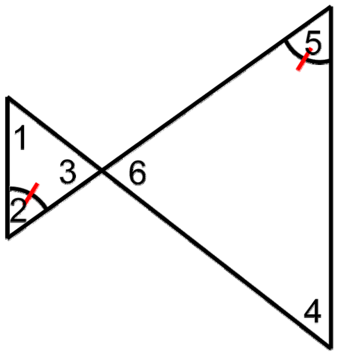
1. Answer: The triangles are similar
   Detailed Solution:

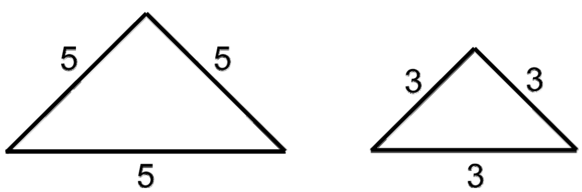


Since $\angle 2 \cong \angle 5$
$\angle 3 \cong \angle 6$ by vertical angles

The two triangles are similar by Postulate 2.2.1: If two angles of a triangle are congruent to two angles of another triangle, then the triangles are similar.

2. The triangles are similar.

3. Answer: The triangles are similar
   Detailed Solution:

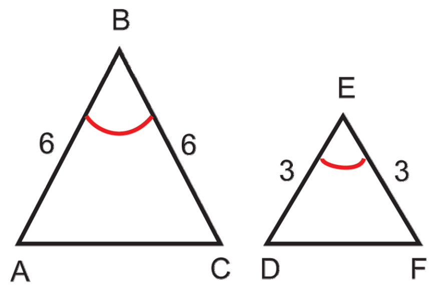


$$\frac{5}{3} = \frac{5}{3} = \frac{5}{3}$$

The two triangles are similar by Theorem 2.2.2: The ratio of the lengths of corresponding sides of two triangles are equal if and only if the triangles are similar.

4. The triangles are similar.

5. Answer: The triangles are similar
   Detailed Solution:



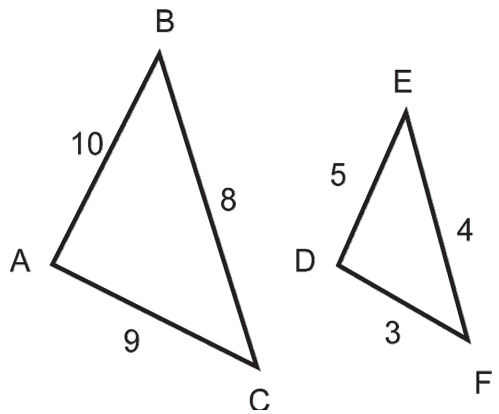
$$\frac{6}{3} = \frac{6}{3} = 2$$

$\angle B \cong \angle E$

The two triangles are similar by Theorem 2.2.3: If two ratios of the lengths of corresponding sides of two triangles are equal and the included angles are congruent, then the two triangles are similar.

6. The triangles are similar.

7. Answer: The triangles are not similar
Detailed Solution:

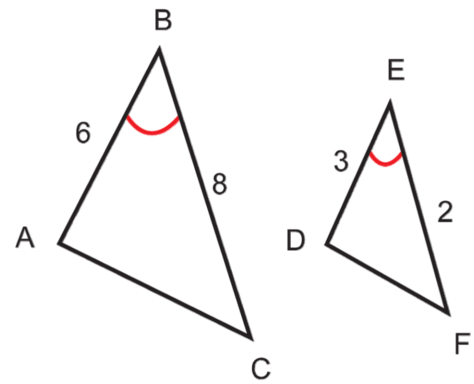


$\frac{10}{5} = 2, \quad \frac{8}{4} = 2, \quad \frac{9}{3} = 3$

Since all of the ratios are not equal, the triangles are not similar.

