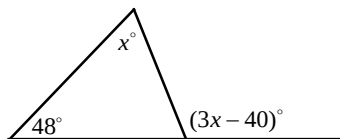


Exercises - Angles of a Triangle

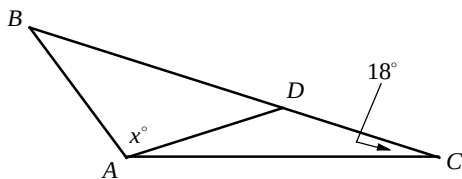
1



In the triangle above, what is the value of x ?

- A) 44
- B) 48
- C) 52
- D) 56

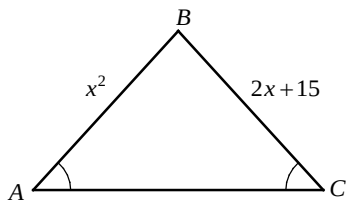
2



In $\triangle ABC$ above, if $AB = AD = DC$, what is the value of x ?

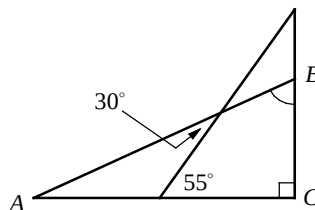
- A) 92
- B) 96
- C) 102
- D) 108

3



In $\triangle ABC$ above, $m\angle A = m\angle C$. If $x > 0$, what is the value of x ?

4

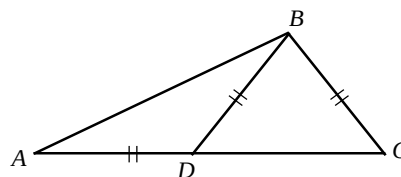


Note: Figure not drawn to scale.

In the figure above, $AC \perp BC$. What is the measure of $\angle ABC$?

- A) 50
- B) 55
- C) 60
- D) 65

5

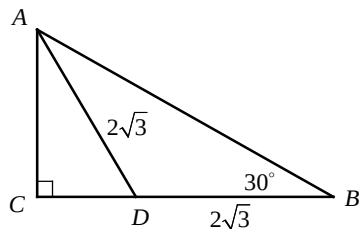


In the figure above, $AD = BD = BC$. If $m\angle A = 26$, what is the measure of $m\angle DBC$?

- A) 68
- B) 72
- C) 76
- D) 82

Exercises - Pythagorean Theorem and Special Right Triangles

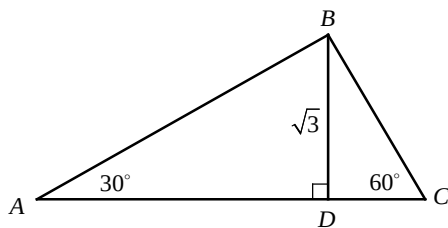
1



In the figure above, if $AD = BD = 2\sqrt{3}$, what is the length of AB ?

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

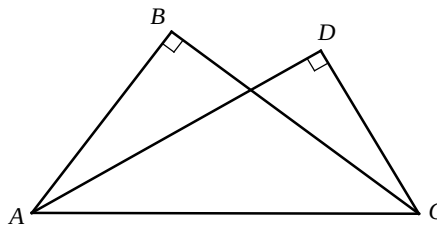
2



In $\triangle ABC$ above, $BD = \sqrt{3}$. What is the perimeter of $\triangle ABC$?

- A) $2\sqrt{2} + 6$
- B) $2\sqrt{3} + 6$
- C) $2\sqrt{6} + 6$
- D) $3\sqrt{2} + 6$

3

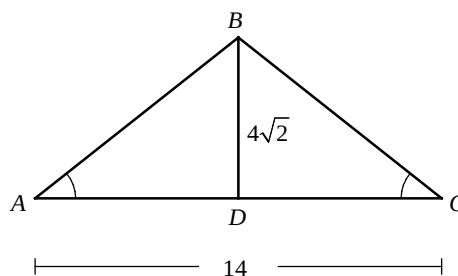


Note: Figure not drawn to scale.

In the figure above, $AB = 6$, $BC = 8$, and $CD = 5$. What is the length of AD ?

