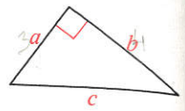
Exercises

A Copy and complete the table.

	1.	2.	3.	4.	5.	6.	7.	8.
a	3	?	5	?	11	$3n$	?	6
b	4	8	?	15	?	$4n$	$3\sqrt{2}$	$6\sqrt{3}$
c	?	10	13	17	61	?	6	?



Draw a figure for each exercise. The length and width of a rectangle are given. Find the length of a diagonal.

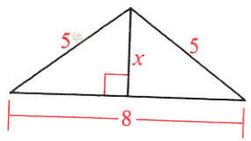
9. 8 and 6 **10.** 0.8 and 0.6 **11.** 80 and 60 **12.** $\sqrt{3}$ and 1

The length of a diagonal of a square is given. Find the length of a side of the square.

13. 2 **14.** 10 **15.** $20k$ **16.** $7n\sqrt{2}$

Find the value of x in each figure.

B **17.**



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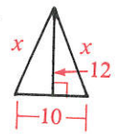

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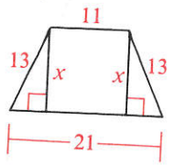

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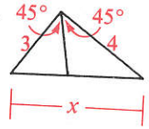

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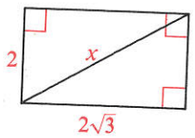

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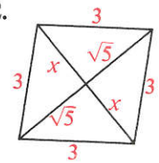

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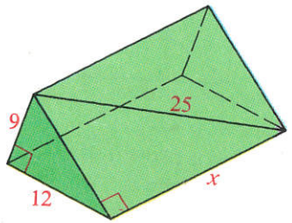

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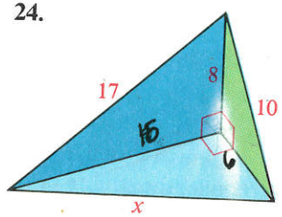
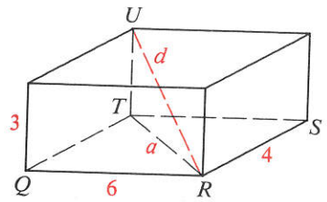
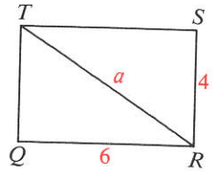


In Exercises 25–30, the dimensions of a rectangular box are given. Find the length of a diagonal of the solid.

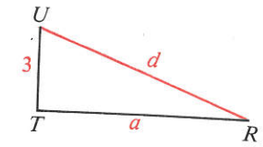
Example Dimensions 6, 4, 3

Solution





$a^2 = 6^2 + 4^2$
$a^2 = 36 + 16$
$a^2 = 52$



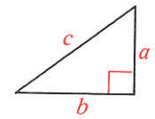
$d^2 = a^2 + 3^2$
$d^2 = 52 + 9$
$d^2 = 61$
$d = \sqrt{61}$

25. 12, 4, 3 **26.** 5, 5, 2 **27.** $\sqrt{7}$, $\sqrt{6}$, $\sqrt{5}$

28. e, e, e **29.** l, w, h **30.** $n + 2$, $\sqrt{2n + 1}$, 2

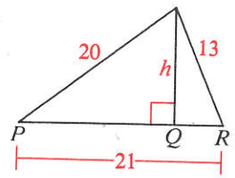
31. See Classroom Exercise 20. State and prove a theorem about a side opposite an acute angle in any triangle.

C **32.** Given: A rt. $\triangle$ with sides a, b, c;
b is the arithmetic mean of a and c.
Prove: $a:b:c = 3:4:5$



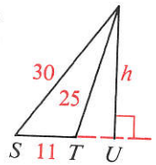
Find the value of h.

33.



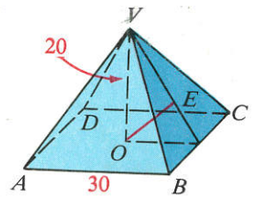
(*Hint:* Let $PQ = x$; $QR = 21 - x$. Use two right triangles.)

34.



(*Hint:* Let $TU = x$; $SU = x + 11$.)

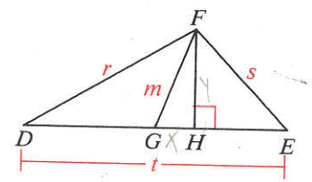
35. O is the *center* of square $ABCD$ (the point of intersection of the diagonals) and $\overline{VO}$ is perpendicular to the plane of the square. Find OE, the distance from O to the plane of $\triangle VBC$.



36. Given: $\triangle DEF$ with median $\overline{FG}$

Prove: $m = \frac{1}{2}\sqrt{2r^2 + 2s^2 - t^2}$

(*Hint:* Draw the perpendicular from F to $\overline{DE}$. Let $GH = x$ and $FH = y$.)

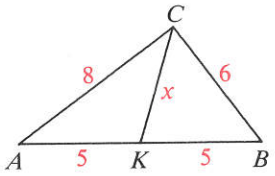


For Exercises 8–10, refer to the figures below.

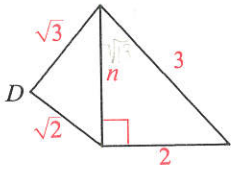
8. Explain why x must equal 5.