8. The triangles are not similar.

9. Answer: The triangles are not similar
Detailed Solution:

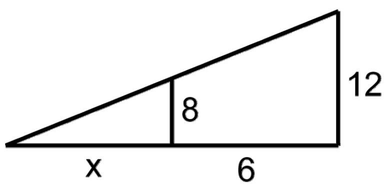


$\frac{6}{3} = 2, \quad \frac{8}{2} = 4$

Since all of the ratios are not equal, the triangles are not similar.

10. The triangles are not similar.

11. Answer: x = 12 units
Detailed Solution:



$$\frac{12}{8} = \frac{6+x}{x}$$

12x = 8(6 + x)

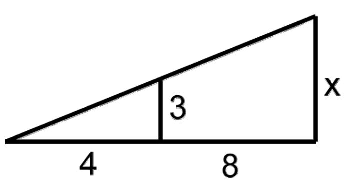
12x = 48 + 8x

4x = 48

x = 12

12. x = 7.8 units

13. Answer: x = 9
Detailed Solution:



$$\frac{x}{3} = \frac{8+4}{4}$$

$$\frac{x}{3} = \frac{12}{4}$$

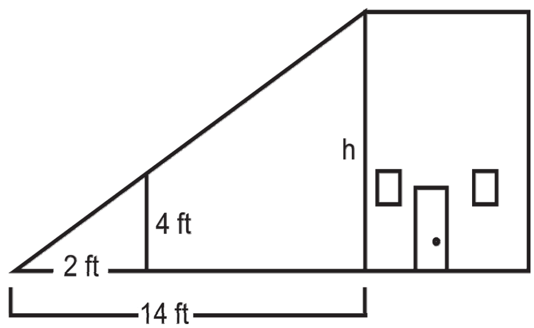
4x = 3•12

4x = 36

x = 9

14. x = 15 units

15. Answer: 28 feet
Detailed Solution:
Let h be the height of the house.



$$\frac{h}{4} = \frac{14}{2}$$

2h = 4•14

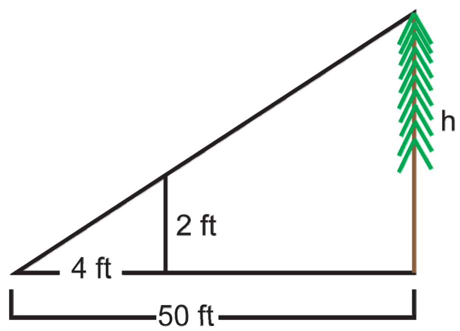
2h = 56

h = 28

Therefore, the house is 28 feet tall.

16. The house is 36 feet tall.

17. Answer: 25 feet
Detailed Solution:
Let h be the height of the tree.



$$\frac{h}{2} = \frac{50}{4}$$

$4h = 2 \bullet 50$

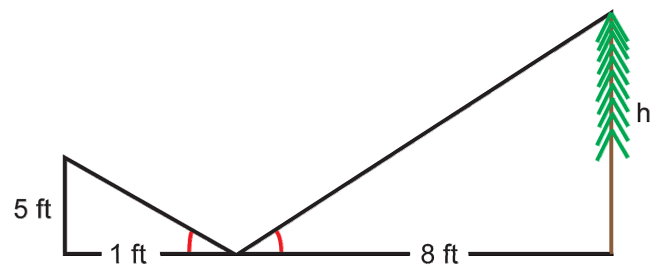
$4h = 100$

$h = 25$

Therefore, the tree is 25 feet tall.

18. The tree is 27.5 feet tall.

19. Answer: 40 feet
Detailed Solution:
Let h be the height of the tree.



$$\frac{8}{1} = \frac{x}{5}$$

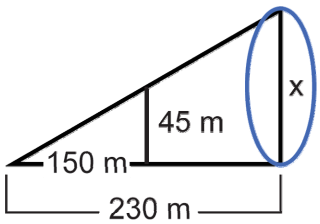
$x = 8 \bullet 5$

$x = 40$

Therefore, the tree is 40 feet tall.

