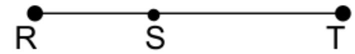
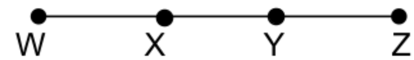
BC/AHS-PB January Invitational Geometry Team Question #1.

Diagrams below may not be to scale. All points are coplanar.

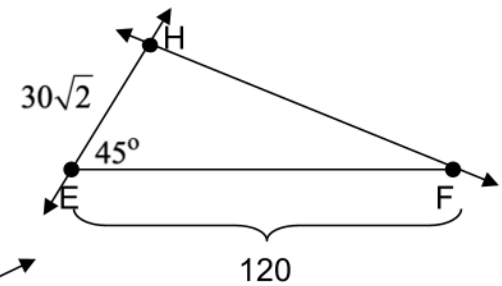
Part A: S is on $\overline{RT}$ so that $RS = \frac{2}{3}(ST)$. If RT = 60, find RS.



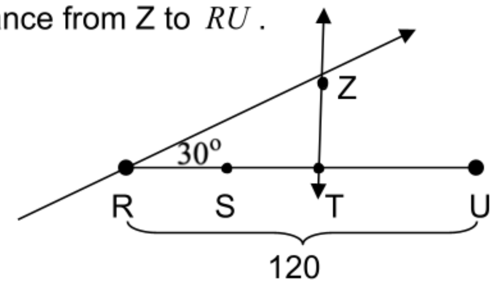
Part B: X and Y are on $\overline{WZ}$ so that WX=XY=YZ.
If XZ= $(4x+20)$ and WZ=120, then find the value of x



Part C: HE = $30\sqrt{2}$. $m\angle HEF = 45^{o}$.
If EF=120, find HF.



Part D: S and T are on $\overline{RU}$. RS:ST:TU = 1 : 1 : 2.
RU=120 and $m\angle ZRU = 30^{o}$.
$\overleftrightarrow{ZT} \perp \overline{RU}$ and find the distance from Z to $\overline{RU}$.



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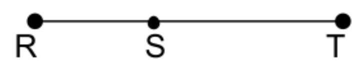

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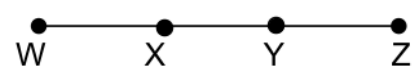

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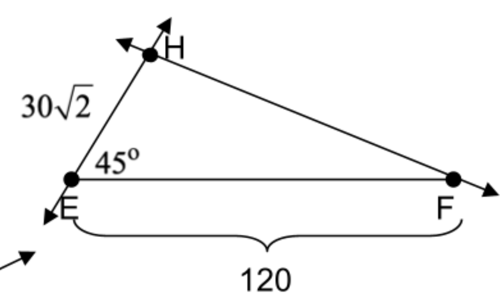

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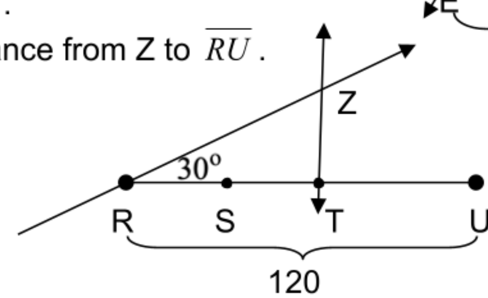

BC/AHS-PB January Invitational Geometry Team Question #2.

"Exterior angle" is an angle which forms a linear pair with an interior angle of a polygon.

Part A: A regular polygon has one interior angle with measure $(11a+10)^{\circ}$ and one exterior angle with measure $(6a)$. How many sides does the polygon have?

Part B: A regular polygon has interior angles with measures which total 1800 degrees. Give the measure of one exterior angle of the polygon.

Part C: A regular polygon has 54 diagonals. How many sides does the polygon have?

Part D: A regular polygon has 36 sides. Give the sum of the interior angles of the polygon.

BC/AHS-PB January Invitational Geometry Team Question #2.

