SOLUTION:

1. What is the product of three consecutive integers?

(1) At least one of the integers is positive.

We can have three cases:
(i) All three integers are positive. In this case the product will obviously be positive.
(ii) Two of the integers are positive: {0, 1, 2}. In this case the product will be zero.
(iii) Only one of the integers is positive: {-1, 0, 1}. In this case the product will be zero.

Not sufficient.

(2) The sum of the integers is less than 6. Clearly insufficient, consider {-1, 0, 1} and {-3, -2, -1}.

(1)+(2) The second statement implies that we cannot have case (i) from (1), since the least sum of three positive consecutive integers is 1+2+3=6. Thus we have either case (ii) or case (iii). Therefore the product of the integers is zero. Sufficient.

Answer: C.

2. If x and y are both positive integers and x>y, what the remainder when x is divided by y?

If x and y are *positive integers*, there exist unique integers q and r, called the *quotient* and *remainder*, respectively, such that $y=divisor*quotient+remainder=xq+r$ and $0\leq r<x$.

(1) y is a two-digit prime number. Clearly insufficient since we know nothinf about x.

(2) x=qy+9, for some positive integer q. It's tempting to say that this statement is sufficient and $r=9$, since given equation is very similar to $y=divisor*quotient+remainder=xq+r$. But we don't know whether $y>9$: remainder must be less than divisor.

For example:
If $x=10$ and $y=1$ then $10=1*1+9$, then the remainder upon division 10 by 1 is zero.
If $x=11$ and $y=2$ then $11=1*2+9$, then the remainder upon division 11 by 2 is one.
Not sufficient.

(1)+(2) From (2) we have that x=qy+9 and from (1) that y is more than 9 (since it's a two-digit number), so we have direct formula of remainder, as given above. Sufficient.

Answer: C.

3. The length of the median BD in triangle ABC is 12 centimeters, what is the length of side AC?

(1) ABC is an isosceles triangle. Clearly insufficient.

(2) AC^2 = AB^2 + BC^2. This statement implies that ABC is a right triangle and AC is its hypotenuse. Important property: **median from right angle is half of the hypotenuse**, hence BD=12=AC/2, from which we have that AC=24. Sufficient.

Answer: B.

4. Two machines, A and B, each working at a constant rate, can complete a certain task working together in 6 days. In how many days, working alone, can machine A complete the task?

Given that 1/A+1/B=1/6, where A is the time needed for machine A to complete the task working alone and B is the time needed for machine B to complete the task working alone.

(1) The average time A and B can complete the task working alone is 12.5 days. This statement implies that A+B=2*12.5=25. Now, since we don't know which machine works faster then even if we substitute B with 25-A (1/A + 1/(25-A) = 1/6) we must get two different answers for A and B: A<B and A>B. Not sufficient.

(2) It would take machine A 5 more days to complete the task alone than it would take for machine B to complete the task. A=B+5, so we have that 1/A+1/(A-5)=1/6. From this we can find that A=2 (not a valid solution since in this case B will be negative) or A=15. Sufficient.

Answer: B.

5. Set A={3-2x, 3-x, 3, 3+x, 3+2x}, where x is an integer. Is the standard deviation of set A more than the standard deviation of set B={3-2x, 3-x, 3, 3+x, 3+2x, y}

(1) The standard deviation of set A is positive. We know that the standard deviation of any set is more than or equal to zero. The standard deviation of a set is zero only when the set consists of identical elements. So, this statement implies that set A does NOT consists of identical elements or that x does not equal to zero. Still this statement is not sufficient to answer the question.

(2) y=3. The mean of set A is 3. Now, if $x \neq 0$ for example if x=1, then the standard deviation of B would be smaller that the standard deviation A, since the elements of B would be less widespread than the element of set A. But if x=0, then A={3, 3, 3, 3, 3} and B={3, 3, 3, 3, 3}, so both will have the standard deviation of zero. Bot sufficient.

(1)+(2) Since from (1) $x \neq 0$, then adding a new element which equals to the mean will shrink the standard deviation, thus SD(A)>SD(B). Sufficient.

Answer: C.

6. The ratio of the number of employees of three companies X, Y and Z is 3:4:8, respectively. Is the average age of all employees in these companies less than 40 years?

Given that the ratio of the number of employees is 3x:4x:8x, for some positive multiple x.

The questions asks whether (average age)=(total age)/(# of employees)<40, or whether (total age)/(3x+4x+8x)<40, which is the same as: is (total age)<600x?

(1) The total age of all the employees in these companies is 600. The question becomes: is 600<600x? Or is 1<x. We don't know that: f x=1, then the answer is NO but if x>1, then the answer is YES. Not sufficient.

(2) The average age employees in X, Y, and Z, is 40, 20, and 50, respectively. (total age)=40*3x+20*4x+50*8x=600x, so the answer to the question is NO. Sufficient.

Answer: B.

7. Was the average (arithmetic mean) temperature in city A in March less than the average (arithmetic mean) temperature in city B in March?

(1) The median temperature in City A in March was less than the median temperature in city B. Clearly insufficient.

(2) The ratio of the average temperatures in A and B in March was 3 to 4, respectively. Temperatures can be negative, thus this statement is also not sufficient. Consider T(A)=3 and T(B)=4 AND T(A)=-3 and T(B)=-4.

(1)+(2) We have no additional useful info. Not sufficient.

Answer: E.

8. Two marbles are drawn from a jar with 10 marbles. If all marbles are either red of blue, is the probability that both marbles selected will be red greater than 3/5?

The question: is P(R and R)=R/10*(R-1)/9>3/5?
Is R(R-1)>54?
Is R>7? (By number plugging) So, the question asks whether the number of red marbles is more than 7 (8, 9, or 10).

(1) The probability that both marbles selected will be blue is less than 1/10. This implies that B/10*(B-1)/9<1/10. So, we have that B(B-1)<9, thus B<4, so the number of red marbles in the jar is 7, 8, 9, or 10. Not sufficient.

(2) At least 60% of the marbles in the jar are red. This implies that the number of red marbles is 6 or more. Not sufficient.

(1)+(2) From above we have that R>6. Not sufficient.

Answer: E.

9. Is $x^2>2x$?

Is $x(x-2)>0$? --> is $x<0$ or $x>2$. Basically if x is not 0, 1, or 2 we have an YES answer to the question.

(1) x is a prime number. If $x=2$ then the answer is NO but if x is some other prime, then the answer is YES. Not sufficient.

(2) x^2 is a multiple of 9. If $x=0$ then the answer is NO but if $x=3$, then the answer is YES. Not sufficient.

(1)+(2) Since from (1) x is a prime and from (2) x^2 is a multiple of 9, then x can only be 3. Therefore the answer to the question is YES. Sufficient.

Answer: C.

10. What is the value of the media of set A?

(1) No number in set A is less than the average (arithmetic mean) of set A.

Since no number is less than the average, then no number is more than the average, which implies that the list contains identical elements: A={x, x, x, ...}. From this it follows that *(the average)=(the median)*. But we don't know the value of x, thus this statement is NOT sufficient.

(2) The average (arithmetic mean) of set A is equal to the range of set A.

Not sufficient: if A={0, 0, 0, 0}, then *(the median)=0*, but if A={1, 2, 2, 3}, then *(the median)=2*.

(1)+(2) From (1) we have that the list contains identical elements. The range of all such sets is 0. Therefore, from (2) we have that *(the average)=(the range)=0* and since from (1) we also know that *(the average)=(the median)*, then *(the median)=0*. Sufficient.

Answer: C.