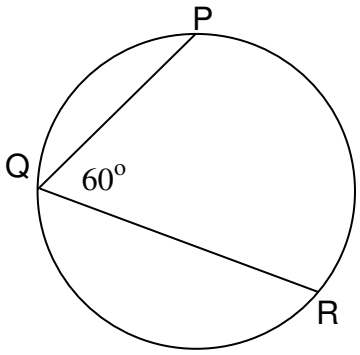
GEOMETRY INDIVIDUAL TEST

February Regional Competition

The abbreviation NOTA found in choice E stands for "None of The Above" and should be chosen if choices A, B, C and D are not correct.

Diagrams may not be drawn to scale.

1.



P and R are on the circle shown.

The circle shown has circumference 18 cm. Inscribed angle, $\angle PQR$, has measure 60 degrees. Find the length of $\overset{\frown}{PQR}$ (arc).

A. 137 cm B. 12 cm
C. 8 cm D. 6 cm
E. NOTA

2. A regular hexagon has perimeter 600. What is the length of its apothem?

A. 100 B. $100\sqrt{3}$
C. $50\sqrt{3}$ D. 50
E. NOTA

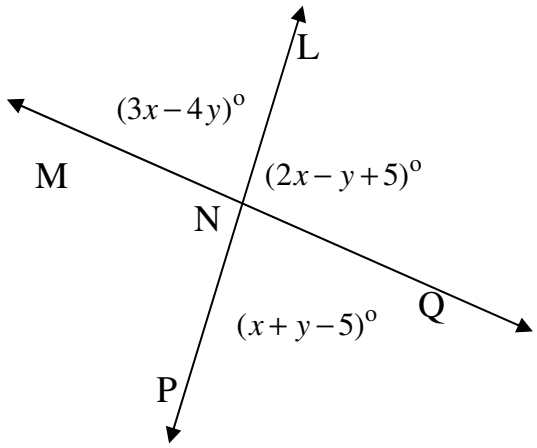
3. $\overleftrightarrow{RS}$ and $\overleftrightarrow{TU}$ intersect at point X. $\overleftrightarrow{XY}$ is perpendicular to $\overleftrightarrow{RS}$. Y does not lie in the plane containing $\overleftrightarrow{RS}$.

Which of the following must be true?

I. $\overleftrightarrow{XY}$ is perpendicular to $\overleftrightarrow{TU}$
II. $TX + XU = TU$.
III. $\overleftrightarrow{RS}$ and $\overleftrightarrow{TY}$ are skew lines.

A. I, II only B. II, III only
C. I, III only D. I, II, III
E. NOTA

4.



$\overleftrightarrow{PL}$ and $\overleftrightarrow{MQ}$ intersect at point N.

$m\angle MNL = (3x-4y)^o$.

$m\angle LNQ = (2x-y+5)^o$.

$m\angle PNQ = (x+y-5)^o$. Give the value of $x+y$.

A. 85 B. 80
C. 75 D. 70
E. NOTA

5. A chord in a circle has length 12 cm and is a distance of 4 cm from the circle's center. What is the area of the circle, in square cm?

A. 20π B. 52π
C. 128π D. 160π
E. NOTA

6. In ΔRST, RS=6, ST=8 and RT=12. Which describes ΔRST?

A. acute B. 30^o-60^o-90^o triangle
C. obtuse D. not possible
E. NOTA

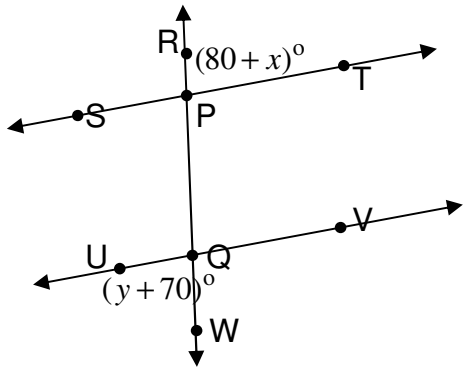
7. Right ΔRST has hypotenuse $\overline{RS}$ with length $2\sqrt{13}$. $Tan(\angle SRT)=\frac{3}{2}$. Q is on side $\overline{ST}$ so that $\overline{RQ}$ is the median to side $\overline{ST}$. Find $\sin(\angle QRT)$.

