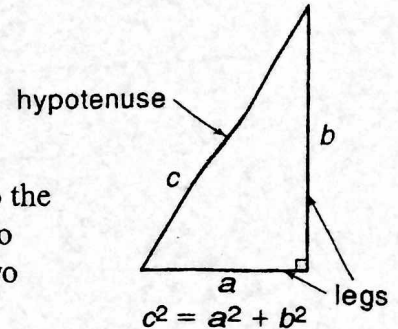# 9-4 Study Guide

The Pythagorean Theorem

The longest side of a right triangle is the **hypotenuse**.
The hypotenuse is the side opposite the right angle.
The other two sides of the triangle are the **legs**.

The **Pythagorean Theorem** relates the lengths of the sides of a right
triangle: For any right triangle, the square of the hypotenuse is equal to the
sum of the squares of the legs. You can use the Pythagorean Theorem to
find the length of a side of a right triangle if the lengths of the other two
sides are known.

hypotenuse

b

c

a

legs

$c^2 = a^2 + b^2$

Examples

1 If $a = 30$ and $b = 40$, find c.

$$c^2 = a^2 + b^2$$
$$c^2 = 30^2 + 40^2$$
$$c^2 = 900 + 1,600$$
$$c^2 = 2,500$$
$$c = \sqrt{2,500}$$
$$c = 50$$

The length of the hypotenuse is
50 units.

2 If $c = 20$ and $a = 15$, find b.

$$c^2 = a^2 + b^2$$
$$20^2 = 15^2 + b^2$$
$$400 = 225 + b^2$$
$$400 - 225 = b^2$$
$$175 = b^2$$
$$\sqrt{175} = b$$
$$13.228757 = b$$

The length of the leg is 13.2 units.

The converse of the Pythagorean Theorem can be used to test whether a
triangle is a right triangle: If the sides of a triangle have lengths a, b, and c
units such that $c^2 = a^2 + b^2$, then the triangle is a right triangle.

Find the missing measure for each right triangle. Round decimal answers to the nearest tenth.

1. $a = 8$ m; $c = 10$ m

2. $a = 5$ ft, $b = 12$ ft

3. $b = 15$ cm, $c = 25$ cm

4. $a = 7$ km, $c = 12$ km

5. $a = 8$ yd, $b = 11$ yd

6. $b = 14$ in., $c = 20$ in.

Determine whether each triangle with sides of given lengths is a right triangle.
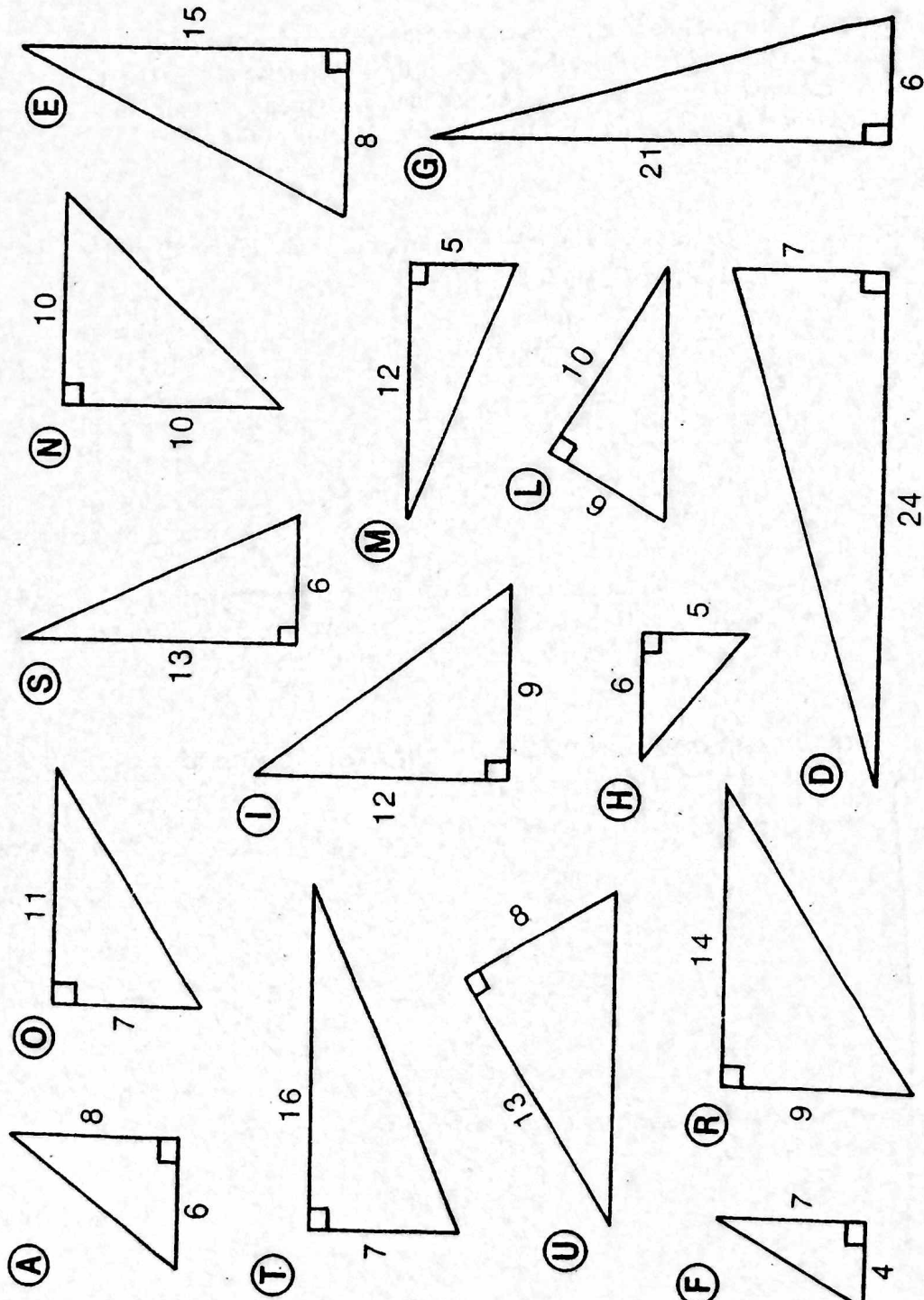
7. 20, 21, 29

8. 7, 24, 25

9. 9, 11, 14

Why Did The Cow Hate The Farmer?

Figure out the length of the hypotenuse of any right triangle below. Find your answer in the answer column and notice the number to the left of it. Each time this number appears in the code, write the letter of the triangle above it. Keep working and you will decode the answer to the title question.

ANSWERS

① $\sqrt{169}$ = 13
② $\sqrt{625}$ = 25
③ $\sqrt{305}$ ÷ 17.5
④ $\sqrt{277}$ ÷ 16.7
⑤ $\sqrt{100}$ ÷ 10
⑥ $\sqrt{233}$ ÷ 15.3
⑦ $\sqrt{289}$ = 17
⑧ $\sqrt{136}$ ÷ 11.7
⑨ $\sqrt{65}$ ÷ 8.06
⑩ $\sqrt{200}$ ÷ 14.1
⑪ $\sqrt{170}$ ÷ 13.0
⑫ $\sqrt{61}$ ÷ 7.81
⑬ $\sqrt{477}$ ÷ 21.8
⑭ $\sqrt{205}$ ÷ 14.3
⑮ $\sqrt{225}$ = 15

3−12−7−9−5−4−1−7−4−12−5−2−10−11−4−7−13−5−4−2−9−11−4−3−12−7−9−7−7−8−15−10−13−11−9−6−2−2−7−4−1