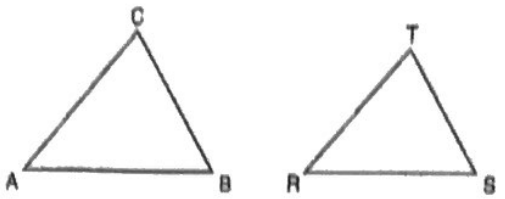
Date _____ Geometry CC

Ratio, Proportion and Similar Triangles HW

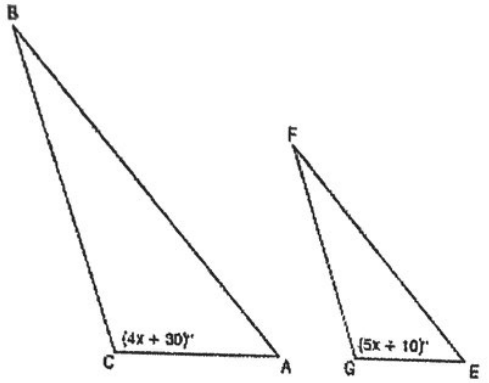
1. In the diagram below, $\Delta ABC \sim \Delta RST$.
Which statement is *not* true?
   1) $\angle A \cong \angle R$
   2) $\frac{AB}{RS} = \frac{BC}{ST}$
   3) $\frac{AB}{BC} = \frac{ST}{RS}$
   4) $\frac{AB+BC+AC}{RS+ST+RT} = \frac{AB}{RS}$



2. If $\Delta ABC \sim \Delta ZXY$, $m\angle A = 50$, and $m\angle C = 30$, what is $m\angle X$?
   1) 30
   2) 50
   3) 80
   4) 100

$m\angle A = m\angle Z$
$m\angle B = m\angle X$
$m\angle C = m\angle Y$

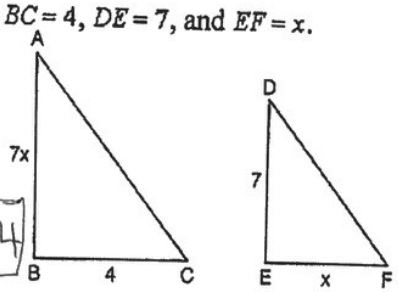
3. In the diagram below, $\Delta ABC \sim \Delta EFG$, $m\angle C = 4x + 30$, and $m\angle G = 5x + 10$. Determine the value of x.



$4x+30=5x+10$
$20=x$

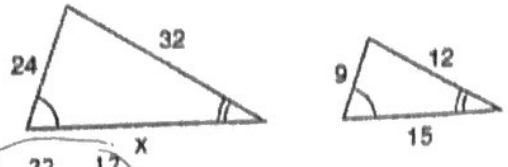
4. As shown in the diagram below, $\Delta ABC \sim \Delta DEF$, $AB = 7x$, $BC = 4$, $DE = 7$, and $EF = x$.
What is the length of $\overline{AB}$?

$\frac{7x}{4} = \frac{7}{x}$ $7x^2 = 28$
$\sqrt{x^2} = \sqrt{4}$
$x = 2$ $AB = 14$



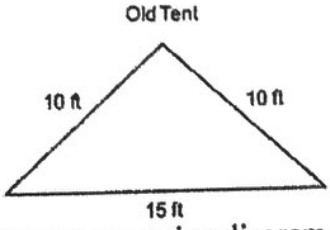
5. A triangle has sides whose lengths are 5, 12, and 13. A similar triangle could have sides with lengths of
   1) 3, 4, and 5
   2) 6, 8, and 10
   3) 7, 24, and 25
   4) 10, 24, and 26

The accompanying diagram shows two similar triangles. Which proportion could be used to solve for x?

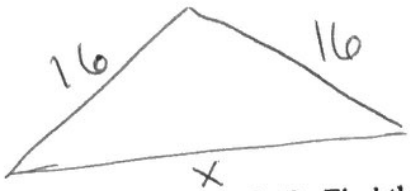


1) $\frac{x}{24} = \frac{9}{15}$
2) $\frac{24}{9} = \frac{15}{x}$
3) $\frac{32}{x} = \frac{12}{15}$
4) $\frac{32}{12} = \frac{15}{x}$

7. The Rivera family bought a new tent for camping. Their old tent had equal sides of 10 feet and a floor width of 15 feet, as shown in the accompanying diagram.
If the new tent is similar in shape to the old tent and has equal sides of 16 feet, how wide is the floor of the new tent?



new tent

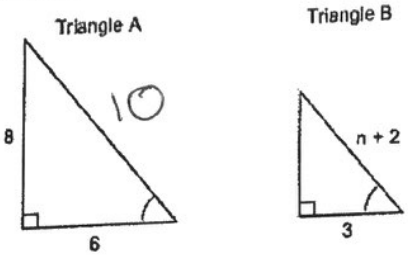


$\frac{10}{16} = \frac{15}{x}$

$10x = 240$

$x =$ 24 feet

8. In the accompanying diagram, triangle A is similar to triangle B. Find the value of n.



(1) $a^2 + b^2 = c^2$
$8^2 + 6^2 = c^2$
$64 + 36 = c^2$
$\sqrt{100} = \sqrt{c^2}$
$10 = c$

(2) $\frac{10}{6} = \frac{n+2}{3}$
$30 = 6n + 12$
$18 = 6n$
$3 = n$

9. Two triangles are similar, and the ratio of each pair of corresponding sides is 2:1. Which statement regarding the two triangles is *not* true?
1) Their areas have a ratio of 4:1.
2) Their altitudes have a ratio of 2:1.
3) Their perimeters have a ratio of 2:1.
4) Their corresponding angles have a ratio of 2:1.