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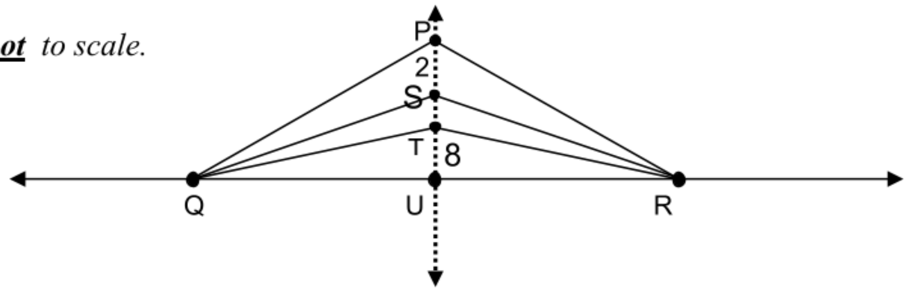
BC/AHS-PB January Invitational **Geometry Team** **Question #3.**

Diagram is ***not*** *to scale.*



In the diagram above, $\overleftrightarrow{PU} \perp \overleftrightarrow{QR}$, S and T lie on $\overline{PU}$ as shown, PS=2, TU=8, $m\angle TQU = 30^{\circ}$ **and** $m\angle SQT = 15^{\circ}$.

Part A: Find the perimeter of ΔQRT.

Part B: Find the perimeter of ΔQSR.

Part C: Find the perimeter of ΔQST.

Part D: The square of the length of $\overline{QP}$ is $a+b\sqrt{c}$ for c a prime integer and a and b rational. Give the value of $(a+b+c)$.

BC/AHS-PB January Invitational **Geometry Team** **Question #3.**

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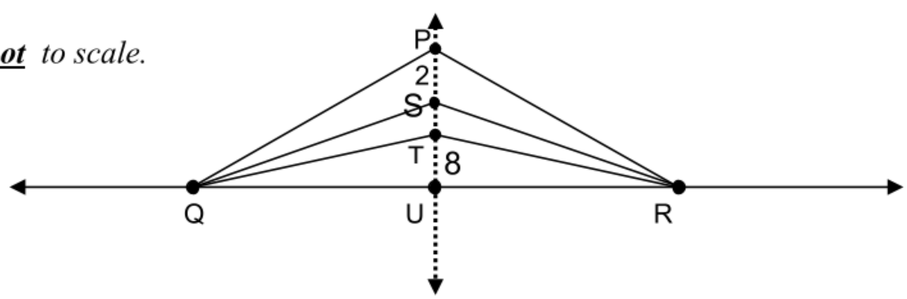

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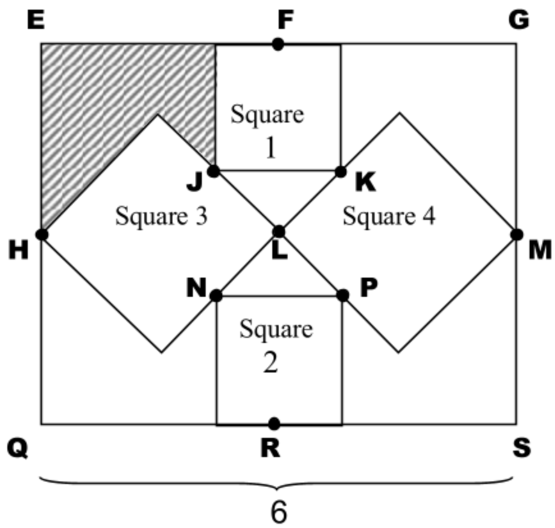
BC/AHS-PB January Invitational Geometry Team Question #4.



In the diagram, which is not drawn to scale, EGSQ is a square. Four smaller squares are drawn: Squares 1 and 2 are congruent and share a midpoint on one side with EGSQ (F and R). Squares 3 and 4 are congruent and have a vertex (H and M) on the midpoint of $\overline{EQ}$ and $\overline{GS}$ as shown. L is the center of EGSQ. J, K, N and P are midpoints of one side of squares 3 and 4. **QS = 6**.