- A) $4\sqrt{3}$
- B) $5\sqrt{2}$
- C) $5\sqrt{3}$
- D) $6\sqrt{2}$

4



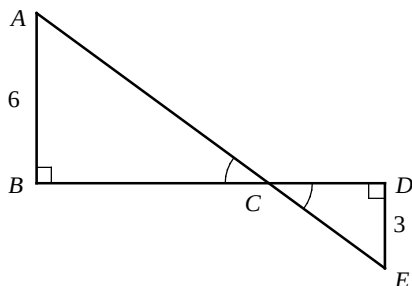
Note: Figure not drawn to scale.

In the figure above, $\angle A \cong \angle C$ and $\overline{BD}$ bisects $\overline{AC}$. What is the perimeter of $\triangle ABC$?

- A) 32
- B) 36
- C) $14 + 10\sqrt{2}$
- D) $14 + 12\sqrt{2}$

Exercises - Similar Triangles and Proportional Parts

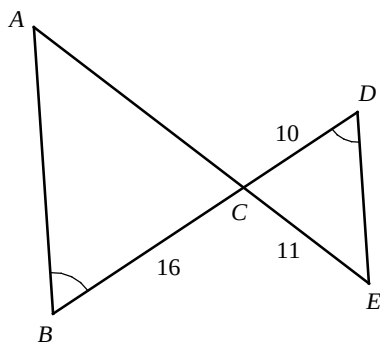
1



In the figure above, if $AB = 6$, $DE = 3$, and $BD = 12$, what is the length of AE ?

- A) 12
- B) $9\sqrt{2}$
- C) $8\sqrt{3}$
- D) 15

2

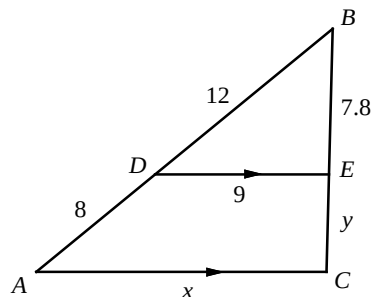


Note: Figure not drawn to scale.

In the figure above, $\angle B \cong \angle D$. If $BC = 16$, $CD = 10$, and $CE = 11$, what is the length of AE ?

- A) 16.8
- B) 17.2
- C) 17.6
- D) 18.4

Questions 3 and 4 refer to the following information.



In the figure above, $\overline{DE} \parallel \overline{AC}$.

3

What is the value of x ?

- A) 12.5
- B) 15
- C) 16.5
- D) 18

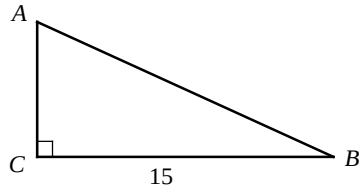
4

What is the value of y ?

- A) 5.2
- B) 5.6
- C) 6.0
- D) 6.4

Exercises - Area of a Triangle

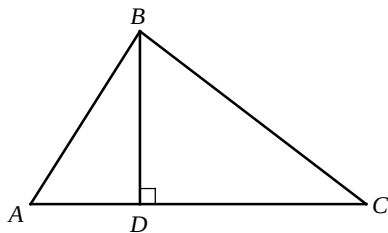
1



In the figure above, the area of right triangle ABC is 60. What is the perimeter of $\triangle ABC$?

- A) 34
- B) 36
- C) 38
- D) 40

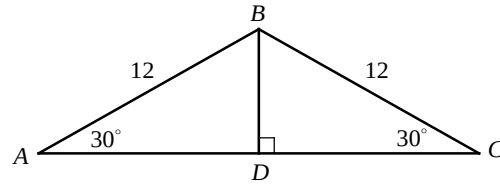
2



In triangle ABC above, if BD was increased by 50 percent and AC was reduced by 50 percent, how would the area of $\triangle ABC$ change?

- A) The area of $\triangle ABC$ would be decreased by 25 percent.
- B) The area of $\triangle ABC$ would be increased by 25 percent.
- C) The area of $\triangle ABC$ would not change.
- D) The area of $\triangle ABC$ would be decreased by 50 percent.

