

Unit 5

Lesson 5

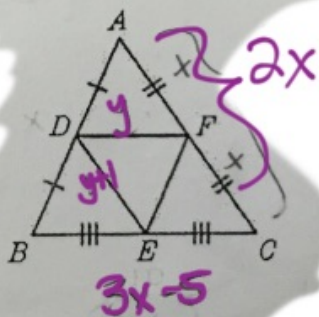
Triangle Proportionality Theorem

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14. In the diagram, E is the midpoint of \overline{BC} , D is the midpoint of \overline{AB} , and F is the midpoint of \overline{AC} . If $BC = 3x - 5$, $DF = y$, $DE = y + 1$, and $AC = 2x$, what is the length of \overline{DE} ?

- F) 6 G) 1 **H) 3** J) 5 K) 2



$$2(y+1) = 2x$$

$$2(y) = 3x - 5$$

$$2y + 2 = 2x$$

$$2y = 3x - 5$$

$$2 + 1 = 3 \checkmark$$

$$2y - 2x = -2$$

$$-2y + 3x = +5$$

$$x = 3$$

$$2y - 2(3) = -2$$

$$2y - 6 = -2$$

$$+6 \quad +6$$

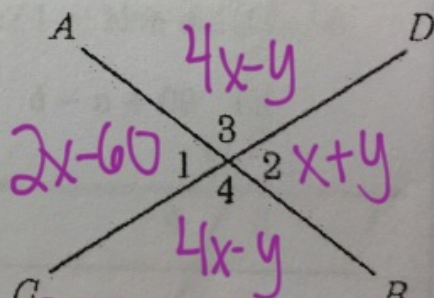
$$2y = 4$$

$$y = 2$$



3. If \overleftrightarrow{AB} and \overleftrightarrow{CD} are two intersecting straight lines with $m\angle 1 = (2x - 60)^\circ$, $m\angle 2 = (x + y)^\circ$, and $m\angle 3 = (4x - y)^\circ$, then $m\angle 4$ equals:

- A) 75°
- B) 12°
- C) 36°
- D) 168°**
- E) 155°



$$2(36) - 60 + 4(36) - y = 180 \quad 4x - y + x + y = 180$$

$$72 - 60 + 144 - y = 180 \quad 5x = 180$$

$$156 - y = 180$$

$$\begin{array}{r} -156 \quad -156 \\ \hline -y = 24 \end{array}$$

$$-y = 24$$

$$y = -24$$

$$x = 36$$

$$4(36) - (-24) = 168$$

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9. In the figure, $\ell \parallel m$ with $m\angle 2 = x + 20$ and $m\angle 5 = 4x - 30$ find $m\angle 7$.

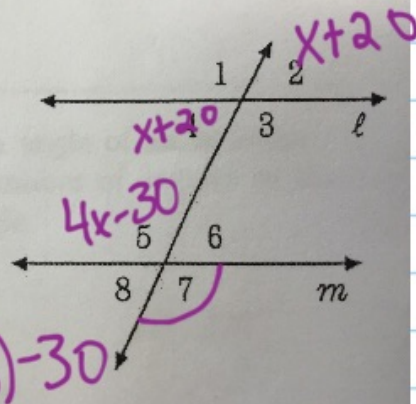
A) ~~38°~~

B) 142°

C) 58°

D) 122°

E) 180°



$$\begin{aligned} 5x - 10 &= 180 \\ 5x &= \frac{190}{5} \\ x &= 38 \end{aligned}$$

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10. The first angle of a triangle is twice the second and the third is 20 degrees larger than the second angle. Find the number of degrees of the measure of the smallest angle of the triangle.

(A) 40° B) 50° C) 60° D) 70° E) 80°

$$2x + x + x + 20 = 180$$

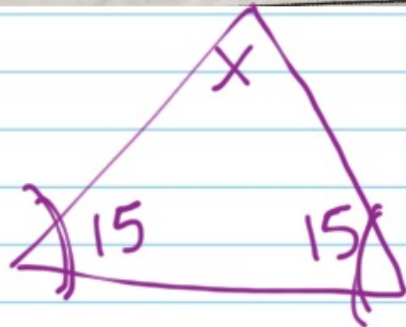
$$4x = 160$$

$$x = 40$$

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The measure of each base angle of an isosceles triangle is 15° , find the number of degrees in the measure of the vertex angle.

