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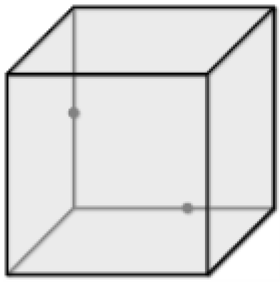
Question: 1

Identify a possible cross-section polygon NOT formed by a plane containing the given points on the cube.

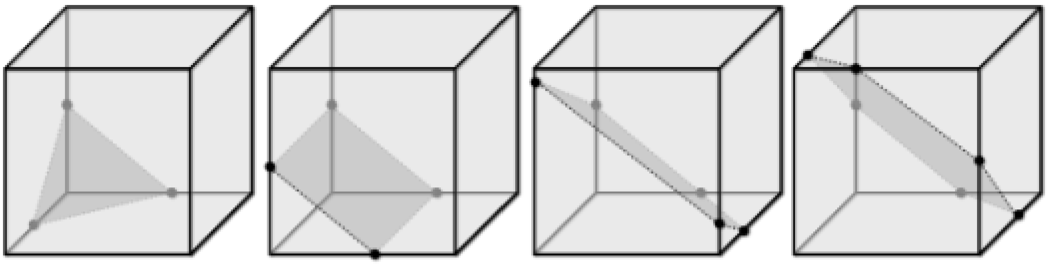


A. Triangle
B. Square
C. Pentagon
D. Hexagon

Answer: B

Explanation:

The only cross-section connecting the points that is not possible is a square; a rectangle is possible, but a square is not.



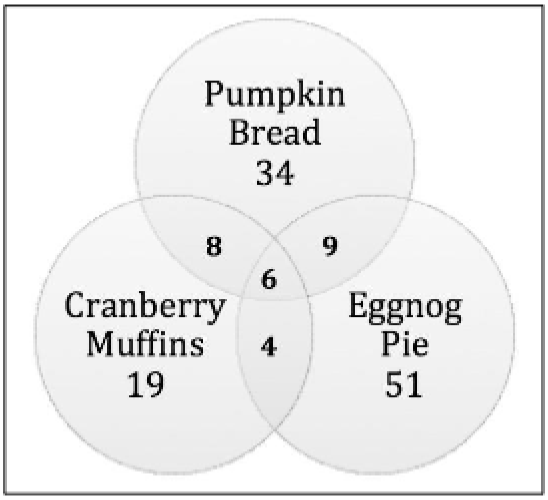
Question: 2

For the holidays, Luke's Bakery offered three seasonal items: pumpkin bread, cranberry muffins, and their famous eggnog pie. They received 57 orders for pumpkin bread, 37 orders for cranberry muffins, and 70 orders for eggnog pie. Fourteen customers ordered both pumpkin bread and cranberry muffins, ten customers ordered both cranberry muffins and eggnog pie, and fifteen customers ordered both pumpkin bread and eggnog pie. Six customers ordered all three items. How many customers placed an order for seasonal items?

A. 112
B. 131
C. 149
D. 164

Answer: B

Explanation:
Use a Venn diagram to help organize the given information. Start by filling in the space where the three circles intersect: six customers ordered all three items. Now, use that information to fill in the spaces where two circles intersect. For example, fourteen customers ordered both pumpkin bread and cranberry muffins, and six of those were the customers who purchased all three items, so eight customers bought pumpkin bread and cranberry muffins but not eggnog pie. Once the diagram is completed, add the number of orders from each portion of the diagram. The total number of customers was 34 + 19 + 51 + 9 + 8 + 4 + 6 = 131.



Question: 3

Which of these statements is (are) true for the function g(x)?

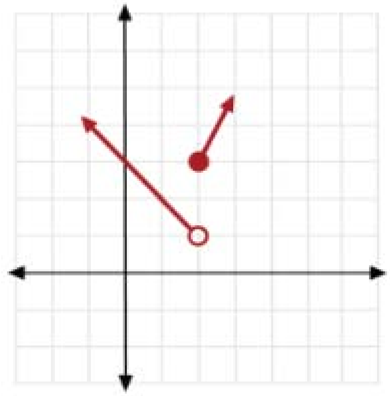
$$g(x) = \begin{cases} -x+3 & x < 2 \\ 2x-1 & x \geq 2 \end{cases}$$

