Back by popular demand…let's try another GMAT Challenge Question today, and since we're doing two consecutive days of challenge questions, let's just go all out. As Ernie Banks would say, let's play two. The questions, courtesy of San Diego GMAT instructor Matt Douglas, our 2010 worldwide Instructor of the Year, are below; post your answers in the comments field and check back later today for detailed solutions.

1. Is a = 0?

(1) $a = a^2$

(2) $a = a^3 – a^2$

2. Is ab < a?

(1) a = 0

(2) b = 0

UPDATE: Solutions

Question 1 is a great example of a GMAT unscored, experimental question. If you selected B…you should be commended for your work. Clearly statement 1 is not sufficient, as both 0 and 1 satisfy the given equation, so we cannot determine whether a is exclusively 0. Statement 2 most likely leads you to "sufficient", as 0 is the only rational solution. But further examination leads us to:

a = a^3 – a^2

0 = a^3 – a^2 – a

0 = a (a^2 – a – 1)

Here, 0 is one solution for a, and so are the factors of the quadratic a^2 – a – 1 = 0. Were you to apply the Quadratic Formula – which the GMAT will NOT require you to do – you'd note that there are, indeed, two imaginary solutions for the quadratic. Accordingly, although it's not likely that you would go as far as to calculate those solutions past the point of determining that they do exist, statement 2 is also not sufficient.

Taking the statements together, we know that:

Statement 1: a = 0 or a = 1

Statement 2: a = 0 or a = one of two imaginary (not 1) numbers

Therefore, as 0 is the only number that satisfies both statements, the correct answer is C. However, note that because the GMAT does not explicitly require the quadratic formula, this may be the type of question that becomes weeded out due to the GMAT's sophisticated item analysis via unscored experimental questions. If statistical analysis on a question demonstrates that there is noise in the data – that a 700 scorer may not be significantly more likely to answer this question correctly than a 600 scorer, for example, an item like this may be removed. We bring that up because, while B is a tempting but probably a valid incorrect answer given that you can solve this without using the quadratic formula, and just knowing that it does exist, E is also a possible answer that a reasonable high-scorer could confidently suggest. If you use statement 1 and substitute that into statement 2, you could replace a with a^2 to get: a^2 = a^3 – a^2. That also means that 2a^2 = a^3, leaving open the possibility that 2 is a solution in addition to 0, when clearly that solution does not work in the individual solutions. Because this question can get so dense with the quadratic formula and some unique algebraic rules associated with non-function quadratics…well, like plenty of officially-tested GMAT questions over time, this one is probably a lot more complicated than we intended when we first drew it up. It's a great learning tool, but ultimately we predict that the GMAT's rigorous statistical analysis would weed this one out in the experimental phase.

#2: Is ab < a?

Statement 1, that a = 0, is sufficient. If a is 0, then we'd have: 0(b) < 0 ? Clearly that is not the case; 0 = 0, so ab can never be less than a if a is 0. The answer is "no" and statement 1 is sufficient.

Statement 2, that b = 0, is not sufficient. Here we know that the left hand side of the inequality is 0, but we don't know anything about the right hand side. a(0) < a ? That asks whether 0 < a, and it all depends on the value of a. Because statement 2 is not sufficient, the correct answer is A.