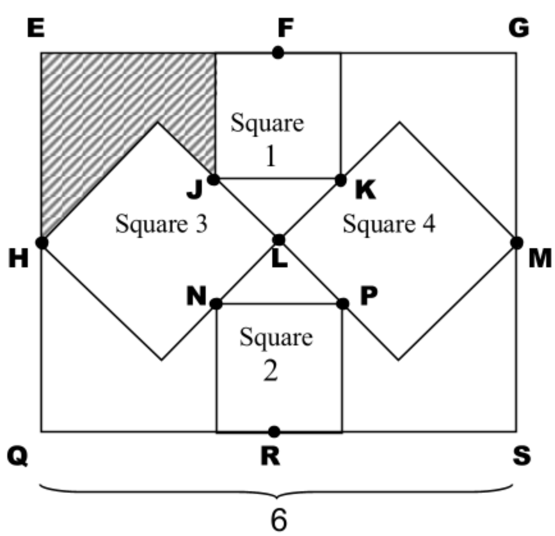
Part A: Find the length of one side of square 1.

Part B: Find the length of one side of square 3.

Part C: Find the perimeter of the shaded pentagon.

Part D: Find the height of ΔLNP from L to $\overline{NP}$.

BC/AHS-PB January Invitational Geometry Team Question #4.



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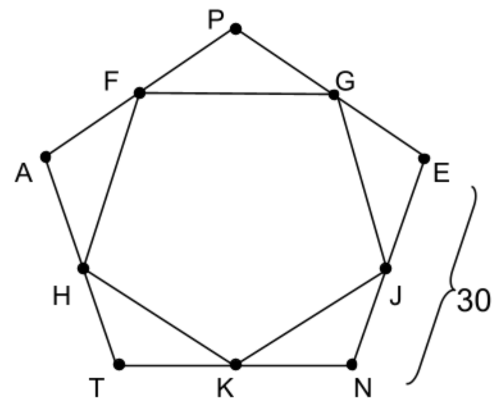
BC/AHS-PB January Invitational **Geometry Team** **Question #5.**

Regular pentagon PENTA has midpoints of its sides G, J, K, H and F. EN = 30.



Part A: Find $m\angle PFG$.

Part B: If $\Delta PFG \sim \Delta FHG$ then the answer to part B is 1. If $\Delta PFG,\ \Delta FHG$ are not similar, then the answer to part B is 0. If it cannot be determined, then the answer to part B is -1.

Part C: If $\frac{4}{5}$ is used as an approximation of $\cos 36^{\text{o}}$, find the perimeter of pentagon FGJKH.

Part D: If $\frac{4}{5}$ is used as an approximation of $\cos 36^{\text{o}}$, find the length of diagonal $\overline{AE}$.

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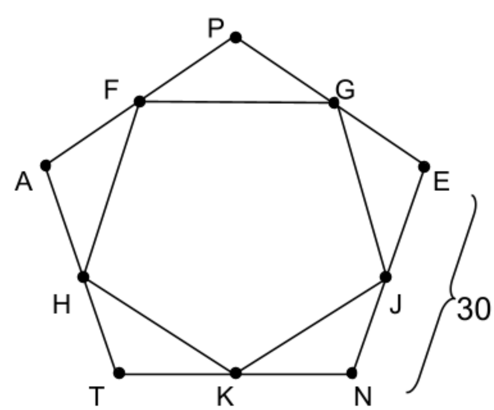

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BC/AHS-PB January Invitational **Geometry Team** **Question #6.**

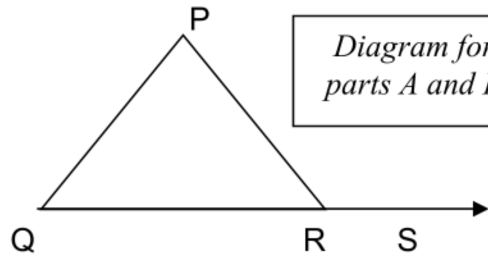


Diagram for parts A and B

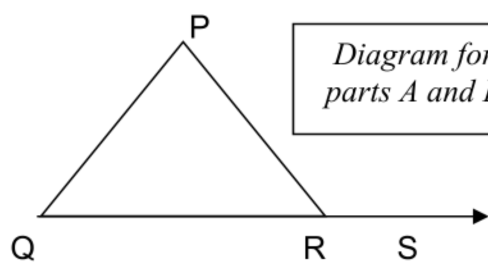
Part A: For ΔPQR, $\overrightarrow{QS}$ is drawn so that Q, R and S are collinear.
$m\angle PQR = (6y + 52)^{o}$,
$m\angle RPQ = (10y + 20)^{o}$, and
$m\angle PRS = (20y + 46)^{o}$. Find y.

