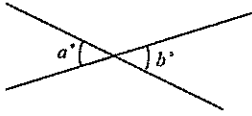
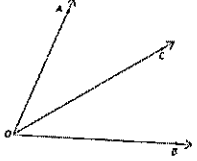
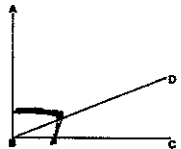
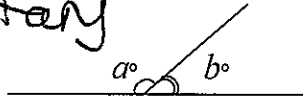
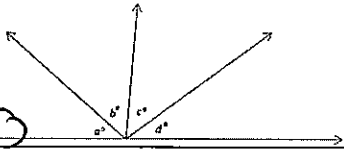
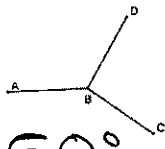
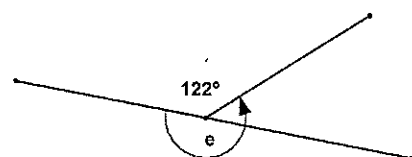
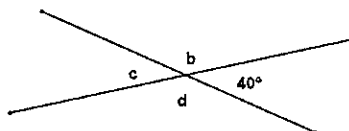
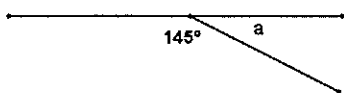


**Aim: Solving for the Unknown Angle**

	FACTS	DIAGRAM
1.	vertical $\angle$ 's are = $m\angle a = m\angle b$	
2.	angle addition property $m\angle AOC + m\angle DOC = m\angle AOB$	
3.	complementary $\angle$ 's add to $90^\circ$ $m\angle ABD + m\angle CBD = 90^\circ$	
4.	Linear pairs are supplementary $m\angle a + m\angle b = 180^\circ$	
5.	consecutive angles on a line add to $180^\circ$ $m\angle a + m\angle b + m\angle c + m\angle d = 180$	
6.	angles at a point add to $360^\circ$ $m\angle ABD + m\angle CBD + m\angle ABC = 360^\circ$	

7. Find the measures of each labeled angle. Give a reason for your solution.



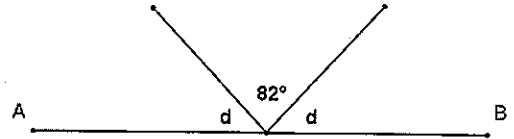
Angle	Angle measure	Reason
$\angle a$	$35^\circ$	Linear pairs are supplementary
$\angle b$	$140^\circ$	Linear pairs are supplementary
$\angle c$	$40^\circ$	vertical $\angle$ 's are equal
$\angle d$	$140^\circ$	vertical $\angle$ 's are equal
$\angle e$	$238^\circ$	$\angle$ 's at a point add to $360^\circ$

Directions: For Exercises 8-11, use the figure at the below. In the figures below,  $\overline{AB}$ ,  $\overline{CD}$ , and  $\overline{EF}$  are straight line segments. Find the measure of each marked angle or find the unknown numbers labeled by the variables in the diagrams. Give reasons for your calculations. Show all the steps to your solution.

