Section 2: Notation and proof

Section test

1. $x = y$ … $x^2 = y^2$
   Which of the symbols below is the correct symbol to inserted in the gap between the statements above
   (a) $\Rightarrow$
   (b) $\Leftarrow$
   (c) $\Leftrightarrow$
   (d) none of the above

2. For the following, say whether statement A is necessary or sufficient for statement B (or both or neither):
   A There are thirteen people in the room
   B Two people in the room have a birthday in the same month
   (a) necessary
   (b) sufficient
   (c) both necessary and sufficient
   (d) neither necessary nor sufficient

3. all the sides of quadrilateral Q ……. are equal — all the internal angles of quadrilateral Q are equal
   Which of the below is the correct symbol to inserted in the gap between the statements above?
   (a) $\Rightarrow$
   (b) $\Leftarrow$
   (c) $\Leftrightarrow$
   (d) none of the above

4. What is the converse of the statement '$n + m > 10 \Rightarrow n > 5$ or $m > 5$'.
   (a) '$n > 5$ and $m > 5 \Rightarrow n + m > 10$'
   (b) '$n + m > 10 \Rightarrow n > 5$ and $m > 5$'
   (c) '$n > 5$ or $m > 5 \Rightarrow n + m > 10$'
   (d) '$n > 5$, $m > 5$ and $n + m > 5$.

5. For which of the following statements about integers n and m is the converse true?
   (a) '$n + m > 10 \Rightarrow n > 5$ or $m > 5$'
   (b) 'if nm is odd then both n and m are odd'
   (c) 'n is even and m is even $\Rightarrow m + n$ is even'
   (d) 'if $n = 1$ and $m = 1$ then $nm = 1$'

6. Which of the following is a counter example to the statement '$(x + 3)^2 > (x - 1)^2$ for all values of x'?
   (a) $x = 1$
   (b) $x = 0$

(c) $x = -1$
(d) $x = -2$

7. Which of the following is a counter example to the statement
'if x is divisible by 3 then $x = n(n+1)(n+2)$ for some integer n'?
(a) $x = 6$
(b) $x = 24$
(c) $x = 48$
(d) $x = 60$

8. 'Let n be any integer. Then $n + (n + 1) = 2n + 1$ which must be odd.'
This is a proof of which statement below?
(a) The sum of any two integers is odd.
(b) The sum of any two consecutive integers is odd
(c) The sum of an odd and an even integer is odd
(d) Multiplying any integer by 2 and adding 1 results in an odd integer.

9. 'Let n be an even number. Then $n = 2m$ for some integer m. So $n^2 = 4m^2$ which is a multiple of 4.
This is a proof of which statement below?
(a) The square of an even number is a multiple of 4.
(b) Every multiple of 4 is the square of a number
(c) The square of any integer is a multiple of 4.
(d) Halving any even number and squaring the result gives a multiple of 4.

10. A: $ax^2 + c \geq 0$ for all values of x B: $a \geq 0$ and $c \geq 0$
Tick all of the symbols below which, when written between A and B (in that order) above results in a true statement.
(a) $\Rightarrow$
(b) $\Leftarrow$
(c) $\Leftrightarrow$
(d) none of the above