

Relations and Functions

ordered pairs, and the rule that a function may not break

From a product to a relation

- $A \times B$ is the set of ordered pairs (a, b) with a in A and b in B , so $n(A \times B) = n(A) \times n(B)$
- ordered means the position carries meaning: $(1, 2)$ is not $(2, 1)$, and two pairs are equal only when both coordinates match
- a relation R from A to B is any subset of $A \times B$, which is the entire definition; a set of m by n pairs therefore has 2^{mn} possible relations
- domain is the set of first coordinates that actually appear, range the set of second coordinates, and codomain is all of B whether used or not

A function, and the one rule

- a function from A to B is a relation in which EVERY element of A appears as a first coordinate exactly once
- so two conditions: nothing in the domain is left out, and nothing in the domain has two images
- the vertical line test is that rule drawn: a vertical line may cut the graph at most once
- two elements of A may share the same image, which is allowed and is what makes a function many to one rather than illegal
- the range is a SUBSET of the codomain, and they are equal exactly when the function is onto

Finding a domain, which is most of the marks

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- the domain is every real input for which the formula gives a real answer, so three things are being excluded
- a denominator may not be zero, so solve denominator $= 0$ and remove those points
- an even root needs a non negative inside, so solve the inequality rather than an equation
- a logarithm needs a strictly positive argument, and the base must be positive and not 1
- when several conditions apply, the domain is their INTERSECTION, and writing it as an interval is what the answer must look like