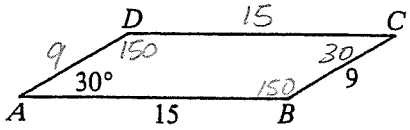
Use the notes that you just read to help you solve the following problems. Do all your work on a separate sheet of paper.

***ABCD* is a parallelogram. Find the value of each ratio.**

1. $AB:BC = 15:9 = 5:3$
2. $AB:CD = 1:1$
3. $m\angle C : m\angle D = 30:150 = 1:5$
4. $m\angle B : m\angle C = 5:1$
5. AD : perimeter of $ABCD = 9:48 = 3:16$



30
18
48

In Exercises 6–14, $x = 12$, $y = 10$, and $z = 24$. Write each ratio in simplest form.

6. x to $y = 6:5$
7. z to $x = 2:1$
8. $x + y$ to $z = 22:24 \rightarrow 11:12$
9. $\frac{x}{x+z} = \frac{12}{36} \rightarrow \frac{1}{3}$
10. $\frac{x+y}{z+y} = \frac{22}{34} \rightarrow \frac{11}{17}$
11. $\frac{y+z}{x-y} = \frac{34}{2} \rightarrow \frac{17}{1}$
12. $x:y:z$ — $12:10:24$ — $6:5:12$
13. $z:x:y$ — $24:12:10$ — $12:6:5$
14. $x:(x+y):(y+z)$ — $12:22:34$ — $6:11:17$

In Exercises 24–29 find the measure of each angle.

24. The ratio of the measures of two complementary angles is 4:5. → 40°, 50°
25. The ratio of the measures of two supplementary angles is 11:4. → 132, 48
26. The measures of the angles of a triangle are in the ratio 3:4:5. → 45, 60, 75
27. The measures of the acute angles of a right triangle are in the ratio 5:7. → 37.5, 52.5
28. The measures of the angles of an isosceles triangle are in the ratio 3:3:2. 67.5, 67.5, 45
29. The measures of the angles of a hexagon are in the ratio 4:5:5:8:9:9. 72, 90, 90, 144, 162, 162
30. The perimeter of a triangle is 132 cm and the lengths of its sides are in the ratio 8:11:14. Find the length of each side. 32, 44, 56
31. The measures of the consecutive angles of a quadrilateral are in the ratio 5:7:11:13. Find the measure of each angle, draw a quadrilateral that satisfies the requirements, and explain why two sides must be parallel.
32. What is the ratio of the measure of an interior angle to the measure of an exterior angle in a regular hexagon? A regular decagon? A regular n-gon?
33. A team's best hitter has a lifetime batting average of .320. He has been at bat 325 times.
    a. How many hits has he made?
    b. The same player goes into a slump and doesn't get any hits at all in his next ten times at bat. What is his current batting average to the nearest thousandth?

25) $15x = 180$, $x = 12$

26) $12x = 180$, $x = 15$

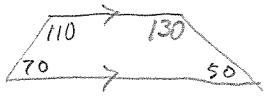
27) $2x = 90$, $x = 7.5$

28) $8x = 180$, $x = 22.5$

29) $(6-2)180 = 720$, $40x = 720$, $x = 18$

30) $8x + 11x + 14x = 132$, $x = 4$

31) $5x + 7x + 11x + 13x = 360$, $36x = 360$, $x = 10$, 50, 70, 110, 130



2 sides ∥ b/c 2 pairs of ∠s are supplementary this means they are same side interior ∠s and ∥ lines.

32) hexagon: $\frac{360}{6} = 60$, int : ext. 120 : 60, 2:1

decagon: $\frac{360}{10} = 36$, int : ext. 144 : 36, 4:1

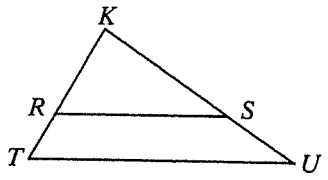
n-gon: $\frac{360}{n}$, $180 - \frac{360}{n} : \frac{360}{n}$, $\frac{180n - 360}{n} : \frac{360}{n}$, $(n-2)180 : 360$

33a) 104 hits

b) $\frac{104}{335} = .310$

For the figure shown, it is given that $\frac{KR}{RT} = \frac{KS}{SU}$. Copy and complete the table.

