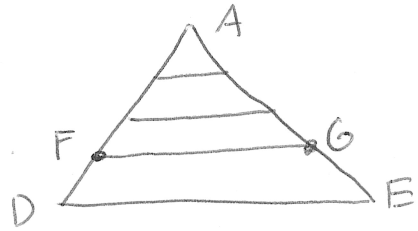
2018 A12 Q8) OMC 10/6/23 Geo Solutions

$\boxed{E}$ ADE is similar to the unit triangles.



So is AFG. Let $x = FD$. Let $cx = AF$

$$\frac{c^2x}{(c+1)^2x} = \frac{c^2x}{(c^2+7)x} \rightarrow c=3$$

Thus AF : AD is 3:4. Area DBCE = 40 - Area(ADE)

Area ratio is 9:16. = 40 - 16

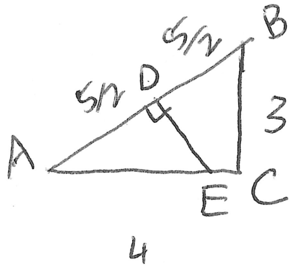
Since Area(ADE) - Area(AFG) = 7, $= \boxed{24}$ $\boxed{E}$

it follows that $16x - 9x = 7 \Rightarrow x = 1$

and area(ADE) = 16

2018 A12 Q11

$\boxed{D}$



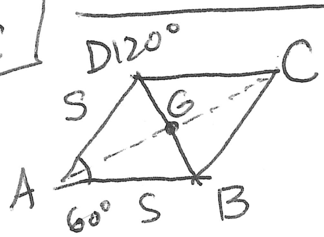
Note $\triangle ADE$ is similar to $\triangle ACB$

It follows that $\frac{DE}{AD} = \frac{BC}{AC} \rightarrow \frac{DE}{\frac{5}{2}} = \frac{3}{4}$

$\boxed{D}$ $DE = \frac{3}{4} \times \frac{5}{2} = \boxed{\frac{15}{8}}$

2006 B12 Q13

$\boxed{C}$



Rhombus is 2 eq triangles.

Let $S = AD$. Then $AG = \frac{\sqrt{3}}{2}s$ and $AC = \sqrt{3}s$

Long diag of larger rhombus $= \sqrt{3}\,s$

Long diag of small rhombus $= s$

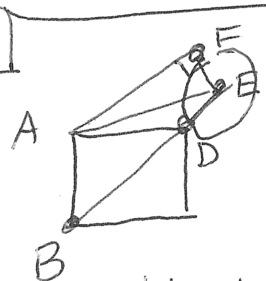
Ratio sides $1 : \sqrt{3}$, Ratio areas $1^2 : \sqrt{3}^2$, so

$1:3$.

Area(BFDE) $= \frac{1}{3} \times 24 = \boxed{8}$ $\boxed{C}$

2006 A12 Q17

$\boxed{B}$



$\measuredangle AFE = 90^\circ$

$\measuredangle ADE = 135^\circ$ since B, D, E collinear

$AE^2 = r^2 + (\sqrt{9+5\sqrt{2}})^2 = r^2 + 9 + 5\sqrt{2}$

Via law cos, $AE^2 = s^2 + r^2 - 2rs\left(-\frac{\sqrt{2}}{2}\right) = r^2 + s^2 + \sqrt{2}rs$

Thus $r^2 + 9 + 5\sqrt{2} = r^2 + s^2 + \sqrt{2}rs$

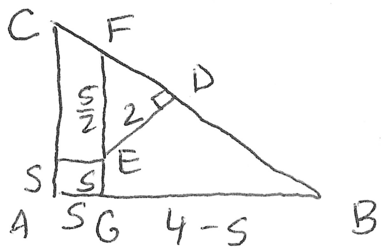
$9 + 5\sqrt{2} = s^2 + rs\sqrt{2}$

Since r, s rational, $s^2 = 9 \rightarrow s = 3$ $\quad rs = 5 \rightarrow r = \frac{5}{3}$

