 15 g's, how much longer is the new town name than the lake name?

Answers:

Wee ones: Different for everyone...spell out your town name and count the letters.

Little kids: Again, different for everyone...count the syllables in your first name (most likely between 1 and 5), and subtract that from

14. *Bonus:* Count the letters in your first name, then add 15. But you decide how to say it!

Big kids: 14 letters. *Bonus:* 22 letters longer. The gap between the two used to be just 14, but now you've increased it by 8 letters (4 more on one, 4 less on the other). To test it: the town now has 62 letters and the lake now has 40, for a difference of 22.





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Bedtime Math Neighborhood Mystery

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Photo: Roland zh via Wikimedia Commons

Have you ever seen a baby pigeon out and about? We've asked around and no one else has seen one, either. Why is that? Where do baby pigeons hang out? You'd think that with tons of pigeons flocking at fountains and statues to eat bread crumbs, someone would eventually spot the mini version. One possibility is that the pigeons we see ARE baby pigeons, while the adults are actually 7 or 8 feet tall and they're the ones who are hiding. But we would have seen one of them by now, too. Then we have squirrels: how come we never see really tiny squirrels running around? A little research on our neighborhood friends doesn't explain these mysteries, but does turn up some cool facts.

Wee ones: Pigeons and doves are close relatives. If you find 2 pigeons and 2 doves, how many bird feet do they have in total?

Little kids: Pigeons lay only 1 or 2 eggs at a time. If you have 10 mama pigeons, and half lay just 1 egg while the other half lay 2 eggs, how many baby pigeons are coming? **Bonus:** What's the fewest number of nests that can hold 1/3 of those eggs?

Big kids: Apparently baby pigeons stay in their nests anywhere from [7 to 28 days](#). Hmmm...maybe they do all their growing before they come out. If a pigeon egg hatched today, April 14, what's the earliest date the baby would venture out? **Bonus:** What's the *latest* date? (Reminder: April has 30 days.)

The sky's the limit: Let's get back to baby squirrels. Apparently they're born naked, toothless and blind – no wonder they hide for a while. If on April 1 a bunch of baby squirrels and pigeons come out into the open, and starting that day new baby pigeons appear every 4th day while new squirrels pop out every 6th day, when's the *third* date that both baby pigeons and baby squirrels will appear together?

Answers:

Wee ones: 8 bird feet on 4 birds.

Little kids: 15 baby pigeons. *Bonus:* 5 eggs require at least 3 nests, since two 2-egg nests can hold only 4 eggs at most.

Big kids: April 21. *Bonus:* May 12.

The sky's the limit: April 25. Every 12th day will bring both kinds of babies out into the open, since 12 is the smallest multiple of both 4 and 6. So if April 1 was the first instance, the next two will occur on April 13 and April 25.





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Bedtime Math You Say Tomato, I Say To-mah-to

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Photo: Dwight Sipler via Wikimedia Commons

If there is one food that has caused confusion, it's the tomato – and not just around how to say its name. When [tomatoes](#) were first discovered and brought to Europe hundreds of years ago, everyone thought they were poisonous. But Thomas Jefferson figured out that you could eat these round red things, and now the average person eats 70 pounds of tomatoes or foods made from tomatoes every year. Ketchup, salsa, spaghetti sauce, soup...it all adds up. Meanwhile, the tomato is technically a fruit, since it pops out of a flower, but in 1893 the U.S. Supreme Court declared it a vegetable, and the label has stuck. Either way, we're lucky that a tomato holds so many seeds that can sprout into new plants, so we can reap more tomatoes, plant their seeds and start over. Hopefully somewhere along the way, we'll learn how to pronounce it.

Wee ones: If your tomato plant has 2 flowers on one branch and 3 flowers on another, how many tomatoes are you hoping to get? (Each flower turns into just 1 tomato.)

Little kids: To plant tomato seedlings (baby plants), you put each one in a little mound of dirt in the garden. If you make 4 rows of 4 mounds each, how many mounds for tomato plants do you have? *Bonus:* If each one grows 10 tomatoes, how many tomatoes will you harvest?

Big kids: If the 4 people in a family each eat 70 pounds of tomato, how many pounds of tomato do they plow through?

Bonus: Apparently 5 tomato plants together produce enough tomatoes for a typical family's tomato-eating for a year. How many pounds would each plant have to produce for this family?

Answers:

Wee ones: 5 tomatoes.

Little kids: 16 plants. *Bonus:* 160 tomatoes.

Big kids: 280 pounds of tomatoes and tomato products. *Bonus:* 56 pounds each.





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Bedtime Math Top Ten Pets

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Photo: Sean Bowling

So what *are* the most popular household pets? Is it dogs? Fish? Flamingos? It turns out that it depends on whether you count the number of homes with that pet, or the number of animals themselves. At least [in the U.S.](#), more households have a dog than any other kind of pet. But when you count animals, there's more than one per house, and the dogs are outnumbered by both cats and fish: 81 million cats and nearly 76 million fish, vs. just 72 million dogs. Hey, as long as you're putting out food or filling the fish tank, you might as well toss more pets in there, right? Rabbits, turtles, and guinea pigs all make the list, too, along with livestock like chickens and sheep. But they don't come close to outnumbering your regular old cats and dogs.

Wee ones: If you have 2 cats, 4 hamsters and a ferret, how many whiskery noses do you have?

Little kids: About 2 million homes have pet rabbits, but together they have about 6 million rabbits. Roughly how many rabbits per house is that? *Bonus:* 43 million households have dogs, but just 37 million have cats. How many more dog-owning families than cat-owning families are there?

Big kids: 9 million households have fish, but since it's easy to have more than 1 fish, there are 76 million fish. How many more fish are there than if each household had just 1? *Bonus:* The 43 million dog owners have 72 million dogs. If every dog lived with exactly 1 other

canine friend, how many more pet pooches would there be?

The sky's the limit: Cats and dogs don't always get along, but many people have both. Say 20 houses on your street have pets. There are 24 dogs, but 6 houses have 2 dogs apiece. The rest of the dogs get to be the only dog. Of the 26 cats, only 4 are the solo cat in the house; the rest are in pairs. What's the fewest number of dogs that have to live in a house where they're outnumbered by cats?

Answers:

Wee ones: 7 whiskery noses.

Little kids: 3 rabbits per house. *Bonus:* 6 million more dog owners.

Big kids: 67 million more fish. *Bonus:* 14 million more dogs, because the 43 million owners would have 86 million dogs.

The sky's the limit: The only set-up where dogs are outnumbered is 1 dog, 2 cats. 12 dogs live in 1-dog houses. Of the cats, 22 are paired up which means 11 houses; 4 houses have just 1 cat, leaving 5 houses with no cat at all. You can put 5 singleton dogs in cat-less houses, then the next 4 dogs in 1-cat houses, but that still leaves you with 3 unlucky dogs who have to live with 2 cats.





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Bedtime Math Gadgets Gone Wild

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Photo: Andrew Skudder via Wikimedia Commons

This week is National Robotics Week, so it's a fine time to think about all the behind-the-scenes robots that make our lives easier. Factories use robotic arms to cut pieces of objects, stick them together and paint them, just like a real person would but with no mistakes. There are funny little [robotic vacuum cleaners](#) that drive around the carpet all by themselves, happily gobbling up dirt and dust. Outdoor robotic pool cleaners can swim around your pool to suck up the water and filter junk out of it. There are robotic cameras, sensors, and cat litter boxes that clean themselves, not to mention robots shaped like real people. If you're looking to get something done right – and avoid doing it yourself – chances are that someone has built a robot that does that task, or is working on it.

Wee ones: The 4 dancing robots in this [strange video](#) are shaped a lot like people, including having 2 feet each. How many dancing robot feet do they have all together?

