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	

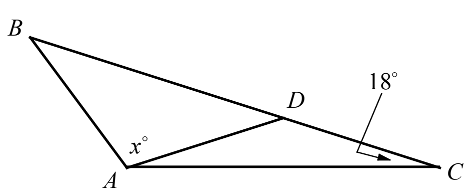
Answers and Explanations

Section 17-1

1. A

$3x-40=x+48$	Exterior Angle Theorem
$3x-40-x=x+48-x$	Subtract x from each side.
$2x-40=48$	Simplify.
$2x=88$	Add 40 to each side.
$x=44$	

2. D

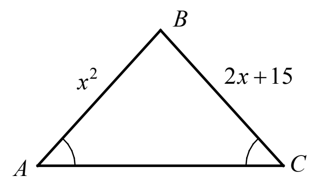


$AD=DC$	Given
$m\angle DAC=m\angle DCA=18$	Isosceles Δ Theorem
$m\angle BDA$ $=m\angle DCA+m\angle DAC$	Exterior $\angle$ Theorem
$m\angle BDA=18+18$	$m\angle DAC=m\angle DCA=18$
$m\angle BDA=36$	Simplify.
$AB=AD$	Given
$m\angle DBA=m\angle BDA=36$	Isosceles Δ Theorem

In triangle ABD, the angle sum is 180.

Thus, $x+36+36=180$.
Solving the equation for x gives $x=108$.

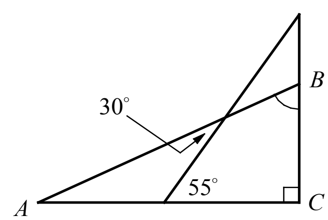
3. 5



$m\angle A=m\angle C$	Given
$AB=BC$	Isosceles Δ Theorem
$x^2=2x+15$	Substitution
$x^2-2x-15=0$	Make one side 0.
$(x+3)(x-5)=0$	Factor.
$x+3=0$ or $x-5=0$	Zero Product Property
$x=-3$ or $x=5$	

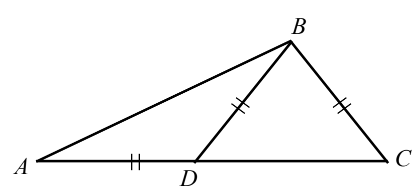
Since $x>0$, the value of x is 5.

4. D



$m\angle A+30=55$	Exterior Angle Theorem
$m\angle A=25$	
$m\angle A+m\angle B=90$	The acute $\angle s$ of a right Δ are complementary.
$25+m\angle B=90$	$m\angle A=25$.
$m\angle B=65$	

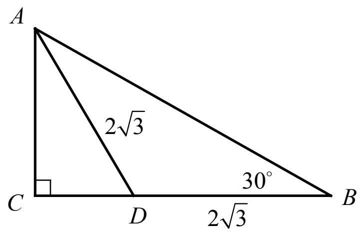
5. C



$AD=BD$	Given
$m\angle ABD=m\angle A$	Isosceles Δ Theorem
$m\angle A=26$	Given
$m\angle ABD=26$	$m\angle A=26$
$m\angle BDC$ $=m\angle A+m\angle ABD$	Exterior $\angle$ Theorem
$m\angle BDC=26+26=52$	$m\angle A=m\angle ABD=26$
$BD=BC$	Given
$m\angle C=m\angle BDC$	Isosceles Δ Theorem
$m\angle C=52$	$m\angle BDC=52$
$m\angle C+m\angle BDC+m\angle DBC=180$	Angle Sum Theorem
$52+52+m\angle DBC=180$	$m\angle C=m\angle BDC=52$
$m\angle DBC=76$	

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,

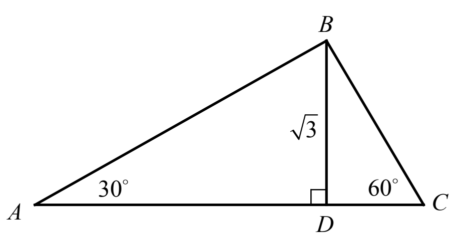
$BC = \sqrt{3}AC$

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

$3 = AC$.