A. $\frac{\sqrt{13}}{13}$ B. $\frac{3\sqrt{10}}{10}$

C. $\frac{\sqrt{5}}{10}$ D. $\frac{3}{5}$

E. NOTA

8.



Parallel lines $\overleftrightarrow{ST}$ and $\overleftrightarrow{UV}$ intersect transversal $\overleftrightarrow{RW}$ at P and Q, respectively as shown. $m\angle RPT=(80+x)^o$ and $m\angle UQW=(y+70)^o$. If $xy=56$, then find the value of x^2+y^2. $\angle RPT$ is acute.

A. Undetermined unless $\overleftrightarrow{PQ}\perp\overleftrightarrow{UV}$

B. 212

C. 156

D. 122

E. NOTA

9. Rhombus RSTU has RS=10 and TR=12. Find the area of RSTU.

A. 96 B. 48

C. 28 D. 24

E. NOTA

10. In ΔRST, RS=ST, $m\angle S=(2x+10)^o$ and $m\angle T=(x-5)^o$. Give the value of x.

A. 43.75 B. 45

C. 53 D. $58.\overline{3}$

E. NOTA

11. One interior angle of a regular polygon has measure 175^o. If this polygon has n sides, then give the measure of one exterior angle of a regular polygon with $\frac{n}{9}$ sides.

A. 30^o B. 40^o

C. 42^o D. 45^o

E. NOTA

12. A convex polygon has n sides and $(n+3)$ diagonals. What is the sum of the measures of the interior angles of this polygon?

A. 720^o B. 900^o

C. 1620^o D. 1500^o

E. NOTA

13. Point P has coordinates (10, 0) on the xy-coordinate plane. Point Q is on the y-axis of the same plane. The slope of $\overleftrightarrow{PQ}$ is -4. Find the distance from P to Q.

A. 50 B. $10\sqrt{17}$

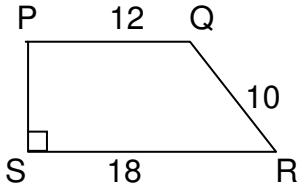
C. 30 D. $10\sqrt{5}$

E. NOTA

14. A pentagon has interior angle measures $(100p-70)^o$, $(120p-130)^o$, 100^o, $34(p+1)^o$ and $(30p+38)^o$. Give the area of the regular triangle with one side length p cm.

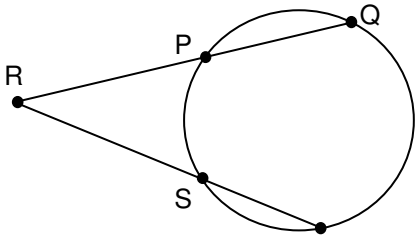
A. $4\sqrt{3}$ B. $3\sqrt{3}$
C. $2\sqrt{3}$ D. $\sqrt{3}$
E. NOTA

15. Trapezoid PQRS has side lengths PQ=12, QR=10, and SR=18. $m\angle S = 90^o$. Give the area of PQRS.



A. 150 B. 120
C. 180 D. 210
E. NOTA

16.



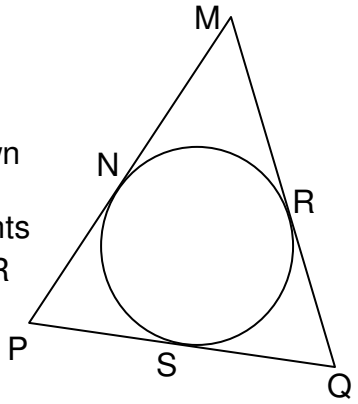
P, Q, S and T are on the circle shown. $\overleftrightarrow{PQ}$ and $\overleftrightarrow{ST}$ intersect at R. $\overset{\frown}{PQ}$, $\overset{\frown}{QT}$, $\overset{\frown}{ST}$ and $\overset{\frown}{PS}$ are minor arcs, with measures 80^o, $(20c+10)^o$, 60^o and $(10c)^o$ respectively. Find $m\angle R$.

