

Triangle Ratio Tracks

Use parallel segments to unlock side lengths.

HIGH SCHOOL • HSG-SRT.B.4

CCSS.Math.Content.HSG-SRT.B.4 "Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity."

NAME _____

DATE _____

PARALLEL SEGMENT RULE

When a segment inside a triangle is parallel to the third side, it divides the other two sides in the same ratio. If the two pairs of side segments have equal ratios, the converse tells you that the connecting segment is parallel to the third side.

WORKED EXAMPLE

In triangle RST, U lies on RS and V lies on RT. UV is parallel to ST. If $RU = 5$, $US = 7$, and $RV = 15$, find VT.

1. Because UV is parallel to ST, $RU/US = RV/VT$.
2. Write the proportion: $5/7 = 15/x$.
3. Cross multiply: $5x = 105$.
4. Solve: $x = 21$.

Answer: VT = 21

PRACTICE 6 problems

- 1** In triangle ABC, D lies on AB and E lies on AC. DE is parallel to BC. If $AD = 3$, $DB = 8$, and $AE = 9$, find EC.

ANSWER _____

- 2** In triangle ABC, D lies on AB and E lies on AC. DE is parallel to BC. If $AD = 12$, $DB = 18$, and $EC = 20$, find AE.

ANSWER _____

- 3** In triangle ABC, D lies on AB and E lies on AC. DE is parallel to BC. If $AB = 35$, $AD = 14$, and $AC = 30$, find AE.

ANSWER _____

- 4** In triangle ABC, D lies on AB and E lies on AC. $AD = 16$, $DB = 24$, $AE = 18$, and $EC = 27$. Is DE parallel to BC?

ANSWER _____

- 5** In triangle ABC, D lies on AB and E lies on AC. DE is parallel to BC. If $AB = 32$, $AD = 8$, and $BC = 44$, find DE.

ANSWER _____

- 6** In triangle ABC, D lies on AB and E lies on AC. DE is parallel to BC. If $AD = x$, $DB = 18$, $AE = 14$, and $EC = 28$, find x.

ANSWER _____

APPLY IT Show your work

- 1** A student crew builds a triangular stage backdrop shaped like triangle ABC. A brace DE connects sides AB and AC and is parallel to base BC. If $AD = 10$ ft, $DB = 26$ ft, and $AE = 25$ ft, what is EC?

WORK SPACE

ANSWER _____

- 2** A BMX ramp has a triangular side shaped like triangle ABC. A painted stripe DE is parallel to the ground, BC, and crosses AB at D and AC at E. If $AB = 39$ in., $AD = 13$ in., and $BC = 48$ in., find DE.

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

In right triangle ABC, angle C is 90 degrees. Altitude CD meets hypotenuse AB at D. Let $AD = m$, $DB = n$, $AC = b$, $BC = a$, and $AB = c$. Use triangle similarity to explain why $a^2 + b^2 = c^2$.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	In triangle ABC, D lies on AB and E lies on AC. DE is parallel to BC. If $AD = 3$, $DB = 8$, and $AE = 9$, find EC.	EC = 24
2	In triangle ABC, D lies on AB and E lies on AC. DE is parallel to BC. If $AD = 12$, $DB = 18$, and $EC = 20$, find AE.	AE = 40/3
3	In triangle ABC, D lies on AB and E lies on AC. DE is parallel to BC. If $AB = 35$, $AD = 14$, and $AC = 30$, find AE.	AE = 12
4	In triangle ABC, D lies on AB and E lies on AC. $AD = 16$, $DB = 24$, $AE = 18$, and $EC = 27$. Is DE parallel to BC?	Yes, DE is parallel to BC.
5	In triangle ABC, D lies on AB and E lies on AC. DE is parallel to BC. If $AB = 32$, $AD = 8$, and $BC = 44$, find DE.	DE = 11
6	In triangle ABC, D lies on AB and E lies on AC. DE is parallel to BC. If $AD = x$, $DB = 18$, $AE = 14$, and $EC = 28$, find x.	x = 9

PART 2 • APPLY IT

- EC = 65 ft** Use $AD/DB = AE/EC$. Then $10/26 = 25/EC$, so $EC = 65$ ft.
- DE = 16 in.** The small triangle is similar to triangle ABC, so $AD/AB = DE/BC$. Then $13/39 = DE/48$, so $DE = 16$ in.

CHALLENGE

Similarity gives $b^2 = cm$ and $a^2 = cn$. Adding gives $a^2 + b^2 = c(m + n) = c^2$ because $m + n = c$.

Accept equivalent proportions and fraction forms. For the converse problem, students should show that the two segment ratios are equal before concluding that the connecting segment is parallel to the third side.