10. Given $\triangle ABC \sim \triangle DEF$ such that $\frac{AB}{DE} = \frac{3}{2}$. Which statement is *not* true?

1) $\frac{BC}{EF} = \frac{3}{2}$
2) $\frac{m\angle A}{m\angle D} = \frac{3}{2}$
3) $\frac{\text{area of } \triangle ABC}{\text{area of } \triangle DEF} = \frac{9}{4}$
4) $\frac{\text{perimeter of } \triangle ABC}{\text{perimeter of } \triangle DEF} = \frac{3}{2}$

11 Which is *not* a property of all similar triangles?
1) The corresponding angles are congruent.
2) The corresponding sides are congruent.
3) The perimeters are in the same ratio as the corresponding sides.
4) The altitudes are in the same ratio as the corresponding sides.

Regents Exam Questions G.G.46: Side Splitter Theorem
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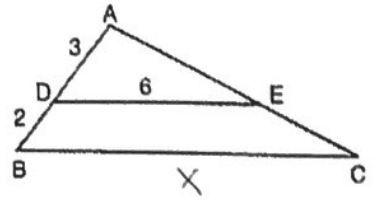
Name: _____

G.G.46: Side Splitter Theorem: Investigate proportions among segments of sides of the triangle, given line(s) parallel to one side and intersecting the other sides of the triangle

1 In the diagram of ΔABC below, $\overline{DE} \parallel \overline{BC}$, $AD = 3$, $DB = 2$, and $DE = 6$.

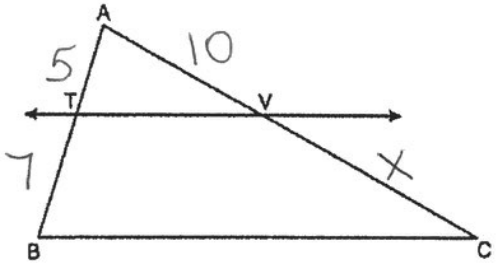


What is the length of $\overline{BC}$?

1) 12
2) 10
3) 8
4) 4

$\frac{3}{6} = \frac{5}{X}$

2 In the diagram below of ΔABC, $\overleftrightarrow{TV} \parallel \overline{BC}$, $AT = 5$, $TB = 7$, and $AV = 10$.

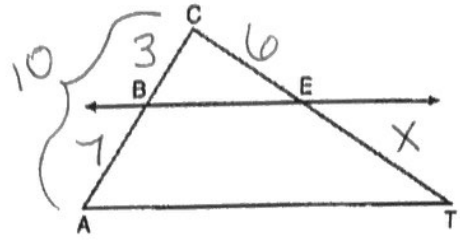


What is the length of $\overline{VC}$?

1) $3\frac{1}{2}$
2) $7\frac{1}{7}$
3) 14
4) 24

$\frac{5}{7} = \frac{10}{X}$

3 In the diagram below of ΔACT, $\overleftrightarrow{BE} \parallel \overline{AT}$.

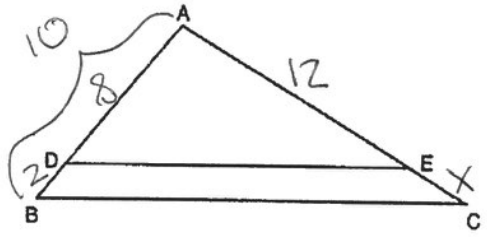


If $CB = 3$, $CA = 10$, and $CE = 6$, what is the length of $\overline{ET}$?

1) 5
2) 14
3) 20
4) 26

$\frac{3}{7} = \frac{6}{X}$

4 In the diagram of ΔABC shown below, $\overline{DE} \parallel \overline{BC}$.



If $AB = 10$, $AD = 8$, and $AE = 12$, what is the length of $\overline{EC}$?

1) 6
2) 2
3) 3
4) 15

$\frac{8}{2} = \frac{12}{X}$

9

Regents Exam Questions G.G.46: Side Splitter Theorem
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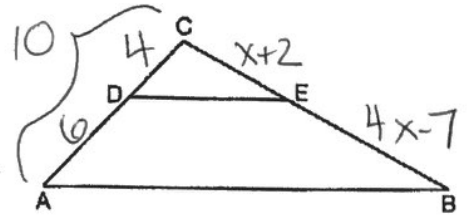
5 In the diagram of ΔABC below, $\overline{DE} \parallel \overline{AB}$.



If $CD = 4$, $CA = 10$, $CE = x + 2$, and $EB = 4x - 7$, what is the length of $\overline{CE}$?

