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STEM (Math)

Harnessing the Wind

Answers

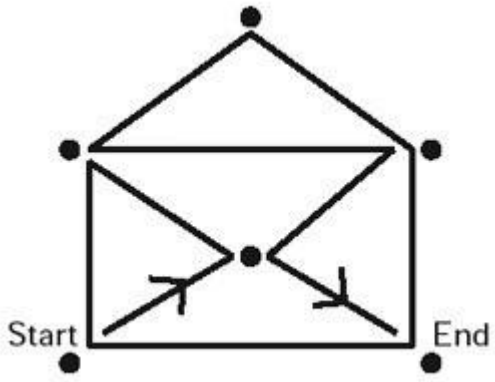
1. 403.846 ÷ 7 = 57.692
Estimate to check: 403.846 is close to 420, and 420 ÷ 7 = 60. Since 57.692 is close to 60, my answer is reasonable.
The C-Train uses about 57.692 megawatt hours of electricity in one day.

2. a) 2.34 x 7 = 16.38
Estimate to check: 2.34 is about 2, and 2 x 7 = 14. Since 16.38 is close to 14, my answer is reasonable.
The family uses about 16.38 kilowatt hours of electricity on laundry in one week.
b) The cost of wind-generated electricity ranges from 5 to 10 cents per kilowatt hour.
At 5¢ per kilowatt-hour: 16.38 x 5 = 81.9
At 10¢ per kilowatt hour: 16.38 x 10 = 163.8
So, it would cost between 82¢ and 164¢ (or $1.64) to generate the electricity for the weekly laundry.

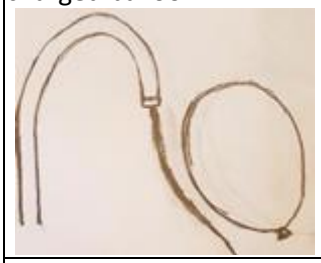
3. 18.9 ÷ 9 = 2.1
Estimate to check: 18.9 is close to 18, and 18 ÷ 9 = 2. Since 2.1 is close to 2, my answer is reasonable.
Each turbine generates 2.1 gigawatt hours of electricity in one year.

4. For example: How much electricity does a typical Canadian home use each week?
A typical Canadian home uses about 25.75 kilowatt hours of electricity per day. So, multiply this amount by 7:
25.75 x 7 = 180.25. A typical Canadian uses about 180.25 kilowatt hours of electricity each week.

Possible answer to the brain teaser:



STEM (Science)

Balloon Activities	Comb Activities
1st Activity **2. No**, the balloon does not stick to the wall because both the balloon and the wall are neutral (same number of protons and electrons). **3. Yes**, the balloon does stick to the wall because when you rubbed the balloon on your hair or a cloth, electrons transferred from your hair or cloth to the surface of the balloon making that part of the balloon negatively charged (extra electrons). When you brought the negatively charged balloon close to the neutral wall, the extra electrons on the surface of the balloon repelled (pushed) the electrons back from that part of the wall, leaving that part of the wall positively charged. The negatively charged balloon sticks (attracted) to the positively charged wall. **4. Yes**, the balloon sticks to the wall stronger and for a longer time because a **greater** number of electrons transferred from your hair or the cloth when you increased the number of times and how vigorously you rubbed the balloon on your hair or the cloth.	**1st Activity** **3. Nothing happens** because the comb and the paper are neutral (same number of protons and electrons). **4. The pieces of paper stick to the comb** because when you rubbed the comb through your hair or on a cloth, electrons transferred from your hair or cloth to the surface of the comb making that part of the comb negatively charged (extra electrons). When you brought the negatively charged comb close to the neutral pieces of paper, the extra electrons on the surface of the comb repelled (pushed) the electrons back from the surface of the pieces of paper, leaving that surface of the pieces of paper positively charged. The positively charged pieces of paper stick (attracted) to the negatively charged comb.
2nd Activity Stream of water bends toward (attracted to) charged balloon.  Water molecules (H_2O) have a positively charged end and a negatively charged end. The positively charged end of the water molecule is attracted to the negatively charged balloon.	**2nd Activity** Stream of water bends toward (attracted to) charged comb.  Water molecules (H_2O) have a positively charged end and a negatively charged end. The positively charged end of the water molecule is attracted to the negatively charged comb.
3rd Activity **5. The balloons stick together** because when you rubbed 1 balloon on your hair or a cloth, electrons transferred from your hair or cloth to the surface of that balloon making that part of the balloon negatively charged (extra electrons). When you brought the negatively charged balloon close to the neutral balloon, the extra electrons on the surface of the negatively charged balloon repelled (pushed) the electrons back from that part of the neutral balloon leaving that part of the balloon positively charged. The negatively charged balloon sticks (attracted) to the positively charged balloon. **7. The balloons push away (repel) from each other** because when you rubbed **both** balloons on your hair or a cloth, electrons transferred from your hair or cloth to the surface of each balloon making that part of each balloon negatively charged (extra electrons). Objects with the same charge (in this case, negative) will repel each other.	**3rd Activity** **3. The pepper (and maybe the salt) sticks to the comb** because when you rubbed the comb through your hair or on a cloth, electrons transferred from your hair or cloth to the surface of the comb making that part of the comb negatively charged (extra electrons). When you brought the negatively charged comb close to the neutral salt and pepper, the extra electrons on the surface of the comb repelled (pushed) the electrons back from the surface of the grains of salt and pepper, leaving that surface of the grains of salt and pepper positively charged. The positively charged grains of pepper stick (attracted) to the negatively charged comb. Since grains of pepper are much lighter than grains of salt, the pepper easily sticks. The salt grains are attracted as well but they are much heavier, so they may not have stuck for you. **4. The pepper sticks (attracted) to the comb *and* the individual grains of pepper push or jump away (repel) from each other.** The pepper sticks to the comb for the reasons outlined in the answer to question 3 (comb is negative and pepper is positive). The individual grains of pepper repel each other because the surface of each grain of pepper became positively charged when the negatively charged comb approached the grains of pepper. Objects with the same charge (in this case positive) will repel each other.