I. g (3) = 0
II. The graph of g(x) is discontinuous at x = 2.
III. The range of g(x) is all real numbers.

A. II only
B. III only
C. I and II
D. II and III

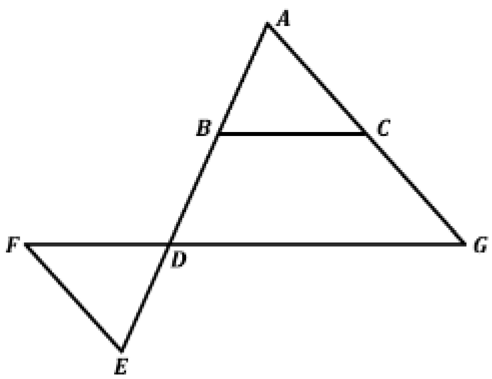
Answer: A

Explanation:
Below is the graph of g (x).



Statement II is true. The graph is discontinuous at x = 2. Statement I is false, because g(3) = 2(3) — 1 = 5. Statement II is also false because, from the graph, the range of the function is y >1.

Refer to the following for questions 4 - 5:



Statement	Reason
1. $\overline{BC} \parallel \overline{FG}$	Given
2.	
3. $\overline{FD} \cong \overline{BC}$	Given
4. $\overline{AB} \cong \overline{DE}$	Given
5. $\Delta ABC \cong \Delta EDF$	______
6. ______	
7. $\overline{FE} \parallel \overline{AG}$	

Given: $\overline{BC} \parallel \overline{FG}$; $\overline{FD} \cong \overline{BC}$; $\overline{AB} \cong \overline{DE}$

Prove: $\overline{FE} \parallel \overline{AG}$

Question: 4

Which of the following justifies step 5 in the proof?

A. AAS
B. SSS
C. ASA
D. SAS

Answer: D

Explanation:

Since it is given that $\overline{FD} \cong \overline{BC}$ and $\overline{AB} \cong \overline{DE}$, step 2 needs to establish either that $\overline{AC} \cong \overline{EF}$ or that $\Delta ABC \cong \Delta FDE$ in order for step 5 to show that $\Delta ABC \cong \Delta EDF$. The statement $\overline{AC} \cong \overline{EF}$ cannot be shown directly from the given information. On the other hand, $\Delta ABC \cong \Delta FDE$ can be determined: when two parallel lines $\overline{BC} \parallel \overline{FG}$ are cut by a transversal $(\overline{AE})$, alternate exterior angles $(\Delta ABC, \Delta FDE)$ are congruent. Therefore, $\Delta ABC \cong \Delta EDF$ by the side-angle-side (SAS) theorem.

Question: 5

Step 6 in the proof should contain which of the following statements?

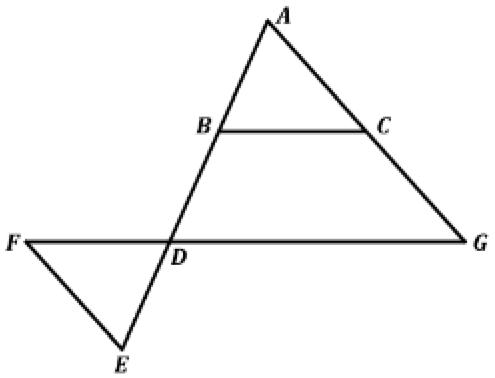
A. $\angle BAC \cong \angle DEF$
B. $\angle ABC \cong \angle EDF$
C. $\angle ACB \cong \angle EFD$
D. $\angle GDA \cong \angle EDF$

Answer: A

Explanation:

Step 5 established that $\Delta ABC \cong \Delta EDF$. Because corresponding parts of congruent triangles are congruent (CPCTC), $\angle BAC \cong \angle DEF$. This is useful to establish when trying to prove $\overline{FE} \parallel \overline{AG}$: when two lines ($\overline{FE}$ and $\overline{AG}$) are cut by a transversal $(\overline{AE})$ and alternate interior angles $(\angle BAC, \angle DEF)$ are congruent, then the lines are parallel. The completed proof is shown below:

