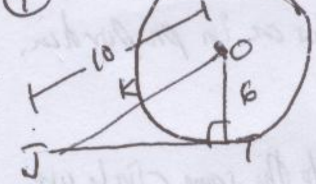
HW #18: (Note: Some assignments will vary with problems assigned; just read the relevant solutions.)

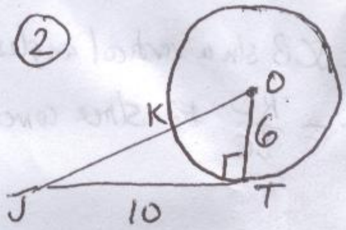
R: p. 335 #1-6, 10, 11, 16

H: p. 335 #1-6, 10, 15, 16, 18

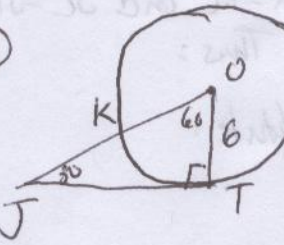
For these, recall that tangents are always perpendicular to radii at the point of tangency.

① 

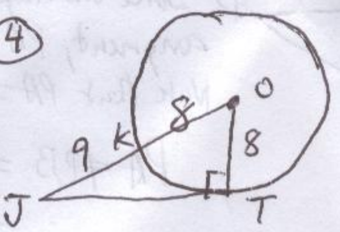
$\boxed{JT = 8}$, since we have double a 3-4-5 Pythagorean Triple.

② 

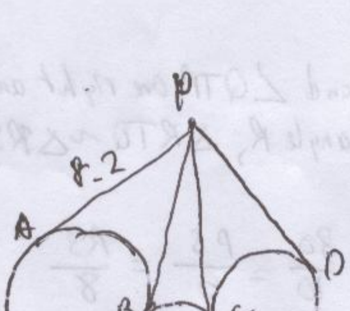
$JO^2 = 6^2 + 10^2$
$= 36 + 100$
$= 136 = \sqrt{4} \cdot \sqrt{34}$
$= \boxed{2\sqrt{34}}$

③ 

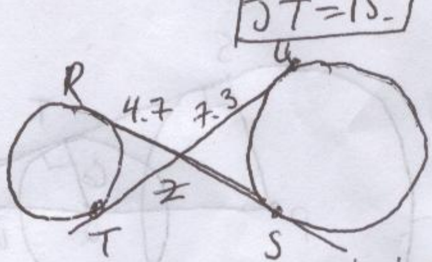
Use 30-60-90 △'s.
$JO = 2 \cdot OT = 2 \cdot 6$
$= \boxed{12.}$

④ 

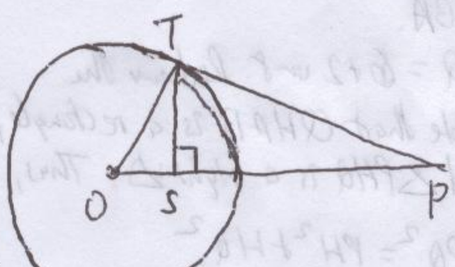
Note $OT = 8$ since $OT = OK$ as both are radii. Thus,
$JT^2 + 8^2 = 17^2$
$JT^2 + 64 = 289$
$JT^2 = 225$
$\boxed{JT = 15.}$

⑤ 

Note that $PA = PB$ since they are both tangents drawn to the same circle from P. By the same reason, $PB = PC$, and $PC = PD$.
Thus,
$PD = PC = PB = PA = \boxed{8.2.}$

⑥ 

$ZR = ZT$ as they are tangents to the same circle from Z. Similarly, $ZU = ZS$.
Thus, by Addition Postulate,
$RZ + ZS = TZ + ZU$, or $RS = TU$.
Thus, $RS = TU = RZ + ZS = 4.7 + 7.3$
$= \boxed{12.}$

⑩ 

Use the Right Triangle Altitude Theorem.

A TS, an altitude, is the geometric mean of left and right, or $\boxed{OS \text{ and } SP.}$

B TO, a leg, is the geometric mean of the hypotenuse and shadow, or: $\boxed{OS \text{ and } OP.}$

C $\dfrac{OS}{ST} = \dfrac{ST}{SP}$

$\dfrac{6}{ST} = \dfrac{ST}{24}$

$ST^2 = 144$

$\boxed{ST = 12.}$

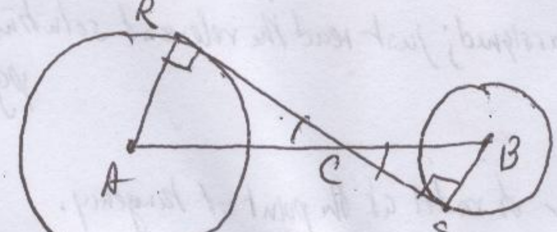
$\dfrac{SP}{TP} = \dfrac{TP}{OP}$

$\dfrac{24}{TP} = \dfrac{TP}{30}$

$TP^2 = 720$

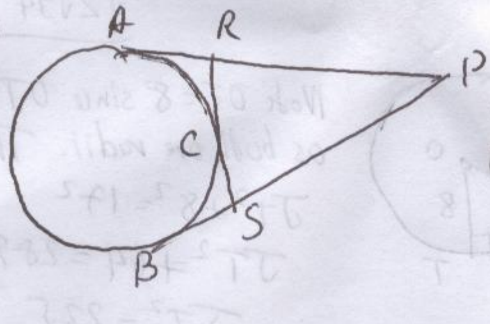
$TP = \sqrt{720} = \sqrt{36} \cdot \sqrt{20} = 6\sqrt{4} \cdot \sqrt{5}$
$= \boxed{12\sqrt{5}}$

