

Throughout this quiz, use quotes to delimit the ends of strings.

PROBLEM 1 *Products and Powers*

Write out the following in full.

$$\{1, 2\} \times \{3\} \times \{1, 4\} = \underline{\hspace{15em}}$$

$$\{56\}^3 = \underline{\hspace{15em}}$$

$$\{1, 2\} \times \mathcal{P}(\{1\}) = \underline{\hspace{15em}}$$

$$\{(1, 2)\} \times \mathcal{P}(\{(1, 2, 3, 4)\}) = \underline{\hspace{15em}}$$

$$\{a, b\}^2 = \underline{\hspace{15em}}$$

PROBLEM 2 *Members of Products and Powers*

Give two different example members of each of the following sets. Make them different from one another: different lengths, different internal patterns, etc., is the set allows that. If there are not enough elements of the set to give two different elements, leave some blanks blank.

$$\{a, b, c\}^4 \text{ contains } \underline{\hspace{5em}} \text{ and } \underline{\hspace{5em}}$$

$$\{a, b, c\}^1 \text{ contains } \underline{\hspace{5em}} \text{ and } \underline{\hspace{5em}}$$

$$\{a, b, c\}^0 \text{ contains } \underline{\hspace{5em}} \text{ and } \underline{\hspace{5em}}$$

$$\{a, b, c\}^* \text{ contains } \underline{\hspace{5em}} \text{ and } \underline{\hspace{5em}}$$

$$\{\text{"good"}, \text{"fun"}\}^2 \text{ contains } \underline{\hspace{5em}} \text{ and } \underline{\hspace{5em}}$$

PROBLEM 3 *Subsequences*

Definition 1 A *subsequence* is a sequence that can be derived from another sequence by deleting zero or more elements without changing the order of the remaining elements.

What are the subsequences of the string "OK"? _____

What is the longest subsequence shared by "MATHEMATICS" and "COMPUTERS"? _____

PROBLEM 4 *Images of Functions*

What is the image of $\{1, 2, 3\}$ under $R(x) = |x|$? _____

What is the image of $\{-1, 0, 1\}$ under $R(x) = |x|$? _____

If $R(x) = |x|$, what is the image of $\{1, 2, 3\}$ under R^{-1} ? _____

If $R(x) = |x|$, what is the image of $\{-2, 1, 3\}$ under $R^{-1} \circ R$? _____

If $R(x) = |x|$, what is the image of $\{-2, 1, 3\}$ under $R \circ R^{-1}$? _____

PROBLEM 5 *Properties of Relations*

For the following, assume the domain and codomain are \mathbb{R} and you are limited to pre-calc math unless otherwise specified.

Give an example function that is not total: $f(x) =$ _____

Give an example function that is total but not invertible: $f(x) =$ _____

Give an example function that is invertible: $f(x) =$ _____

See also §4 Problems 4.12–4.33