Little kids: Your robotic vacuum will happily vacuum for you, but more slowly than you would. If you can vacuum your room in 11 minutes but the robot needs 4 minutes longer, how long does the robot

take? Bonus: If you have another robot that in 10 minutes can zoom to the kitchen, open up the cookie jar and bring back a snack for you, how many minutes in total do the robots spend working for you?

Big kids: This [robotic burger-making machine](#) can make burgers with

choice of toppings without any humans touching anything, at a rate of 360 burgers per hour. How many burgers is that per minute?

Bonus: What if you could find a robot like this to make lunches in the morning? If it makes sandwiches 1/2 as fast for the 270 kids at your school, how fast can the robot make lunch for all of you?

Answers:

Wee ones: 8 robot feet.

Little kids: 15 minutes. *Bonus:* 25 minutes total.

Big kids: 6 burgers per minute. *Bonus:* It's now making only 3 sandwiches per minute, so 90 minutes.



Bedtime Math Pillow Fight

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Photo: "christopher" via Wikimedia Commons

When a good pillow fight gets started, it's hard to keep from diving in, especially if you have a big, fluffy, squishy pillow on hand. Swinging a pillow into another person is a great way to release energy without hurting anyone, and really should be done more often. Apparently grown-ups like the idea as much as kids: this weekend over 140 cities took part in [International Pillow Fight Day](#), where in some places hundreds of pillow-wielding people showed up to strut their stuff(ing). So how many pillows got into the act – and how many feathers were lost?

Wee ones: It was the 6th international pillow fight day ever, but it was New York City's 8th. How many more times have New Yorkers held pillow fights than the world at large?

Little kids: It turns out feather pillows are not allowed at the official pillow fights, because feathers have prickly points. If 16 people show up but 8 of them are banned from the event because they brought feather pillows, how many people are left who can play? *Bonus:* If half of the remaining people brought a spare foam pillow for others to borrow, now how many people can play?

Big kids: Feathers and foam don't weigh much, so a normal pillow for sleep weighs only about 2 pounds. How many of those would have to get chucked at you for the stack to weigh more than you? *Bonus:* If you and your family use pillows with 850 feathers in each, and in a big pillow fight 4 of the pillows split open, how many feathers do you have

flying around?

The sky's the limit: At these citywide pillow fights, participants wore everything from tutus to sequins and dressed up as giraffes, pirates and bananas. If among New York City's 2000 pillow fighters there were twice as many banana costumes as tutus, twice as many giraffes as bananas, and twice as many pirates as giraffes, and the remaining 800 people wore plain old pajamas, how many people dressed up as giraffes?

Answers:

Wee ones: 2 more pillow fights.

Little kids: 8 people. Bonus: 12, since there are now 4 extra pillows.

Big kids: Different for everyone...divide your weight by 2 and add 1 (whether you got a round number or not). Bonus: 3,400 feathers floating around.

The sky's the limit: The costumes are in a tutu:banana:giraffe:pirate ratio of 1:2:4:8, so each full costume "set" has 15 people. After carving out the 800 people you have 1200 people left, or 80 sets. There are 4 giraffes in each set, giving you 320 giraffes.





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Bedtime Math Diner Dogs, and Ice Cream for All

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We're doing two-fer Tuesdays for Math Awareness Month, which means that along with the daily math problem, we have a new video! In episode 2, "[Diner Dogs](#)," our not-so-talented friend Kevin tries to work as a short-order cook...but because he isn't so great at it, he's stuck cooking for dogs. [Click here to watch](#), and if you enjoy it please like it and share with your diner-loving dog fans! One more way to get kids – and grown-ups – hungry for more math.

We seem to have a real food theme going: as it turns out, today is also [Free Cone Day](#) at Ben and Jerry's. If you stop by any Ben & Jerry's ice cream shop today, you can get a free ice cream cone! There are few things in life as awesome as this annual event, which Ben and Jerry started on their first anniversary on May 5, 1979. Given that they give away about a million cones each Free Cone Day, let's do the math to find out how fast the cone count can add up.

Wee ones: If you order 2 free cones with 3 scoops on each, how many scoops of ice cream did you score? (The deal is probably for just one scoop, but hey, you can try.)

Little kids: Ben and Jerry's first shop served [only 12 flavors](#). If you have 5 different flavor pints in your freezer, how many more do you need to match their first shop? *Bonus:* There are 300 flavors in their "[Flavor Graveyard](#)," where tombstones mark the flavors they've stopped making. Since they've been making ice cream for about 30 years, roughly how many flavors do they retire each year?

Big kids: There are 5,812 Ben and Jerry locations holding this event. If each one serves “just” 100 cones, how many cones is that? *Bonus:* Ben & Jerry’s expects to serve one cone every 4 1/2 seconds today – whoa. How many cones will they serve every hour? (Hint: You can first figure out the time to serve 2 cones.)

Answers:

Wee ones: 6 scoops (though they probably don’t give out triple scoops today).

Little kids: 7 more flavors. *Bonus:* 10 flavors per year.

Big kids: 581,200 cones – that’s *only* half a million, so in reality they serve more. *Bonus:* 800 cones per hour. There are 3600 seconds in an hour, or 400 9-second chunks, and each 9-second chunk produces 2 cones.





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Bedtime Math "Draw a Picture of a Bird" Day

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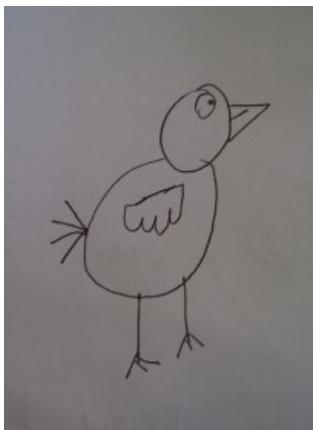


Image: Brian P.J. Cronin

What do you like to draw? Have you ever drawn a bird? Well, if you've never had the pleasure of doing that, now's your big chance because today is [Draw a Picture of a Bird Day](#). That means exactly what it sounds like it means, so grab some paper and crayons or a sidewalk and some chalk, and get to work! When you draw anything, you're actually making lots of decisions without even realizing it: what exactly to draw, what coloring tools to use in what colors, and how big to draw your subject. Luckily, on Draw a Picture of a Bird Day it doesn't have to be a bird you saw *today*, which opens up a lot of possibilities.

Wee ones: Groups of birds aren't always called "flocks." If you draw a "parliament" of 5 owls and a "gaggle" of 4 geese, how many birds did you draw in total?

Little kids: If you draw a 6-inch tall penguin and real penguins of that type are 38 inches tall, how much shorter is your drawing than the real thing? **Bonus:** If you and your 2 friends all decide to draw penguins, and each of you draws 1 cute pair of them, how many penguin feet in total did you draw?

Big kids: If you draw an ostrich at half its real height, and the typical ostrich is 7 feet tall, how tall is your ostrich drawing in inches?

Bonus: How many 11-inch-long pieces of paper do you need to tape end to end to fit your ostrich drawing on the paper, if the pages overlap 1 inch at each end?

Answers:

Wee ones: 9 birds.

Little kids: 32 inches. *Bonus:* 12 penguin feet, since you've drawn 6 penguins (3 pairs) in total.

Big kids: 42 inches. *Bonus:* You need 5 pieces. The first piece gives you 11 inches, and each subsequent piece adds another 10 inches, whether or not another piece is laid on after it. The first 4 pieces give you just 41 inches.