A. 32^o B. 36^o
C. 40^o D. 42^o
E. NOTA

17. $\overline{RV}$ is the altitude to the hypotenuse of right ΔRST, with V on $\overline{ST}$. If $RS=9$ and $RT=12$ then tell the length of $\overline{VS}$.

A. $\frac{48}{5}$ B. $\frac{36}{5}$
C. $\frac{27}{5}$ D. $12\sqrt{3}$
E. NOTA

18. The circle shown is inscribed in ΔMPQ with points of tangency N, R and S. PM=14, PQ=11 and MQ=13. Find NP.



A. 6 B. 8
C. 10 D. 12
E. NOTA

19. ΔRST has side lengths $RS=100$ and $ST=120$. If $\angle R$ is the largest angle of ΔRST then how many integral (integer) lengths are possible for RT?

A. 199 B. 139
C. 118 D. 99
E. NOTA

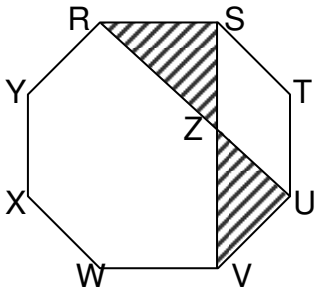
20. Two coplanar circles share a common center. The radii are r cm and $(r+2)$ cm. and the area outside of the smaller circle and inside of the larger circle is 32π cm^2. Give the sum of the circumferences of the two circles, in cm.

A. 40π B. 36π
C. 34π D. 32π
E. NOTA

21. A right triangle has two angle measures of $(3x-12)^{\circ}$, $(x+10)^{\circ}$. Find the sum of the possible values of x.

A.137 B. 57
C. 34 D. 23
E. NOTA

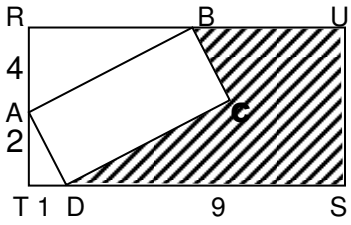
22.



Regular octagon RSTUVWXY has perimeter **2k** cm. Diagonals $\overline{RU}$ and $\overline{SV}$ intersect at Z. The combined area of the shaded regions (ΔRSZ and ΔZUV) is **k** square cm. Give the value of k.

A. 64 B. 32
C. 16 D. 8
E. NOTA

23.



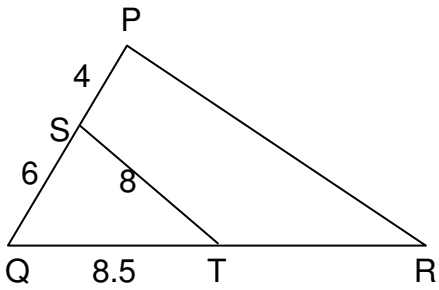
Rectangle RUST is drawn so that a smaller rectangle ABCD has A on $\overline{RT}$, with RA=4, and TA=2. D is on $\overline{TS}$ so that TD=1 and DS=9. Find the area of concave pentagon BUSDC.

A. 40 B. 30
C. 24 D. 23
E. NOTA

24. A triangle has angles in the ratio of 3:4:5. If the shortest side of the triangle has length 10 then what is the length of the longest side of the triangle?

A. $5+5\sqrt{3}$ B. $5+5\sqrt{2}$
C. $5\sqrt{3}+5\sqrt{2}$ D. $5\sqrt{6}$
E. NOTA

25.



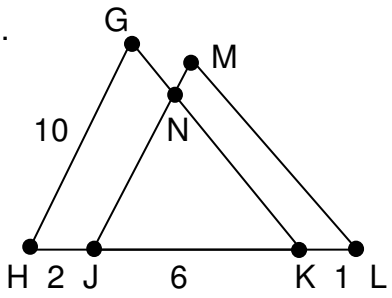
In ΔPQR, S is on $\overline{PQ}$ and T is on $\overline{QR}$, so that $\overline{ST}$ is NOT parallel to $\overline{PR}$. QS=6, SP=4, QT=8.5 and ST=8. ΔSQT is similar to the large triangle with angles P, Q and R. Find the length of $\overline{PR}$.