	KR	RT	KT	KS	SU	KU
21.	12	9	?21	16	?12	?28
22.	8	?2	10	12	?3	?15
23.	16	?8	?24	?20	10	30
24.	?6	2	?8	9	?3	12
25.	?8	?4	12	10	5	?15
26.	12	4	?16	?15	?5	20
27.	?27	9	36	?36	?12	48
28.	?20	?10	30	28	?14	42



(*Hint for Ex. 25*: Let $KR = x$, then $RT = 12 - x$.)

(31) $(a-b)(c+d) = (a+b)(c-d)$

$ac + ad - bc - bd = ac - ad + bc - bd$

$ad - bc = -ad + bc$

$2ad = 2bc \rightarrow ad = bc$

(32) $(a+c)(b-d) = (b+d)(a-c)$

$ab - ad + bc - cd = ab - bc + ad - cd$

$-ab + bc = ad - bc$

$-2ab = -2bc$

$ab = bc$

Show that the given proportions are equivalent.

31. $\frac{a-b}{a+b} = \frac{c-d}{c+d}$ and $\frac{a}{b} = \frac{c}{d}$ — same $ad = bc$

32. $\frac{a+c}{b+d} = \frac{a-c}{b-d}$ and $\frac{a}{b} = \frac{c}{d}$ — same $ad = bc$

Find the value of x.

33. $\frac{x}{x+5} = \frac{x-4}{x}$ $x = 20$

34. $\frac{x-2}{x} = \frac{x}{x+3}$ $x = 6$

35. $\frac{x+1}{x-2} = \frac{x+5}{x-6}$ $x = \frac{1}{2}$

36. $\frac{x-1}{x-2} = \frac{x+4}{x+2}$ $x = 6$

37. $\frac{x(x+5)}{4x+4} = \frac{9}{5}$ $x = 4$, $x = -\frac{9}{5}$

38. $\frac{x-1}{x+2} = \frac{10}{3x-2}$ $x = 6$, $x = -1$

Find the values of x and y.

39. $\frac{y}{x-9} = \frac{4}{7}$, $\frac{x+y}{x-y} = \frac{5}{3}$ $x = 16$, $y = 4$

40. $\frac{x-3}{4} = \frac{y+2}{2}$, $\frac{x+y-1}{6} = \frac{x-y+1}{5}$ $x = 11$, $y = 2$

41. Prove: If $\frac{a}{b} = \frac{c}{d} = \frac{e}{f}$, then $\frac{a+c+e}{b+d+f} = \frac{a}{b}$. (*Hint*: Let $\frac{a}{b} = r$. Then $a = br$, $c = dr$, and $e = \underline{?}$.)

$e = fr$

$\frac{br + dr + fr}{b+d+f} \stackrel{?}{=} \frac{a}{b} \rightarrow \frac{r(b+d+f)}{(b+d+f)} = \frac{a}{b}$

$\rightarrow r = \frac{a}{b}$ ✓

43. If $\frac{4a-9b}{4a} = \frac{a-2b}{b}$, find the numerical value of the ratio $a:b$. $a:b = 3:2$

$b(4a-9b) = 4a(a-2b)$

$4ab - 9b^2 = 4a^2 - 8ab$

$0 = 4a^2 - 12ab + 9b^2$

$0 = (2a-3b)(2a-3b)$

$2a - 3b = 0$

$2a = 3b$

$a = \frac{3b}{2}$

$\frac{a}{b} = \frac{3}{2}$

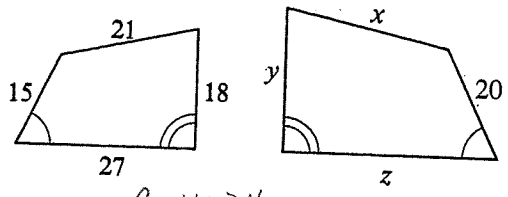
Written Exercises

Tell whether the two polygons are *always*, *sometimes*, or *never* similar.

