Team names: _____

Application Exercise 1

Which expression is the simplest?

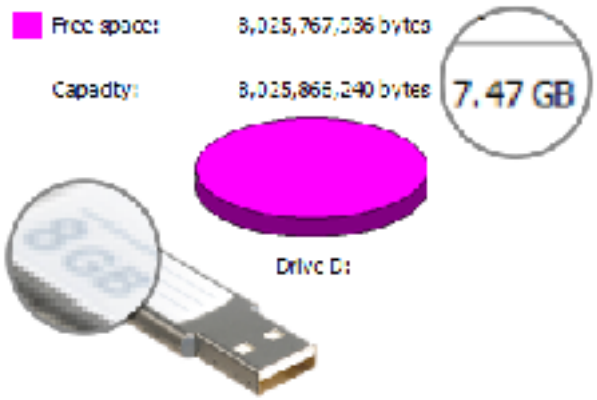
(A) $\dfrac{2^3 \times 3^6 \times 2^3}{3^4 \times 2^6 \times 3^2}$

(B) $\dfrac{2^6 \times 2^3 \times 2^7}{(2^4)^4}$

(C) $\dfrac{4^2 \times 3^2 \times 2^2}{2^2 \times 3^2 \times 2^2 \times 2^2}$

(D) $\left(\dfrac{2^3 \times 5^2 \times 8^3}{4^7 \times 3^2 \times 6^1} \right)^0$

Bonus Exercise



Digital storage is often measured in gigabytes (GB) but you might have noticed less than the full amount available on your USB flash drive or smart phone.

This is because storage is advertised as a power of ten (10^9 for giga-) but the digital devices work using binary (0s and 1s - only two **bi**nary digi**ts** - or bits, with 8 bits in a byte)*. Finish the table:

Prefix	Power of 10	Base 10 bytes	Power of 2	Base 2 bytes	Base 10 ÷ Base 2 × 100%
-	10^0	1	2^0	1	100%
kilo-		1000	2^{10}	1024	98%
mega-	10^6	1,000,000	2^{20}	1,048,576	95%
giga-	10^9		2^{30}		
tera-	10^{12}	1,000,000,000,000			

Is digital storage capacity a rip off?

(A) Yes! My 16GB phone has only 14.9GB!

(B) Yes, they should advertise storage in gibibytes (base 2).

(C) No, but they should display both amounts.

(D) No, there's fine print explaining available storage is less.

* Seriously. There have been multiple legal disputes about this issue.

Team names: _____

Application Exercise 2

This photograph was taken about 110 years ago. The girl on the left was about the same age as you. As she got older, she had children, grandchildren, great grandchildren and so on. Now, 110 years later, *all* this girl's descendants are meeting for a family party.

Twentieth Century facts

At the beginning of the century the average number of children per family was 3.5 and by the end of the century this number had fallen to 1.7.

In 1900, life expectancy of new born children was 45 years for boys and 49 for girls. By the end of the century it was 75 years for boys and 80 for girls.

Approximately how many would you expect at the party?

(A) 120

(B) 240

(C) 480

(D) 600