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2015 Q6

6. In $\triangle ABC$, $AB = BC = 29$, and $AC = 42$. What is the area of $\triangle ABC$?

(A) 100 **(B)** 420 **(C)** 500 **(D)** 609 **(E)** 701

6. **Answer (B):** Let D be the midpoint of side $\overline{AC}$. Then $\overline{BD}$ is the altitude to $\overline{AC}$ and $\triangle BDC$ is a right triangle with $BC = 29$ and $DC = 21$. So $BD = \sqrt{29^2 - 21^2} = \sqrt{400} = 20$. The area of $\triangle ABC = \frac{1}{2} \cdot 20 \cdot 42 = 420$.

OR

Heron's formula gives the area of a triangle in terms of the lengths of its sides. If the side lengths are a, b and c, then let $s = \frac{a+b+c}{2}$. The area is then $\sqrt{s(s-a)(s-b)(s-c)}$. In this problem, $s = \frac{29+29+42}{2} = 50$, and the area is $\sqrt{50 \cdot 21 \cdot 21 \cdot 8} = 21\sqrt{400} = 21 \cdot 20 = 420$.

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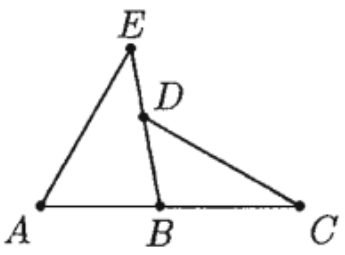
1994 Q7

7. If $\angle A = 60°$, $\angle E = 40°$ and $\angle C = 30°$, then $\angle BDC =$

(A) 40° **(B)** 50° **(C)** 60°
(D) 70° **(E)** 80°



7. **(B)** Since the sum of the angles in any triangle is $180°$,

$$\angle ABE = 180° - (60° + 40°) = 80°.$$

Since $\angle ABD$ and $\angle DBC$ together form a straight angle, their sum is $180°$, so $\angle DBC = 180° - 80° = 100°$. Thus $\angle BDC = 180° - (100° + 30°) = 50°$.

2015 Q8

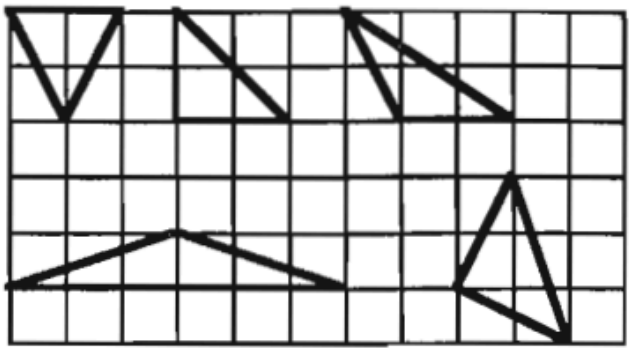
8. What is the smallest whole number larger than the perimeter of any triangle with a side of length 5 and a side of length 19?

(A) 24 **(B)** 29 **(C)** 43 **(D)** 48 **(E)** 57

8. **Answer (D):** Let t be the length of the third side of the triangle. By the Triangle Inequality, $t < 5 + 19 = 24$. So the perimeter $5 + 19 + t < 5 + 19 + (5 + 19) = 48$.

1988 Q9

9. An isosceles triangle is a triangle with two sides of equal length. How many of the five triangles on the square grid below are isosceles?



A) 1 B) 2 C) 3 D) 4 E) 5

9. D All but the triangle in the upper right are isosceles.

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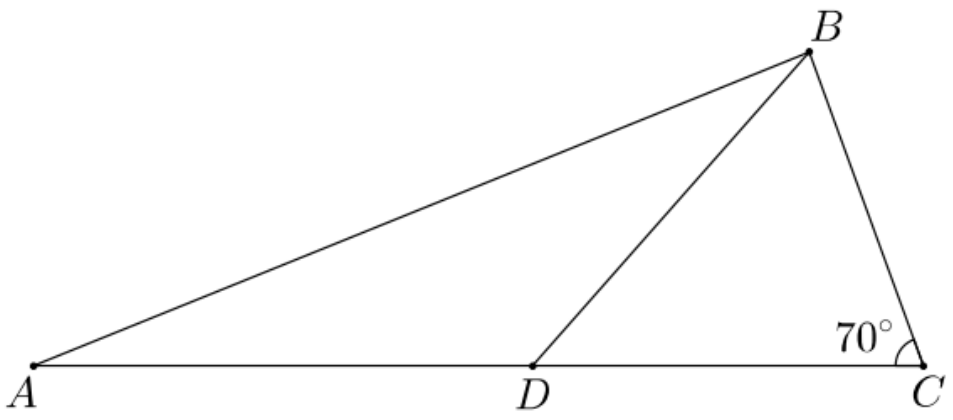
2014 Q9

9. In $\triangle ABC$, D is a point on side $\overline{AC}$ such that $BD = DC$ and $\angle BCD$ measures $70°$. What is the degree measure of $\angle ADB$?

(A) 100 **(B)** 120 **(C)** 135 **(D)** 140 **(E)** 150



9. **Answer (D):** Triangle BCD is isosceles, so $\angle BCD = \angle CBD = 70°$ and $\angle BDC = 180° - 2 \cdot 70° = 40°$. Hence $\angle ADB = 180° - 40° = 140°$.