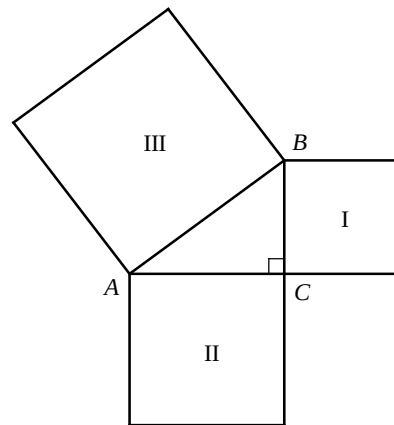
3



In the figure above, what is the area of $\triangle ABC$?

- A) $24\sqrt{3}$
- B) $30\sqrt{3}$
- C) $36\sqrt{3}$
- D) $48\sqrt{3}$

4



The figure above shows right triangle $\triangle ABC$ and three squares. If the area of square region I is 80 square inches and the area of square region II is 150 square inches, which of the following is true about the area of square region III?

- A) Less than 230 square inches.
- B) More than 230 square inches.
- C) Equal to 230 square inches.
- D) It cannot be determined from the information given.

Answer Key

Section 17-1

1. A 2. D 3. 5 4. D 5. C

Section 17-2

1. C 2. B 3. C 4. A

Section 17-3

1. D 2. C 3. B 4. A

Section 17-4

1. D 2. A 3. C 4. C

Chapter 17 Practice Test

1. B 2. A 3. B 4. C 5. D
6. A 7. 10.4 8. 45 9. 240

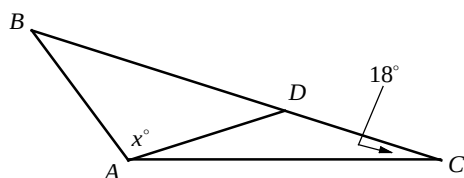
Answers and Explanations

Section 17-1

1. A

$$\begin{array}{ll} 3x - 40 = x + 48 & \text{Exterior Angle Theorem} \\ 3x - 40 - x = x + 48 - x & \text{Subtract } x \text{ from each side.} \\ 2x - 40 = 48 & \text{Simplify.} \\ 2x = 88 & \text{Add 40 to each side.} \\ x = 44 & \end{array}$$

2. D



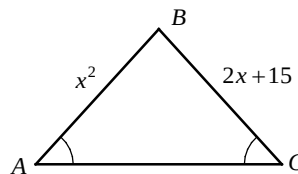
$$\begin{array}{ll} AD = DC & \text{Given} \\ m\angle DAC = m\angle DCA = 18 & \text{Isosceles } \Delta \text{ Theorem} \\ m\angle BDA & \text{Exterior } \angle \text{ Theorem} \\ = m\angle DCA + m\angle DAC & \\ m\angle BDA = 18 + 18 & m\angle DAC = m\angle DCA = 18 \\ m\angle BDA = 36 & \text{Simplify.} \\ AB = AD & \text{Given} \\ m\angle DBA = m\angle BDA = 36 & \text{Isosceles } \Delta \text{ Theorem} \end{array}$$

In triangle ABD, the angle sum is 180.

Thus, $x + 36 + 36 = 180$.

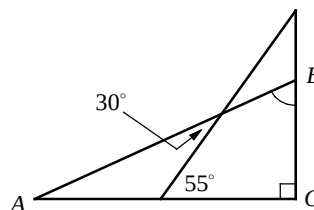
Solving the equation for x gives $x = 108$.

3. 5



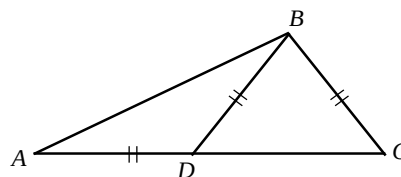
$$\begin{array}{ll} m\angle A = m\angle C & \text{Given} \\ AB = BC & \text{Isosceles } \Delta \text{ Theorem} \\ x^2 = 2x + 15 & \text{Substitution} \\ x^2 - 2x - 15 = 0 & \text{Make one side 0.} \\ (x + 3)(x - 5) = 0 & \text{Factor.} \\ x + 3 = 0 \text{ or } x - 5 = 0 & \text{Zero Product Property} \\ x = -3 \text{ or } x = 5 & \\ \text{Since } x > 0, \text{ the value of } x \text{ is 5.} & \end{array}$$

