Avid Academy for Gifted Youth

Math Olympiad and Problem Solving Programs

E210 - Introductory Math Competitions

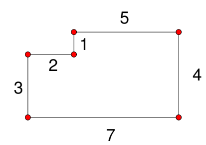
Problem Set 19.1 - Area and Perimeter

Name: Date:

1. $\boxed{10 \text{ cm}}$

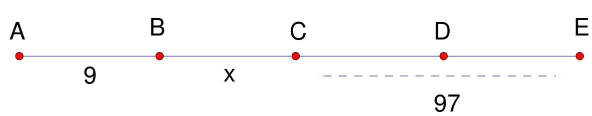
2. In order to maximize the area of the figure, we need to minimize the area of the cut out piece in the top left corner. We make one of the sides 1 and the other 2. Now to make the big rectangle the largest, we want the long sides to be the largest numbers, 5 and 7. So we need $1 + \textit{something} = 5$ and $2 + \textit{something} = 7$. We can't assign 3 and 4 to the *somethings*, so we have to change one of our guesses.

   Let's change the long sides to 4 and 7. Now we need $1+\textit{something} = 4$ and $2+\textit{something} = 7$. Now we can assign the other two numbers, 3 and 5, to the *somethings*. So assign the sides as shown.



   Now we find the area of the big rectangle $(4 \times 7 = 28)$ and the area of the small rectangle $(1 \times 2 = 2)$, and subtract to find the area of the figure. $\boxed{26}$

3. Draw the line and points. Then assign the values. Let's make segment $BC = x$. Since $AC = BD$, and $AB + BC = BC + CD$. Replace $AB = 9$ and $BC = x$, so $9 + x = x + CD$. Thus $CD = 9$. We know $CE = 97$, and $CE = CD + DE$, so $97 = 9 + DE$, so $DE = \boxed{88}$



4. $\boxed{8.5}$

5. Since the area of $\triangle ABC$ is 72 cm^2, and we know the area of a triangle is $\frac{1}{2}bh$, and we know the triangle is isoceles so $b = h$. So $72 = \frac{1}{2}b^2 \Rightarrow 144 = b^2 \Rightarrow b = 12$. So the side lengths of ABC are 12. So $AC = 12$. We know DA is 1/3 of DC, so $DC = 18$. Cut $\triangle DEC$ in half by drawing a line from point E to the middle of line DC. We know the base and height of the two right isoceles triangles inside $\triangle DEC$ is $18 \div 2 = 9$, so the area of DEC is $2 \times \frac{1}{2}9^2 = \boxed{81}$

6. $\boxed{1{:}16}$

7. See the drawing for the solution to the equation