6

Right triangles ABC and DEF are similar, where A and D are right angles, and B corresponds to E. If $AB = 12$, $BC = 60\sqrt{2}$, and $DF = 105$, what is the length of side EF ?

A) $48\sqrt{2}$
B) $75\sqrt{2}$
C) $100\sqrt{2}$
D) $525\sqrt{2}$

7

Isosceles triangles ABC and DEF are similar, where A corresponds to D and B corresponds to E. The measure of angle A is equal to the measure of angle B, $AB = 10$, $AC = 5$, and $EF = 40$. What is the length of side DE ?

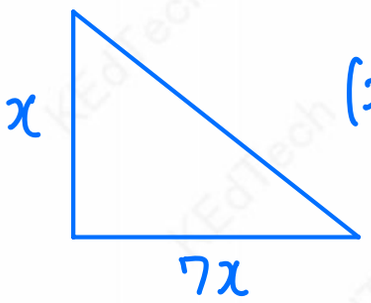
A) 20
B) 40
C) 60
D) 80

8

$$A(x) = \frac{1}{2}x(7x)$$

The function A gives the area, in square feet, of a certain right triangle, where x is the length, in feet, of one of the legs of the triangle. If the length of this triangle's hypotenuse, in feet, can be written in the form $ax\sqrt{b}$, where a and b are integers, what is the value of $a + b$?

$S = x \cdot 7x \cdot \frac{1}{2}$



$(x)^2 + (7x)^2$

$= x^2 + 49x^2$

$= 50x^2$

length of hyp: $5\sqrt{2}x = ax\sqrt{b}$

9

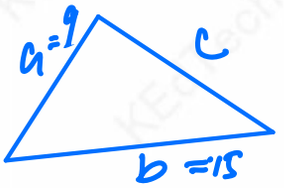
In triangle ABC, the measure of angle A is 30° and $AB = AC$. In triangle DEF, the measure of angle E is 75°. Which additional piece of information is sufficient to determine whether triangle ABC is similar to triangle DEF ?

A) The lengths of $\overline{AB}$ and $\overline{DE}$
B) The lengths of $\overline{BC}$ and $\overline{EF}$
C) The measure of angle B
D) The measure of angle F

10

According to the triangle inequality theorem, the length of any side of a triangle must be smaller than the sum of the lengths of the other two sides. If a triangle has side lengths of 9 inches, 15 inches, and x inches, which inequality represents all possible values of x ?

A) $0 < x < 24$
B) $6 < x < 24$
C) $12 < x < 24$
D) $x > 24$



$a + b > c$ $\quad c < 9 + 15 = 24$

$a > c - b$ $\quad c > b - a = 15 - 9 = 6$

11

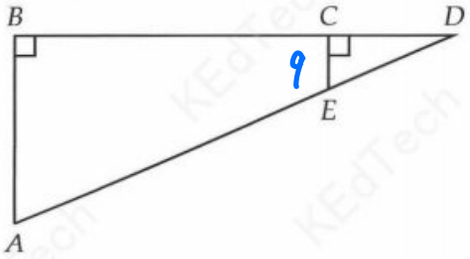
In triangles LMN and PQR, angles M and Q each have measure 54°, $MN = 16$, and $QR = 16$. Which additional piece of information is sufficient to prove that triangle LMN is congruent to triangle PQR ?

A) Angles L and R each have measure 44°.
B) Angles N and P each have measure 44°.
C) $LM = 11$ and $PQ = 11$
D) $LN = 11$ and $PR = 11$

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a=5 b=2 a+b=7

12



Note: Figure not drawn to scale.

In the figure shown, $CE = 9$ and $BC = 6CD$. What is the length of line segment AB ?

△CDE ~ △BDA

$\frac{9}{AB} = \frac{CE}{AB} = \frac{CD}{BD} = \frac{CD}{BE+CD} = \frac{CD}{6CD+CD} = \frac{CD}{7CD}$

$\frac{9}{AB} = \frac{1}{7}$ AB=63

13

A circle is inscribed in an equilateral triangle. The radius of the circle is 9 inches. What is the perimeter, in inches, of the triangle?

A) $18\sqrt{3}$
B) $27\sqrt{3}$
C) $54\sqrt{3}$
D) 108

14

In triangle ABC, angle B measures 90°, $AC = 106$, and $BC = 90$. Point D on side AC is connected by a line segment with point E on side BC such that line segment DE is parallel to side AB, and $DE = 14$. What is the length of line segment BE ?

67.5

15

In triangle FGH, $FG = 21$ and $GH = 27$. In triangle XYZ, $XY = 28$ and $YZ = 36$. Which additional piece of information is sufficient to prove that triangles FGH and XYZ are similar?