4. D



$$\begin{array}{ll} m\angle A + 30 = 55 & \text{Exterior Angle Theorem} \\ m\angle A = 25 & \\ m\angle A + m\angle B = 90 & \text{The acute } \angle\text{s of a right } \Delta \text{ are complementary.} \\ 25 + m\angle B = 90 & m\angle A = 25. \\ m\angle B = 65 & \end{array}$$

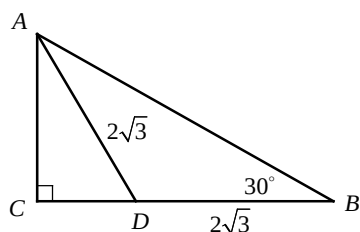
5. C



$$\begin{array}{ll} AD = BD & \text{Given} \\ m\angle ABD = m\angle A & \text{Isosceles } \Delta \text{ Theorem} \\ m\angle A = 26 & \text{Given} \\ m\angle ABD = 26 & m\angle A = 26 \\ m\angle BDC & \text{Exterior } \angle \text{ Theorem} \\ = m\angle A + m\angle ABD & \\ m\angle BDC = 26 + 26 = 52 & m\angle A = m\angle ABD = 26 \\ BD = BC & \text{Given} \\ m\angle C = m\angle BDC & \text{Isosceles } \Delta \text{ Theorem} \\ m\angle C = 52 & m\angle BDC = 52 \\ m\angle C + m\angle BDC + m\angle DBC = 180 & \text{Angle Sum Theorem} \\ 52 + 52 + m\angle DBC = 180 & m\angle C = m\angle BDC = 52 \\ m\angle DBC = 76 & \end{array}$$

Section 17-2

1. C



$AD = BD$ Given
 $m\angle BAD = m\angle B = 30$ Isosceles Δ Theorem
 $m\angle ADC = m\angle BAD + m\angle B$ Exterior $\angle$ Theorem
 $m\angle ADC = 30 + 30 = 60$ $m\angle BAD = m\angle B = 30$
 ΔADC is a 30° - 60° - 90° triangle.

In a 30° - 60° - 90° triangle, the hypotenuse is twice as long as the shorter leg. Therefore,

$$AD = 2CD$$

$$2\sqrt{3} = 2CD$$

$$\sqrt{3} = CD.$$

$$BC = BD + CD = 2\sqrt{3} + \sqrt{3} = 3\sqrt{3}$$

Triangle ABC is also a 30° - 60° - 90° triangle.

In a 30° - 60° - 90° triangle, the longer leg is $\sqrt{3}$ times as long as the shorter leg. Therefore,

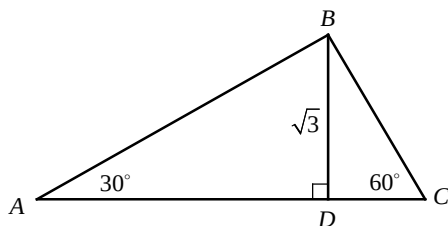
$$BC = \sqrt{3}AC$$

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

$$3 = AC.$$

$$AB = 2AC = 2 \times 3 = 6$$

2. B



In the figure above, ΔABD and ΔBCD are 30° - 60° - 90° triangles.

In a 30° - 60° - 90° triangle, the hypotenuse is twice as long as the shorter leg and the longer leg is $\sqrt{3}$ times as long as the shorter leg. In ΔABD ,

$$AB = 2BD = 2\sqrt{3}$$

$$AD = \sqrt{3}BD = \sqrt{3} \cdot \sqrt{3} = 3.$$

In ΔBCD ,

$$BD = \sqrt{3}CD$$

$$\sqrt{3} = \sqrt{3}CD$$

$$1 = CD$$

$$BC = 2CD = 2 \cdot 1 = 2$$

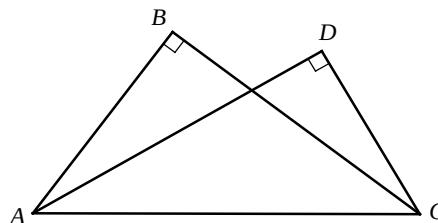
perimeter of ΔABC

$$= AB + BC + AC$$

$$= 2\sqrt{3} + 2 + (3 + 1)$$

$$= 2\sqrt{3} + 6$$

3. C



Note: Figure not drawn to scale.