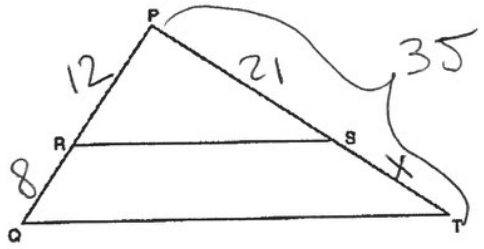
1) 10
2) 8
3) 6
4) 4

$\frac{4}{6} = \frac{x+2}{4x-7}$

$6x+12 = 16x-28$

$x = 4$

6 Triangle PQT with $\overline{RS} \parallel \overline{QT}$ is shown below.



If $PR = 12$, $RQ = 8$, and $PS = 21$, what is the length of $\overline{PT}$?

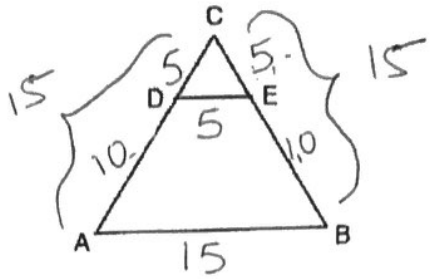
1) 14
2) 17
3) 35
4) 38

$\frac{12}{8} = \frac{21}{x}$

$x = 14$

7 In the accompanying diagram of equilateral triangle ABC, $DE = 5$ and $\overline{DE} \parallel \overline{AB}$.

ΔCDE is an equilateral Δ

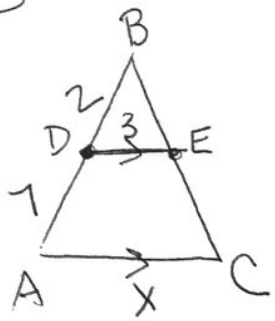


If AB is three times as long as DE, what is the perimeter of quadrilateral $ABED$?

1) 20
2) 30
3) 35
4) 40

8 In ΔABC, point D is on $\overline{AB}$, and point E is on $\overline{BC}$ such that $\overline{DE} \parallel \overline{AC}$. If $DB = 2$, $DA = 7$, and $DE = 3$, what is the length of $\overline{AC}$?

1) 8
2) 9
3) 10.5
4) 13.5



$\frac{2}{3} = \frac{9}{x}$

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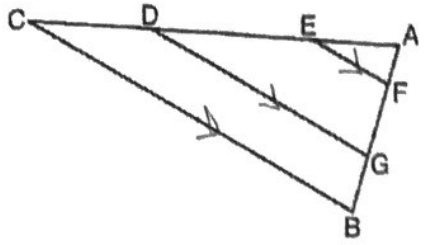
Name: _____

9 In the diagram below of $\triangle ABC$, with $\overline{CDEA}$ and $\overline{BGFA}$, $\overline{EF} \parallel \overline{DG} \parallel \overline{CB}$.



Which statement is *false*?

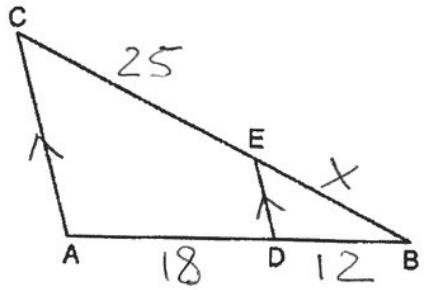
1) $\frac{AC}{AD} = \frac{AB}{AG}$

2) $\frac{AE}{AF} = \frac{AC}{AB}$

3) $\frac{AE}{AD} = \frac{EC}{AC}$

4) $\frac{BG}{BA} = \frac{CD}{CA}$

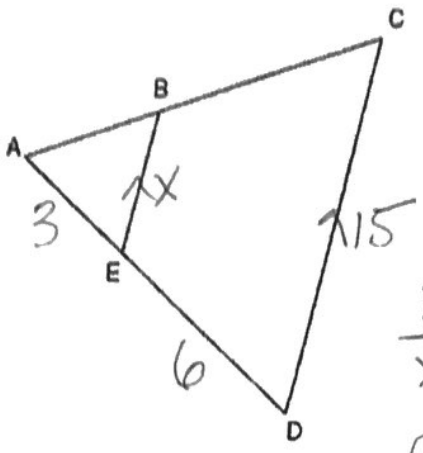
10 In the diagram below of $\triangle ABC$, D is a point on $\overline{AB}$, E is a point on $\overline{BC}$, $\overline{AC} \parallel \overline{DE}$, $CE = 25$ inches, $AD = 18$ inches, and $DB = 12$ inches. Find, to the *nearest tenth of an inch*, the length of $\overline{EB}$.



$\frac{X}{25} = \frac{12}{18}$

$X = 16.7$

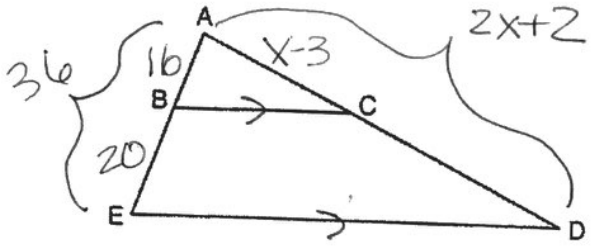
11 In the diagram below of $\triangle ACD$, E is a point on $\overline{AD}$ and B is a point on $\overline{AC}$, such that $\overline{EB} \parallel \overline{DC}$. If $AE = 3$, $ED = 6$, and $DC = 15$, find the length of $\overline{EB}$.