A) 15° B) 60° C) 120° D) 150° E) 165° 

$$X + 30 = 180$$

$$X = 150$$

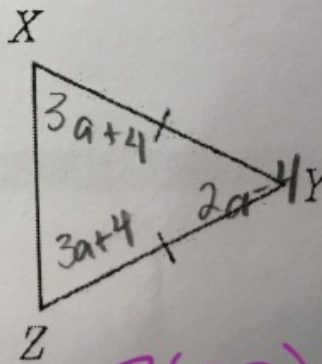
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20. In the given figure, if $\overline{XY} \cong \overline{YZ}$, $m\angle X = 3a + 4$, and $m\angle Y = 2a - 4$, then find the $m\angle Z$.

F) 48° G) 51° H) 62°

J) 83° K) 70°



$$\begin{array}{r} 8a + 4 = 180 \\ -4 \quad -4 \\ \hline 8a = 176 \end{array}$$

$$8a = 176$$

$$a = 22$$

$$3(22) + 4$$

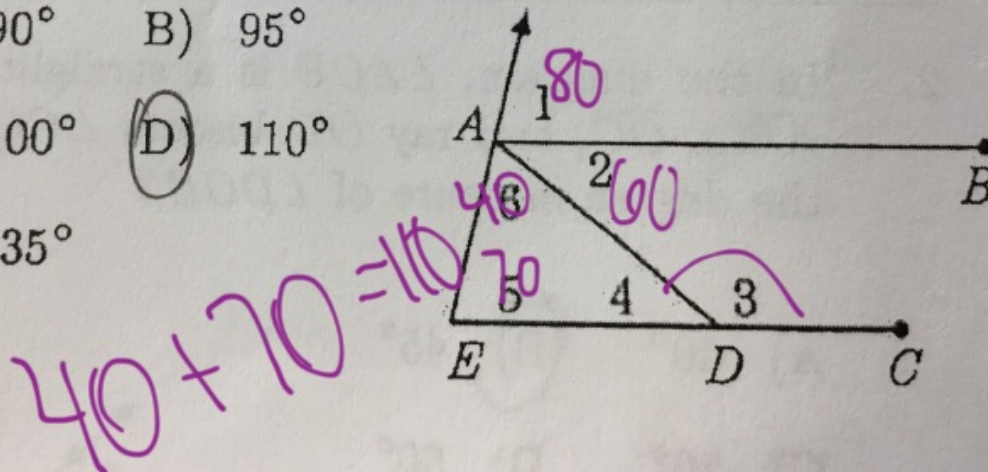
$$70$$

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12. In the given figure, $m\angle 1 = 80$, $m\angle 2 = 60$, and $m\angle 5 = 70$. Find $m\angle 3$.

- A) 90° B) 95°
- C) 100° **(D) 110°**
- E) 135°

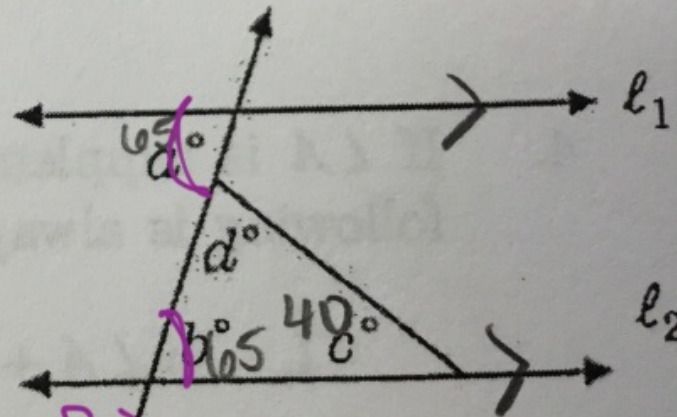


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In the figure, if $l_1 \parallel l_2$, $a = 65$, and $c = 40$. Find d .