$$AC^2 = AB^2 + BC^2 \quad \text{Pythagorean Theorem}$$

$$AC^2 = 6^2 + 8^2 = 100$$

$$AC^2 = AD^2 + CD^2 \quad \text{Pythagorean Theorem}$$

$$100 = AD^2 + 5^2$$

$$AC^2 = 100, CD = 5$$

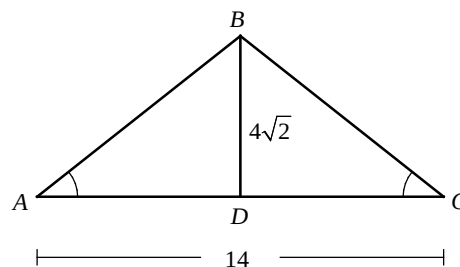
$$100 - 25 = AD^2$$

$$75 = AD^2$$

$$\sqrt{75} = AD$$

$$5\sqrt{3} = AD$$

4. A



Note: Figure not drawn to scale.

$$AD = CD = 7 \quad \text{Definition of segment bisector}$$

$$AB^2 = BD^2 + AD^2 \quad \text{Pythagorean Theorem}$$

$$AB^2 = (4\sqrt{2})^2 + 7^2 \quad \text{Substitution}$$

$$= 32 + 49 = 81$$

$$AB = \sqrt{81} = 9$$

Square root both sides.

$$AB = BC$$

Isosceles Triangle Theorem

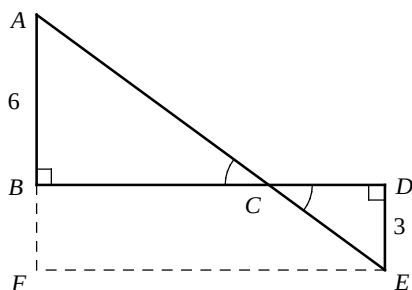
Perimeter of ΔABC

$$= AB + BC + AC$$

$$= 9 + 9 + 14 = 32$$

Section 17-3

1. D



Draw $\overline{EF}$, which is parallel and congruent to $\overline{BD}$. Extend $\overline{AB}$ to point F . Since $\overline{EF} \parallel \overline{BD}$, $\angle F$ is a right angle.

$$BD = EF = 12 \text{ and } DE = BF = 3$$

$$AF = AB + BF = 6 + 3 = 9$$

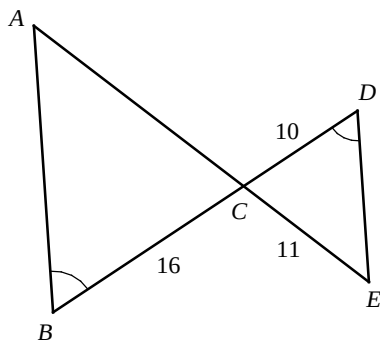
$$AE^2 = AF^2 + EF^2 \quad \text{Pythagorean Theorem}$$

$$= 9^2 + 12^2$$

$$= 225$$

$$AE = \sqrt{225} = 15$$

2. C



Note: Figure not drawn to scale.

$$\angle B \cong \angle D$$

Given

$$\angle ACB \cong \angle ECD$$

Vertical $\angle$ s are $\cong$.

$$\triangle ACB \sim \triangle ECD$$

AA similarity

If two triangles are similar, their corresponding sides are proportional.