Part B: For ΔPQR, $\overrightarrow{QS}$ is drawn so that Q, R and S are collinear. If PQ = QR and $m\angle Q = 50^{o}$, then find $m\angle PRS$.

Part C: An equilateral triangle RST (not shown) has RS = $(4x - 10)$ cm and ST = $(2x + 20)$ cm. Give the height of RST in cm.

Part D: For ΔXYZ (not shown), $XY = XZ$. $m\angle X = (z + 10)^{o}$ and $m\angle Y = (2z + 20)^{o}$. Give the measure of the largest (interior) angle of ΔXYZ.

BC/AHS-PB January Invitational **Geometry Team** **Question #6.**



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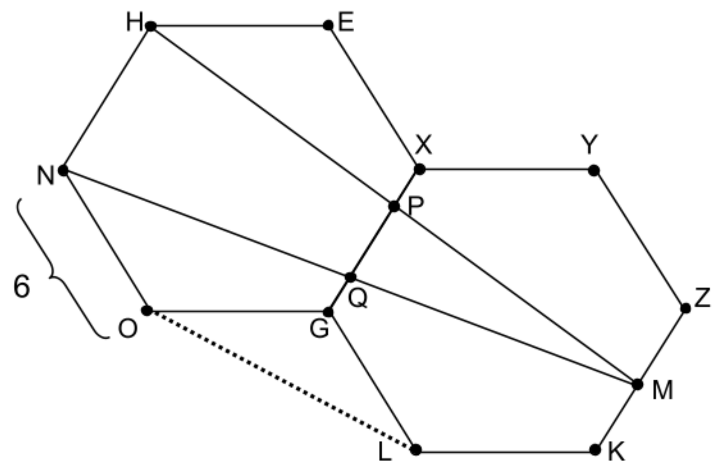
BC/AHS-PB January Invitational **Geometry Team** **Question #7.**

Regular hexagons HEXGON and XYZKLG are congruent. M is the midpoint of $\overline{ZK}$. $\overline{HM}$ and $\overline{NM}$ intersect side $\overline{GX}$ at P and Q as shown. Each side of the hexagons has **length 6**.



Part A: The length of the altitude of ΔMHN from M to $\overline{HN}$.

Part B: The length of $\overline{HM}$.

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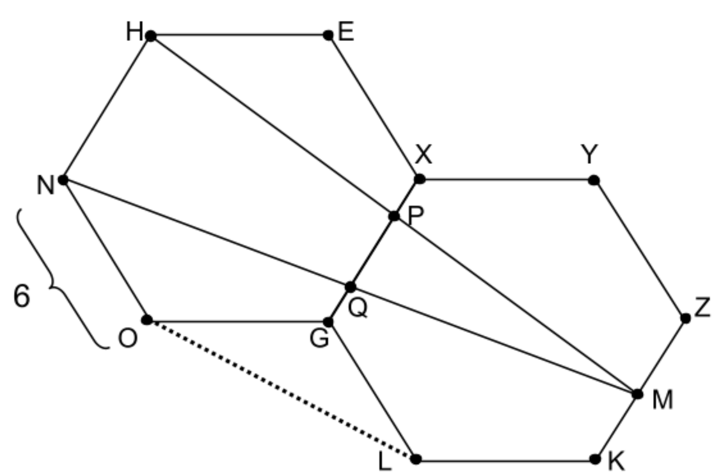

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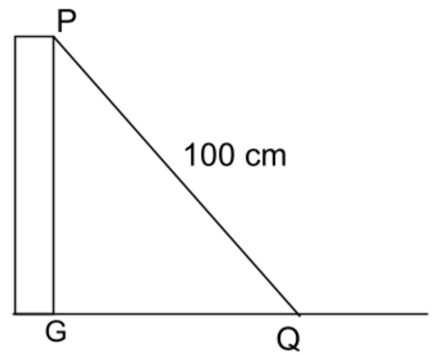
BC/AHS-PB January Invitational **Geometry Team** **Question #8.**

A 100 cm long ladder is leaning against a vertical wall as shown. The top of the ladder is P and the bottom is at ground level, Q. P starts 80 cm above ground on the wall. The diagram is not to scale. When P slides down the wall, the base of the ladder slides along the ground.

