

**SOML MEET 2
TEAM EVENT**

NAME: _____
NAME: _____
NAME: _____
TEAM: _____
SCHOOL: _____

1. [15 Points] A 297-foot piece of string must be cut into 16 pieces, each measuring an exact number of feet (no fractions of a foot). Eight pieces must have the same length. The remaining pieces must each be 1, 2 or 3 feet shorter than the eight pieces of equal length. What lengths should be cut?

Express your answer using some or all of the lines below:

_____ piece(s) should be _____ feet long.
_____ piece(s) should be _____ feet long.
_____ piece(s) should be _____ feet long.
_____ piece(s) should be _____ feet long.

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Solution: Imagine that we wanted all of the pieces to be the same length. Dividing 297 by 16, we would find that each piece would have to be between 18 and 19 feet long.

If we make the eight pieces of equal length 18 feet long, we use up 144 feet of string, leaving us with 153 feet. Even if the remaining pieces were the maximum possible length (17 feet), they would combine to make only 136 feet (coming 17 feet short). A similar situation would exist if we tried to make the eight pieces of equal length shorter than 18 feet.

If we make the eight pieces of equal length 19 feet long, we use up 152 feet of string, leaving us with 145 feet. Even if the remaining pieces were the maximum possible length (18 feet), they would combine to make only 144 feet (coming 1 foot short). Thus, the eight pieces of equal length cannot be 19 feet long.

If we make the eight pieces of equal length 20 feet long, we use up 160 feet of string, leaving us with 137 feet. If the remaining pieces were the minimum possible length (17 feet), they would combine to make 136 feet. Thus, we could cut the string this way:

8 pieces that are each 20 feet long, accounting for 160 feet
7 pieces that are each 17 feet long, accounting for 119 feet
1 piece that is 18 feet long, accounting for 18 feet

Total combined length = $160 + 119 + 18 = 297$ feet.

What if we try to make the eight pieces of equal length 21 feet long? We would use up 168 feet of string, leaving us with 129 feet. The 8 remaining pieces would each have to be at least 18 feet long, and 129 feet is insufficient to make 8 such pieces. A similar situation exists if we try to make the equal pieces even longer.

Thus, the solution shown above is unique.

Express your answer using some or all of the lines below:

_____ piece(s) should be _____ feet long.
_____ piece(s) should be _____ feet long.
_____ piece(s) should be _____ feet long.
_____ piece(s) should be _____ feet long.