Bedtime Math Don't Judge a Frog by Its Cover

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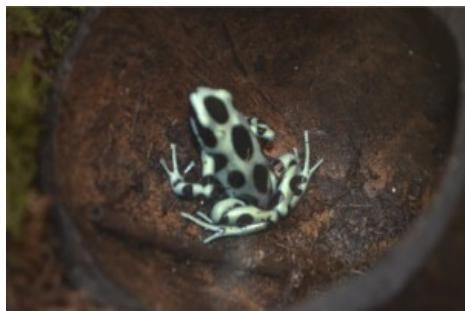


Photo: Sophia D'Angelo

If you're thinking of getting a frog as a pet – or you have a frog that needs a friend – don't go looking for a really colorful one. That bright, tropical-looking frog might be a poisonous dart frog. Dart frogs come from Central and South America and are usually brightly colored. Also called poison arrow frogs, they got these names because long-ago natives of these continents used the frogs' toxic liquids, which are held in their colorful skin, to poison the tips of their weapons. The most poisonous type of dart frog has enough toxin to kill 10,000 mice ...yikes. Those bright colors warn other animals like mice not to eat them – and even if you yourself like frogs' legs as a dish, you won't want to eat these critters, either.

Wee ones: Dart frogs come in all kinds of colors, like red, orange, yellow, green, and bright blue. If you get 2 of each color as pets, which would be a bad idea, how many do you have?

Little kids: Some scientists think [the frogs stay poisonous](#) by eating certain insects, who stay poisonous by eating certain plants. If a frog eats a dozen insects and half of them add to the frogs' toxins, how many poison-boosting insects did it eat? *Bonus:* These frogs especially like spiders (which are not insects) and ants. If a frog eats 5 spiders and twice as many ants, how many creepy crawlies did it eat in total?

Big kids: These frogs are at most about 2 1/2 inches long. If you can fit 2 of them end to end on your hand, how long is your hand?

Bonus: Some frogs jump 50 times their body length! If a dart frog could do that, how far could it jump to get away from that mouse chasing him?

The sky's the limit: Say you dare to own 3 pet dart frogs. The frogs all eat the same number of total bugs but they're picky about it: Frog 1 likes 3 ants for every termite, frog 2 wants 2 ants for every 3 termites, and frog 3 eats like frog 1. If you put out twice as many ants as termites and the frogs all eat at the same pace in their personal ratios, which bug will run out first?

Answers:

Wee ones: 10 pet frogs.

Little kids: 6 insects. *Bonus:* 15 critters in total ($5 + 10$).

Big kids: 5 inches long. *Bonus:* 125 inches (over 10 feet!).

The sky's the limit: As a portion of their meals,

Frog 1's meal is $\frac{3}{4}$ ants, $\frac{1}{4}$ termites.

Frog 2's meal is $\frac{2}{5}$ ants, $\frac{3}{5}$ termites.

Frog 3's meal is $\frac{3}{4}$ ants, $\frac{1}{4}$ termites.

Converting all to a common denominator, they eat

$$\frac{15}{20} + \frac{8}{20} + \frac{15}{20} \text{ ants} = \frac{38}{20} \text{ ants}$$

$$\frac{5}{20} + \frac{12}{20} + \frac{5}{20} \text{ termites} = \frac{22}{20} \text{ termites}$$

So together they eat a 38 to 22 ratio of ants to termites. So if you put out twice as many ants, you're going to have extra of those. Termites will run out first.



Bedtime Math One Skate In Front of the Other

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Photo: William Wegman via Smithsonianmag.com

We know the wheel was invented by a bunch of cavemen thousands of years ago, but that wasn't the end of it. It took centuries for people to see all the objects that could work – or work better – with wheels attached, resulting in all the cars, trucks, pulleys, and all our other machinery that uses spinny round things. Roller skates just showed up in the last couple of centuries: one version came out [in 1760](#) but folks didn't take to it, probably because they kept falling down. Then on [this day in 1869](#), apparently Isaac Hodgson filed a patent for his roller skate, and the rest is history. Now we have sports played entirely on skates, like roller hockey, speed skating and roller derby. All of these go faster on wheels, but are a lot harder than playing on your regular old feet.

Wee ones: If you wear 2 skates with 4 wheels each, how many roller skate wheels do you have?

Little kids: If you skate straight at your car and hop inside, how many wheels do you and the car have all together? (Just wheels on the ground – don't worry about the steering wheel.) *Bonus:* As you see from the photo, animals like to get into the act, too. If you and your dog put on skates, how many wheels are you sporting all together?

Big kids: People have set some amazing world records on skates – like [jumping over the most people](#) lying on the floor. When Jeremy Strecker jumped over 11 people, if each one took up 21 inches of floor, how many inches did he jump? *Bonus:* Then there's the [world's longest conga line on skates](#), where people line up one behind the other and skate while hanging on for dear life. The longest line ever had 197 people. How many wheels did their skates have all together? (Hint: for a shortcut, figure it out for 200 people, then subtract your way down.)

Answers:

Wee ones: 8 wheels.

Little kids: 12 wheels: 8 on you, 4 on the car. *Bonus:* You and your dog are wearing 6 skates all together, so 24 wheels.

Big kids: 231 inches. *Bonus:* 1576 wheels. That's 1600 (for 200 people) minus wheels for 3 people.





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Bedtime Math Six of a Kind

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4 / 5 / 2013

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0 1 2 3 4 5

It's funny how special dates sneak up on us. Today we have a new kind of cool date: it has all the digits from 0 to 5, just in scrambled order. Check it out: there's a 0 a 1, a 2...all the way up to 5. This doesn't happen very often. For one thing, we've had a long stretch where even the year by itself didn't have four different digits, since we had all the 1990's (which all had two 9's) and all the 2000's (two 0's). Now we're heading into nice-variety years, but we won't have the six-in-a-row effect many times. See if you can spot all the cool dates – and figure out how many of those dates you'll likely be around for, too.

Wee ones: If this is the year 2013, counting upwards what is next year going to be?

Little kids: Starting from now, when's the next year that will have 4 different digits in the right order (from smallest to biggest)?

Bonus: What other day this year will have 6 different digits that are "consecutive" when put in order (that is, each one 1 more than the one before)?

Big kids: How many more dates are coming up this *decade* that have one of each of digits 0 through 5? That means years beginning with 201_, and technically includes 2020 (though 2020 won't work). *Bonus:* How many days older than today will you be on the last of those dates?

The sky's the limit: Once we hit the year 2100, how many dates that *century* will have some set of consecutive digits in some scrambled order? (Hint: It can have more than 6 digits.)

Answers:

Wee ones: Next year will be 2014.

Little kids: The year 2345. *Bonus:* The 4th day of the 5th month, or 5/4/13 (by American date structure).

Big kids: 5 more days like this. 2014 and 2015 each have 2 dates that work using the 2 digits not yet taken: 3/5 and 5/3 for 2014, and 3/4 and 4/3 for 2015. Plus there's one more this year on 5/4.

Bonus: 4/3/2015 is 2 days shy of two years from today, so you'll be 728 days older.

The sky's the limit: We ended up finding far more dates than we expected – 42 of them!

- Years 2103, 2104 and 2105 all work, each with 2 dates (the two digits that haven't been used: 4/5 and 5/4 for 2103, etc.).
- We also have 2130, 2140 and 2150, which similarly have 2 dates apiece.
- We can't have a 0 month or day, but you *can* throw in 6 instead, for a 1-through-6 run. That brings in 2134, 2135, 2136, 2143, 2145, 2146, 2153, 2154, 2156, 2163, 2164, and 2165, each of which pairs with the missing x/y and y/x.
- We can't use 10, 20 or 31 as a day of the month because 1 and 2 are taken, but you *can* use day 30 for a 7-digit run. That adds 1 day each for 2145, 2146, 2154, 2156, 2164, and 2165.
- We're done. There are no dates with 7s in them because there are only 7 slots, you're anchored by the 1 in the year (so you can't use day 31), and you can't use numbers like 24 or 56 for the day.

Thus, by our count we have 18 years with 2 days apiece plus 6 extra dates, which gives us 42 dates in total. But hey, check the math for us!

And thank you to Lynn Salvo at [MathTree](#) for pointing out today's cool-dateness!