$\frac{3}{x} = \frac{9}{15}$

$x = 5$

12 In the diagram below of $\triangle ADE$, B is a point on $\overline{AE}$ and C is a point on $\overline{AD}$ such that $\overline{BC} \parallel \overline{ED}$, $AC = x - 3$, $BE = 20$, $AB = 16$, and $AD = 2x + 2$. Find the length of $\overline{AC}$.



$\frac{16}{36} = \frac{X-3}{2x+2}$

$36x - 108 = 32x + 32$

$4x = 140$

$x = 35$

$AC = 35 - 3 = 32$

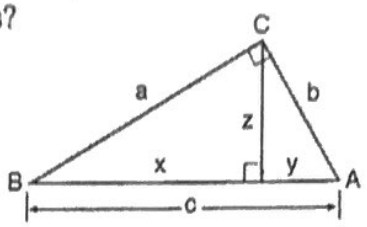
11

Date _____

Proportions in a Right Triangle (Altitude to Hypotenuse) Geometry CC

$$\frac{H}{L} = \frac{L}{S} \quad \text{OR} \quad \frac{S_1}{A} = \frac{A}{S_2}$$

1 In the diagram below of right triangle ABC, an altitude is drawn to the hypotenuse $\overline{AB}$.
Which proportion would always represent a correct relationship of the segments?



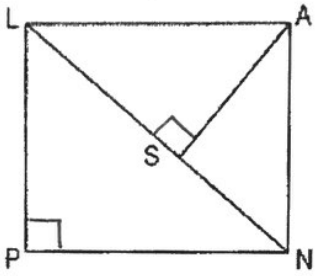
1) $\frac{c}{z} = \frac{z}{y}$

2) $\frac{c}{a} = \frac{a}{y}$

3) $\frac{x}{z} = \frac{z}{y}$ $\frac{S}{A} = \frac{A}{S}$

4) $\frac{y}{b} = \frac{b}{x}$

2 The accompanying diagram shows part of the architectural plans for a structural support of a building. $PLAN$ is a rectangle and $\overline{AS} \perp \overline{LN}$.
Which equation can be used to find the length of $\overline{AS}$?



1) $\frac{LS}{AS} = \frac{AS}{SN}$ $\frac{S}{A} = \frac{A}{S}$

2) $\frac{AN}{LN} = \frac{AS}{LS}$

3) $\frac{AS}{SN} = \frac{AS}{LS}$

4) $\frac{AS}{LS} = \frac{LS}{SN}$

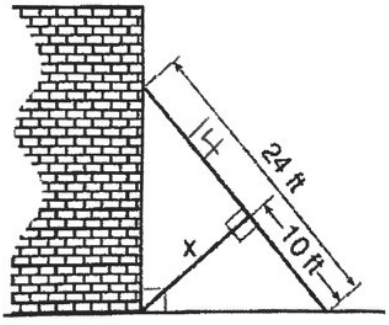
3 The accompanying diagram shows a 24-foot ladder leaning against a building. A steel brace extends from the ladder to the point where the building meets the ground. The brace forms a right angle with the ladder.
If the steel brace is connected to the ladder at a point that is 10 feet from the foot of the ladder, which equation can be used to find the length, x, of the steel brace?

1) $\frac{10}{x} = \frac{x}{14}$ $\frac{S}{A} = \frac{A}{S}$

2) $\frac{10}{x} = \frac{x}{24}$

3) $10^2 + x^2 = 14^2$

4) $10^2 + x^2 = 24^2$

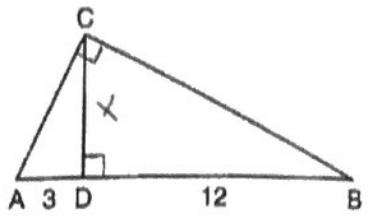


14

4 In the diagram below of right triangle ABC, altitude $\overline{CD}$ is drawn to hypotenuse $\overline{AB}$. If $AD = 3$ and $DB = 12$, what is the length of altitude $\overline{CD}$?

1) 6
2) $6\sqrt{5}$
3) 3
4) $3\sqrt{5}$

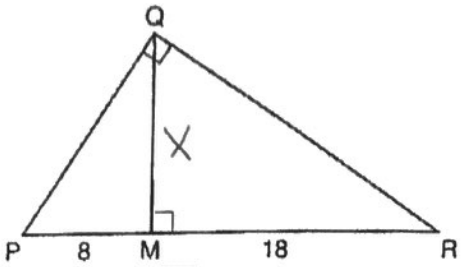
$\frac{3}{x} = \frac{x}{12}$ $\sqrt{x^2} = \sqrt{36}$ $x = 6$



5 In the diagram below, $\overline{QM}$ is an altitude of right triangle PQR, $PM = 8$, and $RM = 18$. What is the length of $\overline{QM}$?