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

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 ,

$BD = \sqrt{3}CD$

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

$1 = CD$

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

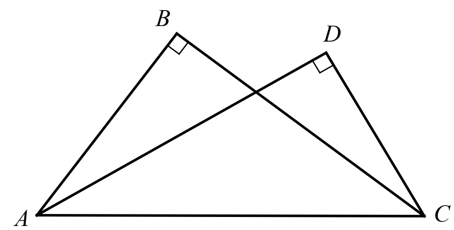
perimeter of ΔABC

$= AB + BC + AC$

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

$= 2\sqrt{3} + 6$

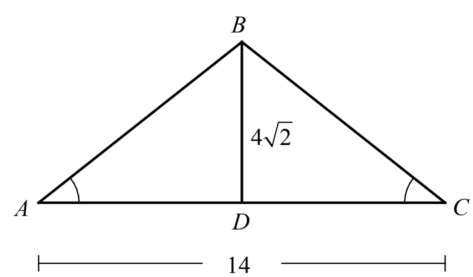
3. C



Note: Figure not drawn to scale.

$AC^2 = AB^2 + BC^2$	Pythagorean Theorem
$AC^2 = 6^2 + 8^2 = 100$	
$AC^2 = AD^2 + CD^2$	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.

$AD = CD = 7$	Definition of segment bisector
$AB^2 = BD^2 + AD^2$	Pythagorean Theorem
$AB^2 = (4\sqrt{2})^2 + 7^2$	Substitution
$= 32 + 49 = 81$	
$AB = \sqrt{81} = 9$	Square root both sides.
$AB = BC$	Isosceles Triangle Theorem

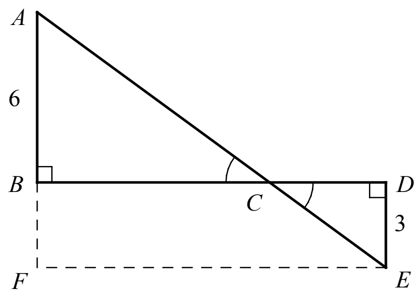
Perimeter of ΔABC

$= AB + BC + AC$

$= 9 + 9 + 14 = 32$

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.

$BD = EF = 12$ and $DE = BF = 3$

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

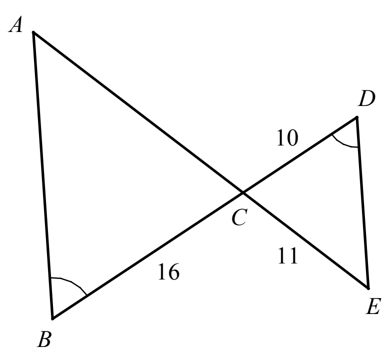
$AE^2 = AF^2 + EF^2$ Pythagorean Theorem

$= 9^2 + 12^2$

$= 225$

$AE = \sqrt{225} = 15$

2. C



Note: Figure not drawn to scale.

$\angle B \cong \angle D$ Given

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

$\Delta ACB \sim \Delta ECD$ AA similarity

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

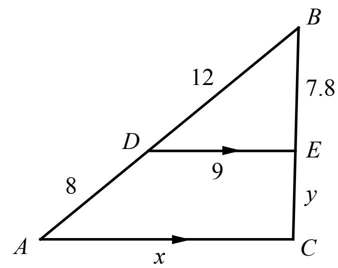
$\frac{BC}{DC} = \frac{AC}{EC}$

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

$10AC = 16 \times 11$

$AC = 17.6$

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

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

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

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

$AB^2 = AC^2 + BC^2$ Pythagorean Theorem

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

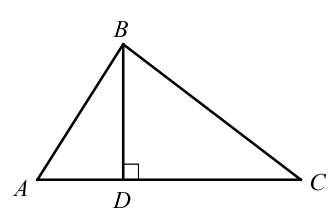
$= 289$

$AB = \sqrt{289} = 17$

Perimeter of $\Delta ABC = AB + BC + AC$

$= 17 + 15 + 8 = 40$

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 $1.5h$.

