**KEY**

1. A storage container full of basketballs is 10 feet long, 5 feet wide and 4 feet tall. If the diameter of a basketball is about 9.2 inches, approximately how many basketballs fit in the container? Volume of a sphere = 4/3 π r3.

**THERE ARE MANY SOLUTIONS TO THIS PROBLEM, BUT ONE *POSSIBLE SOLUTION IS****:*

***1st*** *FIND THE VOLUME OF THE BOX WITH THE INFORMATION THAT HAS ALREADY BEEN PROVIDED.*

* VOLUME OF BOX (RECTANGULAR PRISM) = H x L x W = (10FT) (5FT) (4FT) = **200 FT3**

***2nd*** *FIND THE VOLUME OF A BASKETBALL WITH THE INFORMATION THAT HAS ALREADY BEEN PROVIDED.*

* RADIUS OF BBALL = The ball’s diameter is 9.2 in. To obtain the radius you need the following equation= ½ (9.2 IN) = 4.6 IN
* VOLUME OF BBALL = 4/3 π (4.6)3 = (1.33333) (3.1416) (4.6)3 = **407.72 IN3**

***3rd*** *DIVIDING THE VOLUME OF THE BOX BY THE VOLUME OF THE BBALL WILL GIVE YOU AN UPPER BOUND (Highest value you would roundou to the next estimated value) FOR THE NUMBER OF BALLS THAT CAN FIT IN THE BOX.*

* **REMEMBER** BEFORE DIVIDING THE VOLUMES, MAKE THE UNITS THE SAME; CONVERT THE VOLUME OF THE BOX **FROM FT3 TO IN3**

1 FT = 12 IN, SO MULTIPLY BY THE CONVERSION FACTOR (12 IN / 1 FT)3

200 FT3 (12 IN / 1 FT) (12 IN / 1 FT) (12 IN / 1 FT) = 345600 IN3

* DIVIDE THE VOLUME OF BOX BY THE VOLUME OF BBALL:

 345600 IN3 PER BOX / 407.72 IN3 PER BALL = **ABOUT 847 BASKETBALLS PER BOX**

*NOTE: THIS IS DEFINITELY AN OVERESTIMATION SINCE BASKETBALLS WILL HAVE QUITE A BIT OF EMPTY SPACE AROUND THEM. If you would like to get a more accurate number you would have to multiply your result by 190%, since packing spheres in a rectangular prism usually take up 190% of the volume of the spheres.*

* **REMEMBER** BEFORE MULTIPLYING YOUR RESULT, YOU NEED TO CONVERT YOUR PERCENTAGE INTO A DECIMAL NUMBER.

100% = 1.00

10% = 0.10

50% = 0.50

190% = 1.90

847 BASKETBALLS (1.90) = **1609 BASKETBALLS PER BOX**

2. To create license plates, Georgia uses a system of three letters and four digits for license plates. Montana uses six digits.

1. How many possible license plates can Georgia make?

HOW MANY LETTERS ARE IN THE ALPHABET? **26**

HOW MANY NUMBERS ARE THERE FROM 0-9? **10**

# OF PLATES = (26) (26) (26) (10) (10) (10) (10) = **175,760,000 PLATES**

1. How many license plates can Montana make if the first digit cannot be 0?

FOR THE FIRST DIGIT, HOW MANY NUMBERS ARE THERE FROM 1-9? **9**

HOW MANY NUMBERS ARE THERE FROM 0-9? **10**

# OF PLATES = (9) (10) (10) (10) (10) (10) = **900,000 PLATES**

1. If Montana is getting close to running out of possible license plates, how can they change their systems to include more possibilities?

**THERE ARE MANY SOLUTIONS TO THIS PROBLEM.**

***SOME POSSIBLE SOLUTIONS:***

* CHANGE SOME OF THE DIGITS TO LETTERS (THAT WAY YOU WILL HAVE MORE CHOICES)
* USE MORE DIGITS (MAYBE 7 INSTEAD OF JUST 6)

3. A football field is 360 feet long and 160 feet wide. The principal is making an evacuation plan for the school. How many students can the principal expect to fit on the football field in an emergency? (Remember the expected floor space a standing person occupies is about 2.5ft²).

160 ft

360 ft

1.58 ft

1.58 ft

FIST YOU NEED TO SOLVE THE AREA OF THE FOOTBALL FIELD.

* **A = L X W** = (160FT) (360FT) = **57,600FT²**

DIVIDE THE ARE OF THE FOOTBALL FIELD BY THE AREA THAT A PERSON OCCUPIES (2.5FT²)

* 57,600FT² / 2.5FT² = **23,040 PEOPLE FIT IN THE FOOTBALL FIELD**