1) 20
2) 16
3) 12
4) 10

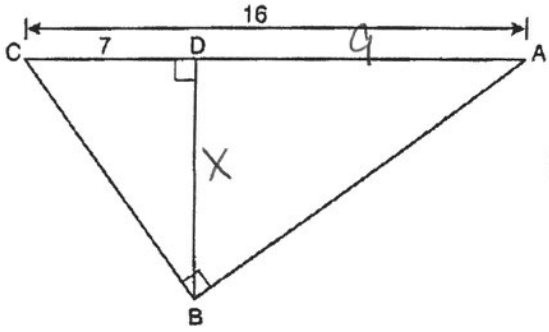
$\frac{8}{x} = \frac{x}{18}$ $\sqrt{x^2} = \sqrt{144}$ $x = 12$



6 In the diagram below of right triangle ABC, altitude $\overline{BD}$ is drawn to hypotenuse $\overline{AC}$, $AC = 16$, and $CD = 7$. What is the length of $\overline{BD}$?

1) $3\sqrt{7}$
2) $4\sqrt{7}$
3) $7\sqrt{3}$
4) 12

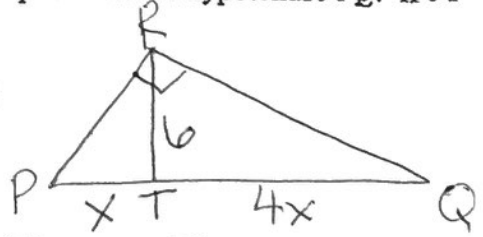
$\frac{7}{x} = \frac{x}{9}$ $\sqrt{x^2} = \sqrt{63}$ $\sqrt{9}\sqrt{7}$ $x = 3\sqrt{7}$



7 In $\triangle PQR$, $\angle PRQ$ is a right angle and $\overline{RT}$ is drawn perpendicular to hypotenuse $\overline{PQ}$. If $PT = x$, $RT = 6$, and $TQ = 4x$, what is the length of $\overline{PQ}$?

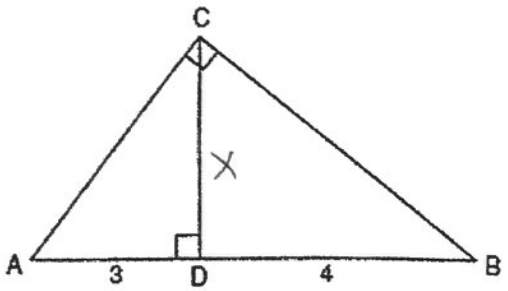
1) 9
2) 12
3) 3
4) 15

$\frac{x}{6} = \frac{6}{4x}$ $4x^2 = 36$ $\sqrt{x^2} = \sqrt{9}$ $x = 3$

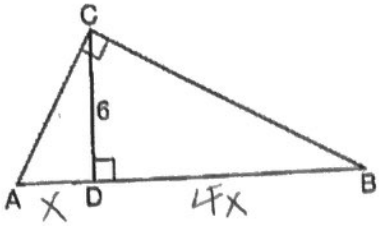


8 In the diagram below of right triangle ACB, altitude $\overline{CD}$ intersects $\overline{AB}$ at D. If $AD = 3$ and $DB = 4$, find the length of $\overline{CD}$ in simplest radical form.

$\frac{3}{x} = \frac{x}{4}$ $\sqrt{x^2} = \sqrt{12}$ $\sqrt{4}\sqrt{3}$ $x = \boxed{2\sqrt{3}}$



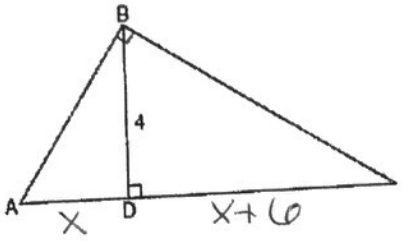
9 In right triangle ABC below, $\overline{CD}$ is the altitude to hypotenuse $\overline{AB}$. If $CD = 6$ and the ratio of AD to AB is 1:5, determine and state the length of $\overline{BD}$. [Only an algebraic solution can receive full credit.]



$\frac{X}{6} = \frac{6}{4X}$ $4x^2 = 36$ $\sqrt{x^2} = \sqrt{9}$ $x = 3$

$\overline{BD} = 12$

10 The drawing for a right triangular roof truss, represented by $\triangle ABC$, is shown in the accompanying diagram. If $\angle ABC$ is a right angle, altitude $BD = 4$ meters, and $\overline{DC}$ is 6 meters longer than $\overline{AD}$, find the length of base $\overline{AC}$ in meters.



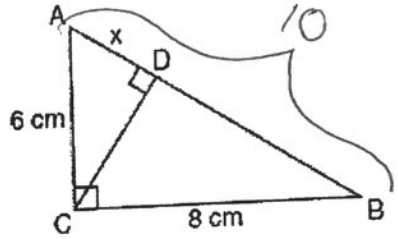
$\frac{X}{4} = \frac{4}{x+6}$ $X(x+6) = 16$ $x^2 + 6x = 16$ $x^2 + 6x - 16 = 0$ $(x+8)(x-2) = 0$

$x = -8$ | $x = 2$

$AC = 10$ m

11 In the diagram below, the length of the legs $\overline{AC}$ and $\overline{BC}$ of right triangle ABC are 6 cm and 8 cm, respectively. Altitude $\overline{CD}$ is drawn to the hypotenuse of $\triangle ABC$. What is the length of $\overline{AD}$ to the *nearest tenth of a centimeter*?

