Multiply both sides by 152 · 9, or 1368.

$$1368 \cdot \frac{34}{152} = 1368 \cdot \frac{x}{9}$$
$$9 \cdot 34 = 152x$$
$$306 = 152x$$
$$x = \frac{306}{152} \approx 2.01$$

Ernie's earned run average is 2.01.

16. 12 ft by 15 ft. Let w represent the width of the room and l represent the length of the room.

$$\frac{\frac{1}{4}\text{ in.}}{1\text{ ft}} = \frac{3\text{ in.}}{w\text{ ft}} \qquad \frac{\frac{1}{4}\text{ in.}}{1\text{ ft}} = \frac{3\frac{3}{4}\text{ in.}}{l\text{ ft}}$$
$$\frac{\frac{1}{4}}{1} = \frac{3}{w} \qquad \frac{\frac{1}{4}}{1} = \frac{3\frac{3}{4}}{l}$$
$$\frac{1}{4} = \frac{3}{w} \qquad \frac{1}{4} = \frac{\frac{15}{4}}{l}$$
$$4w \cdot \frac{1}{4} = 4w \cdot \frac{3}{w} \qquad 4l \cdot \frac{1}{4} = 4l \cdot \frac{15}{4}$$
$$w = 12\text{ ft} \qquad l = 15\text{ ft}$$

Thus the actual size of the room is 12 ft by 15 ft.

17. Almost 80 years old. Find the sum of the lengths of the antennae for both Altor and Zenor.

Altor: $8 + 10 + 13 + 16 + 14 + 12 = 73$ cm

Zenor: $7(17) = 119$ cm

Let A represent Altor's age.

$$\frac{73\text{ cm}}{A\text{ yr}} = \frac{119\text{ cm}}{130\text{ yr}}$$
$$\frac{73}{A} = \frac{119}{130}$$
$$130A \cdot \frac{73}{A} = 130A \cdot \frac{119}{130}$$
$$9490 = 119A$$
$$A = \frac{9490}{119} \approx 79.7$$

Altor is almost 80 years old.

18. $AB = 3$ cm, $BC = 7.5$ cm. Let $p = AB$; then $BC = 10.5 - p$.

$$\frac{AB}{XY} = \frac{BC}{YZ}$$
$$\frac{p}{2} = \frac{10.5 - p}{5}$$
$$10\left(\frac{p}{2}\right) = 10\left(\frac{10.5 - p}{5}\right)$$
$$5p = 2(10.5 - p)$$
$$5p = 21 - 2p$$
$$7p = 21$$
$$p = 3 \text{ and } 10.5 - p = 7.5$$

Therefore $AB = 3$ cm and $BC = 7.5$ cm.

IMPROVING YOUR ALGEBRA SKILLS

Write equations from two rows or columns in which the coefficients of x are different. In the second and third rows, for example, the coefficients of x are both 2, so the equations would be $2x + 20 = 2x + 20$, not yielding a way to solve for x. Many other pairs of equations lead to the solution, $x = 7$.

EXTENSION

Results will vary.

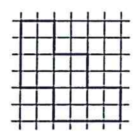
LESSON 11.1 #2

EXERCISES

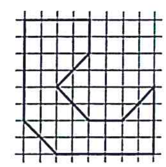
1. A

2. B

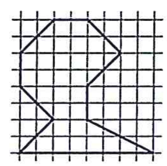
3. Possible answer:



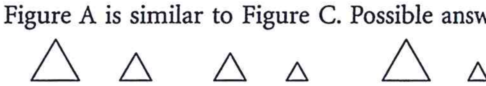
4. Possible answer:



5. Possible answer:



6. Figure A is similar to Figure C. Possible answer:



If A ~ B and B ~ C, then A ~ C.

7. $AL = 6$ cm, $RA = 10$ cm, $RG = 4$ cm, $KN = 6$ cm. Corresponding sides of similar polygons are proportional, so $\frac{TK}{LE} = \frac{KN}{EG} = \frac{NI}{RG} = \frac{TH}{RA} = \frac{HT}{AL}$. Substitute the given side lengths.

$$\frac{4}{8} = \frac{KN}{12} = \frac{2}{RG} = \frac{5}{RA} = \frac{3}{AL}$$

Because $\frac{TK}{LE} = \frac{4}{8} = \frac{1}{2}$, each side of the smaller pentagon is half as long as the corresponding side of the larger pentagon, so $KN = 6$ cm, $RG = 4$ cm, $RA = 10$ cm, and $AL = 6$ cm.

8. No; the corresponding angles are congruent, but the corresponding sides are not proportional. Three pairs of corresponding angles are marked as congruent, so the fourth pair of angles must also be congruent by the Quadrilateral Sum Conjecture. Compare ratios of corresponding sides.

$$\frac{150}{165} = \frac{10}{11} \text{ and } \frac{120}{128} = \frac{15}{16}$$

Because these two pairs of corresponding sides are not proportional, the pentagons are not similar. (It is not necessary to check the ratios of the other two pairs of corresponding sides because for polygons to be similar, *all* pairs of corresponding sides must be proportional.)

