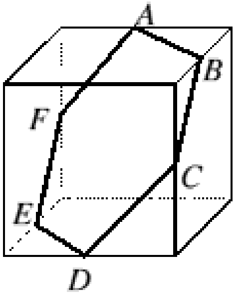
24. A solid red plastic cube, volume $1\,\text{cm}^3$, is painted white on its outside. The cube is cut by a plane passing through the mid-points of various edges, as shown.
What, in cm^2, is the *total* red area exposed by the cut?



A $\frac{3\sqrt{3}}{2}$ B 2 C $\frac{9\sqrt{2}}{5}$ D 3 E $\frac{3(\sqrt{3}+\sqrt{2})}{4}$

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24. A Let O be the centre of the cube. Consider triangle ABO: from Pythagoras' Theorem, $OA = AB = BO = \sqrt{(\frac{1}{2})^2 + (\frac{1}{2})^2}\ \text{cm} = \frac{1}{\sqrt{2}}\ \text{cm}$. So triangle OAB is equilateral.
A similar argument may be applied to triangles OBC, OCD etc. The area of each of these equilateral triangles is $\frac{1}{2} \times \frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}} \times \sin 60^\circ\ \text{cm}^2$, that is $\frac{1}{8}\sqrt{3}\ \text{cm}^2$. So the area of hexagon $ABCDEF$ is $6 \times \frac{\sqrt{3}}{8}\ \text{cm}^2$. However, the total red area exposed by the cut is twice the area of this hexagon, that is $\frac{3\sqrt{3}}{2}\ \text{cm}^2$.