20. The tree is 27 feet tall.

21. Answer: x = 69 meters
Detailed Solution:
Find x.



$$\frac{x}{45} = \frac{230}{150}$$

$150x = 45 \cdot 230$

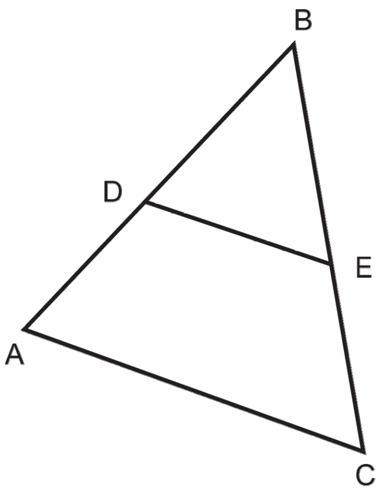
$150x = 10350$

x = 69 meters

22. x = 120 meters

23. Prove theorem 2.1.2 using similar triangles:

If the mid-segment is drawn in a triangle, then it is parallel to the side that is not included in the mid-segment.



Given: $\overline{DE}$ is the mid-segment

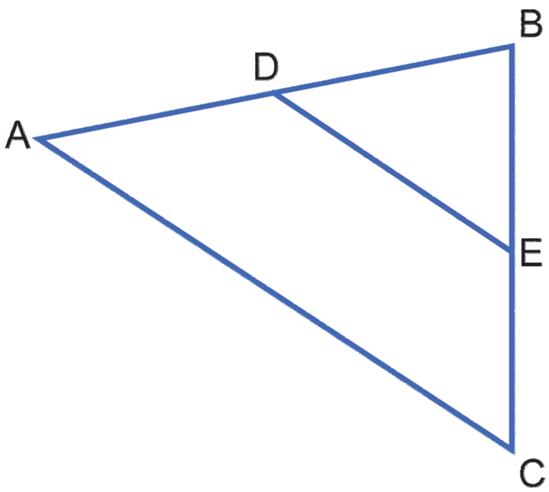
Prove: $\overline{DE} \parallel \overline{AC}$

23. Continued:

Statement	Reason
1. $\overline{DE}$ is the mid-segment.	1. Given.
2. D is the midpoint of $\overline{AB}$. E is the midpoint of $\overline{CB}$.	2. Definition of mid-segment.
3. AD = BD CE = EB	3. Definition of midpoint.
4. AD + DB = AB CE + EB = CB	4. Definition of segment addition.
5. DB + DB = AB EB + EB = CB	5. Substitution from lines 3 and 4.
6. 2DB = AB 2EB = AB	6. Combine like terms.
7. $DB = \frac{AB}{2}$, $EB = \frac{CB}{2}$	7. Division by 2.
8. $\frac{DB}{AB}$, $\frac{EB}{CB}$	8. Ratios of the triangles ABC and DBE.
9. $\frac{DB}{AB} = \frac{AB}{2AB}$, $\frac{EB}{CB} = \frac{CB}{2CB}$	9. Substitution from line 7.
10. $\frac{DB}{AB} = \frac{1}{2}$, $\frac{EB}{CB} = \frac{1}{2}$	10. Cancel like terms.
11. $\frac{DB}{AB} = \frac{EB}{CB}$	11. Substitution from line 10.
12. $\angle B \cong \angle B$	12. Reflexive property.
13. $\Delta ABC \sim \Delta DBE$	13. SAS similarity.
14. $\angle A \cong \angle BDE$	14. Theorem 2.2.1: Two triangles are similar if and only if at least two sets of corresponding angles are congruent.
15. $\overline{DE} \parallel \overline{AC}$	15. Postulate 1.6.3: If two lines are cut by a transversal and a pair of corresponding angles are congruent, then the lines are parallel.