Part A: If P is 80 cm high, tell the distance from the midpoint of $\overline{PQ}$ to the wall, in cm.



Part B: If the top of the ladder slides down the wall so that P is on the wall 10 cm lower than it was originally, tell the distance in cm that Q moves because of the change in P's position.

Part C: Find the number of cm that P must slide down the wall from its original position so that the angle of elevation at Q becomes 45 degrees.

Part D: As P slides down the wall from its original position, maintaining contact with the wall always, the height of P above ground (G) changes from 80 cm to 0 cm. How many integer lengths (in cm) can the base $\overline{GQ}$ have during that slide? (Include the integer lengths which occur when PG is 80 cm and 0 cm.)

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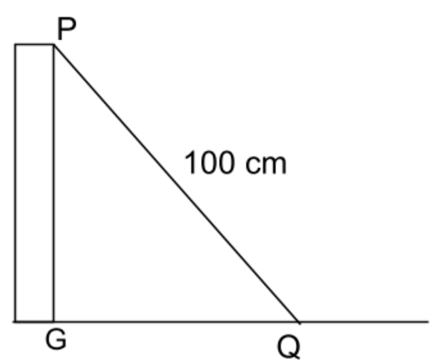

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BC/AHS-PB January Invitational **Geometry Team** **Question #9.**

Part A: ΔRST has integer length sides. One side length is 3 and the perimeter is 9. If ΔRST is not equilateral, then determine whether it is a(n) acute, obtuse or right triangle. Answer with one word: acute, obtuse or right. You must spell the word correctly!

Part B: ΔRST has angle measures $(2x+6)^{\circ}$, $(3x-21)^{\circ}$, and $(4x+6)^{\circ}$.

$$\text{If } \Delta RST \text{ is } \begin{cases} acute, & let\ B=1 \\ obtuse, & let\ B=2 \\ right, & let\ B=3 \\ not\ possible, & let\ B=4 \end{cases}$$

Give the value of B.

Part C: ΔRST has side lengths 3, 4 and k. Find the greatest possible integer length for k so that ΔRST is acute.

Part D: ΔRST is isosceles with angle measures $(x+12)^{\circ}$, $(2x-12)^{\circ}$, and y°. Give the greatest possible value of y.

BC/AHS-PB January Invitational **Geometry Team** **Question #9.**

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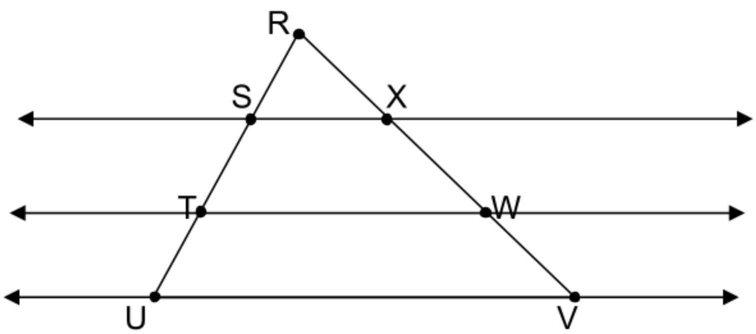
BC/AHS-PB January Invitational   Geometry Team   Question #10.



$\overleftrightarrow{XS} \parallel \overleftrightarrow{WT} \parallel \overleftrightarrow{VU}$.

$RS : RT : TU = 2:5:4$.

UV = 20.

Diagram is not drawn to scale.

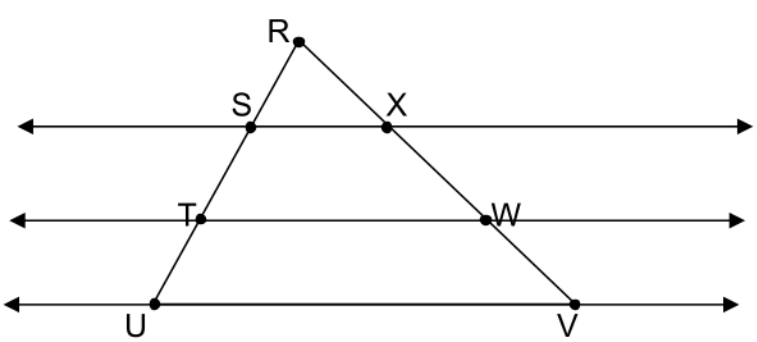
Part A: If RT = 15, then give the length of $\overline{RU}$.