1) 3.6
2) 6.0
3) 6.4
4) 4.0

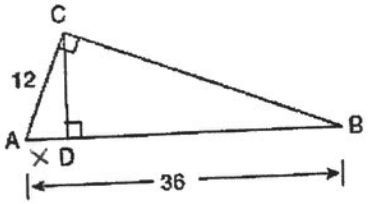


$6^2 + 8^2 = c^2$ $36 + 64 = c^2$ $\sqrt{100} = \sqrt{c^2}$ $10 = c$

$\frac{10}{6} = \frac{6}{X}$ $10x = 36$ $x = 3.6$

12 In the diagram below of right triangle ACB, altitude $\overline{CD}$ is drawn to hypotenuse $\overline{AB}$. If $AB = 36$ and $AC = 12$, what is the length of $\overline{AD}$?

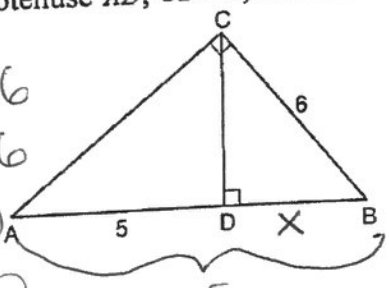
1) 32
2) 6
3) 3
4) 4



$\frac{36}{12} = \frac{12}{X}$ $36x = 144$ $x = 4$

13 In the diagram below of right triangle ABC, $\overline{CD}$ is the altitude to hypotenuse $\overline{AB}$, $CB = 6$, and $AD = 5$. What is the length of $\overline{BD}$?

1) 5
2) 9
3) 3
4) 4



$\frac{X+5}{6} = \frac{6}{X}$ $x(x+5) = 36$ $x^2 + 5x = 36$ $x^2 + 5x - 36 = 0$ $(x-4)(x+9) = 0$

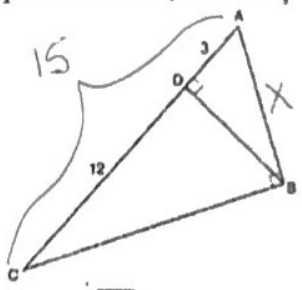
$x = 4$ | $x = -9$

14 In right triangle ABC shown in the diagram below, altitude $\overline{BD}$ is drawn to hypotenuse $\overline{AC}$, $CD = 12$, and $AD = 3$.

What is the length of $\overline{AB}$?

1) $5\sqrt{3}$
2) 6
3) $3\sqrt{5}$
4) 9

$\frac{15}{x} = \frac{x}{3}$ $\sqrt{45} = \sqrt{x^2}$ $\sqrt{9}\sqrt{5}$ $3\sqrt{5} = x$

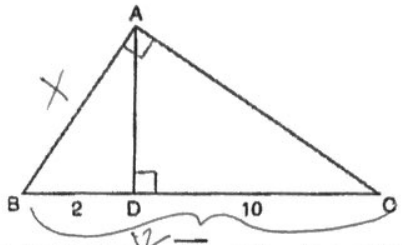


15 Triangle ABC shown below is a right triangle with altitude $\overline{AD}$ drawn to the hypotenuse $\overline{BC}$.

If $BD = 2$ and $DC = 10$, what is the length of $\overline{AB}$?

1) $2\sqrt{2}$
2) $2\sqrt{5}$
3) $2\sqrt{6}$
4) $2\sqrt{30}$

$\frac{12}{x} = \frac{x}{2}$ $\sqrt{x^2} = \sqrt{24}$ $\sqrt{4}\sqrt{6}$ $x = 2\sqrt{6}$

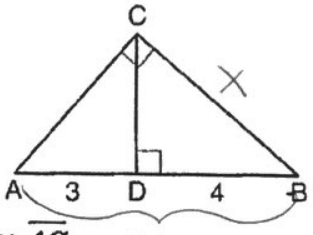


16 In the diagram below of right triangle ABC, $\overline{CD}$ is the altitude to hypotenuse $\overline{AB}$, $AD = 3$, and $DB = 4$.

What is the length of $\overline{CB}$?

1) $2\sqrt{3}$
2) $\sqrt{21}$
3) $2\sqrt{7}$
4) $4\sqrt{3}$

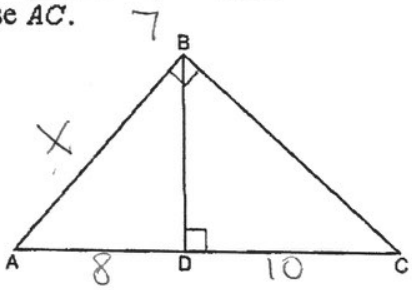
$\frac{7}{x} = \frac{x}{4}$ $\sqrt{x^2} = \sqrt{28}$ $\sqrt{4}\sqrt{7}$ $x = 2\sqrt{7}$



17 In right triangle ABC shown below, altitude $\overline{BD}$ is drawn to hypotenuse $\overline{AC}$.

If $AD = 8$ and $DC = 10$, determine and state the length of $\overline{AB}$.