9. $NY = 21$ cm, $YC = 42$ cm, $CM = 27$ cm, $MB = 30$ cm

$$\frac{SP}{HN} = \frac{ER}{MB} = \frac{DE}{CM} = \frac{ID}{YC} = \frac{PI}{NY}$$

$$\frac{88}{66} = \frac{40}{MB} = \frac{36}{CM} = \frac{56}{YC} = \frac{28}{NY}$$

$$\frac{88}{66} = \frac{22 \cdot 4}{22 \cdot 3} = \frac{4}{3}, \text{ so } \frac{4}{3} = \frac{40}{MB} = \frac{36}{CM} = \frac{56}{YC} = \frac{28}{NY}$$

$28 = 4(7)$, so $NY = 3(7) = 21$ cm

$56 = 4(14)$, so $YC = 3(14) = 42$ cm

$36 = 4(9)$, so $CM = 3(9) = 27$ cm

$40 = 4(10)$, so $MB = 3(10) = 30$ cm

10. Yes; the corresponding angles are congruent, and the corresponding sides are proportional. Because four of the five pairs of corresponding angles are marked as congruent, the angles in the fifth pair must also be congruent because the sum of the measures of the angles of any pentagon is 540° by the Pentagon Sum Conjecture. Corresponding sides are proportional:

$$\frac{30}{20} = \frac{27}{18} = \frac{39}{26} = \frac{78}{52} = \frac{21}{14} = \frac{3}{2}$$

11. $x = 6$ cm, $y = 3.5$ cm. $\triangle ACE \sim \triangle IKS$, so $\frac{AC}{IK} = \frac{CE}{KS} = \frac{AE}{IS}$. Then, $\frac{7}{y} = \frac{8}{4} = \frac{12}{x}$. Because $\frac{CE}{KS} = \frac{8}{4} = \frac{2}{1}$, each side of $\triangle ACE$ is twice as long as the corresponding side of $\triangle IKS$, so $x = 6$ cm and $y = 3.5$ cm.

12. $z = 10\frac{2}{3}$ cm. $\triangle RAM \sim \triangle XAE$, so corresponding sides are proportional.

$$\frac{RA}{XA} = \frac{AM}{AE} = \frac{RM}{XE}$$

$$\frac{4}{3} = \frac{AM}{AE} = \frac{z}{8}$$

$$24\left(\frac{4}{3}\right) = 24\left(\frac{z}{8}\right)$$

$$32 = 3z$$

$$z = \frac{32}{3} = 10\frac{2}{3}$$

13. Yes, the corresponding angles are congruent. Yes, the corresponding sides are proportional. Yes, $\triangle AED \sim \triangle ABC$. Because $\overline{DE} \parallel \overline{BC}$, $\angle B \cong \angle AED$ and $\angle C \cong \angle ADE$ (CA Conjecture). Also, $\angle A \cong \angle A$ (same angle), so all pairs of corresponding angles are congruent. Now check the ratios of corresponding sides:

$$\frac{AE}{AB} = \frac{2}{4\frac{2}{3}} = \frac{2}{\frac{14}{3}} = \frac{2}{1} \cdot \frac{3}{14} = \frac{3}{7}$$

$$\frac{AD}{AC} = \frac{3}{7}$$

$$\frac{ED}{BC} = \frac{4}{9\frac{1}{3}} = \frac{4}{\frac{28}{3}} = \frac{4}{1} \cdot \frac{3}{28} = \frac{3}{7}$$

Therefore all pairs of corresponding sides are proportional. Because corresponding angles are congruent and corresponding sides are proportional, $\triangle AED \sim \triangle ABC$.

14. $m = \frac{9}{2}$ cm, $n = \frac{9}{4}$ cm. $\triangle ABC \sim \triangle DBA$, so $\frac{AB}{DB} = \frac{BC}{BA} = \frac{AC}{DA}$. Then, $\frac{3}{n} = \frac{4}{3} = \frac{6}{m}$. To find m and n, solve two proportions:

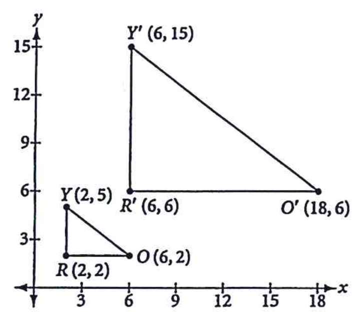
$$\frac{3}{n} = \frac{4}{3} \qquad\qquad \frac{4}{3} = \frac{6}{m}$$

$$3n \cdot \frac{3}{n} = 3n \cdot \frac{4}{3} \qquad\qquad 3m \cdot \frac{4}{3} = 3m \cdot \frac{6}{m}$$

$$9 = 4n \qquad\qquad 4m = 18$$

$$n = \frac{9}{4} \qquad\qquad m = \frac{18}{4} = \frac{9}{2}$$

15. $\frac{1}{3}$. Let R', O', and Y' represent the coordinates of the dilation of $\triangle ROY$.



$\triangle ROY$ is a 3-4-5 triangle, so the perimeter of $\triangle ROY$ is $RO + OY + YR = 4 + 5 + 3 = 12$ units.

From the graph, you can see that the vertices of $\triangle R'O'Y'$ are $R'(6, 6)$, $O'(18, 6)$, and $Y'(6, 15)$. $\triangle R'O'Y'$ is a 9-12-15 triangle (a multiple of 3-4-5), so the perimeter of $\triangle R'O'Y'$ is $R'O' + O'Y' + Y'R' = 12 + 15 + 9 = 36$ units.

$$\frac{\text{perimeter of smaller triangle}}{\text{perimeter of larger triangle}} = \frac{12 \text{ units}}{36 \text{ units}} = \frac{1}{3}$$

16.