I. The measure of angle G is equal to the measure of angle Y.
II. $FH = 15$ and $XZ = 20$

A) I is sufficient, but II is not.
B) II is sufficient, but I is not.
C) I is sufficient and II is sufficient.
D) Neither I nor II is sufficient.

16

An equilateral triangle is inscribed in a circle. The triangle has a side length of $22\sqrt{3}$ feet. What is the radius, in feet, of the circle?

A) $11\sqrt{3}$
B) 22
C) 33
D) 44

17

In triangle ABC, angle A is a right angle, point D lies on $\overline{AC}$, point E lies on $\overline{BC}$, and $\overline{DE}$ is parallel to $\overline{AB}$. The length of $\overline{DE}$ is 36 inches, the length of $\overline{AB}$ is 54 inches, and the length of $\overline{AD}$ is 15 inches. What is the area, in square inches, of triangle CDE ?

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18

In triangle ABC, angle B is a right angle, point D lies on $\overline{AB}$, point E lies on $\overline{AC}$, and $\overline{DE}$ is perpendicular to $\overline{AC}$. If the length of $\overline{AB}$ is 12 units, the length of $\overline{AC}$ is 13 units, and the length of $\overline{DE}$ is 3 units, what is the length of $\overline{AE}$, in units?

7, 2

19

In triangle ABC, $AB = 6$, $BC = 6$, and the measure of angle ABC is $120°$. What is the area of triangle ABC ?

A) $2\sqrt{3}$
B) $4\sqrt{3}$
C) $6\sqrt{3}$
D) $9\sqrt{3}$

20

Square $ABCD$ has a side length of 12. Point F lies on $\overline{BC}$, and $\overline{AF}$ and $\overline{BD}$ intersect at point E. The length of $\overline{BF}$ is 4. What is the length of $\overline{BE}$?

A) 3
B) $2\sqrt{2}$
C) $3\sqrt{2}$
D) $4\sqrt{2}$

21

A right triangle has a perimeter of $78 + 78\sqrt{3}$ centimeters and an angle measuring $30°$. What is the length, in centimeters, of the shortest side of this triangle?

A) 26
B) $26\sqrt{3}$
C) 39
D) $39\sqrt{3}$

22

In triangle QRS, angle Q is a right angle and $\overline{QT}$ is an altitude of the triangle. The length of $\overline{QS}$ is 15 units and the length of $\overline{RS}$ is 17 units. What is the length of $\overline{TS}$ to the nearest tenth of a unit?

A) 12.6
B) 12.8
C) 13.2
D) 13.4

23

In triangle WXY, point Z lies on $\overline{WY}$, and the measures of $\angle W$ and $\angle YXZ$ are each $36°$. Which of the following ratios is equal to $\frac{WY}{XY}$?

A) $\frac{WX}{XZ}$
B) $\frac{XY}{WX}$
C) $\frac{XY}{YZ}$
D) $\frac{YZ}{XZ}$

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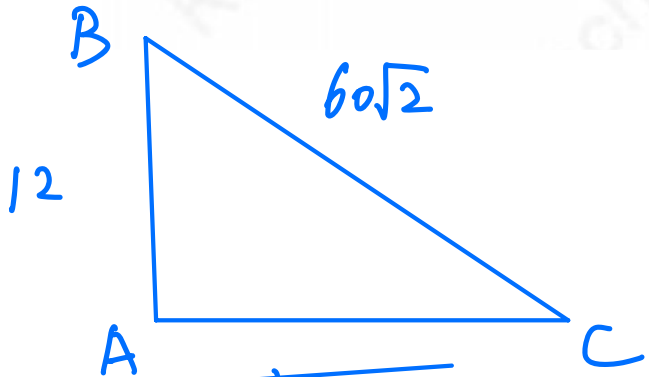
Right triangles ABC and DEF are similar, where A and D are right angles, and B corresponds to E. If $AB = 12$, $BC = 60\sqrt{2}$, and $DF = 105$, what is the length of side EF ?