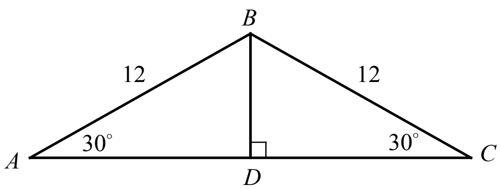
If AC was reduced by 50 percent, the new AC will be $b - 0.5b$,or $0.5b$.

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

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

Because the area of the triangle before change was $\frac{1}{2}(bh)$, the area has decreased by 25 percent.

3. C



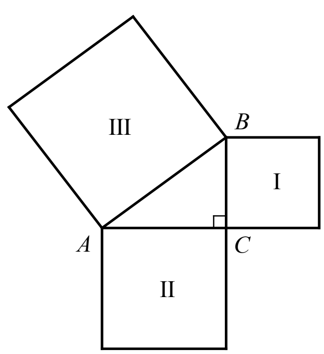
ΔABD and ΔCBD are 30°-60°-90° triangles.

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.

$AB = 2BD$
$12 = 2BD$
$6 = BD$
$AD = \sqrt{3}BD$
$AD = \sqrt{3}(6) = 6\sqrt{3}$
$AC = 2AD = 12\sqrt{3}$

Area of $\Delta ABC = \frac{1}{2}AC \cdot BD = \frac{1}{2}(12\sqrt{3})(6)$
$= 36\sqrt{3}$

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 $= AC^2 = 150$.

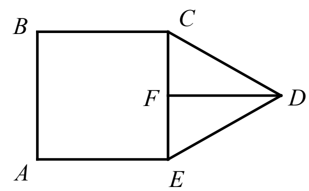
The area of square region III $= AB^2$

$AB^2 = BC^2 + AC^2$ Pythagorean Theorem
$= 80 + 150 = 230$

Therefore, the area of square region III is 230.

Chapter 17 Practice Test

1. B



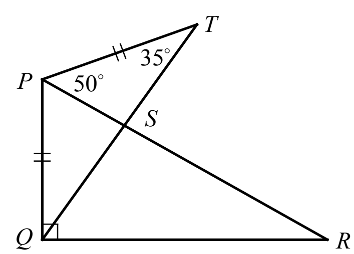
If the area of square $ABCD$ is $4x^2$, the length of the side of square $ABCD$ is $2x$.

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

$CE = 2x$
$CF = \frac{1}{2}CE = \frac{1}{2}(2x) = x$
$DF = \sqrt{3}CF = \sqrt{3}x$

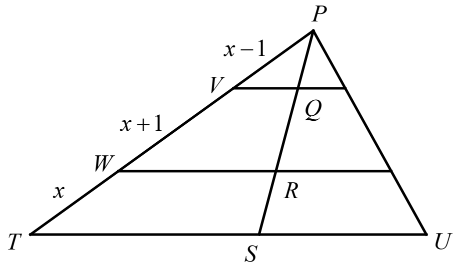
Area of $\Delta CDE = \frac{1}{2}CE \cdot DF = \frac{1}{2}(2x)(\sqrt{3}x)$
$= \sqrt{3}x^2$

2. A



$\overline{PQ} \cong \overline{PT}$	Given
$m\angle PQT = m\angle T = 35$	Isosceles Δ Theorem
$m\angle PQT + m\angle T + m\angle QPT = 180$	Angle Sum Theorem
$35 + 35 + m\angle QPT = 180$	Substitution
$m\angle QPT = 110$	
$m\angle QPT = m\angle QPR + m\angle RPT$	Angle Addition Postulate
$110 = m\angle QPR + 50$	Substitution
$60 = m\angle QPR$	
$\overline{PQ} \perp \overline{QR}$	Given
$m\angle PQR = 90$	Definition of Right $\angle$
$m\angle PQR + m\angle QPR + m\angle R = 180$	Angle Sum Theorem
$90 + 60 + m\angle R = 180$	Substitution
$m\angle R = 30$	

3. B



Note: Figure not drawn to scale.