$\frac{r}{s} = \frac{5/3}{3} = \boxed{\frac{5}{9}}$ $\boxed{B}$

2018 A12 Q17

$\boxed{D}$



DEF is similar ABC so

$DF = \frac{3}{4} \times 2$ and $EF = \frac{5}{4} \times 2 = \frac{5}{2}$

Thus $FG = \frac{5}{2} + s$, $BG = 4 - s$

GBF is similar to ABC. Thus

$$\frac{\frac{5}{2} + s}{4 - s} = \frac{3}{4} \rightarrow \quad 10 + 4s = 12 - 3s$$

$7s = 2$

$s = \frac{2}{7}$

Area Square $= \left(\frac{2}{7}\right)^2 = \frac{4}{49}$ $\quad$ Planted $= \frac{1}{2} \times 3 \times 4 - \frac{4}{49}$

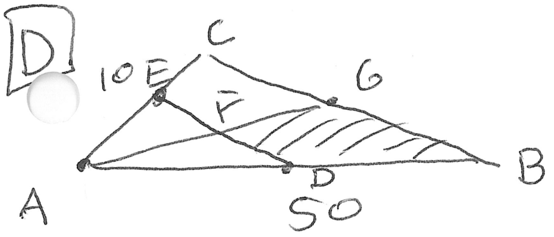
$= 6 - \frac{4}{49} = \frac{294 - 4}{49}$

$= \frac{290}{49}$

fraction planted $= \frac{290}{294} = \boxed{\frac{145}{147}}$ $\boxed{D}$ $\quad$ Whole $= \frac{294}{49}$

2018A12 Q18

$\boxed{D}$



Via angle bisector thm or $\frac{1}{2}bc\sin A$ area formula $\frac{\triangle ACG}{\triangle AGB} = \frac{10}{50}$. If

area $AGG = x$, area $AGB = 5x$, $x + 5x = 120$, so $x = 20$ and $\triangle AGB = 100$

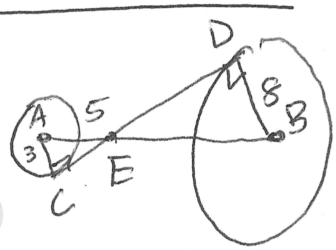
Now, let's find area AFD $\triangle AED$ is similar to $\triangle ACB$. Since $AE = EC$, Area$(AED) = \frac{1}{4} \times 120 = 30$. Via angle bisector thm, area $AFD = \frac{5}{6}$ area$(AED) = \frac{5}{6} \times 30 = 25$.

It follows that area$(FDBG)$ = area(AGB) − area(AFD) = $100 - 25$

$= \boxed{75}$ $\boxed{D}$

2006 A12 Q16

$\boxed{B}$



$\triangle ACE$ is similar to $\triangle BDE$

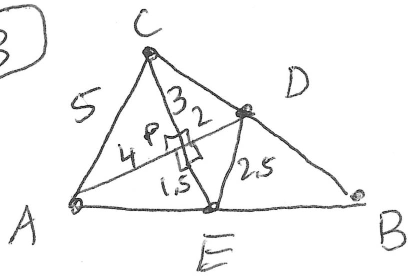
$\triangle ACE$ is 3-4-5 so $CE = 4$

$DE = \frac{4}{3} \times BD = \frac{4}{3} \times 8 = \frac{32}{3}$

$CD = CE + ED = 4 + \frac{32}{3} = \boxed{\frac{44}{3}}$ $\boxed{B}$

2013 AMC10B Q16

$\boxed{B}$



Since EPD is in ratio $3:4:5$, it's a right triangle.

Also $\triangle EDB$ is similar to $\triangle ACB$.

It follows that $AC = 2(ED) = 5$, since D, E are midpts of CB and AB, respectively.

Finally CPA is similar to EPD so $CP = 3$, $AP = 4$, $AC = 5$

Using 4 right triangles area $AEDC = \frac{1}{2}(3)(2) + \frac{1}{2}(3)(4) + \frac{1}{2}(2)(1.5) + \frac{1}{2}(4)(1.5)$

$= 3 + 6 + 1.5 + 3$

$= \boxed{13.5}$ $\boxed{B}$