$$\begin{array}{r} 180 \\ - 82 \\ \hline 98 \end{array}$$

$$98 \div 2 = 49^\circ$$

$$\boxed{m\angle d = 49^\circ}$$

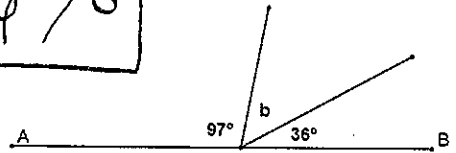


Reason consecutive  $\angle$ 's on a line add to  $180^\circ$

$$\begin{array}{r} 97 \\ + 36 \\ \hline 133 \end{array}$$

$$\begin{array}{r} 180 \\ - 133 \\ \hline 47^\circ \end{array}$$

$$\boxed{m\angle b = 47^\circ}$$

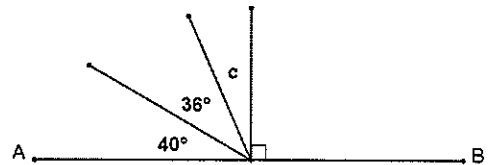


Reason consecutive  $\angle$ 's on a line add to  $180^\circ$

$$\begin{array}{r} 40 \\ + 36 \\ \hline 76 \end{array}$$

$$\begin{array}{r} 90 \\ - 76 \\ \hline 14^\circ \end{array}$$

$$\boxed{m\angle c = 14^\circ}$$

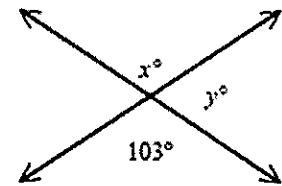


Reason complementary  $\angle$ 's add to  $90^\circ$

11. Solve for  $x$  &  $y$ .

$$\boxed{m\angle x = 103^\circ}$$

$$\begin{array}{r} 180 \\ - 103 \\ \hline 77^\circ = m\angle y \end{array}$$



① vertical  $\angle$ 's are =

Reason ② linear pairs are supplementary

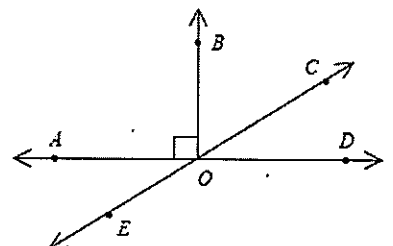
Directions: For Exercises 12-15. Name an angle or angles in the diagram described by each of the following.

12. Complementary to  $\angle BOC$   $\angle COD$

13. Supplementary to  $\angle DOE$   $\angle AOE$

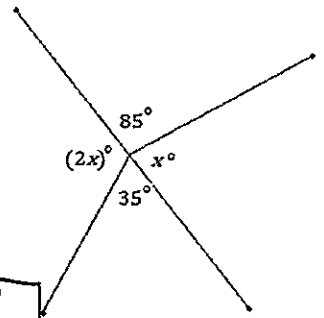
14. Adjacent and supplementary to  $\angle AOC$   $\angle COD$

15. Vertical angle to  $\angle COD$   $\angle AOE$



16. Solve for each missing angle.

$$\begin{aligned}
 85 + 2x + x + 35 &= 360 \\
 3x + 120 &= 360 \\
 -120 \quad -120 & \\
 \hline
 3x &= 240 \\
 \frac{3x}{3} &= \frac{240}{3} \\
 x &= 80
 \end{aligned}$$

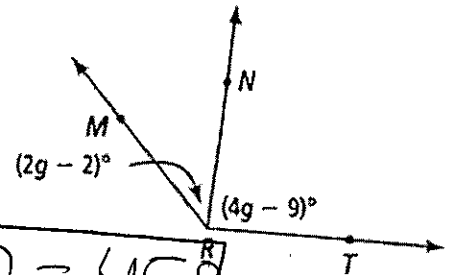


$$\begin{aligned}
 x^\circ &= 80^\circ \\
 (2x)^\circ &= 160^\circ
 \end{aligned}$$

Reason ∠'s at a point add to 360°

17.  $m\angle MRT = 133$ . What is  $m\angle MRN$ ?

$$\begin{aligned}
 2g - 2 + 4g - 9 &= 133 \\
 6g - 11 &= 133 \\
 +11 \quad +11 & \\
 \hline
 6g &= 144 \\
 \frac{6g}{6} &= \frac{144}{6} \\
 g &= 24
 \end{aligned}$$



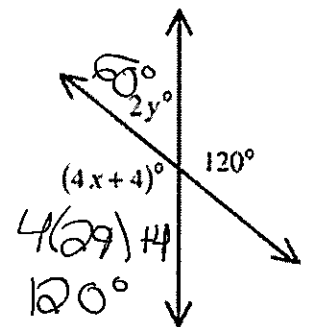
$$\begin{aligned}
 2(24) - 2 &= 46 \\
 4(24) - 9 &= 87^\circ
 \end{aligned}$$

Reason addition property

18. Solve for each missing angle.

$$\begin{aligned}
 4x + 4 &= 120 \\
 -4 \quad -4 & \\
 \hline
 4x &= 116 \\
 \frac{4x}{4} &= \frac{116}{4} \\
 x &= 29
 \end{aligned}$$

$$\begin{aligned}
 2y + 120 &= 180 \\
 -120 \quad -120 & \\
 \hline
 2y &= 60 \\
 \frac{2y}{2} &= \frac{60}{2} \\
 y &= 30 \\
 2(30) &= 60^\circ
 \end{aligned}$$



Reason ① vertical ∠'s are -

② Linear pairs are supplementary

19.  $\angle JKL$  and  $\angle MNP$  are complementary;  $m\angle JKL = 2x - 3$  and  $m\angle MNP = 5x + 2$ . What are  $m\angle JKL$  and  $m\angle MNP$ ?