1. Two equilateral triangles A
2. Two right triangles S
3. Two isosceles triangles S
4. Two scalene triangles S
5. Two squares A
6. Two rectangles S
7. Two rhombuses S
8. Two isosceles trapezoids S
9. Two regular hexagons A
10. Two regular polygons S
11. A right triangle and an acute triangle N
12. An isosceles triangle and a scalene triangle N
13. A right triangle and a scalene triangle S
14. An equilateral triangle and an equiangular triangle A

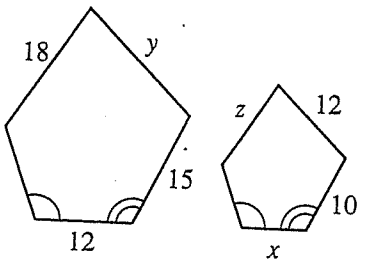
Two similar polygons are shown. Find the values of x, y, and z.

24.



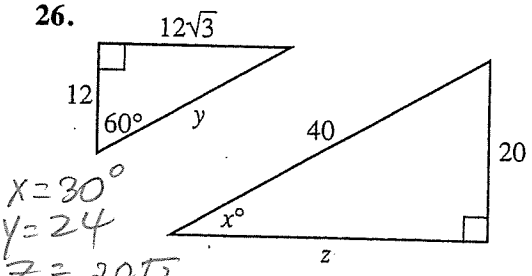
$x=28,\ y=24,\ z=30$

25.



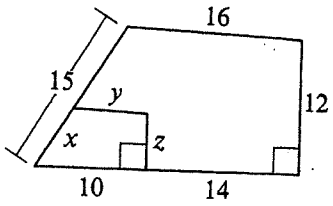
$x=8$
$y=18$
$z=12$

26.



$x=30^\circ$
$y=24$
$z=20\sqrt{3}$

27.



$x=\frac{25}{4}$
$y=\frac{20}{3}$
$z=5$

28. Draw two equilateral hexagons that are clearly not similar.

29. Draw two equiangular hexagons that are clearly not similar.

30. If $\triangle ABC \sim \triangle DEF$, express AB in terms of other lengths. (There are two possible answers.)

(30) $\frac{AB}{DE}=\frac{AC}{DF}$ ↘ $\quad \frac{AB}{DE}=\frac{BC}{EF}$ ↘

$AB=\frac{(AC)(DE)}{DF}$ $\quad AB=\frac{(BC)(DE)}{EF}$

31. Explain how you can tell at once that quadrilateral $RSWX$ is not similar to quadrilateral $RSYZ$.

RX and SW are shorter yet RS and ZY remain the same.

$\frac{RS}{RS}=1$ but $\frac{ZR}{XR}\neq 1$

Plot the given points on graph paper. Draw quadrilateral $ABCD$ and $A'B'$. Locate points C' and D' so that $A'B'C'D'$ is similar to $ABCD$.

32. $A(0, 0)$, $B(4, 0)$, $C(2, 4)$, $D(0, 2)$, $A'(-10, -2)$, $B'(-2, -2)$

$C'(-6,6)$ $\quad D'(-10,2)$

$C'(-6,-10)$ $\quad D'(-10,-6)$

$\frac{a}{b} = r \rightarrow a = br \quad \frac{c}{d} = r \rightarrow c = dr$

(41) $\frac{e}{f} = r \rightarrow e = fr$

$$\frac{br + dr + fr}{b + d + f} \stackrel{?}{=} \frac{a}{b}$$

$$\frac{r(b+d+f)}{(b+d+f)} = \frac{a}{b}$$

$$r = \frac{a}{b}$$

Since we let $\frac{a}{b} = r$, then $r = \frac{a}{b}$ is $\frac{a}{b} = \frac{a}{b}$.

(43) $b(4a - 9b) = 4a(a - 2b)$

$4ab - 9b^2 = 4a^2 - 8ab$

$0 = 4a^2 - 12ab + 9b^2$

$0 = (2a - 3b)(2a - 3b)$

$2a - 3b = 0$

$\frac{2a}{2} = \frac{3b}{2}$

$a = \frac{3}{2}b$

$\frac{a}{b} = \frac{3}{2}$