Bedtime Math We're Real Rear Wheels

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Try saying “We’re real rear wheels” ten times fast – or even just twice. Not so easy, huh? It’s a tongue twister, and there are a ton of word combinations that twist your tongue just as much, and that become harder to say as you say them faster. Try saying “Willie’s really weary” over and over, or “world wide web” – or better yet, try getting someone else to say these things. In fact, next time someone tells you to sell seashells at the seashore, or tie twine to three tree twigs, tell them to tell you again much faster, and they’ll eventually stop trying to tell you to do anything.

Wee ones: If you have 2 real cars with 2 real rear wheels each, how many real rear wheels do you have?

Little kids: Try saying “Sixth sick sheep” over and over, fast. If you get 6 sheep twice, how many sheep have you gotten? *Bonus:* Now try saying “11 benevolent elephants” over and over fast. If you have those 11 elephants plus the 6 sick sheep, how many tongue-tying animals do you have?

Big kids: Now you get to graduate to “The sixth sick sheik’s sixth sheep’s sick.” If all 6 sheiks have 6 sick sheep, how many sheep do they have in total? *Bonus:* If only half of the 6 sheiks are sick, and only half of each one’s 6 sheep are sick, how many sick sheep are there now?

Answers:

Wee ones: 4 real rear wheels.

Little kids: 12 sick sheep. *Bonus:* 17 animals.

Big kids: 36 sick sheep. *Bonus:* 9 sick sheiks' sick sheep.



Bedtime Math Get Hopping

bedtimemath.org



Photo: Laura Overdeck

Do you know how to hop? It isn't the easiest thing, jumping up and down on just one leg. Even bunnies think it's too much work: we say bunnies hop, but they actually jump off *both* back feet. Hopping is such good exercise that over a thousand years ago soldiers in the Roman army trained by hopping through numbered squares drawn on the ground...little kids liked the game so much that they drew their own smaller versions, and that's where hopscotch came from. In hopscotch you can write whatever numbers you like, throw rocks to block squares, and make up your own rules, to make the math as tricky as you like. But as you'll see below, you don't need a sidewalk and chalk to do a lot of hopping.

Wee ones: If you and your 2 pet bunnies start hopping, how many feet in total are hopping? (Remember: bunnies hop on 2 feet, but you don't!)

Little kids: If your hopscotch board has spaces numbered 1 through 10, how many hops do you do if you hop through on only the even numbers (without turning around)? *Bonus:* If you toss rocks onto the multiples of 4 and have to avoid those, how many squares can you hop onto?

Big kids: You can hop farther than a hopscotch board, though. The world record for [hopping for a whole mile](#) is 23 minutes 15 seconds, set last year by Joseph Scavone Jr. If you can hop it backwards in double that time, how long would it take you? *Bonus:* There are 5,280 feet in a mile. If the record hopper took 3/4 as many hops as there are feet, how many hops did he have to do?

The sky's the limit: If 54 people and bunnies in total hold a hopping race, and there are 42 more bunny feet than people feet on the ground, how many of each type of hop-racer do we have? (Reminder: 2 bunny feet will be grounded when they hop.)

Answers:

Wee ones: 5 feet.

Little kids: 5 spaces (2, 4, 6, 8 and 10). *Bonus:* 8 spaces, since you have to avoid the 4 and 8.

Big kids: 46 minutes and 30 seconds. *Bonus:* 3,960 hops.

The sky's the limit: There will be 22 people (22 feet) and 32 bunnies (64 feet). Why? If we have p people and b bunnies...

$$p + b = 54 \dots \text{so } b = 54 - p$$

$$p + 42 = 2b$$

$$p + 42 = 2(p - 54)$$

$$p + 42 = 108 - 2p$$

So $3p = 66$. That means $p = 22$, and then $b = 32$.



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Bedtime Math Ninja Training and Cricket Counting

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First, it's Math Awareness Month, and we're celebrating with a new series of comedic mini math videos, as an extra treat every Tuesday! In today's premiere episode, "[Ninja Training](#)," we meet Kevin, who's enthusiastic about everything but not so good at anything. He's trying to find a job, but learns that to be a ninja you can't just be sneaky, you also have to do the math right. It's just one more way Bedtime Math hopes to get kids – and grown-ups! – jazzed about math. (Note that you might want to check it out before showing to your wee-est ones.) [Click here](#) to watch!

And secondly...we humans aren't the only creatures who are math-aware. As the weather gets warmer you might hear crickets chirp, which they do by rubbing their legs together (the boy crickets, at least). Interestingly, the warmer the weather, the faster they chirp, and you can use their rate of chirping to [figure out the temperature](#)! For a rough guess, count the number of chirps in 14 seconds, then add 40 and you'll have the outside temperature in degrees Fahrenheit. For Celsius, count the chirps in 25 seconds, divide by 3, and add 4. Try it out and amaze your friends!

Wee ones: A cricket has 6 legs, like any insect. If he's rubbing 2 legs together to chirp, how many legs does he have left to stand on?

Little kids: If you count 20 chirps in that magic 14-second period, what's the outside temperature in Fahrenheit? *Bonus:* For a shortcut,

you could just count the chirps in half that time and double that number. So how many seconds would you count?

Big kids: Switching to Celsius, if you count 36 chirps in a 25-second period, what's the temperature in Celsius? *Bonus:* If it's 21 degrees C out, how many chirps will you hear in 25 seconds?

Answers:

Wee ones: 4 leftover legs.

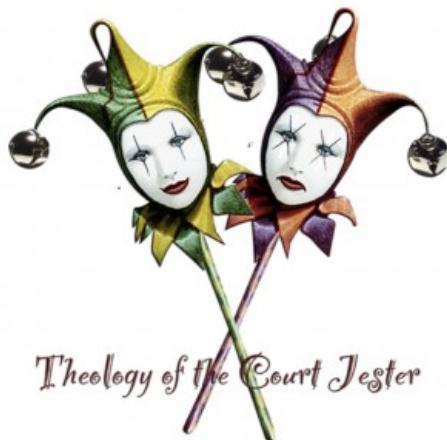
Little kids: 60 degrees F. *Bonus:* 7 seconds.

Big kids: 16 degrees C (that's $12 + 4$). *Bonus:* 51 chirps (which is 3×17).



Bedtime Math Something Fishy

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Source: Braxtonuniversity via Wikimedia Commons

It's April 1, the day when a lot of places celebrate April Fools' Day, also known as All Fool's Day. Different countries have different customs, but they all involve playing pranks and practical jokes to make people look and/or feel like fools. According to our usual sources, in France, Italy and Belgium folks try to tape paper fish on other people's backs without being caught. In Belgium, kids also apparently try to lock their parents and teachers out of the house or school building. In the US, people play jokes not only by gluing doors shut or dyeing the milk pink, but also by just telling made-up stories to see if anyone will believe them. Now, we're not even sure any of the above is true, because maybe these *webpages* about April Fools' are jokes...but we can still play with some numbers, because math doesn't lie.

Wee ones: If 3 fish get taped to your back but you tape 5 fish to other people's backs, how many more fish did you tape than you got stuck with yourself?

Little kids: If you go around town gluing a coin to the ground in various spots, and you glue down 12 dimes and 9 pennies, how many coins are glued down to trick people? *Bonus:* If you also prank your parents by setting their alarm 20 minutes earlier, if it's normally set for 7 am

what time will it now ring?

Big kids: Another prank is to sneak into the kitchen and swap all the cereals so they're all in the wrong boxes. If you have 3 cereals and want every one of them in the wrong box, how many possible ways do you have to scramble them? *Bonus:* What if you have 4 cereals?

Answers (no really, these are the answers...):

Wee ones: 2 fish more.

Little kids: 21 coins. *Bonus:* 6:40 am.

