1

Is $10^m<5000$?

(1) $10^{m+1}>9000$ --> $10^m>900$. If 10^m is in the range $900<10^m<5000$ (for instance if $m=3$) then the answer to the question will be YES, but if $10^m\geq 5000$ (for instance if $m=4$) then the answer to the question will be NO. Not sufficient.

To elaborate more: $10^m>900$ means $m>log_{10}900\approx 2.95$.

(2) $10^{m-1}=10^m-900$ --> we can calculate m, so we can answer to the question whether $10^m<5000$. Sufficient.

To show how it can be done: $900=10^m(1-\frac{1}{10})$ --> $10^m=1000<5000$ ($m=3$).

Answer: B.

2

There is something wrong with this question as statements contradict each other: (1) says m^n=1/81 and (2) says m^n=-(1/64). Guess (2) should read: n^m=-(1/64).

If m and n are negative inegers what is the value of m*n?

(1) m^n=1/81 --> as both m and n are negative integers then $m^n=\frac{1}{81}=(-9)^{-2}=(-3)^{-4}$ --> $mn=18$ or $mn=12$ (note that as negative integer in negative integer power gives positive number then the power must be negative even number). Not sufficient.

(2) n^m=-(1/64) --> as the result is negative then m must be negative odd number --> $n^m=-\frac{1}{64}=(-4)^{-3}=(-64)^{-1}$ --> $mn=12$ or $mn=64$. Not sufficient.

(1)+(2) Only one pair of negative integers m and n satisfies both statements $m=-3$ and $n=-4$ --> $mn=12$. Sufficient.

Answer: C.

3

First of all the question should be:

If x and y are nonzero integers, is (x^(-1) + y^(-1))^(-1) > (x^(-1)*y^(-1))^(-1) ?

Is $(x^{-1}+y^{-1})^{-1}>(x^{-1}*y^{-1})^{-1}$? --> is $(\frac{1}{x}+\frac{1}{y})^{-1}>(\frac{1}{xy})^{-1}$? --> is $(\frac{x+y}{xy})^{-1}>xy$ --> is $\frac{xy}{x+y}>xy$?

Now, from this point you can not divide both parts of the inequality by xy and write $\frac{1}{x+y}>1$ (as you did), because you don't know whether xy is positive or negative: if $xy>0$ then you should write $\frac{1}{x+y}>1$ BUT if $xy<0$ then you should flip the sign and write $\frac{1}{x+y}<1$. But even if you knew that $xy>0$ then the next step of writing $x+y<1$ from $\frac{1}{x+y}>1$ would still be incorrect for the same exact reason: you don't k now whether $x+y$ is positive or negative, hence you can not muliply both sides of the inequality by $x+y$.

Never multiply or divide inequality by a variable (or by an expression with variable) unless you are sure of its sign since you do not know whether you must flip the sign of the inequality.

Thus the question is boiled down to: is $\frac{xy}{x+y}>xy$? Actually we can manipulate further but there is no need.

(1) x = 2y --> question becomes: is $\frac{2y^2}{3y}>2y^2$? Now, as we know that y is **nonzero** then $2y^2>0$ and we can divide both parts by it --> is $\frac{1}{3y}>1$? As y is an**integer** (no matter positive or negative) then the answer to this question is always NO (if it's a positive integer then $\frac{1}{3y}<1$ and if it's a negative integer then again: $\frac{1}{3y}<0<1$). Sufficient.

(2) x + y > 0 --> if $x=y=1$ then the answer will be NO but if $x=3$ and $y=-1$ then the answer will be YES. Not sufficient.

Answer: A.

4

Is 5^k less than 1,000?

Is $5^k<1{,}000$?

(1) 5^(k+1) > 3,000 --> $5^k>600$ --> if $k=4$ then the answer is YES: since $600<(5^4=625)<1{,}000$ but if $k=10$, for example, then the answer is NO. Not sufficient.

(2) 5^(k-1) = (5^k) - 500 --> we can solve for k and get the single numerical value of it, hence this statement is sufficient. Just to illustrate: $5^k-5^{k-1}=500$ --> factor out 5^{k-1}: $5^{k-1}(5-1)=500$ --> $5^{k-1}=125$ --> $k-1=3$ --> $k=4$. Sufficient.

Answer: B.

5

If x, y, and n are positive integers, is (x/y)^n greater than 1,000 ?

Question: is $\left(\frac{x}{y}\right)^n>1{,}00$

(1) x=y^3 and n>y --> $\left(\frac{x}{y}\right)^n=\left(\frac{y^3}{y}\right)^n=y^{2n}$, so the question becomes is $y^{2n}>1{,}000$ --> y=1 and n=2 answer is NO but y=10 and n=11 answer is YES. Not sufficient.

(2) x>5y and n>x --> $\frac{x}{y}>5$ also as x, y, and n are positive integers then the least value of x is 6 (for $y=1$) and the least value of n is 7 --> so we would have $(\#\ more\ than\ 5)^{(at\ least\ 7)}$ which is more than 1,000 (5^7>1,000). Sufficient.

Answer: B.

6

If x, y, and n are positive integers, is (x/y)^n greater than 1,000 ?

Question: is $\left(\frac{x}{y}\right)^n>1{,}00$

(1) x=y^3 and n>y --> $\left(\frac{x}{y}\right)^n=\left(\frac{y^3}{y}\right)^n=y^{2n}$, so the question becomes is $y^{2n}>1{,}000$ --> y=1 and n=2 answer is NO but y=10 and n=11 answer is YES. Not sufficient.

(2) x>5y and n>x --> $\frac{x}{y}>5$ also as x, y, and n are positive integers then the least value of x is 6 (for $y=1$) and the least value of n is 7 --> so we would have $(\#\ more\ than\ 5)^{(at\ least\ 7)}$ which is more than 1,000 (5^7>1,000). Sufficient.

Answer: B.

7

Is 3^(a^2/b) < 1?

Notice that $3^{\frac{a^2}{b}}<1$ to hold true, the power of 3 must be less than 0. So, the question basically asks whether $\frac{a^2}{b}<0$. This will happen if $a\neq0$ **AND** $b<0$ (if $a=0$ then $\frac{a^2}{b}=0$).

(1) a<0. The first condition is satisfied ($a\neq0$) but we don't know about the second one. Not sufficient.

(2) b<0. The second condition is satisfied ($b<0$) but we don't know about the first one (again if $a=0$ then $\frac{a^2}{b}=0$). Not sufficient.

(1)+(2) Both condition are satisfied. Sufficient.

Answer: C.