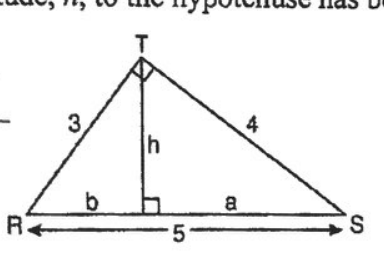
$\frac{18}{x} = \frac{x}{8}$ $\sqrt{x^2} = \sqrt{144}$ $x = 12$



18 In the diagram below, $\triangle RST$ is a 3 – 4 – 5 right triangle. The altitude, h, to the hypotenuse has been drawn. Determine the length of h.

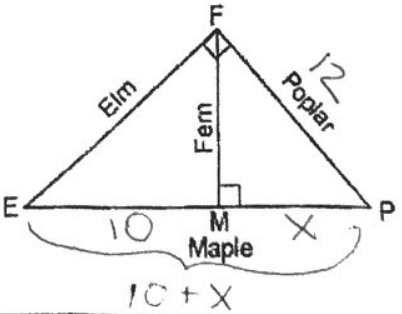
(1) $\frac{5}{3} = \frac{3}{b}$ $5b = 9$ $b = 1.8$ $5 - 1.8 = 3.2 = a$

(2) $\frac{1.8}{h} = \frac{h}{3.2}$ $\sqrt{h^2} = \sqrt{5.76}$ $h = 2.4$



19 Four streets in a town are illustrated in the accompanying diagram. If the distance on Poplar Street from F to P is 12 miles and the distance on Maple Street from E to M is 10 miles, find the distance on Maple Street, in miles, from M to P.

$\frac{10+x}{12} = \frac{12}{x}$ $x(10+x) = 144$ $10x + x^2 = 144$ $x^2 + 10x - 144 = 0$ $(x-8)(x+18) = 0$ $x = 8$ | $x = -18$



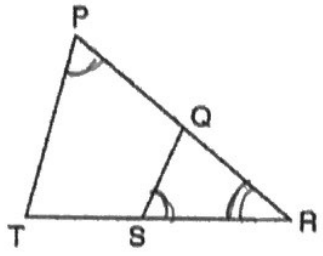
17

G.G.44: Similarity Proofs: Establish similarity of triangles, using the following theorems: AA, SAS, and SSS

1 In the diagram below of $\triangle PRT$, Q is a point on $\overline{PR}$, S is a point on $\overline{TR}$, $\overline{QS}$ is drawn, and $\angle RPT \cong \angle RSQ$. Which reason justifies the conclusion that $\triangle PRT \sim \triangle SRQ$?

1) AA
2) ASA
3) SAS
4) SSS

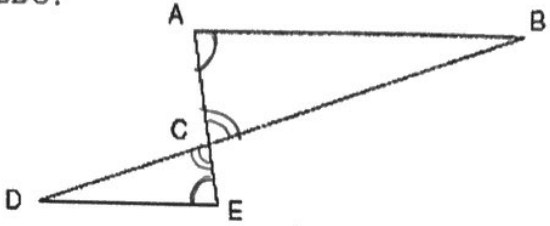
They share ∠R



2 In the diagram of $\triangle ABC$ and $\triangle EDC$ below, $\overline{AE}$ and $\overline{BD}$ intersect at C, and $\angle CAB \cong \angle CED$. Which method can be used to show that $\triangle ABC$ must be similar to $\triangle EDC$?

1) SAS
2) AA
3) SSS
4) HL

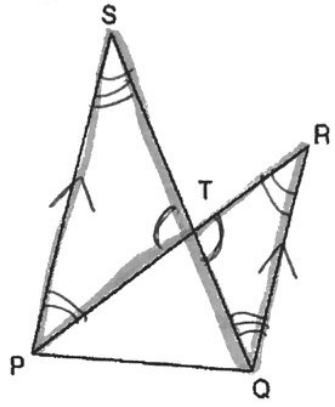
vertical ∠'s!



3 In the diagram below, $\overline{SQ}$ and $\overline{PR}$ intersect at T, $\overline{PQ}$ is drawn, and $\overline{PS} \parallel \overline{QR}$. What technique can be used to prove that $\triangle PST \sim \triangle RQT$?

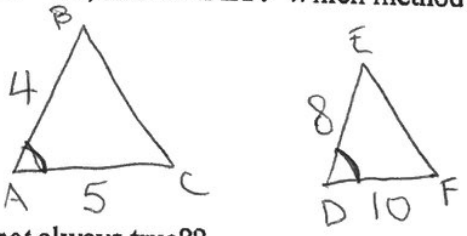
1) SAS
2) SSS
3) ASA
4) AA

alt. int. ∠'s & vertical ∠'s

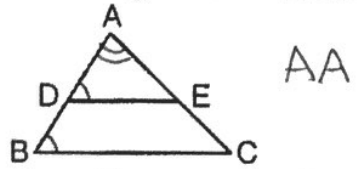


4 In triangles ABC and DEF, $AB = 4$, $AC = 5$, $DE = 8$, $DF = 10$, and $\angle A \cong \angle D$. Which method could be used to prove $\triangle ABC \sim \triangle DEF$?