Big kids: Only 2 possible ways: in boxes 1, 2, and 3 you can have cereals 231 or 312. *Bonus:* Only 9 combinations. You can have only 3 cereals in the first box (2, 3, or 4), and for each of those there are only 3 combos where 2 is never in the 2 box, 3 is never in the 3 box, etc.: 2143, 2341, 2413, 3142, 3412, 3421, 4123, 4312, 4321.





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Bedtime Math Apple Swans

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(Note: As we do on special holidays, in honor of today we're providing a second extra math problem about Easter, for those who celebrate or would like to learn more about it...see the two posts below Enjoy!)



Photo: Laura Overdeck

They say an apple a day keeps the doctor away – apples are really good for you. But you can do cool things to them before you take that first bite. You can peel them in stripes, or slice them thin and fan out the pieces on a plate...or, as we just learned here at Bedtime Math, you can carve an apple to look like a bird. In [this video](#), chef John Mitzewich shows us how to turn an apple into a swan, with feathery-looking wings and a long neck, and even tiny apple-peel eyes. As you see in the photo, we tried it here... we sort of got them looking like birds, right? If you can find a grown-up who's willing to pick up a knife and tackle an apple, you too can have these swans floating across your breakfast table.

Wee ones: If you have 5 apples but you start chomping into 1, how many nice neat clean ones are left to turn into swans?

Little kids: Each swan wing here has 4 long L-shaped pieces. How many wing pieces does 1 swan have in total? *Bonus:* The trick is to cut those L's without snapping them – but you do get to snap them when you eat them. If you snap each L in half, how many total little wing pieces do you get from 1 swan?

Big kids: If you need 10 seconds to cut each wing piece, 10 seconds to make the neck hole, and another 10 to carve the head, how long do you take to make that swan? *Bonus:* If your guests are arriving in 5 minutes, how many swans can you finish by the time they arrive?

The sky's the limit: Suppose you start with 10 red apples and 10 yellow, to make swans of different colors, and you cut 3-piece wings on half the apples and 4-piece wings on the other half – but not necessarily on half of each color. If you end up with 8 more red wing pieces than yellow wing pieces, how many swans of each color and wing style did you cut? (You can either solve this with logic, or give algebra a whirl.)

Answers:

Wee ones: 4 apples left.

Little kids: 8 wing pieces. *Bonus:* 16 apple pieces.

Big kids: 100 seconds. *Bonus:* 5 minutes equals 300 seconds, so you can finish 3 swans.

The sky's the limit: Of the reds, 7 swans have 4-piece wings and 3 have 3-piece, and the reverse for yellow. Why? We know half the apples will be cut each wing-style, and we have half the apples in each color...so however many red 3-piece-wing swans you have, you'll have that many 4-piece-wing swans in yellow, and vice versa. To start, if you had exactly 5 of each wing type and in each color, you'd have a zero gap between the number of red wing pieces and yellow wing pieces. When you switch a swan from 3-piece-wing to 4-piece-wing, that color gets 2 more wing pieces, but the other color loses 2, so the gap increases by 4. So, a gap of 8 means you made 2 switches, from 5-5 to 6-4, and from 6-4 to 7-3. Thus, there are 7 4-piece-wing red swans and 3 3-piece-wing reds, and 3 4-style yellow swans and 7 3-style yellows.

If you want to use algebra instead...Call them red3, red4, yell3 and yell4:

red3+red4=10 and yell3+yell4=10 (total apples of each color)

red3+yell3=10 and red4+yell4=10 (total apples of each style)

The second equation tells us yell3=10-yell4. If you stick that into the third equation, you get

red3+(10-yell4)=10 So red3 = yell4 and red4 = yell3/ It's a mirror image.

Meanwhile...wing pieces:

$6 \times \text{red3} + 8 \times \text{red4} = 6 \times \text{yell3} + 8 \times \text{yell4} + 8$ (there are 8 more red wing pieces than yellow)

But red3 and red 4 equal the opposite yellow numbers. Substitute:

$$6 \times \text{yell4} + 8 \times \text{yell3} = 6 \times \text{yell3} + 8 \times \text{yell4} + 8$$

Subtracting $6 \times \text{yell4}$ and $6 \times \text{yell3}$ from each side, you get

$$2 \times \text{yell3} = 2 \times \text{yell4} + 8.$$

But you know those yellows add up to 10, so...

$$2 \times \text{yell3} = 2 \times (10 - \text{yell3}) + 8$$

$$2 \times \text{yell3} = 28 - (2 \times \text{yell3})$$

$$4 \times \text{yell3} = 28$$

so $\text{yell3} = 7$. That means you have 7 yellow apples with 3-piece wings, and 3 yellows with 4-piece wings. So you have the reverse for red: 7 red swans with 4-piece wings and 3 swans with 3-piece wings.



Bedtime Math Egg Hunt

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Photo: Laura Overdeck

Today is Easter Sunday, the day that Christians celebrate the rising of Jesus from the dead. On this holiday we also see a lot of fun, playful stuff, like fluffy chicks and Easter bunnies delivering eggs – but interestingly, even that egg is a [very special symbol](#). It represents the empty stone tomb of Jesus: an egg is round and smooth like a stone, but life comes out of it. In fact, it was tradition not to eat eggs at all during the 40 days of Lent leading up to Easter, and some people still follow that rule. So it's no surprise that the Easter egg hunt became a popular way to celebrate Easter and the end of Lent. For your egg hunt, you might get to help set up by dyeing and decorating hard-boiled eggs, or filling plastic eggs with candy. But it's even more fun to go out there and find them.

Wee ones: If you dye 2 blue eggs, 3 yellow eggs and 2 green eggs, how many eggs did you dye for the egg hunt?

Little kids: If during the egg hunt you find 5 eggs and each one has 3

candies inside, how many candies did you get? *Bonus:* If 2 of those plastic eggs contain little chocolate eggs while the rest of them contain jelly beans, how many jelly beans did you get?

Big kids: If the eggs hidden for the big hunt include 4 greens, twice as many pinks as greens, and 3 times as many blues as pinks, how many eggs is that all together? *Bonus:* Say you and your cousin each find a dozen eggs, a mix of purple or pink. If you find twice as many purples as pinks, and your cousin finds 6 more purple than pink, which of you found more purples?

Answers:

Wee ones: 7 eggs.

Little kids: 15 chocolate eggs. *Bonus:* 9 jelly beans (inside 3 eggs).

Big kids: 36 eggs, since you have 4 green, 8 pink and 24 blue.

Bonus: Your cousin found more: you found 8 purples vs. 4 pinks, and your cousin found 9 purples vs. 3 pinks.





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Bedtime Math Water Works

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Photo: Sbittante via Wikimedia Commons

Niagara Falls is famous for having more water rush over the edge every minute than any other waterfall in the world – well, except for one really strange day. On [this day in 1848](#), people who lived near the falls woke up to dry riverbeds and spooky silence, as if someone had turned off the water with a giant faucet. The real reason was that big chunks of ice had jammed the mouth of Lake Erie 20 miles away, the source of water for the Falls. But since this was long before phones and email, it took a while for word to reach town about what had happened. So until the news reached them, people kind of freaked out and thought the world was ending. But the next day the ice floes broke and the river started running again. For the 165 years since then, the Falls have been running just fine.

Wee ones: Niagara Falls actually has 3 separate waterfalls, and sometimes crazy people try to ride down them in wooden barrels. If you ride down all 3 waterfalls each day for 2 days in a row, how many barrel rides do you take?

Little kids: During the summer, about [100,000 cubic feet of water](#) flow over the falls every second – enough to fill a whole house! How much water flows through in 5 seconds? *Bonus:* How much water flows through in 1 minute? (Reminder: a minute has 60 seconds...to multiply by 60, just multiply by 6 and then tack on a zero.)

