Chapter Audio Summary for McDougal Littell
Geometry

Chapter 9 Right Triangles and Trigonometry

In Chapter 9 you learned about solving problems involving similar right triangles using the geometric mean and indirect measurement. You used the Pythagorean Theorem and its converse to solve problems. You also found the lengths of sides of special right triangles. You found the sine, cosine, and tangent ratios and used them to solve real-life problems. Finally, you found the magnitude and direction of vectors and added vectors.

Turn to the lesson-by-lesson Chapter Review that starts on p. 582 of the textbook.

Lesson 9.1 Similar Right Triangles

The first goal of Lesson 9.1 is to solve problems involving similar right triangles formed by the altitude drawn to the hypotenuse of a right triangle. Remember that either leg of a right triangle can be used as the altitude in the area formula.

The second goal of Lesson 9.1 is to use a geometric mean to solve problems. The Examples show how to find the geometric mean of a triangle. Looking at the diagram, you can see that $\Delta ACB \sim \Delta CDB$, so, $\frac{DB}{CB} = \frac{CB}{AB}$. *CB* is the geometric mean of *DB* and *AB*.

Now try Exercises 1 through 3. If you need help, go to the worked-out Examples on pages 528 through 530.

Lesson 9.2 The Pythagorean Theorem

An important term to know is: *Pythagorean triple.*

The first goal of Lesson 9.2 is to prove the Pythagorean Theorem. The Example shows how to use the Pythagorean theorem to find the value of *r* given the lengths of the other two sides of the triangle. Since the triangle is a right triangle, the square of the length of the hypotenuse, or 17^2, is equal to the sum of the squares of the lengths of the legs, or $r^2 + 15^2$. You get $289 = r^2 + 225$ when you simplify. Subtracting 225 from each side gives $64 = r^2$, so $r = 8$. The side lengths 8, 15, and 17 form a Pythagorean triple because they are integers.

Keep in mind that many right triangles have side lengths that are not Pythagorean triples.

Now try Exercises 4 through 7. If you need help, go to the worked-out Examples on pages 536 and 537.

Lesson 9.3 The Converse of the Pythagorean Theorem

The first goal of Lesson 9.3 is to use the Converse of the Pythagorean Theorem to solve problems. The Converse of the Pythagorean Theorem states that for ΔABC, if $c^2 = a^2 + b^2$, then ΔABC is a right triangle.

The second goal of Lesson 9.3 is to use side lengths to classify triangles by their angle measures. Let *a*, *b,* and *c* represent the side lengths, with *c* as the length of the longest side. Notice that if $c^2 < a^2 + b^2$, the triangle is acute. $12^2 < 8^2 + 9^2$, so 8, 9, and 12 are side lengths of an *acute* triangle. If $c^2 > a^2 + b^2$, the triangle is *obtuse*.

Now try Exercises 8 through 11. If you need help, go to the worked-out Examples on pages 543 through 545.

Lesson 9.4 Special Right Triangles

An important term to know is: *special right triangles.*

The first goal of Lesson 9.4 is to find the side lengths of special right triangles, those whose measures are 45º–45º–90º or 30º –60º –90º. Notice that for a 45º–45º–90º triangle, the hypotenuse = $\sqrt{2} \bullet$ the length of a leg. The length of a leg is 6, and the length of the hypotenuse is $6\sqrt{2}$. For a 30º –60º –90º triangle, the hypotenuse = 2 $\bullet$ the shorter leg while the longer leg = $\sqrt{3} \bullet$ the shorter leg. The length of the hypotenuse, 8, is twice the length of the shorter leg, 4.

Now try Exercises 12 through 15. If you need help, go to the worked-out Examples on pages 551 through 553.

Lesson 9.5 Trigonometric Ratios

Important words to know are: *trigonometric ratio, sine, cosine, tangent,* and *angle of elevation.*

The first goal of Lesson 9.5 is to find the sine, the cosine, and the tangent of an acute angle. The Example shows how to find the sine, the cosine, and the tangent of $\angle X$. Sin *X* = the side opposite *X* divided by the length of the hypotenuse, or 20/29. Cos *X* = the side adjacent to *X* divided by the length of the hypotenuse, or 21/29. Tan *X* = the side opposite *X* divided by the side adjacent to *X*, or 20/21.

The expression sin 45º means the sine of the angle whose measure is 45º.

Now try Exercises 16 through 18. If you need help, go to the worked-out Examples on pages 558 through 561.

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Lesson 9.6 Solving Right Triangles

An important term to know is: *solve a right triangle.*

The first goal of Lesson 9.6 is to solve a right triangle. To solve ΔABC, begin by using the Pythagorean theorem to find the length of the hypotenuse. $c^2 = 10^2 + 15^2 = 325$, so $c = \sqrt{325} = 5\sqrt{13}$. Then find $m\angle A$ and $m\angle B$. Tan $A = \frac{10}{15} = \frac{2}{3}$. Use a calculator to find that $m\angle A \approx 33.7^\circ$. Then $m\angle B = 90^\circ - m\angle A$. Then $90^\circ - 33.7^\circ = 56.3^\circ$, so $m\angle B = 56.3^\circ$.

The second goal of Lesson 9.6 is to use right triangles to solve real-life problems, such as finding the glide angle and altitude of a space shuttle.

Now try Exercises 19 through 21. If you need help, go to the worked-out Examples on pages 568 and 569.

Lesson 9.7 Vectors

Important words to know are: *magnitude of a vector, direction of a vector, equal vectors, parallel vectors,* and *sum of two vectors.*

The first goal of Lesson 9.7 is to find the magnitude and the direction of a vector. The magnitude of a vector *PQ* is the distance from the initial point *P* to the terminal point *Q*, and is written |*PQ* |. If a vector is drawn in a coordinate plane, you can use the Distance Formula to find it magnitude. So, |*PQ*|= $\sqrt{(8-2)^2 + (10-2)^2} = \sqrt{6^2 + 8^2} = \sqrt{100} = 10$.

The second goal of Lesson 9.7 is to add vectors. To add vectors, find the sum of their horizontal components and the sum of their vertical components. *PQ* + *OT* = (6,8) + (8,–2) = (6 + 8, 8 + (–2)) = (14,6). Remember to pay attention to the direction of the vector when representing it with components.

Now try Exercises 22 through 25. If you need help, go to the worked-out Examples on pages 573 through 575.