2021A24 (BLADE INSPECTIONS, SD CARDS)

Level 1: From the question, we know one side of a blade takes 0.7% of an SD card, and there are three sides of a blade.

$$SD\ Card\ Used\ on\ One\ Blade = SD\ Card\ Used\ on\ One\ Blades\ Side * Number\ of\ Blades\ Sides$$

$$SD\ Card\ Used\ on\ One\ Blade = 0.7\% * 3$$

$$SD\ Card\ Used\ on\ One\ Blade = 2.1\%$$

Sweet! It only takes 2.1% amount of the SD card to do one blade.

But uh oh… the problem also asked us how much of an SD card the entire site of three turbines would take up. Thankfully, we can use a similar process to the first part of this question to solve this second part.

$$SD\ Card\ Used\ for\ Site = SD\ Card\ Used\ on\ One\ Blade * Blades\ Per\ Turbine * Turbines$$

The problem provided the number of blades for each turbine (three) and the number of turbines on this site (three). By inserting those values into the above equation, along with our answer from the first part, we can find the SD card usage for the entire site.

$$SD\ Card\ Used\ for\ Site = 2.1\% * 3 * 3$$

$$SD\ Card\ Used\ for\ Site = 18.9\%$$

Great news for our blade inspectors. They only need to take one SD card to site! If we note that 18.9% is 27 times 0.7%, we can use this in the Level 2 answer.

Level 2: Answering the first part of this question serves as a good warm up for the second part. Expressing 512 kilobytes as a megabyte requires a conversion with some strange numbers. The result follows this process:

$$Number\ of\ Megabytes = Number\ of\ Kilobytes * \frac{1\ Megabyte}{Number\ of\ Kilobytes\ in\ a\ Megabyte}$$

$$Number\ of\ Megabytes = 512\ Kilobytes * \frac{1\ Megabyte}{1{,}024\ Kilobytes} = 512\ \cancel{Kilobytes} * \frac{1\ Megabyte}{1{,}024\ \cancel{Kilobytes}}$$

$$Number\ of\ Megabytes = \frac{512}{1024}\ Megabytes = 0.5\ Megabytes$$

Hopefully, this helps makes some sense of how all these units of bytes relate to each other.

With this knowledge, we can calculate the rest of the problem. We know one picture is about 6.5 megabytes from the question.

$$Size\ of\ Pictures\ from\ One\ Side\ of\ a\ Blade = Size\ of\ One\ Picture * Number\ of\ Pictures\ of\ One\ Side$$

$$Size\ of\ Pictures\ from\ One\ Side\ of\ a\ Blade = 6.5\ megabytes * 110\ pictures$$

$$Size\ of\ Pictures\ from\ One\ Side\ of\ a\ Blade = \ 715\ megabytes$$

From the Level 1 Question, we know that one side of one blade is 1/27th of what we need to complete the entire site.

$$Size\ of\ Site\ Wide\ Pictures = Size\ of\ Pictures\ from\ One\ Side\ of\ a\ Blade * Number\ of\ Sides\ of\ Blades$$

$$Size\ of\ Site\ Wide\ Pictures = \ 715\ megabytes * 27\ sides\ of\ blades$$

$$Size\ of\ Site\ Wide\ Pictures = 19{,}305\ megabytes$$

$$Size\ of\ Site\ Wide\ Pictures = 19{,}305\ megabytes * \frac{1\ gigabyte}{1{,}024\ megabytes} = \frac{19{,}305}{1{,}024}\ gigabytes$$

$$Size\ of\ Site\ Wide\ Pictures = 18.9\ gigabytes$$

Now, we can find this as a fraction of the one terabyte SD card brought to site.

$$Fraction\ of\ SD\ Card = 18.8\ gigabytes * \frac{1\ teraybte}{1{,}024\ gigabytes} = \frac{18.8}{1{,}024} terabytes$$

$$Fraction\ of\ SD\ Card = \ .018 = 1.8\%$$

For this SD card, we've only used about 2 percent of it! Therefore, we only need a single 1 terabyte SD card.

While not from our blade inspections, this picture was taken via a similar method: fly the drone to the top of the turbine and snap a nice, high-resolution picture of a Wind for Industry® project!