$$2x - 3 + 5x + 2 = 90$$

$$7x - 1 = 90$$

$$\begin{array}{r} +1 \quad +1 \\ \hline 7x = 91 \\ \hline x = 13 \end{array}$$

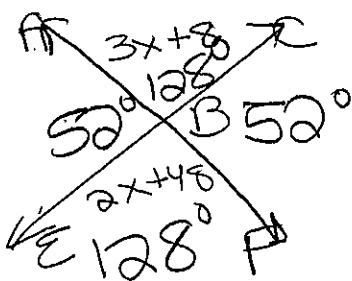
$$x = 13$$

$$2(13) - 3 = 23^\circ$$

$$5(13) + 2 = 67^\circ$$

Reason complementary  $\angle$ 's add to  $90^\circ$

20.  $\angle ABC$  and  $\angle EBF$  are a pair of vertical angles;  $m\angle ABC = 3x + 8$  and  $m\angle EBF = 2x + 48$ . What are the measurements of all four angles?



$$3x + 8 = 2x + 48$$

$$-2x - 8 \quad -2x - 8$$

$$x = 40$$

$$3(40) + 8 = 128^\circ$$

$$180 - 128 = 52^\circ$$

Reason ① Vertical  $\angle$ 's are =

② Linear pairs are supplementary

$\angle CDE$  and  $\angle FDE$  are supplementary,  $m\angle CDE = 3x + 10$ , and

21.  $m\angle FDE = 6x + 8$ . What is  $m\angle FDE$ ?

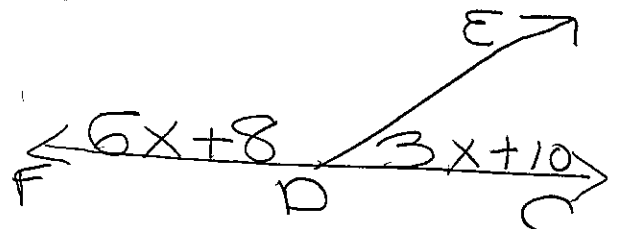
$$6x + 8 + 3x + 10 = 180$$

$$9x + 18 = 180$$

$$-18 \quad -18$$

$$\frac{9x = 162}{9 \quad 9}$$

$$x = 18$$



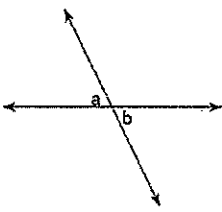
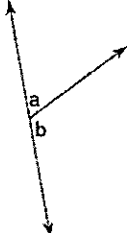
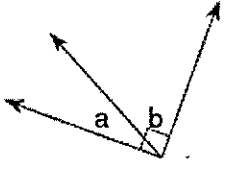
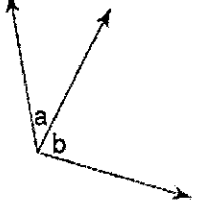
$$m\angle FDE = 6(18) + 8$$

$$m\angle FDE = 116^\circ$$

Reason Linear pairs are supplementary

**HW**

Directions- For exercises 1-4. Name the relationship of the following angles. Using these terms: complementary, supplementary, vertical, or adjacent.

<p>1.</p> 	<p>2.</p> 	<p>3.</p> 	<p>4.</p> 
<p>vertical <math>\angle</math>'s</p>	<p>Supplementary angles</p>	<p>complementary angles</p>	<p>adjacent angles</p>

Directions- For exercises 5-7, use the diagram to the right.

5. Which pair of angles is supplementary?

- a)  $\angle ABE, \angle CBD$     b)  $\angle ABC, \angle ABD$

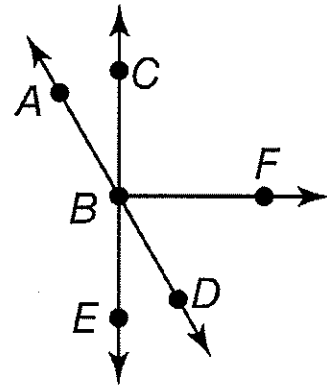
- c)  $\angle ABC, \angle CBD$     d)  $\angle ABC, \angle EBD$

6. Which pair of angles is complementary?

- a)  $\angle ABF, \angle CBD$     b)  $\angle ABC, \angle CBF$

- c)  $\angle ABE, \angle CBD$     d)  $\angle FBD, \angle EBD$

7. Which angle is a vertical angle to  $\angle ABE$ ?  $\angle CBD$

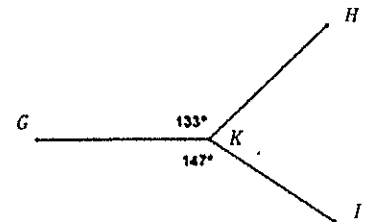


8. Directions- Given the diagram below answer the following questions.

(a) What the total measure of adjacent angles around a point  $K$ ?  $360^\circ$

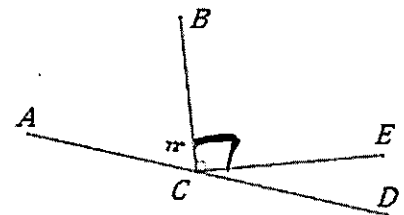
(b) What is the measure of  $\angle HKI$ ?  $80^\circ$

$$\begin{array}{r} 133 \\ + 147 \\ \hline 280 \end{array} \qquad \begin{array}{r} 360 \\ - 280 \\ \hline 80^\circ \end{array}$$

