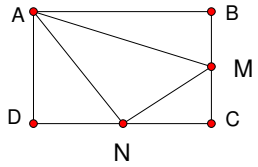
1. C
2. A
3. C
4. D
5. C
6. C
7. B
8. The side lengths must be x, x, and $y \neq x$ so that $2x + y = 23$. We also need to have $2x > y$ and $x + y > x$ but since x is positive, the second inequality is trivial. Notice that since $2x = 23 - y$, y must be odd. That gives us $(x, y) = (11, 1); (10, 3); (9, 5); (8, 7); (7, 9); (6, 11)$ for all possible triangles. C
9. Instead of finding the area of $\triangle AMN$ directly, notice that $[AMN] = [ABCD] - ([ABN] + [MCN] + [ADM])$.



$$[ABN] = \frac{1}{2} \cdot \frac{1}{2}(BC) \cdot (DC) = \frac{1}{4}(BC)(DC) \quad (1)$$

$$[MCN] = \frac{1}{2} \cdot \frac{1}{2}(BC) \cdot \frac{1}{2}(DC) = \frac{1}{8}(BC)(DC) \quad (2)$$

$$[ADM] = \frac{1}{2} \cdot (BC) \cdot \frac{1}{2}(DC) = \frac{1}{4}(BC)(DC) \quad (3)$$

Add equations (1), (2), and (3) to get $[ABN]+[MCN]+[ADM] = \frac{5}{8}(BC)(DC) = \frac{5}{8}[ABCD]$. This means $[AMN] = \frac{3}{8}[ABCD] = \frac{3}{8}(72) = 27$. B

10. $\frac{1}{2}(BC)(BM) = [BCM] = \frac{1}{3}(9) = 3$
$BC = 3$ so we have $\frac{1}{2}(3)(BM) = \frac{3}{2}(BM) = 3$
$BM = 2$ so we can use Pythagorean Theorem to find CM.

$$\begin{aligned} (CM)^2 &= 3^2 + 2^2 \\ (CM)^2 &= 13 \\ CM &= \sqrt{13} \end{aligned}$$

C