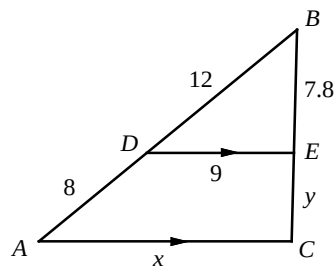
$$\frac{BC}{DC} = \frac{AC}{EC}$$

$$\frac{16}{10} = \frac{AC}{11}$$

$$10AC = 16 \times 11$$

$$AC = 17.6$$

3. B



$$\frac{BD}{DE} = \frac{BA}{AC} \Rightarrow \frac{12}{9} = \frac{20}{x} \Rightarrow 12x = 9 \cdot 20$$

$$\Rightarrow x = 15$$

4. A

$$\frac{BD}{DA} = \frac{BE}{EC} \Rightarrow \frac{12}{8} = \frac{7.8}{y} \Rightarrow 12y = 8 \times 7.8$$

$$\Rightarrow y = 5.2$$

Section 17-4

1. D

$$\text{Area of triangle } ABC = \frac{1}{2} BC \cdot AC$$

$$= \frac{1}{2} (15) AC = 60$$

$$\Rightarrow 7.5AC = 60 \Rightarrow AC = 8$$

$$AB^2 = AC^2 + BC^2 \quad \text{Pythagorean Theorem}$$

$$AB^2 = 8^2 + 15^2$$

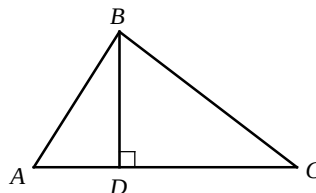
$$= 289$$

$$AB = \sqrt{289} = 17$$

$$\text{Perimeter of } \triangle ABC = AB + BC + AC$$

$$= 17 + 15 + 8 = 40$$

2. A



Let $BD = h$ and let $AC = b$.

If BD was increased by 50 percent, the new BD will be $h + 0.5h$, or $1.5h$.

If AC was reduced by 50 percent, the new AC will be $b - 0.5b$, or $0.5b$.

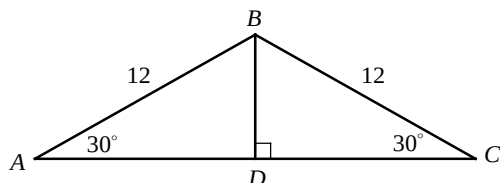
$$\text{The new area of } \triangle ABC = \frac{1}{2} (\text{new } AC) \times (\text{new } BD)$$

$$= \frac{1}{2}(0.5b)(1.5h) = \frac{1}{2}(0.75bh)$$

Because the area of the triangle before change was

$$\frac{1}{2}(bh), \text{ the area has decreased by 25 percent.}$$

3. C



$\triangle ABD$ and $\triangle CBD$ are 30° - 60° - 90° triangles.

In a 30° - 60° - 90° triangle, the hypotenuse is twice as long as the shorter leg and the longer leg is $\sqrt{3}$ times as long as the shorter leg.

$$AB = 2BD$$

$$12 = 2BD$$

$$6 = BD$$

$$AD = \sqrt{3}BD$$

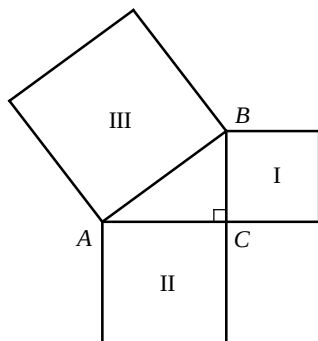
$$AD = \sqrt{3}(6) = 6\sqrt{3}$$

$$AC = 2AD = 12\sqrt{3}$$

$$\text{Area of } \triangle ABC = \frac{1}{2}AC \cdot BD = \frac{1}{2}(12\sqrt{3})(6)$$

$$= 36\sqrt{3}$$

4. C



The area of a square is the square of the length of any side.

The area of square region I = $BC^2 = 80$.

The area of square region II = $AC^2 = 150$.

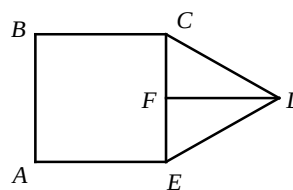
The area of square region III = AB^2

$$\begin{aligned} AB^2 &= BC^2 + AC^2 && \text{Pythagorean Theorem} \\ &= 80 + 150 = 230 \end{aligned}$$

Therefore, the area of square region III is 230.

Chapter 17 Practice Test

1. B



If the area of square $ABCD$ is $4x^2$, the length of the side of square $ABCD$ is $2x$.

