12. Theorem 7-4: Side-Splitter Theorem

$\frac{12}{9} = \frac{2x}{x+4}$ Cross Multiply and distribute $12(x+4) = 9(2x)$

$12x + 48 = 18x$

Subtract 12x from both sides $48 = 6x$

Divide both sides by 6 $8 = x$

18. Theorem 7-4: Side-Splitter Theorem

$\frac{12}{8} = \frac{24-x}{x}$ Cross Multiply and distribute $12x = 8(24-x)$

$12x = 192 - 8x$

Add 8x to both sides $20x = 192$

Divide both sides by 20 $x = 9.6$

22. Theorem 7-5: Triangle-Angle-Bisector Theorem

$\frac{x}{6-x} = \frac{6}{4}$ Cross Multiply and distribute $4x = 6(6-x)$

$4x = 36 - 6x$

Add 6x to both sides $10x = 36$

Divide both sides by 10 $x = 3.6$

28. SQ; Theorem 7-4: Side-Splitter Theorem

34. Theorem 7-5: Triangle-Angle-Bisector Theorem

$\frac{5x}{6x} = \frac{7x}{10x-4}$ Cross Multiply and distribute $5x(10x-4) = 6x(7x)$

$50x^2 - 20x = 42x^2$

Subtract $42x^2$ from both sides $8x^2 - 20x = 0$

Factor out a 4x from both terms $4x\,(2x-5)=0$

set each factor equal to zero to solve $4x = 0$ $2x - 5 = 0$

$x = 0$ $2x = 5$ so $x = 2.5$

Zero does not make sense as a triangle side length, so $x = 2.5$

40. If the lines are to be parallel, by the Theorem 7-5: Triangle-Angle-Bisector Theorem, the proportion will have to be true.

$\frac{16}{20} = \frac{12}{15}$ Cross Multiply and simplify 16 * 15 = 20 * 12

240 = 240

Therefore, the lines are parallel.

45. 7-5: Triangle-Angle-Bisector Theorem

$\frac{7.2}{FC} = \frac{9}{6}$ Cross Multiply and simplify 7.2 * 6 = 9 * FC

Simplify 43.2 = 9 * FC

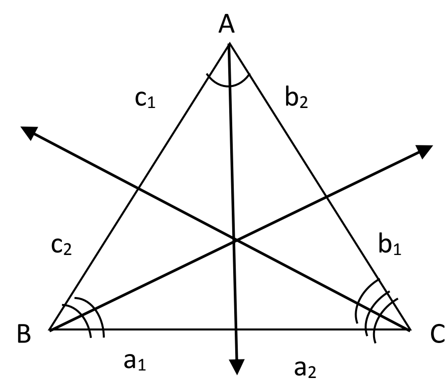
Divide both sides by 9 4.8 = FC

Theorem 7-4: Side-Splitter Theorem

$\frac{7.2}{4.8} = \frac{7.8}{x}$ Cross Multiply and simplify $7.2x = 4.8 * 7.8$
$7.2x = 37.44$

divide both sides by 7.2 $x = 5.2$

46. Given that a // b // c, by Theorem 7-4: Side-Splitter Theorem $\frac{AB}{BC} = \frac{WP}{PC}$ and $\frac{WP}{PC} = \frac{WX}{XY}$; by the Transitive Property, $\frac{AB}{BC} = \frac{WX}{XY}$.



50. a. $\frac{16}{20} = \frac{a1 + a2}{18 + c2}$ and $\frac{18}{c2} = \frac{16 + 20}{a1 + a2}$

Cross multiply $\frac{16(18 + c2)}{20} = \overline{a1 + a2}$

and $\frac{a1 + a2}{} = \frac{c2(16 + 20)}{18}$

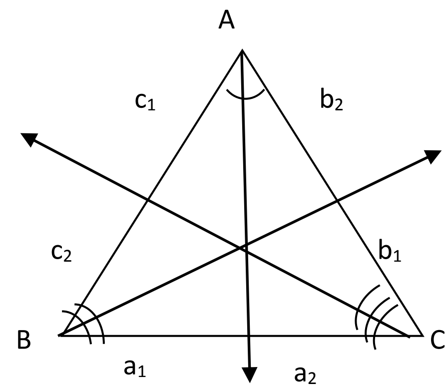
by substitution $\frac{16(18 + c2)}{20} = \frac{c2(16 + 20)}{18}$ cross multiply $18*16(18 + c_2) = 20c_2(36)$

distribute $5184 + 288c_2 = 720c_2$ subtract $5184 = 432\ c_2$ divide $12 = c_2$

so $\frac{16}{20} = \frac{a1 + a2}{30}$ and $\frac{30}{36} = \frac{a1}{a2}$ cross multiply 480/20 = a1 + a2 and a2*5/6 = a1

substitute: 24 = a2 * 5/6 + a2 24 = a2 * 11/6 so a2 = 144/11 so a1 = 120/11

Therefore, Perimeter = 16 + 20 + 18 + 12 + 144/11 + 120/11 = 66 + 264/11 = 90



50. b. $\frac{5/3}{10/3} = \frac{c1 + c2}{15/4 + b2}$ and $\frac{15/4}{b2} = \frac{5/3 + 10/3}{c1 + c2}$

Cross multiply $\frac{5/3(15/4 + b2)}{10/3} = c1 + c2$

and $c1 + c2 = \frac{b2(5/3 + 10/3)}{15/4}$

by substitution $\frac{15/4 + b2}{2} = \frac{5b2}{15/4}$ cross multiply 225/16 + 15/4b_2 = 10b_2

subtract 225/16 = 25/4 b_2 divide 9/4 = b_2

so $\frac{5/3}{10/3} = \frac{c1 + c2}{6}$ and $\frac{6}{5} = \frac{c1}{c2}$ cross multiply 3 = c1 + c2 and c2*6/5 = c1

substitute: 3 = c2 * 6/5 + c2 3 = c2 * 11/5 so c2 = 15/11 so c1 = 18/11

Therefore, Perimeter = 5/3 + 10/3 + 15/4 + 9/4 + 15/11 + 18/11 = 5 + 6 + 3 = 14

51. Theorem 7-4: Side-Splitter Theorem

$\frac{30}{12} = \frac{2x + 10}{x}$ Cross Multiply and Distribute $30x = 12(2x + 10)$
$30x = 24x + 120$

Subtract 24*x* from each side 6*x* = 120

divide both sides by $x = 20$

52. In similar triangles all three angles in one triangle are congruent to the corresponding angles in the second triangle. <V = 48 = <P; <L = 80 = <S; <Q = <X. Since the three angles of a triangle must add to 180, 48 + 80 + <X = 180. So <X = 52º.

53. Since PR = PQ, by the Isoceles Triangle Theorem (If the sides are congruent, the angles opposite them are congruent) <P = <Q. Since the angles of a triangle must add to 180, then 180 - 56 = 124 divided by 2 equals 62

for each of <P and <Q. Since <Q and x would be same side interior angles if the lines were parallel, they must be supplementary, so $180 - 62 = 118^{\circ} = x$.