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

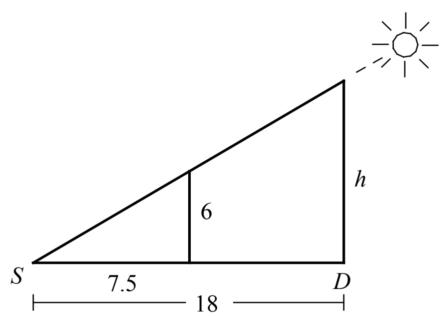
$\frac{(x-1)+(x+1)+x}{15} = \frac{x}{RS}$ Substitution

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

$3x(RS) = 15x$ Cross Products

$RS = 5$

4. C



Note: Figure not drawn to scale.

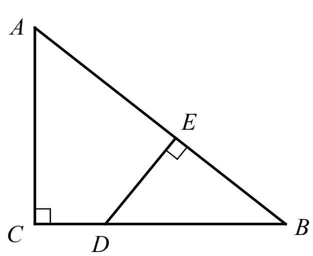
Let $h =$ the length of the pole.

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

$7.5h = 6 \times 18$ Cross Products

$h = 14.4$

5. D



$m\angle C = m\angle BED$ All right $\angle s$ are equal.

$m\angle B = m\angle B$ Reflexive Property

$\Delta ABC \sim \Delta DBE$ AA Similarity Postulate

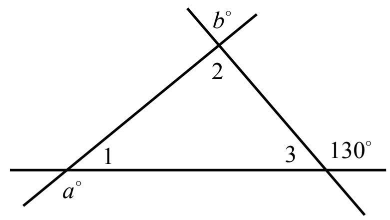
$\frac{AC}{BC} = \frac{DE}{BE}$ AA Similarity Postulate

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

$12BE = 15 \times 8$ Cross Products

$BE = 10$

6. A



$m\angle 1 + m\angle 2 + m\angle 3 = 180$ 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.

$m\angle 3 = 50$

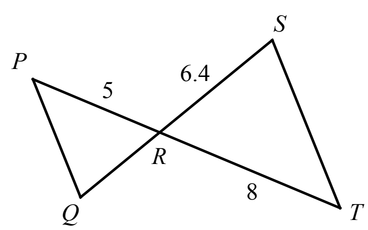
$180 - a + b + 50 = 180$ Substitution

$230 - a + b = 180$

$-a + b = -50$

$a - b = 50$

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 $\cong$.

$\Delta PRQ \sim \Delta TRS$ AA Similarity Postulate

$\frac{PR}{TR} = \frac{RQ}{RS}$ AA Similarity Postulate

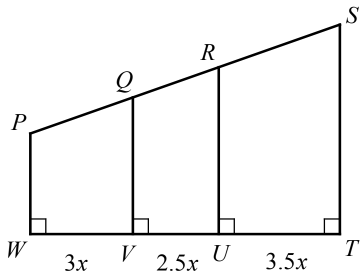
$\frac{5}{8} = \frac{RQ}{6.4}$ Substitution

$8RQ = 5 \times 6.4$ 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, $\dfrac{PS}{WT} = \dfrac{QR}{VU}$.

$\dfrac{162}{3x + 2.5x + 3.5x} = \dfrac{QR}{2.5x}$ Substitution

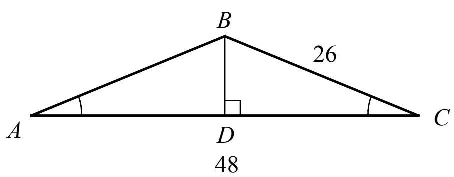
$\dfrac{162}{9x} = \dfrac{QR}{2.5x}$ Simplify.

$9x(QR) = 162(2.5x)$ Cross Products

$9x(QR) = 405x$ Simplify.

$QR = 45$

9. 240



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

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

$CD^2 + BD^2 = BC^2$ Pythagorean Theorem

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

$576 + BD^2 = 676$

$BD^2 = 100$

$BD = 10$

Area of $\Delta ABC = \dfrac{1}{2}(AC)(BD)$.

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

$= 240$