Part B: If RX = 5, then give the ratio of RX to XW.

Part C: If $SX = (2c-10)$, then find the value of c.

Part D: If RU = 27 and RV = 36, then give the perimeter of quadrilateral TWVU in fraction form.

BC/AHS-PB January Invitational   Geometry Team   Question #10.



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BC/AHS-PB January Invitational Geometry Team Question #11.

Part A: The measure of $\angle A$ is 30 degrees more than five times the measure of its supplement. Find the measure of $\angle A$.

Part B: The measure of $\angle B$ is six degrees less than half of its complement. Find the measure of the supplement of $\angle B$.

Part C: The exterior angle at C to ΔCUT has a measure that is three times one of the remote interior angles to C. If the other remote interior angle to C has measure 20°, then find the measure of the exterior angle at C.

Part D: Right ΔTUG has hypotenuse $\overline{GT}$. If $\tan(\angle G) = 4$, then find $\sin(\angle T) \bullet \cos(\angle T)$ in fraction form.

BC/AHS-PB January Invitational Geometry Team Question #11.

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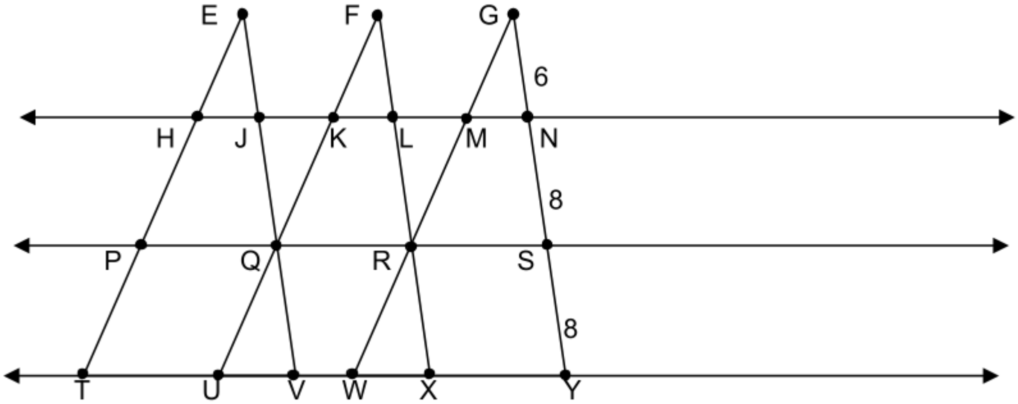
BC/AHS-PB January Invitational **Geometry Team** **Question #12.**



ΔVTE, ΔXUF, and ΔYWG are congruent. **TU: UV=2:1. UW: WX=2:1.**
$\overleftrightarrow{HN} \parallel \overleftrightarrow{PS} \parallel \overleftrightarrow{TY}$. H, J, K, L, M, N are collinear; P, Q, R, S are collinear;
T, U, V, W, X, Y are collinear. GN=6, NS=8, SY=8.

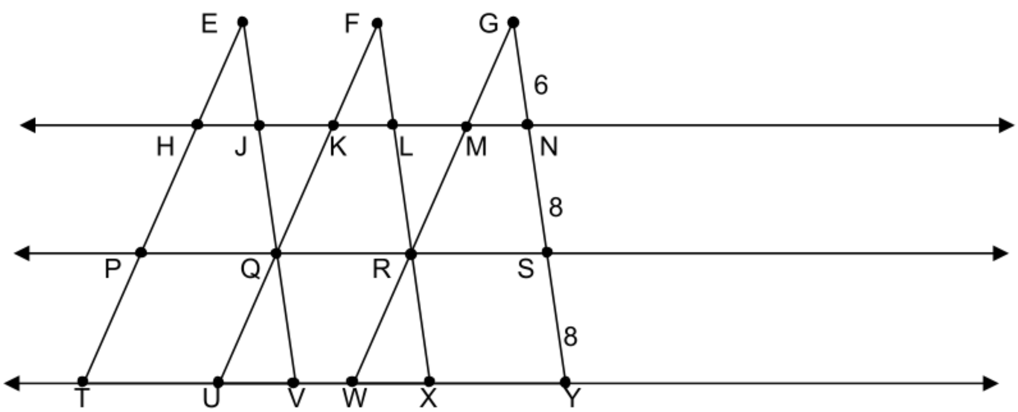
Part A: If GM = 5 and WY = 9 then find the perimeter of ΔGWY.

