Math Challenge #11

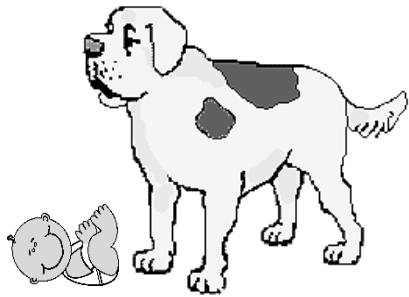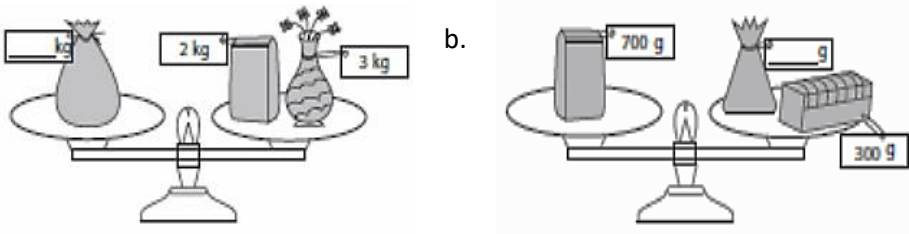| First Name: _____	Last Name: _____	Grade: _____
Teacher: _____	Parent's email: _____	

Weight or Mass

Welcome to the Math Challenge #11. In this challenge, we will be working on solving problems involving weight or mass measurement. Wait…are weight and mass different? They are different. An object has a mass (say 5 kilograms); this makes it heavy enough to show a weight of 5 kilograms on the scale. An object's weight is actually how hard gravity is pulling on it. We think the weight is the same everywhere because we live on the planet Earth. In a different planet or in an orbit, the scale may show 0 kg when the mass is still 5 kg. An object's mass does not change, but its weight can change.
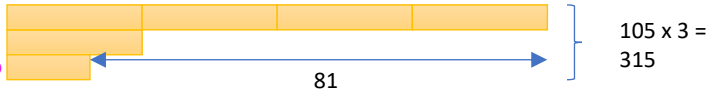
People often say weight when they mean mass. Because gravity is pretty much the same everywhere on Earth, we don't really notice the difference. The scales we use to weigh ourselves actually show an estimate of our mass.

There are three basic weight units in the **US customary measurement system: ounces, pounds, and tons.** One pound = 16 ounces. One ton = 2000 pounds = 32,000 ounces. There are few common weight units in the **Metric measurement system: milligrams, grams, and kilograms.** One kg = 1000 g = 1000000 mg. One gram = 1000 mg.

Kinder & First Grade: solve at least 3 problems.
Second & Third Grade: solve at least 7 problems.
Fourth Grade and above: solve at least 12 problems.

		Answer
1.	Name at least 3 objects you can find that weigh less than your water bottle?	*Varies*

2.	Estimation.
	  a. If a piece of candy weighs about 4 grams, does a tube of toothpaste weigh about 10 kilograms, 100 miligrams, or 10 grams?
	
	  b. If a baby weighs about 10 pounds, does a grown St. Bernard dog weigh about 20 pounds, 200 pounds, or 200 grams?
		a. 10 grams
		
		b. 200 pounds

3.	A **balance scale** is an instrument used to measure the weight of objects by comparing their weights to a set of known weights. When the pans contain exactly the same weight, the beam is in **balance**. Find the weight of the unknown item below. a. b.	*a. 5 kg* *b. 400 g*
4.	A bird weighs 2 pounds and a cat weighs 12 ounces more than the bird. How much does the cat weigh in ounces? *1 pound = 16 ounces* Since 1 pound = 16 ounces, 2 pounds = 16+16 = 32. Because the cat is 12 ounces more than the bird, the cat weighs 32 + 12 = 44 ounces	*44 ounces*

5.	Write the bird names in order of weight, from the lightest to the heaviest.	*Rook, Crow, Buzz, Roller, Osprey*
	Rook 450 g Buzz 900 g Roller 1 kg Osprey 1400 g Crow ½ kg	

6.	Anika bought 1 lb. 4 oz. of ground beef for her mother for dinner, but her mother says she only needs 8 oz. of ground beef. How much extra beef did Anika buy? 1 lb. 4 oz. = 16 oz. + 4 oz. = 20 oz. 20 – 8 = 12 Anika bought 12 oz. more than the amount needed.	*12 oz.*

7.	Which one is heavier? a. The weight of a chapter book is 450 grams. The weight of a dictionary is 2 kilograms. Which is heavier, a dictionary or 4 chapter books? By how much? 4 chapter books: 450 + 450 + 450 + 450 = 1800g. The dictionary is 2000g – 1800 g = 200g heavier. b. Ann's backpack weighs 2½ kg and Jack's backpack weighs 2405 grams. Whose backpack is heavier? By how much? Ann's backpack is ½ kg = 2500 g. It's 2500 – 2405 = 95 g heavier than Jack's backpack.	*a. Dictionary, by 200 g* *b. Ann's backpack, by 95 g*