Big kids: Niagara's 3 waterfalls include the American Falls (1,060 feet wide) and the Bridal Veil Falls (56 feet wide). How much wider are the American Falls than the Bridal Veil? *Bonus:* The Horseshoe Falls are the widest and also the tallest, with a 173-foot drop (about the height of a 14-story building). The Bridal Veil is only [78 feet tall](#). How much farther would you drop riding down the Horseshoe than the Bridal Veil?

Answers:

Wee ones: 6 barrel rides.

Little kids: 500,000 cubic feet per second. *Bonus:* About 6,000,000 cubic feet per minute.

Big kids: 1,004 feet. *Bonus:* 95 feet farther – more than double.





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Bedtime Math Big Blue Marble

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Photo: Joe Mabel via Wikimedia Commons

Most of us think of marbles as those pretty little glass balls that always roll under the couch, never to be seen again. But at tonight's World Marbles Championship in Sussex, England, marbles play the starring role in an exciting game. It all started in 1588, when two men who both loved the same woman played a marbles match to see who would get to marry her. Today's match is played by teams, not single guys, and they come from around the world. Everyone's marbles get dropped inside a 6-foot-wide circle on the floor; in this contest, teams try to shoot their marbles into a hole, while in other versions teams try to knock each other's marbles out of the circle. Let's just hope someone's catching them before they roll under the couch.

Wee ones: If there are 8 marbles in the ring and you knock 3 of them out, how many are left in the ring?

Little kids: In [classic marbles](#) between 2 kids, each kid gets 10 marbles. How many marbles do they have in total? *Bonus:* Each team has its own color marbles so everyone knows how many each team has left. If there are 4 red marbles and twice as many blue ones left, how many marbles are left in total?

Big kids: In the big championship tonight, each team has 6 players, and each player gets 4 marbles. How many marbles does a team get? *Bonus:* The rules are simple: the winner is the team that knocks out all the other team's marbles plus the one extra marble thrown in

there. Between the extra and the two teams' marbles, how many marbles are in the circle at the start?

Answers:

Wee ones: 5 marbles left.

Little kids: 20 marbles total. *Bonus*: 12 in total (4 red, 8 blue).

Big kids: 24 marbles. *Bonus*: 49 marbles total; the winning team is the first to knock out 25.





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Bedtime Math Turning Over a New Leaf

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Photo: Laura Overdeck

Have you ever torn a page out of a magazine or comic book, only to have another page pop out from the other half? If a magazine is stapled together in the middle, each page is actually half of a bigger sheet that you unknowingly tore in half. Books are made from even [bigger sheets of paper](#) folded into quartos (8 pages total), octavos (16 pages)...doubling all the way to 128. If you fold paper in half over and over and then slice off the edges, it's a cool math problem: which parts of the original sheet end up facing each other?

BTW, if you've ever heard of "turning over a new leaf," it means making a fresh start to become a better person – but it has nothing to do with trees or flowers. The word "leaf" is actually talking about a page in a book...you're turning to a new, blank page. The question is, which one?

Wee ones: If you fold a piece of paper in half and then in half again, how many sections does it have on the front? (Try it with a piece of paper to help visualize it).

Little kids: If you stack 5 pieces of paper and staple in the middle to make a 20-page book (with the front cover as 1), which 2 page numbers face each other in the middle? *Bonus:* Which page is on the same side of the same sheet as page 4?

Big kids: Many books are made in quartos, which create 8 pages

(backs and fronts), so the number of pages has to be a multiple of 8. Could a book made in quartos have 76 pages? *Bonus:* Books are also made in octavos (8 sections), which create sets of 16 pages. Could such a book have 96 pages?

The sky's the limit: Suppose you fold a piece of paper 3 times – top half down, then left half to the right, then top half down again – and trim all the edges to make a 16-page book. What number page does the topmost rightmost front-facing corner become? (Again, count the front page of the eventual book as page 1.)

Answers:

Wee ones: 4 sections.

Little kids: Pages 10 and 11 – those are the middle two numbers of 1 through 20. *Bonus:* The 4th to last page, or page 17.

Big kids: No, since 76 is not a round multiple of 8. *Bonus:* Yes – there would be 6 sections.

The sky's the limit: Page 14. The top rightmost corner folds down to become the third to last page, and stays there through the rest of the folding.





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Bedtime Math Doing the Heavy Lifting

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When you build a really, *really* tall building, and you're trying to bring huge beams and pieces of material to the top, a ladder won't help for very long. And you can't just drop them in from a helicopter. You need a very tall machine to lift everything and carefully put it in place, and that's why we have cranes. Maybe you've seen one of these towering skinny machines, with the giant arm and a long cable swinging with a huge hook on the end. There are all types of cranes: one kind, the tower crane, can reach as high as [265 feet](#) and lift close to 40,000 pounds. To keep from tipping over, the crane is bolted to *400,000 pounds* of concrete poured in the ground. Basically, it's a ton of work to build the crane before you even start building the building!

Wee ones: If you have 3 truck-mounted cranes and a tower crane on the ground, and 1 small crane on top of the building, how many cranes do you have in total?





Photo: Kristoferb via Wikimedia Commons

Little kids: A tower crane is shaped like a T, with the top part of the T (the jib) acting like a seesaw at the top of the upright part (the mast). If the mast is 200 feet long and the jib is 60 feet long, how many feet long are the two together? *Bonus:* As you see in the photo, the mast is built out of those red and white 20-foot long pieces, which are added on by *another* crane. How many 20-foot pieces were needed to build this mast?

Big kids: Tower cranes can reach 265 feet tall. If the building is already 230 feet high, how many feet higher can the building go before it's as tall as the crane? *Bonus:* The weight a tower crane can hold depends how far to the side it's hanging, or the crane will tip over. The weight in tonnes and the sideways distance in meters can't multiply out to more than 300. If the load is hanging 50 meters from the crane, how many tonnes can the load weigh?

Answers:

Wee ones: 5 cranes.

Little kids: 260 feet. *Bonus:* 10 20-foot pieces.

Big kids: 35 more feet. *Bonus:* Just 6 tonnes. Of course, a metric tonne is over 2,200 pounds, so that's still a lot!

Bedtime Math Spotting Your First Steps

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Photo: CBS 2/LZCC

When we humans are born, we take a good 9, 12, or even 18 months to walk on our own. But a lot of baby animals take their first steps within an hour of being born, like this [beautiful baby giraffe](#) just born on Friday in Greenwich, CT. Giraffes are basically spotted, stretched-out camels – their Latin name, *camelopardalis*, is literally “camel” and “leopard” strung together – but they have a lot more leg and neck to lift than other 4-legged critters. So it’s all the more impressive when the baby in [this video](#) takes only 2 minutes to get to her feet, and without any help. It’s hard to picture a 30-minute-old human baby doing that ...if they’re going to race, the baby giraffe will definitely win.

Wee ones: If the baby giraffe spent her first 30 minutes of life resting and the next 2 minutes learning to stand, how many minutes old was she when she finally stood?

Little kids: You can’t tell from the pictures, but that baby giraffe is almost 6 feet tall! About how many feet taller than you is she? (You can round off your height to the nearest foot.) *Bonus:* She’s going to grow up to be about 18 feet tall. About how many feet will she grow between now and then?

Big kids: As you’d imagine, an animal that tall has to weigh a lot. The average female giraffe weighs about [1,800 pounds](#), but male giraffes average around 3,500 pounds. How much heavier is the average male? *Bonus:* To fuel that big body, giraffes eat about 75 pounds of

leaves a day. How many pounds of leaves do they eat in a week?

The sky's the limit: The dark patches on a giraffe look like a nice mix of triangles, diamonds, pentagons and hexagons. If a giraffe has 200 patches, with twice as many pentagons as hexagons in the mix and some number of diamonds, and these shapes have a total of 880 sides, how many patches of each shape does the giraffe have?