A) $48\sqrt{2}$
B) $75\sqrt{2}$
C) $100\sqrt{2}$
D) $525\sqrt{2}$

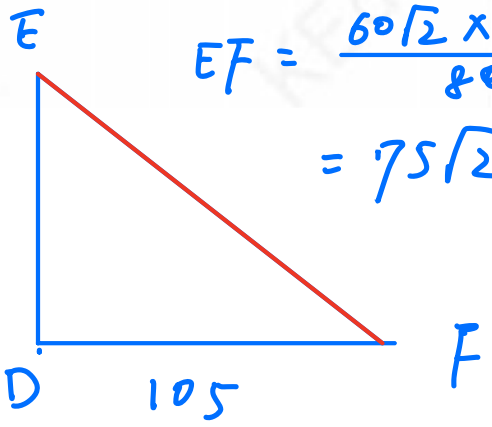
$$\frac{AC}{DF} = \frac{BC}{EF}$$

$$\frac{84}{105} = \frac{60\sqrt{2}}{EF}$$

$$EF = \frac{60\sqrt{2} \times 105}{84} = 75\sqrt{2}$$

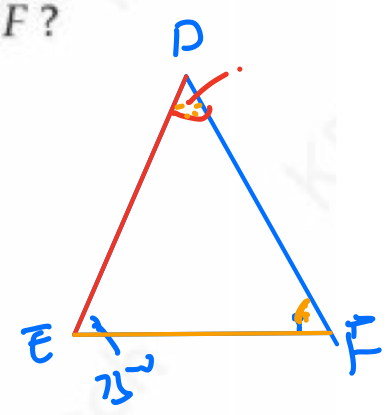


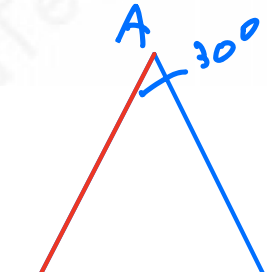
$$AC = \sqrt{(60\sqrt{2})^2 - 12^2} = 84$$



In triangle ABC, the measure of angle A is $30°$ and $AB = AC$. In triangle DEF, the measure of angle E is $75°$. Which additional piece of information is sufficient to determine whether triangle ABC is similar to triangle DEF ?

A) The lengths of $\overline{AB}$ and $\overline{DE}$ ✗
B) The lengths of $\overline{BC}$ and $\overline{EF}$ ✗
C) The measure of angle B ✗
D) The measure of angle F





$AB = AC \Rightarrow \angle B = \angle C$ $\angle A = 30°$

$\Rightarrow \angle B = \angle C = 75°$ A - S - AX



A - A - A

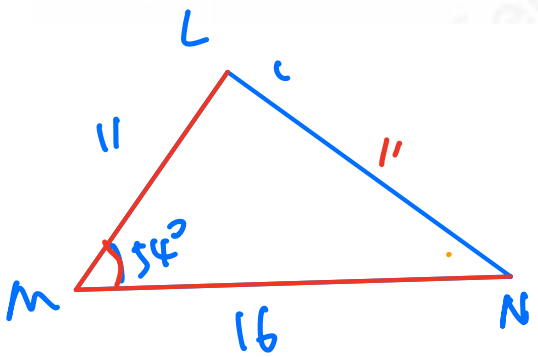
In triangles LMN and PQR, angles M and Q each have measure $54°$, $MN = 16$, and $QR = 16$. Which additional piece of information is sufficient to prove that triangle LMN is congruent to triangle PQR ?

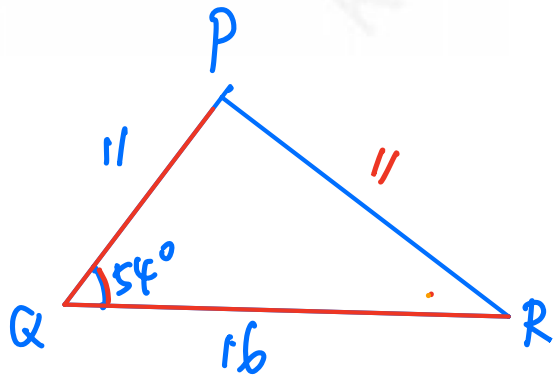
A) Angles L and R each have measure $44°$.

B) Angles N and P each have measure $44°$.

C) $LM = 11$ and $PQ = 11$

D) $LN = 11$ and $PR = 11$





A - S - A

S - A - S

PR = LN

MN = QR

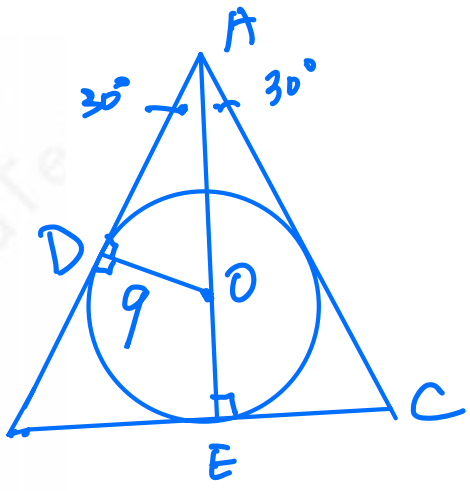
A circle is inscribed in an equilateral triangle. The radius of the circle is 9 inches. What is the perimeter, in inches, of the triangle?