Drawing $\overline{DF}$, a perpendicular bisector of $\overline{CE}$, makes two 30° - 60° - 90° triangles, $\triangle CDF$ and $\triangle EDF$.

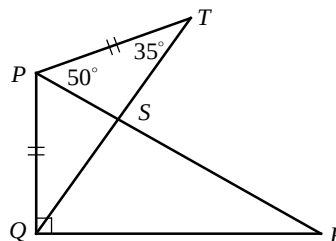
$$CE = 2x$$

$$CF = \frac{1}{2}CE = \frac{1}{2}(2x) = x$$

$$DF = \sqrt{3}CF = \sqrt{3}x$$

$$\begin{aligned} \text{Area of } \triangle CDE &= \frac{1}{2}CE \cdot DF = \frac{1}{2}(2x)(\sqrt{3}x) \\ &= \sqrt{3}x^2 \end{aligned}$$

2. A



$$\overline{PQ} \cong \overline{PT}$$

Given

$$m\angle PQT = m\angle T = 35 \quad \text{Isosceles } \triangle \text{ Theorem}$$

$$m\angle PQT + m\angle T + m\angle QPT = 180 \quad \text{Angle Sum Theorem}$$

$$35 + 35 + m\angle QPT = 180 \quad \text{Substitution}$$

$$m\angle QPT = 110$$

$$m\angle QPT = 110 \quad \text{Angle Addition Postulate}$$

$$= m\angle QPR + m\angle RPT$$

$$110 = m\angle QPR + 50 \quad \text{Substitution}$$

$$60 = m\angle QPR$$

$$\overline{PQ} \perp \overline{QR}$$

Given

$$m\angle PQR = 90$$

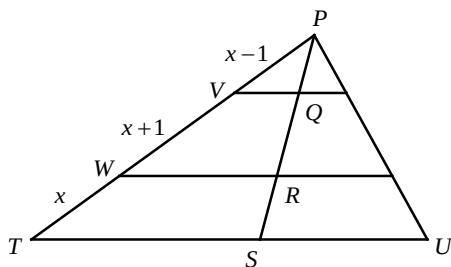
Definition of Right $\angle$

$$m\angle PQR + m\angle QPR + m\angle R = 180 \quad \text{Angle Sum Theorem}$$

$$90 + 60 + m\angle R = 180 \quad \text{Substitution}$$

$$m\angle R = 30$$

3. B



Note: Figure not drawn to scale.

Since $\overline{VQ} \parallel \overline{WR} \parallel \overline{TS}$, $\frac{PT}{PS} = \frac{x}{RS}$.

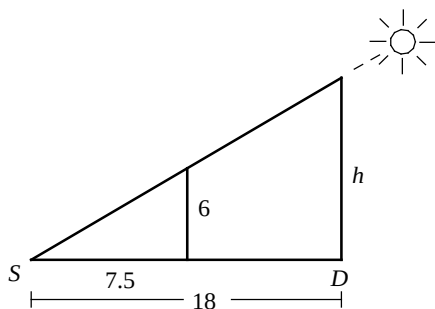
$$\frac{(x-1) + (x+1) + x}{15} = \frac{x}{RS} \quad \text{Substitution}$$

$$\frac{3x}{15} = \frac{x}{RS} \quad \text{Simplify.}$$

$$3x(RS) = 15x \quad \text{Cross Products}$$

$$RS = 5$$

4. C



Note: Figure not drawn to scale.

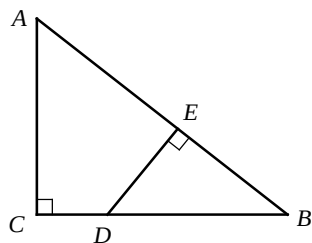
Let h = the length of the pole.

$$\frac{6}{7.5} = \frac{h}{18}$$

$$7.5h = 6 \times 18 \quad \text{Cross Products}$$

$$h = 14.4$$

5. D



$$m\angle C = m\angle BED$$

$$m\angle B = m\angle B$$

$$\triangle ABC \sim \triangle DBE$$

All right $\angle$ s are equal.