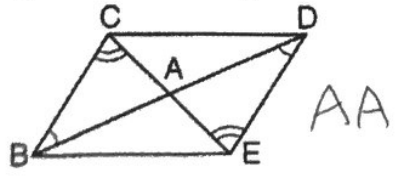
1) AA
2) SAS
3) SSS
4) ASA



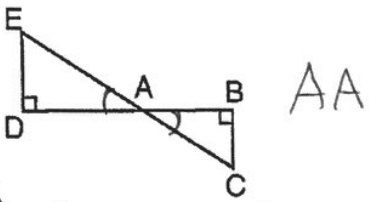
5 For which diagram is the statement $\triangle ABC \sim \triangle ADE$ *not* always true??

1) 

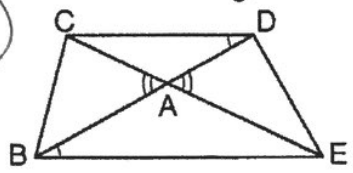
AA

2) 

AA

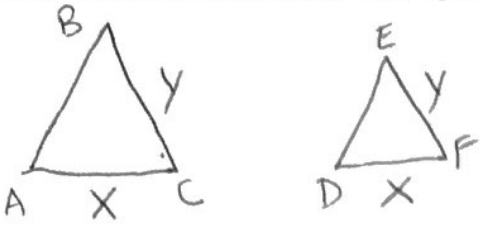
3) 

AA

4) 

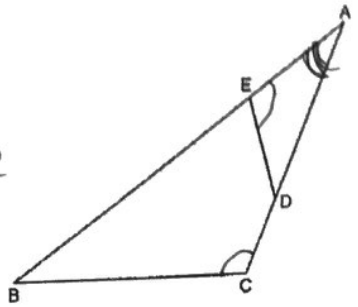
$\triangle ABC$ and $\triangle DEF$, $\frac{AC}{DF} = \frac{CB}{FE}$. Which additional information would prove $\triangle ABC \sim \triangle DEF$?

1) $AC = DF$
2) $CB = FE$
3) $\angle ACB \cong \angle DFE$
4) $\angle BAC \cong \angle EDF$



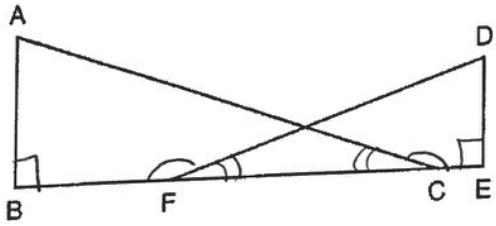
7 The diagram below shows $\triangle ABC$, with $\overline{AEB}$, $\overline{ADC}$, and $\angle ACB \cong \angle AED$. Prove that $\triangle ABC$ is similar to $\triangle ADE$.

S	R
1) $\overline{AEB}$, $\overline{ADC}$, $\angle ACB \cong \angle AED$	1) Given
2) $\angle A \cong \angle A$	2) Reflexive Prop
3) $\triangle ABC \sim \triangle ADE$	3) AA $\cong$ AA

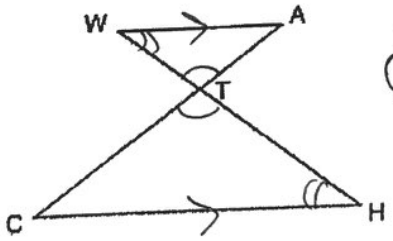


8 In the diagram below, $\overline{BFCE}$, $\overline{AB} \perp \overline{BE}$, $\overline{DE} \perp \overline{BE}$, and $\angle BFD \cong \angle ECA$. Prove that $\triangle ABC \sim \triangle DEF$.

S	R
1) $\overline{BFCE}$, $\overline{AB} \perp \overline{BE}$, $\overline{DE} \perp \overline{BE}$, $\angle BFD \cong \angle ECA$	1) Given
2) $\angle ABC \cong \angle DEF$	2) $\perp$ lines form $\cong$ right $\angle$'s
3) $\angle BFD$ & $\angle DFE$ are supp. $\angle ECA$ & $\angle ACB$ are supp.	3)
4) $\angle DFE \cong \angle ACB$	
5) $\triangle ABC \sim \triangle DEF$	5) AA $\cong$ AA



9 In the accompanying diagram, $\overline{WA} \parallel \overline{CH}$ and $\overline{WH}$ and $\overline{AC}$ intersect at point T. Prove that $(WT)(CT) = (HT)(AT)$.



S	R
1) $\overline{WA} \parallel \overline{CH}$, $\overline{WH}$ & $\overline{AC}$ intersect at point T.	1) Given
2) $\angle WTA \cong \angle HTC$	2) vert. $\angle$'s are $\cong$
3) $\angle W \cong \angle H$	3) alt. int. $\angle$'s are $\cong$
4) $\triangle WTA \sim \triangle HTC$	4) AA $\cong$ AA
5) $\frac{WT}{AT} = \frac{HT}{CT}$	5) Corresponding sides of similar $\triangle$'s are in proportion
6) $(WT)(CT) = (HT)(AT)$	6) In a proportion, the product of the means = the product of the extremes

26