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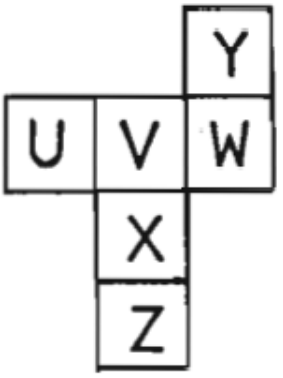
1985 Q11

11. A piece of paper containing six joined squares labeled as shown in the diagram is folded along the edges of the squares to form a cube. The label of the face opposite the face labeled X is

A) Z B) U C) V D) W E) Y



11. (E) If face X is placed on the bottom of the cube, then faces U, V, W and Z are the sides and face Y is the top.

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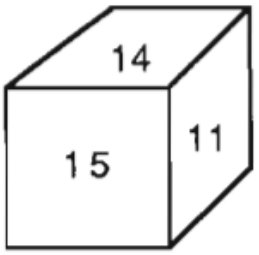
1990 Q11

11. The numbers on the faces of this cube are consecutive whole numbers. The sums of the two numbers on each of the three pairs of opposite faces are equal. The sum of the six numbers on this cube is

A) 75 B) 76 C) 78 D) 80 E) 81



11. E Since 11, 12, 13, 14, and 15 are on five of the faces, the number on the remaining face must be 10 or 16. In the first case, 10 must be on the face opposite the face with 15 which is impossible since $15 + 10 = 25$ would force 14 and 11 to be on opposite faces. Thus 16 is opposite 11, 12 is opposite 15, and 14 is opposite 13. The sum on each pair of opposite faces is 27, and the desired sum, is $3 \times 27 = 81$.

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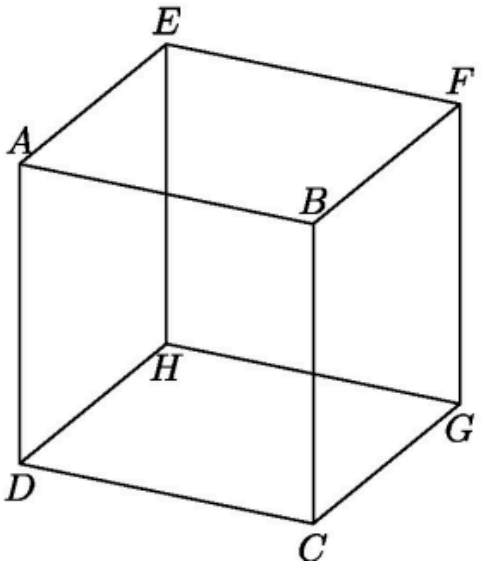
2015 Q12

12. How many pairs of parallel edges, such as $\overline{AB}$ and $\overline{GH}$ or $\overline{EH}$ and $\overline{FG}$, does a cube have?

(A) 6 **(B)** 12 **(C)** 18 **(D)** 24 **(E)** 36



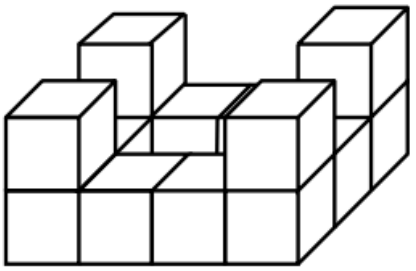
12. **Answer (C):** Each of the 12 edges is parallel to 3 other edges giving 36 possible pairs of parallel edges. But each pair of parallel edges is counted twice in this process, so there are 18 pairs of parallel edges.

OR

There are 6 pairs of parallel edges related to $\overline{AB}$ ($\overline{AB}\|\overline{EF}$, $\overline{AB}\|\overline{HG}$,$\overline{AB}\|\overline{DC}$, $\overline{EF}\|\overline{HG}$, $\overline{EF}\|\overline{DC}$, $\overline{HG}\|\overline{DC}$). Similarly there are 6 pairs of parallel edges related to $\overline{AE}$ and 6 pairs of parallel edges related to $\overline{AD}$ for a total of 18 pairs of parallel edges.

2003 Q13

13. Fourteen white cubes are put together to form the figure on the right. The complete surface of the figure, including the bottom, is painted red. The figure is then separated into individual cubes. How many of the individual cubes have exactly four red faces?

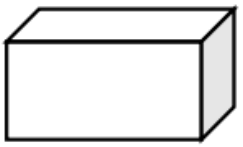


(A) 4 **(B)** 6 **(C)** 8 **(D)** 10 **(E)** 12

13. **(B)** A cube has four red faces if it is attached to exactly two other cubes. The four top cubes are each attached to only one other cube, so they have five red faces. The four bottom corner cubes are each attached to three others, so they have three red faces. The remaining six each have four red faces.