- A) 75° B) 90°
C) 25° D) 40°
E) 65°



$$d + 65 + 40 = 180$$

$$d + 105 = 180$$

$$d = 75$$

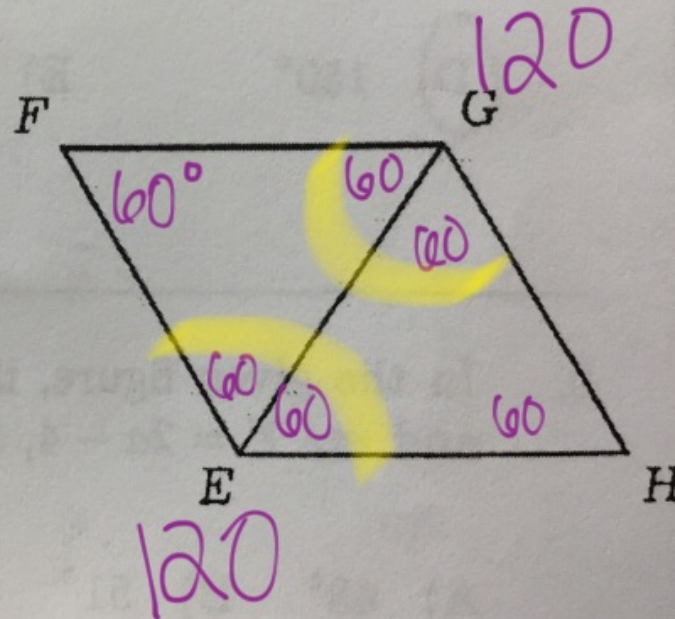
$$180 - 65 - 40$$

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9. Quadrilateral $EFGH$ is composed of equilateral triangles EFG and EGH . What is the sum of the measures of angles FGH and FEH ?

- A) 120°
B) 180°
C) 240°
D) 300°
E) 360°



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Triangle Proportionality Theorem: A line that is parallel to one side of a triangle divides the other two sides proportionally.

- If one triangle is a dilation of a second triangle, the two triangles are **similar** triangles (same shape but different sizes.)
- If two triangles are similar, then the **corresponding angles** of the two triangles are **congruent** and corresponding sides are **proportional**.

Proportional Parts and Triangles

Complete each proportion.

1. $\frac{AD}{AC} = \frac{AE}{AB}$

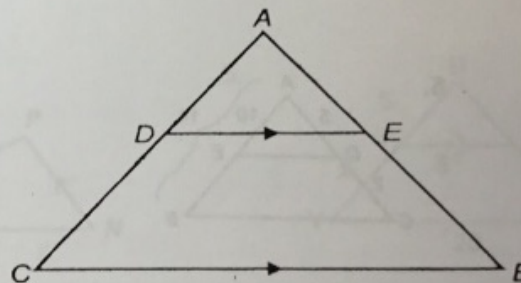
2. $\frac{AD}{DC} = \frac{AE}{EB}$

3. $\frac{DE}{CB} = \frac{AD}{DC}$

4. $\frac{CB}{DE} = \frac{AB}{AE}$

5. $\frac{AC}{AD} = \frac{AB}{AE}$

6. $\frac{DE}{CB} = \frac{AE}{AB}$

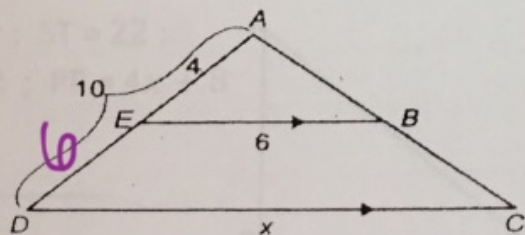


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Find the value for each variable.

7.

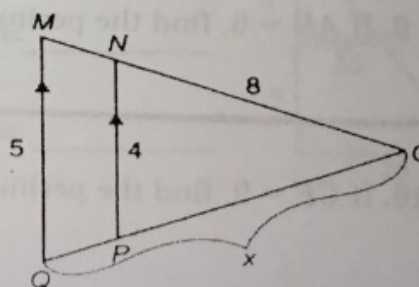


$$\frac{4}{10} = \frac{6}{x}$$

$$4x = 60$$

$$x = 15$$

8.



$$\frac{4}{5} = \frac{8}{x}$$

$$4x = 40$$

$$x = 10$$

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9.