Answers:

Wee ones: 32 minutes.

Little kids: Different for everyone...subtract your height in feet from 6 (unless you're a grown-up over 6 feet tall, in which case you're taller). *Bonus:* 12 more feet.

Big kids: About 1700 pounds heavier – almost double! *Bonus:* 525 pounds.

The sky's the limit: This one becomes pretty easy if you use a little algebra. If we have h hexagons, p pentagons and d diamonds, then $h+p+d=200$.

But we know $p=2h$ (twice as many). So...

$h+2h+d=200$, or $3h+d=200$. So we can write d as $200-3h$

We also know the number of sides: $6h+5p+4d=880$. Let's write it as $6h+5(2h)+4d=880$

$16h+4d=880$, so if we substitute for d :

$$16h+4(200-3h)=880$$

$$16h+800-12h=880$$

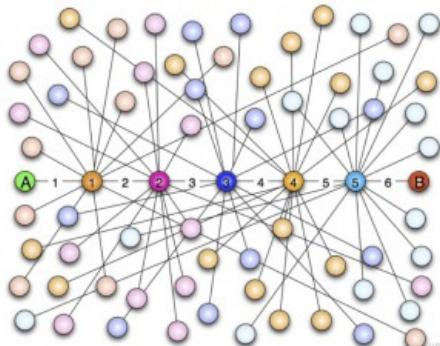
$$4h+800=880$$

$4h=80$, so there are 20 hexagons. That means 40 pentagons, leaving 140 diamonds to fill out the 200 shapes.



Bedtime Math Friend of a Friend of a Friend

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Source: LaurensvanLieshout via wikimedia

Have you ever wondered how many people you know? No matter how old you are, every time you start a new school year, activity, and so on, you meet new people. You might have a new baby sister, brother or cousin come along – more new people. If you start counting up all these folks, you might be surprised how fast the number racks up – and it will keep growing as you get older. Researchers at Columbia University have guessed that the average American grown-up knows around [600 people](#)! And of course, if each of *them* knows 600 people, and each of *those* people knows 600 people...that's even more people you could get to meet.

Wee ones: Let's start with your mom, your dad, and you. How many people is that? (You get to count yourself!)

Little kids: If you have 4 people in your family, including you, and 16 other kids in your class at school, how many people do you know in total? (Again, include yourself.) *Bonus:* If you also did soccer/gymnastics/art class the last 2 years and met 10 other kids each year through that, now how many do you have in total?

Big kids: Your friends are “1 degree of separation” from you, and *their* friends are 2 degrees. If you know 300 people and each of *them* knows 300 more, how many 2nd-degree of separation people do you have? *Bonus:* Of course, most of those 300 know the

same people as each other, so it isn't really 300×300 . If each of your 300 friends adds only half as many friends-of-friends as you'd think, now how many 2nd-degree folks do you have?

Answers:

Wee ones: 3 people.

Little kids: 20 people. *Bonus:* 40 people.

Big kids: 90,000! *Bonus:* 45,000.



Bedtime Math Festival of Freedom

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Photo: Gilabrand via wikipedia

This evening marks the beginning of Passover, the Jewish celebration of freedom from slavery in Egypt over 3,000 years ago. It also celebrates the creation of the Jewish nation under Moses as told in Exodus. Thousands of years later, today's holiday celebrates this important event during 7 or 8 days of rituals that involve family, friends and special foods. As we look more closely at what happens during Passover, we see that much of the celebration revolve around numbers, with very specific counting of days and nights, steps in rituals such as the Seder dinner, and of course ingredients for foods.

Wee ones: During the Seder, you might get to ask the 4 questions about why Passover is different from any other holiday. If you've asked the first 2 questions, how many questions do you have left?

Little kids: Passover always begins on the 15th day of the month of Nisan (which means the night of the 14th day). If you celebrate for 8 days, what day of Nisan is the last day? *Bonus:* During the Seder, adults sometimes hide the afikomen (piece of matzah), and dinner can't finish until the kids find it. If the afikomen is hidden at 7:35 pm and it takes you all 7 minutes to find it, at what time can you all return to finishing dinner?

Big kids: If you have 9 people total at your Seder dinner and each person gets 4 pieces of matzah, how much matzah will you need?

Bonus: If you have 4 boxes with 15 matzah in each, how much matzah will you have left over?

Answers:

Wee ones: 2 more questions.

Little kids: The 22nd day. *Bonus:* 7:42 pm.

Big kids: 36 pieces. *Bonus:* 24 pieces left.





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Bedtime Math At a Snail's Pace

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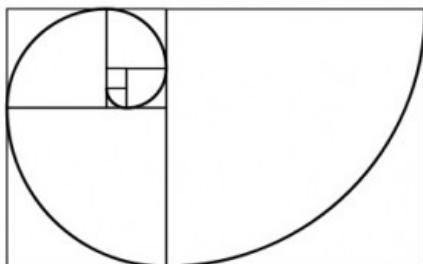


Image: Dick Lyon via Wikimedia Commons

It must be rough being a snail. If someone's chasing you, or it starts raining, or you're just trying to avoid someone coming your way, it's hard to escape. Snails can move only about [3 inches per minute](#). But we love snails because their spirally shells are so beautifully mathematical. If you draw 2 equal squares right next to each other, and then a square up against them that's as tall as those 2 together, and you keep going around adding bigger squares, you can connect their corners diagonally to draw a perfect snail spiral. The numbers are cool because each square's edge equals the last 2 edges added together, giving you 1, 1, 2, 3, 5, 8, 13, 21...which are called the Fibonacci numbers. As you see, you can just keep adding them up to make bigger snails – although that won't make them run faster.

Wee ones: Let's get back to snail speed. If a snail can move only 3 inches per minute, how far can your pet snail travel in 3 minutes?

Little kids: As you look at that series, how often do even numbers pop up – and why? *Bonus:* What number comes next after 13 and 21?

Big kids: If your snail drawing uses 10 squares total, what's the width of that last square? *Bonus:* If you draw only the first 5 squares, what area do those squares cover? (Reminder: The area of a square is its width times itself.)

The sky's the limit: The inches your pet snail travels in a round number of minutes is always a multiple of 3. What fraction of the

Fibonacci numbers can be your snail's distance – and why?

Answers:

Wee ones: 9 inches.

Little kids: Every 3rd number is even, because it's then added to the previous odd number to make an odd, and the new odd number is added to the even to make the next. Then you finally have two odds in a row to make an even, and you start all over. *Bonus:* 34.

Big kids: 55, because 21 and 34 are the 8th and 9th numbers.

Bonus: 40, because the first 5 areas are 1, 1, 4, 9 and 25.

The sky's the limit: Every 4th number is a multiple of 3. This involves the idea of "mod 3," meaning how much more than a multiple of 3 is each number. If you add a number with a remainder of 1 to a number with a remainder of 2, the remainders will add to 3 and the total will be a nice neat multiple. In the series, 3 (a multiple) is added to the 2 before it (which is 2 mod 3), so the next number is 2 mod 3, too (5, in this case). Then that gets added to the pure multiple, yielding another 2 mod 3 (8, in this case). The two 2 mod 3 numbers give you a 1 mod 3 (13), and finally we have a 2 mod and a 1 mod in a row to make a new multiple, 21. Then it starts all over with a 1 mod, then a 1 mod, then a 2 mod. Then this 8-number cycle continues.





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Bedtime Math Monkeying Around

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Photo: Andi Howard

Have you ever played on the monkey bars at a playground? That's the piece of jungle gym that looks like a ladder stretched flat across the top. A lawyer in Chicago actually [invented monkey bars](#) as an outdoor math game: Each rung had a number, and you had to climb, swing or get to it whatever way you could when that number was called out. Eventually they got the name "monkey bars" because you have to hang from each one by your hands and grab the next to move forward – like a monkey swinging through the jungle tree branches to get to the next banana. For some reason, we humans like swinging even without a banana waiting at the end.