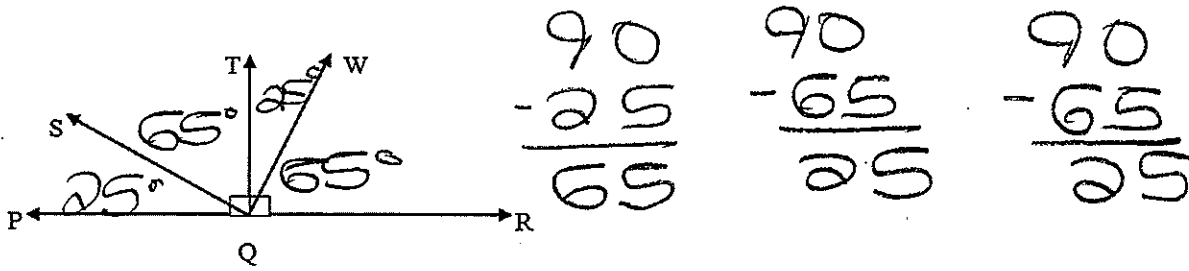


9. In the figure, line segment  $AB$  is drawn. What is the measure of  $\angle DCE$ ?

$$\begin{array}{r} 72 \\ + 90 \\ \hline 162 \end{array} \qquad \begin{array}{r} 180 \\ - 162 \\ \hline 118^\circ = m\angle DCE \end{array}$$



10. In the accompanying diagram,  $QT \perp PQR$  at  $Q$ .  $QW \perp QS$  at  $Q$ . and  $m\angle SQP = 25^\circ$ . Find each measurement.



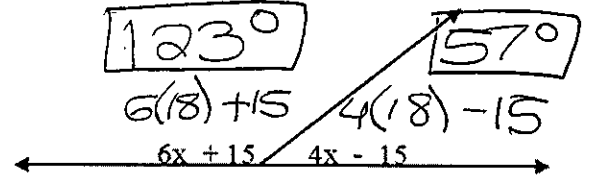
11. Find the value of each angle.

$$6x + 15 + 4x - 15 = 180$$

$$10x = 180$$

$$\frac{10x}{10} = \frac{180}{10}$$

$$x = 18$$

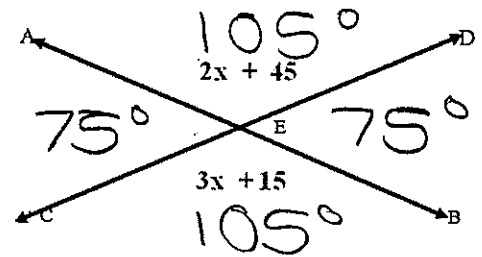


12. Find the value of each angle.

$$2x + 45 = 3x + 15$$

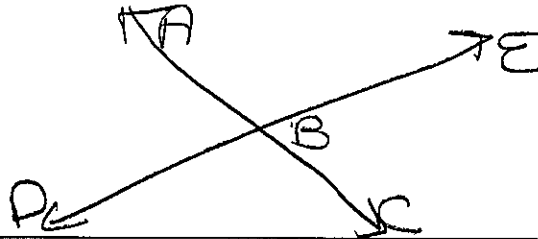
$$-2x - 15 \quad -2x - 15$$

$$\hline 30 = x$$



If  $\overleftrightarrow{ABC}$  and  $\overleftrightarrow{DBE}$  intersect at  $B$ ,  $\angle ABD$  and  $\angle CBE$  are

13. (1) congruent vertical angles. (3) congruent adjacent angles.  
 (2) supplementary vertical angles. (4) supplementary adjacent angles.



$\angle LMN$  and  $\angle NMP$  form a linear pair of angles. Which of the following statements is **false**?

14. (1)  $m\angle LMN + m\angle NMP = 180$   
 (2)  $\angle LMN$  and  $\angle NMP$  are supplementary angles.  
 (3)  $\overrightarrow{ML}$  and  $\overrightarrow{MP}$  are opposite rays.  
 (4)  $\overrightarrow{ML}$  and  $\overrightarrow{MN}$  are opposite rays.