Reflexive Property

AA Similarity Postulate

$$\frac{AC}{BC} = \frac{DE}{BE}$$

AA Similarity Postulate

$$\frac{12}{15} = \frac{8}{BE}$$

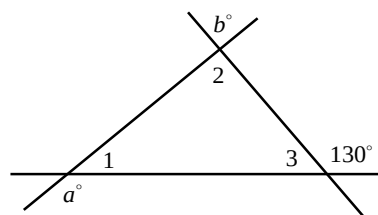
Substitution

$$12BE = 15 \times 8$$

Cross Products

$$BE = 10$$

6. A



$$m\angle 1 + m\angle 2 + m\angle 3 = 180 \quad \text{Angle Sum Theorem}$$

$$a + m\angle 1 = 180$$

Straight $\angle$ measures 180.

$$m\angle 1 = 180 - a$$

$$m\angle 2 = b$$

Vertical $\angle$ s are $\cong$.

$$130 + m\angle 3 = 180$$

Straight $\angle$ measures 180.

$$m\angle 3 = 50$$

$$180 - a + b + 50 = 180$$

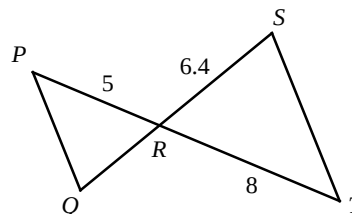
Substitution

$$230 - a + b = 180$$

$$-a + b = -50$$

$$a - b = 50$$

7. 10.4



$$\overline{PQ} \parallel \overline{ST}$$

Given

$$m\angle P = m\angle T$$

If $\overline{PQ} \parallel \overline{ST}$, alternate interior $\angle$ s are $\cong$.

$$m\angle PRQ = m\angle TRS$$

Vertical $\angle$ s are $\cong$.

$$\triangle PRQ \sim \triangle TRS$$

AA Similarity Postulate

$$\frac{PR}{TR} = \frac{RQ}{RS}$$

AA Similarity Postulate

$$\frac{5}{8} = \frac{RQ}{6.4}$$

Substitution

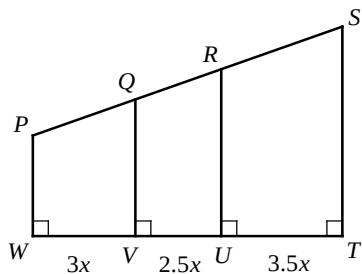
$$8RQ = 5 \times 6.4$$

Cross Products

$$RQ = 4$$

$$QS = SR + RQ = 6.4 + 4 = 10.4$$

8. 45



In the figure above, $\overline{PW} \parallel \overline{QV} \parallel \overline{RU} \parallel \overline{ST}$,
because they are all perpendicular to $\overline{TW}$.

Therefore, $\frac{PS}{WT} = \frac{QR}{VU}$.

$$\frac{162}{3x + 2.5x + 3.5x} = \frac{QR}{2.5x} \quad \text{Substitution}$$

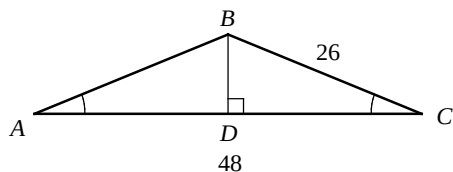
$$\frac{162}{9x} = \frac{QR}{2.5x} \quad \text{Simplify.}$$

$$9x(QR) = 162(2.5x) \quad \text{Cross Products}$$

$$9x(QR) = 405x \quad \text{Simplify.}$$

$$QR = 45$$

9. 240



Draw $\overline{BD}$ perpendicular to $\overline{AC}$. Since $\triangle ABC$ is
an isosceles triangle, $\overline{BD}$ bisects $\overline{AC}$.

Therefore, $AD = CD = \frac{1}{2}AC = \frac{1}{2}(48) = 24$.

$$CD^2 + BD^2 = BC^2 \quad \text{Pythagorean Theorem}$$

$$24^2 + BD^2 = 26^2$$

$$576 + BD^2 = 676$$

$$BD^2 = 100$$

$$BD = 10$$

$$\text{Area of } \triangle ABC = \frac{1}{2}(AC)(BD).$$

$$= \frac{1}{2}(48)(10)$$

$$= 240$$