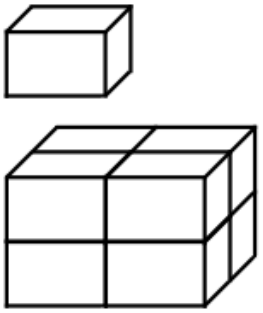
2002 Q13

13. For his birthday, Bert gets a box that holds 125 jellybeans when filled to capacity. A few weeks later, Carrie gets a larger box full of jellybeans. Her box is twice as high, twice as wide and twice as long as Bert's. Approximately, how many jellybeans did Carrie get?



(A) 250 **(B)** 500 **(C)** 625 **(D)** 750 **(E)** 1000

13. **(E)** Since the exact dimensions of Bert's box do not matter, assume the box is $1\times2\times3$. Its volume is 6. Carrie's box is $2\times4\times6$, so its volume is 48 or 8 times the volume of Bert's box. Carrie has approximately $8(125) = 1000$ jellybeans.
Note: Other examples may help to see that the ratio is always 8 to 1.



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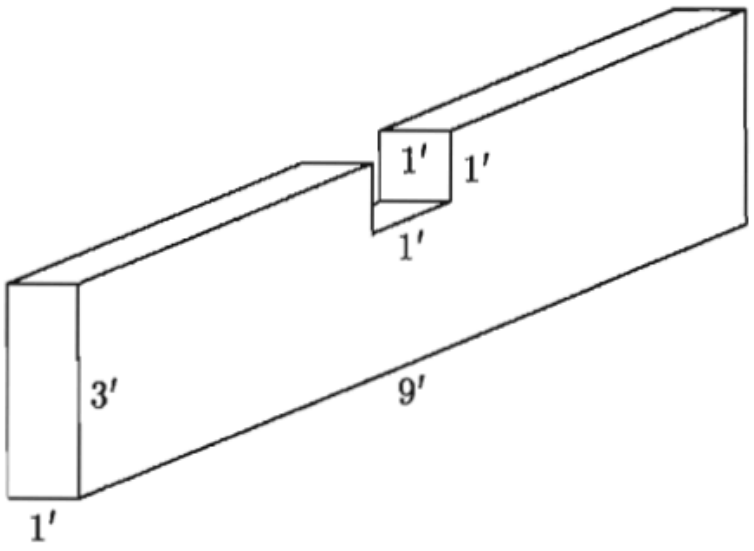
1991 Q15

15. All six sides of a rectangular solid were rectangles. A one-foot cube was cut out of the rectangular solid as shown. The total number of square feet in the surface of the new solid is how many more or less than that of the original solid?

(A) 2 less **(B)** 1 less
(C) the same
(D) 1 more **(E)** 2 more



15. **(C)** When the one-foot cube is removed, three square feet of surface area are "removed", but three new square feet of surface area are "uncovered". Thus, the original surface area is unchanged.

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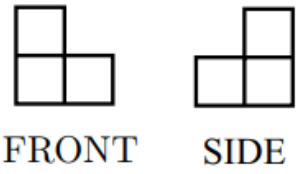
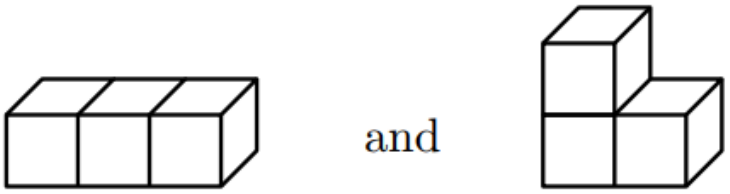
2003 Q15

15. A figure is constructed from unit cubes. Each cube shares at least one face with another cube. What is the minimum number of cubes needed to build a figure with the front and side views shown?

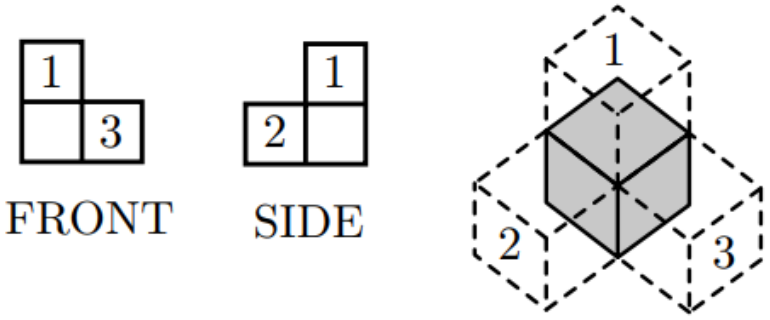


(A) 3 **(B)** 4 **(C)** 5 **(D)** 6 **(E)** 7

15. **(B)** There are only two ways to construct a solid from three cubes so that each cube shares a face with at least one other:



Neither of these configurations has both the front and side views shown. The four-cube configuration has the required front and side views. Thus at least four cubes are necessary.



Question: Is it possible to construct a five-cube configuration with these front and side views?