Wee ones: If you do the monkey bars and grab a total of 4 bars with your left hand and 4 bars with your right, how many monkey bars did you grab to swing through?

Little kids: If your jungle gym has 5 ladder rungs up to the monkey bars and then 8 bars across, how many total rungs and bars do you touch in getting from one end to the other? (Remember: there's a ladder at each end.) *Bonus:* If at the far end you skip the ladder and just drop to the ground, how many did you touch on that trip?

Big kids: If you're all timing yourselves on the monkey bars to see

who's fastest, and you do the 8 bars at 3 seconds each, how long do you take to finish? *Bonus:* Which jungle-gym race can you do faster: swinging through 12 monkey bars at that pace, or going up and down a 9-rung ladder at 1 1/2 seconds per rung? (Count all 9 rungs going both up and down.)

Answers:

Wee ones: 8 rungs total.

Little kids: 18 rungs and bars in total. *Bonus:* 13 bars and rungs.

Big kids: 24 seconds to finish. *Bonus:* You'll do the ladder faster, in 27 seconds (18 rungs total) vs. 36 seconds.





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Bedtime Math Another Reason to Sneeze

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Photo: Vcelalba via wikipedia

Now that it's spring on the northern half of Earth, it's time for leaves, flowers, and allergies all to come into bloom. And one of the biggest celebrations of these springtime signs (minus the allergies) is the Cherry Blossom Festival in Washington, DC. It all started [in 1912](#), when Japan gave the U.S. 3,020 cherry trees to plant in the nation's capital. In 1965 they gave another 3,800. The festival runs for five weeks, and really grew last year for the 100th anniversary of that first planting. All we know is, with over 1.5 million people visiting DC to celebrate, that's a lot of sneezing.

Wee ones: If you have 6 cherry trees and on half of them the blossoms turn into actual cherries, how many trees' worth of cherries do you have?

Little kids: Predicting when the blossoms will “peak” isn’t a perfect science: it’s happened [as early as March 15](#) and as late as April 18. If the festival for that early peaking year was already planned to start March 21, by how many days did the party miss the peak? *Bonus:* If Japan gave 3,020 trees and then another 3,800, how many did they give in total?

Big kids: What if all those cherry blossoms could turn into cherries...if there are 3,700 trees and on each tree 100 blossoms turned into cherries, how many total cherries could you get? (Hint: to multiply by 100, tack on 2 zeros.) *Bonus:* If each tree supplied enough cherries

to make 4 pies, how many cherry pies could you make all together?

Answers:

Wee ones: 3 trees.

Little kids: 6 days late. *Bonus*: 6,820 trees.

Big kids: 370,000 cherries (370 thousand)! *Bonus*: 14,800 pies – yum.

And thank you to Talie B. for reminding us about this special event!





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Bedtime Math Pets in Flight

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Photo: TSA via weather.com

You just won't believe the stuff people try to bring on an airplane – like seven pet snakes and three pet turtles. If you've ever flown on a plane, you know that all passengers and their luggage get screened by x-ray in the airport to make sure no one's bringing anything unsafe onto the plane. This is a huge job: the TSA (Transportation Security Administration) has to screen more than 1,800,000 people a year (that's almost 2 million) at the hundreds of U.S. airports. With numbers as big as that, chances are that, as TSA reported this week, someone's going to show up with a bunch of reptiles in his pants.

Wee ones: If that guy brought 7 snakes and 3 turtles onto the plane, how many pet reptiles was he carrying?

Little kids: Pets, however, are allowed on the plane if they're small, caged, and not smelly (rules listed [here](#)). If on a flight passengers carry on 6 small dogs, 6 cats and a hamster, how many pets are on board? *Bonus:* Bigger pets have to ride in the belly of the plane near the luggage (but in their own cozy heated section). If there are just as many big animals down below as in the passenger cabin, how many pets are on board in total?

Big kids: You have to pay extra if your suitcase weighs more than 50 pounds. What weighs more, 2 50-pound suitcases or 3 drooly 40-pound dogs? *Bonus:* It's a rough ride even for your suitcase: it can have a good [270 pounds](#) of other luggage squashing it. Given that the average suitcase weighs 30 pounds, how many suitcases of the same size does it have piled on top of it?

The sky's the limit: Suppose you get on a plane that's loaded with pets. In the passenger area, people have carried on a total of 16 animals, some mix of dogs, cats, and 1 snake (properly caged this time). Meanwhile, there are 21 more animals down below in the belly of the plane, all dogs or cats. If there are twice as many dogs as cats in total, but twice as many cats as *dogs* up in the cabin, how many dogs are riding down below?

Answers:

Wee ones: 10 reptiles.

Little kids: 13 animals. Bonus: 26 animals in total, since it's now double.

Big kids: The 3 big dogs weigh more, at 120 pounds vs.

100. Bonus: 9 suitcases piled on top.

The sky's the limit: 19 dogs downstairs. There are 15 dogs and cats combined up above (remember to skip the snake), which shakes out to 10 cats and 5 dogs. Since there are 36 dogs or cats in total and twice as many dogs as cats within that, you have 24 dogs vs. 12 cats. 5 of those dogs are up above, leaving 19 dogs below.



Bedtime Math Like Night and Day

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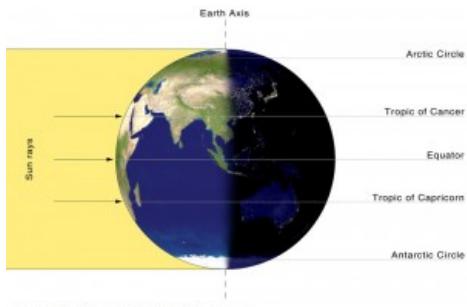


Image: Blueshade via Wikimedia Commons

As we get to say twice a year, today is the equinox: the first day of spring for the north half of earth, and the first day of fall for the south. What's cool about an equinox is that, because of the way the earth is tilted – neither toward nor away from the sun – everyone on our whole planet has a 12-hour night and a 12-hour day. “Equinox” is the Latin word for “equal night” (“nox” means night – that’s where we get the word “nocturnal” for animals who stay up all night). For the northern half, the sun will keep rising earlier and setting later until summer – and maybe you’ll get to stay up later, too.

Wee ones: The sun rose today around 6 am for everyone on local time (and set around 6 pm). But if you have Daylight Savings, your clock time says 1 hour later. What time did your clock say at sunrise?

Little kids: Your sunrise and sunset won’t actually be exactly at 6 and 6 (or 7 and 7), because it’s 12 hours between the *middle* of the sun rising and setting, and it takes a few minutes for the whole sun to show up. If the top of the sun peeps over the horizon at 6:59 am and it takes 2 minutes until the bottom rises, at what time does the bottom rise? **Bonus:** Your sunrise also depends on where you live in your time zone. If you’re on the eastern edge and get sunrise at 6:57 am, and your grandma lives on the western edge where it rises 9 minutes later, at what time does the sun rise for her?

Big kids: Sunrise and sunset change the most from day to day at this time of year. If your sunrise was at 7:05 today on Daylight time, and is

rising 2 minutes earlier each day, at what time will sunrise be for you 2 weeks from today? *Bonus:* The sun actually starts to rise earlier a few weeks after the first day of winter, sometime in mid-January. If your sunrise was 1 hour 23 minutes later on the latest day, what time did the clock say at sunrise- given that it was also standard time?

Answers:

Wee ones: 7:00 am.

Little kids: 7:01 am. *Bonus:* 7:06 am.

Big kids: 6:37 am, since it will rise 28 minutes earlier. *Bonus:* 7:28 am, since your sunrise today was actually 6:05 standard time.