24. Prove theorem 2.1.3 using similar triangles:

If the mid-segment is drawn in a triangle, then it is half the length of the side not included in the mid-segment.



Given: $\overline{DE}$ is the mid-segment

Prove: $DE = \frac{1}{2}AC$

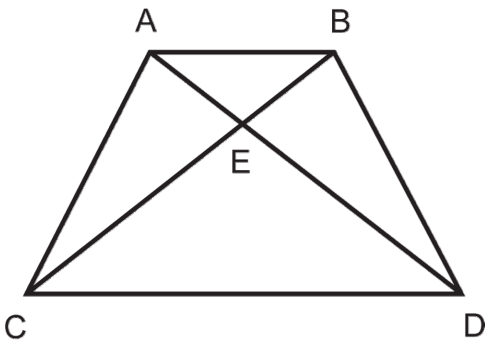
24. Continued:

Statement	Reason
1. $\overline{DE}$ is the mid-segment.	1. Given.
2. D is the midpoint of $\overline{AB}$. E is the midpoint of $\overline{CB}$.	2. Definition of mid-segment.
3. AD = BD CE = EB	3. Definition of midpoint.
4. AD + DB = AB CE + EB = CB	4. Definition of segment addition.
5. DB + DB = AB EB + EB = CB	5. Substitution from line 3.
6. 2DB = AB 2EB = AB	6. Combine like terms.
7. $DB = \frac{AB}{2},\ EB = \frac{CB}{2}$	7. Division by 2.
8. $\frac{DB}{AB}, \frac{EB}{CB}$	8. Ratios of the triangles ABC and DBE.
9. $\frac{DB}{AB} = \frac{AB}{2AB}, \frac{EB}{CB} = \frac{CB}{2CB}$	9. Substitution from line 7.
10. $\frac{DB}{AB} = \frac{1}{2}, \frac{EB}{CB} = \frac{1}{2}$	10. Cancel like terms.
11. $\frac{DB}{AB} = \frac{EB}{CB}$	11. Substitution from line 10.
12. $\angle B \cong \angle B$	12. Reflexive property.
13. $\Delta ABC \sim \Delta DBE$	13. SAS similarity.
14. $\frac{DB}{AB} = \frac{DE}{AC}$	14. Theorem 2.2.2: The ratio of the lengths of corresponding sides of two triangles are equal if and only if the triangles are similar.
15. $\frac{DB}{AB} = \frac{1}{2}$	15. From line 10.
16. $\frac{DE}{AC} = \frac{1}{2}$	16. Substitution from line 14 & 15.
17. $DE = \frac{1}{2}AC$	17. Multiply both sides by AC.

25.

Given: $\overline{AB} \parallel \overline{CD}$

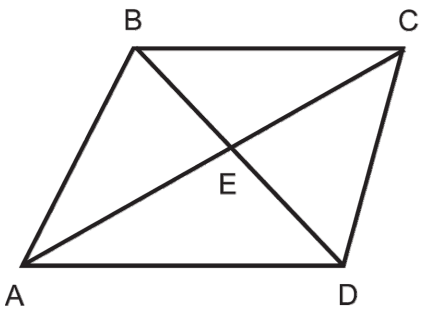
Prove: $\Delta ABE \sim \Delta DEC$



Statement	Reason
1. $\overline{AB} \parallel \overline{CD}$	1. Given.
2. $\angle ABE \cong \angle ECD$	2. Theorem 1.6.1: If two parallel lines are cut by a transversal, then the alternate interior angles are congruent.
3. $\angle BAE \cong \angle CDE$	3. Theorem 1.6.1: If two parallel lines are cut by a transversal, then the alternate interior angles are congruent.
4. $\Delta AEB \sim \Delta DEC$	4. Postulate 2.2.1: If two angles of a triangle are congruent to two angles of another triangle, then the triangles are similar.