A. $\frac{85}{8}$ B. $\frac{160}{17}$
C. $\frac{120}{17}$ D. $\frac{50}{3}$
E. NOTA

26. Parallelogram RSTU has $m\angle R=(4x+40)^{\circ}$, $m\angle T=(3y-30)^{\circ}$ and $m\angle S=(2x+20)^{\circ}$. Give the value of $y-x$.

A. 20 B. 25
C. 30 D. 35
E. NOTA

27.



$\overleftrightarrow{GH} \parallel \overleftrightarrow{MJ}$ and $\overleftrightarrow{ML} \parallel \overleftrightarrow{GK}$

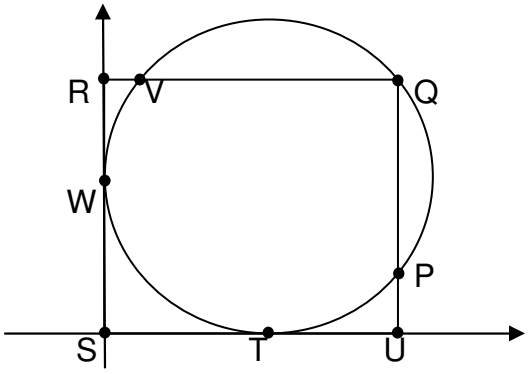
Shown above are ΔGHK, ΔMJL, where $\overline{MJ}$ and $\overline{GK}$ intersect at N, and the points H, J, K and L are collinear. HG=10, HJ=2, KL=1 and JK=6. Find the length of $\overline{NM}$.

A. $\frac{5}{7}$ B. $\frac{3}{4}$

C. $\frac{3}{2}$ D. $\frac{5}{4}$

E. NOTA

28.



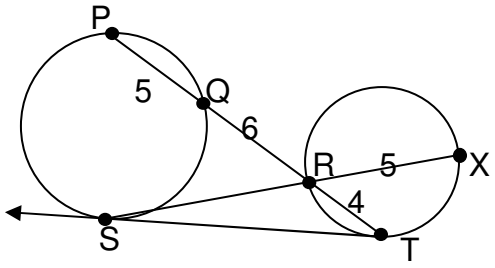
The circle shown contains points V, Q, and P, and is tangent to the $x-$ and $y-$axes at T and W respectively. Rectangle RQUS contains V and P. If P has x-coordinate 9 and T has x-coordinate 5, then give the distance VP.

A. 10 B. $9\sqrt{2}$

C. $9\sqrt{3}$ D. $\sqrt{145}$

E. NOTA

29.



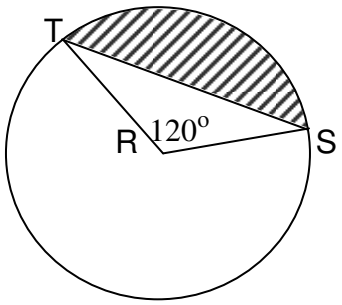
$\overleftrightarrow{ST}$ is tangent to both circles above at points S and T respectively. P and Q lie on the larger circle; R and X lie on the smaller circle. P, Q, R and T are collinear; S, R and X are collinear. PQ=5, QR=6, RT=4 and RX=5. Find the length of $\overline{SR}$.

A. $\sqrt{82}+6$ B. $5\sqrt{6}$

C. 10 D. $\sqrt{159}-3$

E. NOTA

30.



In circle R above, central angle TRS has measure 120^{o}. RS= $2\sqrt{6}$. The area of the segment bounded by chord $\overline{TS}$ and arc $\overset{\frown}{TS}$ is $n\pi-\sqrt{m}$. Find the value of $m-n$.

A. 40 B. 80

C. 96 D. 100

E. NOTA