9. Explain why $\angle D$ must be a right angle.

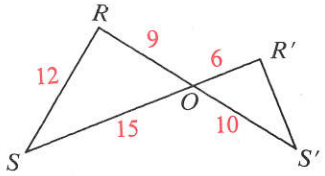
10. Explain why $\angle R'$ must be a right angle.



Ex. 8



Ex. 9



Ex. 10

Written Exercises

Tell whether a triangle formed with sides having the lengths named is acute, right, or obtuse. When it isn't possible to decide, write *can't tell.*

A

1. 11, 11, 15

2. 9, 9, 13

3. 8, $8\sqrt{3}$, 16

4. 0.03, 0.04, 0.05

5. 300, 400, 501

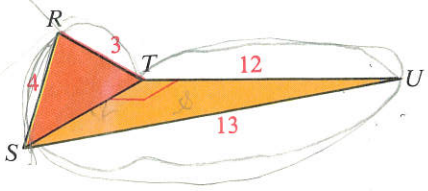
6. 0.6, 0.8, 1

7. $5n$, $12n$, $13n$ where $n > 0$

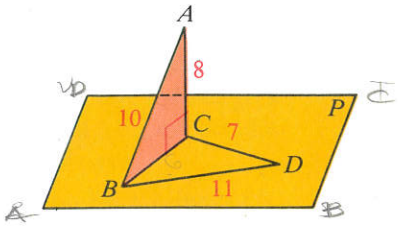
8. $n + 4$, $n + 5$, $n + 6$ where $n \geq 1$

9. $7 - n$, 7, $7 + n$ where $0 < n \leq 3$

10. Given: $\angle UTS$ is a rt. $\angle$.
Explain why $\triangle TRS$ must be a right triangle.



11. Given: $\overline{AC} \perp$ plane P
Explain why $\triangle BCD$ must be an obtuse triangle.



B

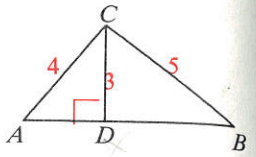
12. Sketch $\square ABCD$ with $AB = 13$, $AC = 24$, and $BD = 10$. What special kind of parallelogram is $ABCD$? Explain your answer.

13. Sketch $\square RSTU$, with diagonals intersecting at M. $RS = 9$, $ST = 20$, and $RM = 11$. Which segment is longer, $\overline{SM}$ or $\overline{RM}$? Explain your answer.

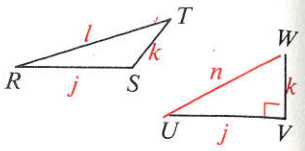
14. Given: A triangle with sides a, b, c;
$a = n^2 - 1$; $b = 2n$; $c = n^2 + 1$
Prove: The triangle is a rt. $\triangle$.

15. The sides of a triangle have lengths x, $x + 4$, and 20. Specify those values of x for which the triangle is acute with longest side 20.

16. Is $\triangle ABC$ acute, right, or obtuse? Explain your answer.

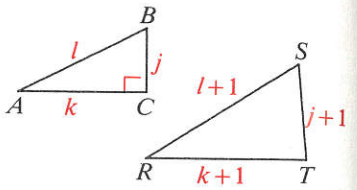


C **17.** Write a plan for the proof of Theorem 6–4.
Given: $\triangle RST$; $l^2 > j^2 + k^2$
Prove: $\triangle RST$ is an obtuse triangle.
(*Hint*: Start by drawing right $\triangle UVW$ with legs j and k. Compare lengths l and n.)

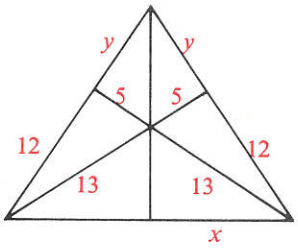


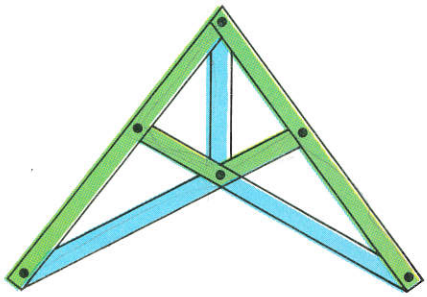
18. Write a plan for the proof of Theorem 6–5.

19. Given: $\triangle ABC$ and $\triangle RST$, with sides having the lengths shown; $\angle C$ is a rt. $\angle$.
Prove: $\triangle RST$ is an acute $\triangle$.



20. Find the values of x and y. *Note:* A frame in this shape, like the simple *scissors truss* shown at the right below, can be used to support a peaked roof. The weight of the roof compresses some parts of the frame (green), while other parts are in tension (blue). A frame made with s segments joined at j points is stable if $s \geq 2j - 3$. In the truss shown, 9 segments connect 6 points. Verify that the truss is stable.





COMPUTER KEY-IN

Suppose a, b, and c are positive integers such that $a^2 + b^2 = c^2$. Then the converse of the Pythagorean Theorem guarantees that a, b, and c are the lengths of the sides of a right triangle. Because of this, any such triple of integers is called a **Pythagorean triple.**

For example, 3, 4, 5 is a Pythagorean triple since $3^2 + 4^2 = 5^2$. Another triple is 6, 8, 10, since $6^2 + 8^2 = 10^2$. The triple 3, 4, 5 is called a *primitive* Pythagorean triple because no factor (other than 1) is common to all three integers. 6, 8, 10 is *not* a primitive triple.