26. Given: $\overline{AB} \parallel \overline{CD}$

Prove: $\Delta ABE \sim \Delta CDE$

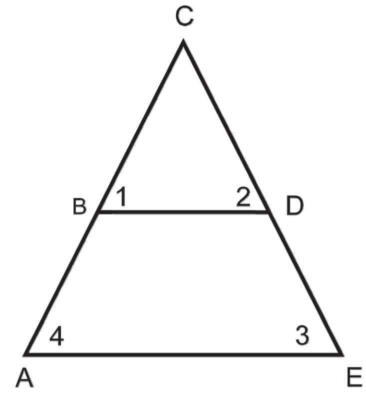


Statement	Reason
1. $\overline{AB} \parallel \overline{CD}$	1. Given.
2. $\angle ABE \cong \angle ECD$	2. Theorem 1.6.1: If two parallel lines are cut by a transversal, then the alternate interior angles are congruent.
3. $\angle BEA$ & $\angle CED$ are vertical angles	3. Definition of vertical angles.
4. $\angle BEA \cong \angle CED$	4. Theorem 1.2.1: If two angles are vertical angles, then they are congruent.
5. $\Delta ABE \sim \Delta CDE$	5. Postulate 2.2.1: If two angles of a triangle are congruent to two angles of another triangle, then the triangles are similar.

27.

Given: $\frac{BA}{CB} = \frac{DE}{CD}$

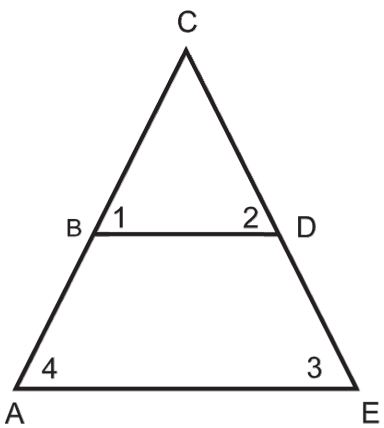
Prove: $\overline{BD} \parallel \overline{AE}$



Statement	Reason
1. $\frac{BA}{CB} = \frac{DE}{CD}$	1. Given.
2. CA = CB + BA CE = CD + DE	2. Definition of segment addition.
3. BA = CA - CB DE = CE - CD	3. Subtration property.
4. $\frac{CA - CB}{CB} = \frac{CE - CD}{CD}$	4. Substitiution from lines 1 and 3.
5. $\frac{CA}{CB} - \frac{CB}{CB} = \frac{CE}{CD} - \frac{CD}{CD}$	5. Fraction subtraction.
6. $\frac{CA}{CB} - 1 = \frac{CE}{CD} - 1$	6. Property of 1.
7. $\frac{CA}{CB} = \frac{CE}{CD}$	7. Addition of 1 to both sides.
8. $\angle C \cong \angle C$	8. Reflexive.
9. $\Delta CBD \sim \Delta CAE$	9. SAS similarity.
10. $\angle 1 \cong \angle 4$	10. AA similarity.
11. $\overline{BD} \parallel \overline{AE}$	11. Postulate 1.6.3: If two lines are cut by a transversal and a pair of corresponding angles are congruent, then the two lines are parallel.

28.
Given: $\overline{BD} \cong \overline{AE}$

Prove: $\frac{BA}{CB} = \frac{BA}{CD}$



Statement	Reason
1. $\overline{BD} \cong \overline{AE}$	1. Given.
2. $\angle 1 \cong \angle 4$ $\angle 2 \cong \angle 3$	2. Postulate 1.6.1: If two parallel lines are cut by a transversal, then the corresponding angles are congruent.
3. $\angle C \cong \angle C$	3. Reflexive.
4. $\Delta CBD \sim \Delta CAE$	4. AA Similarity.
5. $\frac{BA}{CB} = \frac{BA}{CD}$	5. Theorem 2.2.2: The ratio of the lengths of corresponding sides of two triangles are equal if and only if the triangles are similar.