8.	A baby boy weighed 8 lb. 6 oz. at birth. After two weeks, his weight was increased by 14 oz. What was the baby's weight when he was two weeks old? 8 lb. 6 oz. + 14 oz. = 8 lb. 20 oz. = 9 lb. 4 oz. The baby's weight was 9 lb. 4 oz. when he was two weeks old.	*9 lb. 4 oz.*

9.	Mrs. Moore handed out 4 ounces of almonds to each of her 22 students. How many pounds of almonds did Mrs. Moore hand out? Total no. of ounces of almonds handed out = 4 x 22 = 88 ounces. Total number of pounds of almonds handed out is 88/16 = 5.5 pounds.	*5.5 lb.*

10.	Selin bought 14 apples from the Green Grocery Outlet. Half of the apples weighed 212.5 grams each, and the rest weighed 195.4 grams each. How much did they weigh altogether? $(14/2 \times 212.5) + (7 \times 195.4) = 1487.5 + 1367.8 = 2855.30$	*2855.30 grams or 2.855 kilogram*

11.	Sweet Stuff candy shop's signature candy mixture contains Sour Chews, Chunky Chocolate and Twisty Spice in the ratio 2:3:4, respectively, by weight. How many more pounds of Twisty Spice than Sour Chews are in a 45-pound batch of this signature candy mixture? Sour Chews account for 2/9 of 45 = 10 lb. Twisty Spice accounts for 4/9 of 45 = 20 pounds. There are 20 – 10 = 10 pounds more Twisty Spice than Sour Chews.	*10 lb.*

12.	A peach weighs 95 grams. If you buy 10 peaches and they sell for $8 per kilogram, how much do you have to pay? The weight of 10 peaches = 950 grams. Since the cost of a kilogram of peach is $8, the cost of 950 grams of peach is 950/1000 x $8 = $ 7.60	*$7.60*

13.	The cost of 8 kilograms of bananas is $12. Find the cost of 12 kilograms of bananas. The cost of 1 banana is $12/8 = $1.50. So the cost of 12 kg of bananas is 12 x $1.50 = $18.00	*$18.00*

14.	The average mass of a buffalo, a deer and a goat is 105 kg. The buffalo is four times as heavy as the goat. The deer is 81 kg lighter than the buffalo. Find the average combined mass of the deer and the buffalo. One way: Buffalo: 4 x Goat Goat: Deer: 81 kg lighter than the buffalo 81 105 x 3 = 315 One unit: (315 + 81)/9 = 44 Buffalo: 4 units: 44 x 4 = 176 kg Deer: 176 – 81 = 95 kg Average mass of the deer and the buffalo: (95 + 176)/2 = 135.5 kg	*135.5 kg*
15.	Sierra has some coins consisting of only pennies and nickels. These coins have a combined weight of 1500 g that is evenly distributed between the two types of coins. If each penny weighs 2.5 g and each nickel weighs 5 g, what is the total value of Sierra's coins? There are 750 g of pennies and 750 g of nickels. Since Each penny has a 2.5 g, Sierra must have 750/2.5 = 300 pennies, which worth $3.00. Since each nickel weighs 5 g, Sierra must have 750/5 = 150 nickels, which worth 150 x $0.05 = $7.50. Therefore, the total value of her coins is $3 + $7.50 = $10.50	*$10.50*
16.	Amol has come down with a bad case of the pookebees. Fortunately, his grandma knows how to cure the pookebees. She sent Amol a medicine in an eyedropper bottle labeled: **Take 1 drop per 10 lbs. of body weight per day divided into 4 doses** **until the pookebees are gone.** If Amol is 160 lbs., how many drops per dose does he have to take? 160 lb./10 = 16 drops/day. Since each day he needs 4 doses, he has to take 16/4 = 4 drops/dose	*4 drops/dose*
17.	David prepares 24 pounds of metal in 1 hour 36 minutes. At the same rate, how many ounces of metal will he prepare in one minute? 1 hour 36 minutes = 60 min + 36 min = 96 minutes 1 pound = 16 ounces 24 pounds = 24 x 16 ounces = 384 ounces 1 hour 36 min -----> 24 pounds ====> 96 minutes ----> 384 pounds So, no. of pounds prepared in 96 minutes = 384 ounces Number of ounces prepared in in one minute = 384 / 96 = 4	*4 ounces in one minute*
18.	Lisa's car has a mass of 1450 kg. She drives it onto a large scale and it reads 239.25 kg. Where in The Solar System is Lisa? *Strength of gravity on Solar System bodies compared to that of Earth:* *Mercury = 0.377* *Venus = 0.904* *Uranus = 1.14* *The Moon = 0.165* *Jupiter = 2.53* *The Sun = 27.9*	*The Moon*

Solution is available on March 22, 2019 at www.mathinaction.org