Part B: If TU = 7 then give the length of $\overline{TY}$.

Part C: If GM = 5, then find the length of $\overline{LR}$.

Part D: If UV = 3, then find the length of the median (midline) of trapezoid PQVT.

BC/AHS-PB January Invitational **Geometry Team** **Question #12.**



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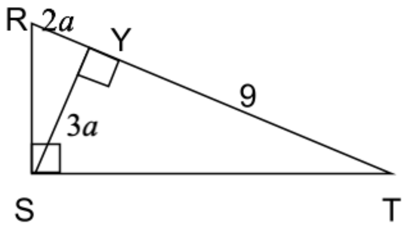
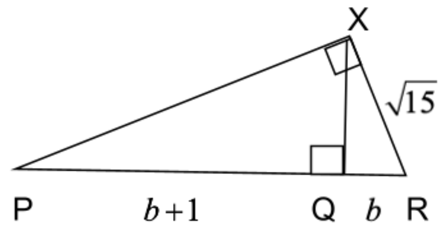
BC/AHS-PB January Invitational — Geometry Team — Question #13.





In ΔRST, $\angle RST$ is a right angle, and $\overline{SY}$ is the altitude to the hypotenuse.
In ΔPXR, $\angle PXR$ is a right angle, and $\overline{XQ}$ is the altitude to the hypotenuse.
Diagrams are not drawn to scale.

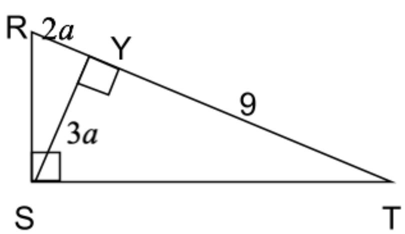
Part A: If RY= $2a$, $YT = 9$ and $SY = 3a$ then find the value of a.

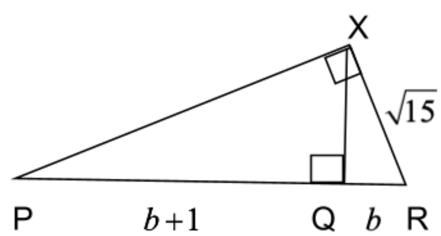
Part B: In ΔPXR, $XR = \sqrt{15}$, $PQ = (b+1)$ and $QR = b$. Find the value of b.

Part C: If RY= $2a$, $YT = 9$ and $SY = 3a$, then find the perimeter of ΔRST.

Part D: In ΔPXR, $XR = \sqrt{15}$, $PQ = (b+1)$ and $QR = b$. Find the length of $\overline{XQ}$.

BC/AHS-PB January Invitational — Geometry Team — Question #13.





In ΔRST, $\angle RST$ is a right angle, and $\overline{SY}$ is the altitude to the hypotenuse.
In ΔPXR, $\angle PXR$ is a right angle, and $\overline{XQ}$ is the altitude to the hypotenuse.
Diagrams are not drawn to scale.

Part A: If RY= $2a$, $YT = 9$ and $SY = 3a$ then find the value of a.

Part B: In ΔPXR, $XR = \sqrt{15}$, $PQ = (b+1)$ and $QR = b$. Find the value of b.

Part C: If RY= $2a$, $YT = 9$ and $SY = 3a$, then find the perimeter of ΔRST.

Part D: In ΔPXR, $XR = \sqrt{15}$, $PQ = (b+1)$ and $QR = b$. Find the length of $\overline{XQ}$.