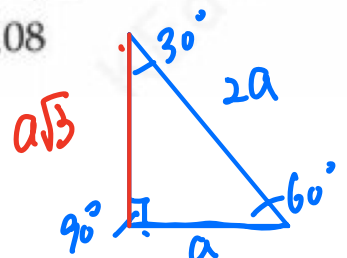
A) $18\sqrt{3}$

B) $27\sqrt{3}$

C) $54\sqrt{3}$

D) 108





$AD = 9\sqrt{3}$

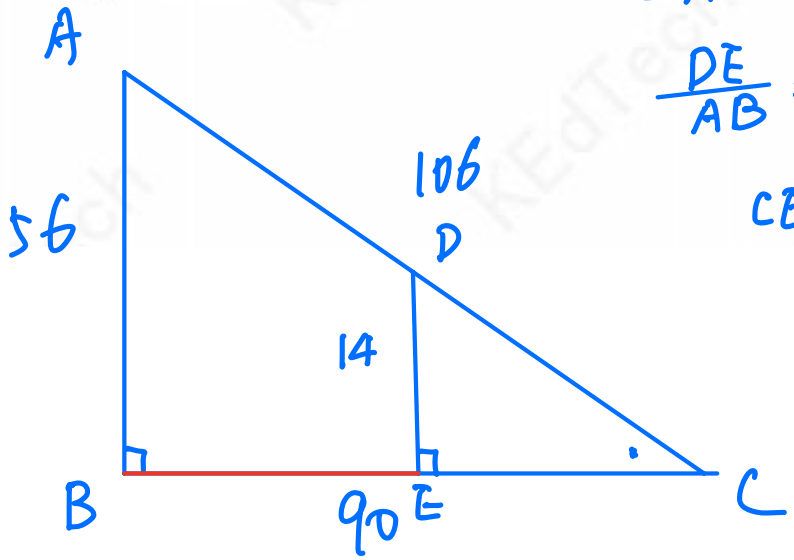
$AB = 2 \cdot 9\sqrt{3} = 18\sqrt{3}$

$3 \cdot AB = 3 \cdot 18\sqrt{3} = 54\sqrt{3}$

BD = AD

BE = CE

In triangle ABC, angle B measures $90°$, $AC = 106$, and $BC = 90$. Point D on side AC is connected by a line segment with point E on side BC such that line segment DE is parallel to side AB, and $DE = 14$. What is the length of line segment BE?



$\triangle ABC \sim \triangle DEC$

$\frac{DE}{AB} = \frac{14}{56} = \frac{CE}{BC = 90}$

$CE = 22.5$

$BE = BC - CE = 90 - 22.5$

$= 67.5$

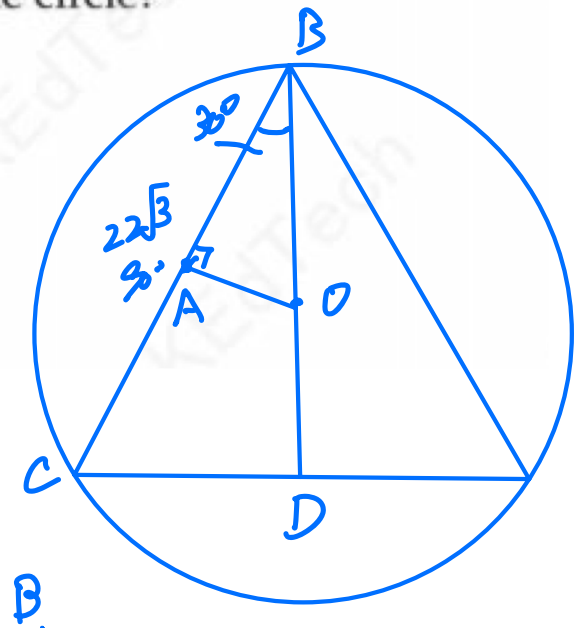
An equilateral triangle is inscribed in a circle. The triangle has a side length of $22\sqrt{3}$ feet. What is the radius, in feet, of the circle?