(11)



Note that $\overline{RS}$ is a common tangent. Thus, $\overline{AR} \perp \overline{RS}$ and $\overline{BS} \perp \overline{RS}$ since a tangent is $\perp$ to a radius at its point of tangency. Thus, $\angle R$ and $\angle S$ are right angles by definition of $\perp$ lines, and $\angle R \cong \angle S$ since all right $\angle$s are $\cong$. $\angle RCA \cong \angle SCB$ since vertical angles are congruent. Thus, $\triangle ARC \sim \triangle BSC$ by AA Postulate. So, $\frac{AC}{BC} = \frac{RC}{SC}$ since corresponding sides of similar triangles are in proportion.

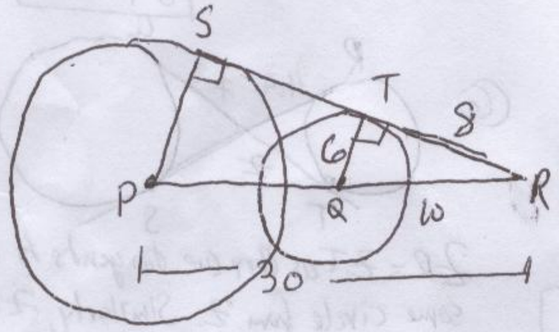
(15)



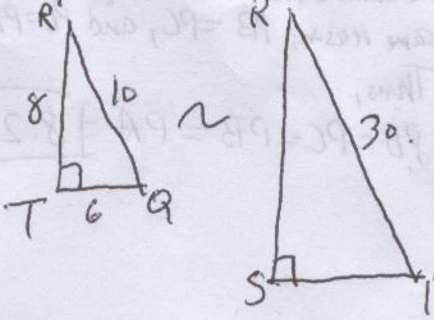
Since two tangents drawn from the same point to the same circle are congruent, $PA = PB$. By the same reason, $AR = RC$ and $SC = SB$. Note that $PA = PR + RA$ and $PB = PS + SB$. Thus:

$$PA + PB = PR + RA + PS + SB. \text{ Substitute:}$$
$$= PR + PS + RC + SC$$
$$= PR + PS + RS.$$

(16)



Tangents are $\perp$ to radii, so $\angle S$ and $\angle QTR$ are right angles. As $\triangle RTQ$ and $\triangle RSP$ share angle R, $\triangle RTQ \sim \triangle RSP$ by AA Postulate. Thus:



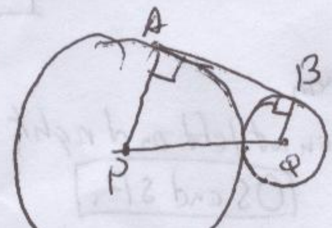
$$\frac{30}{10} = \frac{PS}{6} = \frac{RS}{8}$$

$\boxed{PS = 18}$, $RS = 24$.

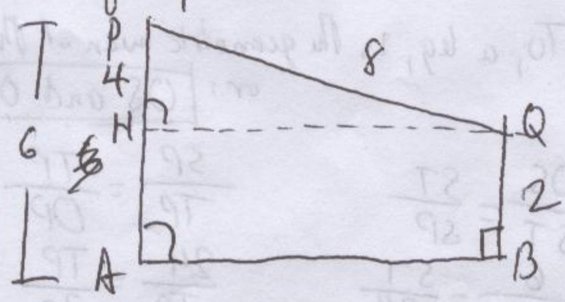
$\boxed{PQ = 30 - 10 = 20.}$

$$\boxed{\begin{aligned} ST &= RS - 8 \\ &= 24 - 8 = 16 \end{aligned}}$$

(18)



Draw the new lines, forming trapezoid $PQBA$.
Note that $PA = 6$, $QB = 2$. Thus, $PQ = 6 + 2$ or 8. Redraw the quad; and draw $HQ \parallel \overline{AB}$. Note that $QHAB$ is a rectangle, and $\triangle PHQ$ is a right $\triangle$. Thus,



$$PQ^2 = PH^2 + HQ^2$$
$$8^2 = 4^2 + HQ^2$$
$$64 = 16 + HQ^2$$
$$HQ^2 = 48$$
$$HQ = \sqrt{48} = \sqrt{16}\sqrt{3} = 4\sqrt{3}.$$

Thus, $\boxed{HQ = AB = 4\sqrt{3}.}$