Statement	Reason
1. $\overline{BC} \parallel \overline{FG}$	Given
2. $\angle ABC \cong \angle FDE$	Alternate exterior angles of parallel lines are congruent
3. $\overline{FD} \cong \overline{BC}$	Given
4. $\overline{AB} \cong \overline{DE}$	Given
5. $\Delta ABC \cong \Delta EDF$	SAS
6. $\angle BAC \cong \angle DEF$	CPCTC
7. $\overline{FE} \parallel \overline{AG}$	Alternate interior angles congruent then lines are parallel

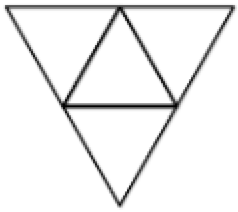


Given: $\overline{BC} \parallel \overline{FG}$; $\overline{FD} \cong \overline{BC}$; $\overline{AB} \cong \overline{DE}$
Prove: $\overline{FE} \parallel \overline{AG}$

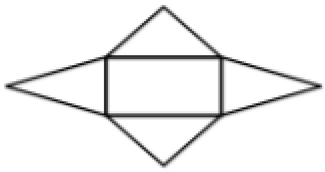
Question: 6

Which of these is a net of a triangular pyramid?

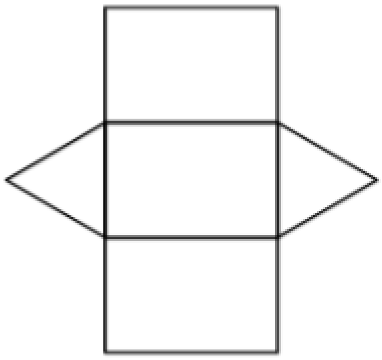
a.



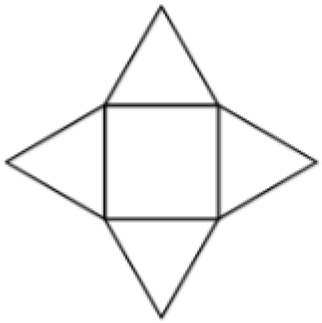
b.



c.



d.



A. Option A
B. Option B
C. Option C
D. Option D

Answer: A

Explanation:
A triangular pyramid has four triangular faces. The arrangement of these faces in a two-dimensional figure is a net of a triangular pyramid if the figure can be folded to form a triangular pyramid. Choice B represents a rectangular pyramid, choice C is a triangular prism, and choice D is a square pyramid.

Question: 7

What is the exact value of $\tan\left(-\frac{\pi}{4}\right)$?

A. $\frac{\sqrt{2}}{2}$
B. $-\frac{\sqrt{2}}{2}$
C. 1
D. -1

Answer: D

Explanation:

A coterminal angle for $-\frac{\pi}{4}$ is $2\pi - \frac{\pi}{4} = \frac{7\pi}{4}$.

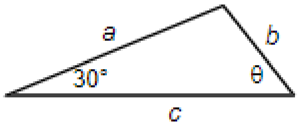
$$\tan\left(-\frac{\pi}{4}\right) = \tan\left(\frac{7\pi}{4}\right) = \frac{\sin\left(\frac{7\pi}{4}\right)}{\cos\left(\frac{7\pi}{4}\right)}$$

From the unit circle, the values of $\sin\left(\frac{7\pi}{4}\right)$ and $\cos\left(\frac{7\pi}{4}\right)$ are $-\frac{\sqrt{2}}{2}$ and $\frac{\sqrt{2}}{2}$, respectively. Therefore:

$$\tan\left(-\frac{\pi}{4}\right) = \frac{-\frac{\sqrt{2}}{2}}{\frac{\sqrt{2}}{2}} = -1$$

Question: 8

In the triangle, which of the following is equal to sin θ?



A. $\frac{a}{2b}$
B. $\frac{2b}{a}$
C. $\frac{a}{2c}$
D. $\frac{b}{ac}$

Answer: A

Explanation:

This problem is most easily solved using the law of sines, which states that the ratio of the sine of each angle in a triangle to the length of the opposite side is equal: $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$. In this case, angle θ is opposite side a, and the angle with a measure of 30° is opposite side b, so we can write $\frac{\sin\theta}{a} = \frac{\sin 30°}{b}$. Since $\sin 30° = \frac{1}{2}$, this becomes $\frac{\sin\theta}{a} = \frac{\frac{1}{2}}{b}$, or $\sin\theta = \frac{a}{2b}$.