Handwritten notes for problem 9:

$\frac{1}{2} \cdot 4$
 $\frac{x+2}{9} = \frac{4}{12}$
 $6x+12 = 9x$
 $-6x \quad -6x$
 $12 = 3x$
 $x = 4$

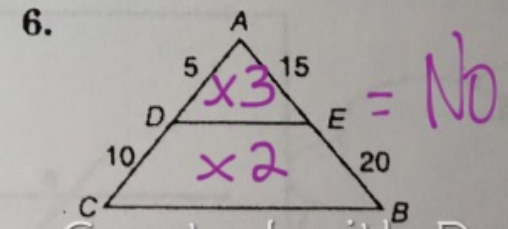
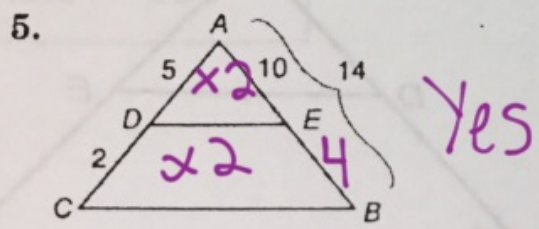
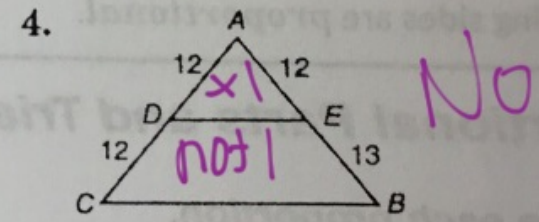
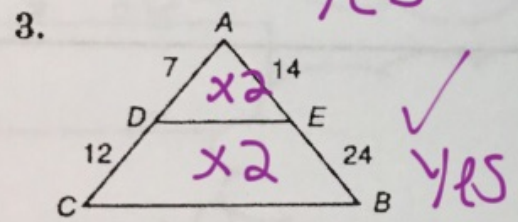
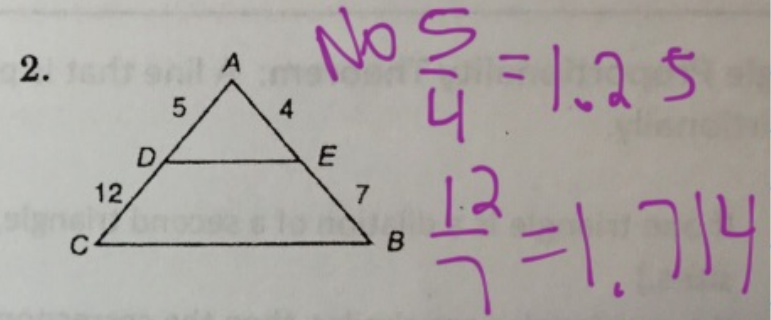
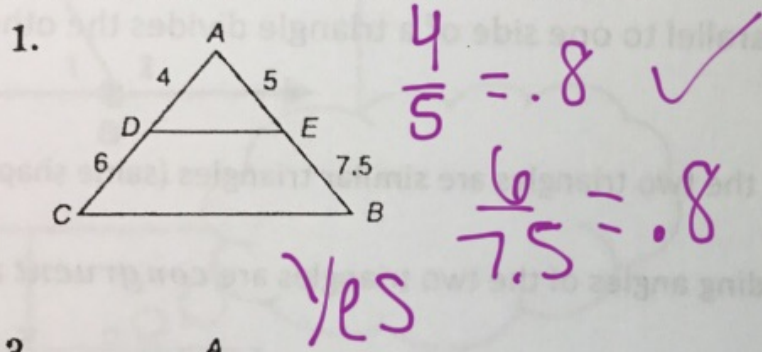
10.


Handwritten notes for problem 10:

$\frac{3}{5} = \frac{4}{x}$
 $3x = 20$
 $x = \frac{20}{3}$
 $\frac{3}{5} = \frac{6}{y}$
 $3y = 30$
 $y = 10$

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In each figure, determine whether $\overline{DE} \parallel \overline{CB}$.



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**D, E, and F are the midpoints of the sides of $\triangle ABC$.
Complete each statement.**

7. $\overline{AB} \parallel$? DF

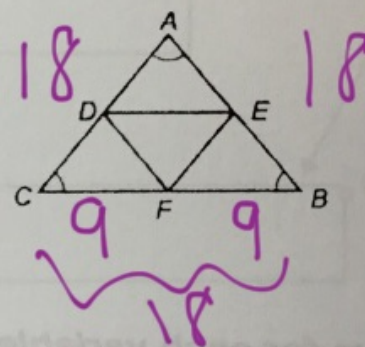
8. If $AC = 22$, then $EF =$ 11

9. If $AE = 6$, find the perimeter of $\triangle DEF$.

18

10. If $CF = 9$, find the perimeter of $\triangle ABC$.

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Socratic

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