A) $11\sqrt{3}$

B) 22

C) 33

D) 44



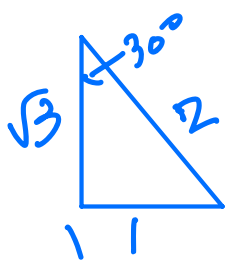
$\frac{11\sqrt{3}}{\sqrt{3}} = \frac{BO}{2}$

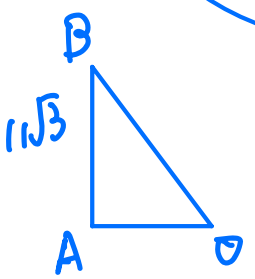
$\frac{2 \cdot 11\sqrt{3}}{\sqrt{3}} = BO$

$22 = BO$

$BA = AC$ $BA = 11\sqrt{3}$

$BO = 11 \times 2 = 22$





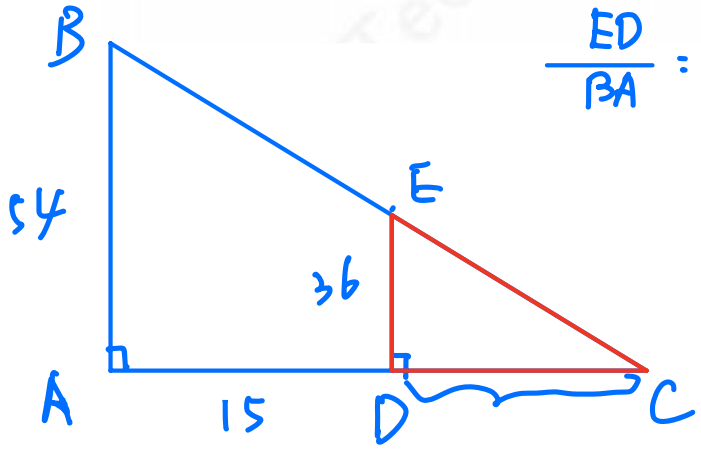
$\frac{11\sqrt{3}}{\sqrt{3}} = \frac{OA}{1}$

$OA = \frac{11\sqrt{3} \cdot 1}{\sqrt{3}}$

$= 11$

In triangle ABC, angle A is a right angle, point D lies on $\overline{AC}$, point E lies on $\overline{BC}$, and $\overline{DE}$ is parallel to $\overline{AB}$. The length of $\overline{DE}$ is 36 inches, the length of $\overline{AB}$ is 54 inches, and the length of $\overline{AD}$ is 15 inches. What is the area, in square inches, of triangle CDE?

① $\triangle EDC \sim \triangle BAC$



$$\frac{ED}{BA} = \frac{36}{54} = \frac{CD}{CD+15}$$

②

$$\frac{ED}{BA} = \frac{36 \div 2}{54 \div 3} = \frac{2}{3}$$

$$\frac{AB}{DE} = k \qquad \frac{S_{[ABC]}}{S_{[DEF]}} = k^2$$

$$\frac{CD}{CD+15} = \frac{2}{3}$$

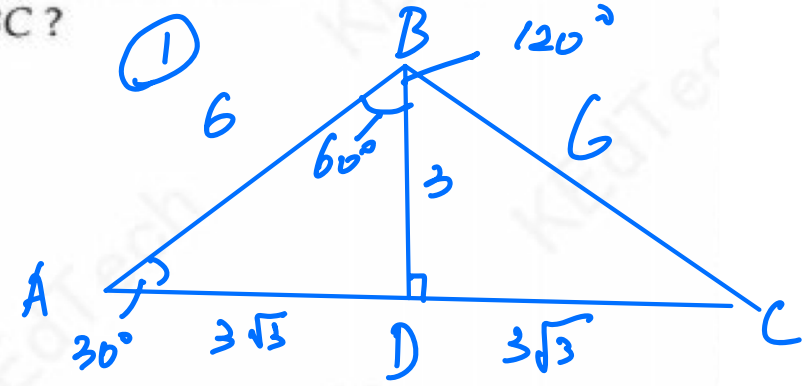
$$3CD = 2CD + 30 \qquad CD = 30$$

$$\frac{54 \times (15+30) \times \frac{1}{2}}{S_{[DEC]}} = \left(\frac{3}{2}\right)^2$$

In triangle ABC, $AB = 6$, $BC = 6$, and the measure of angle ABC is $120°$. What is the area of triangle ABC?

A) $2\sqrt{3}$
B) $4\sqrt{3}$
C) $6\sqrt{3}$
D) $9\sqrt{3}$

①



$$6\sqrt{3} \times 3 \times \frac{1}{2} = 9\sqrt{3}$$

$$\frac{1}{2} AB \cdot BC \cdot \sin\angle ABC = \frac{1}{2} \cdot 6 \times 6 \times \frac{\sqrt{3}}{2} = 9\sqrt{3}$$