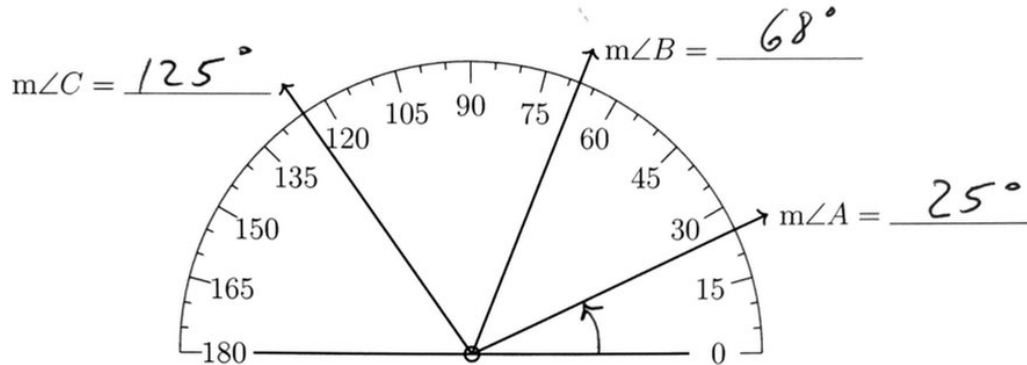


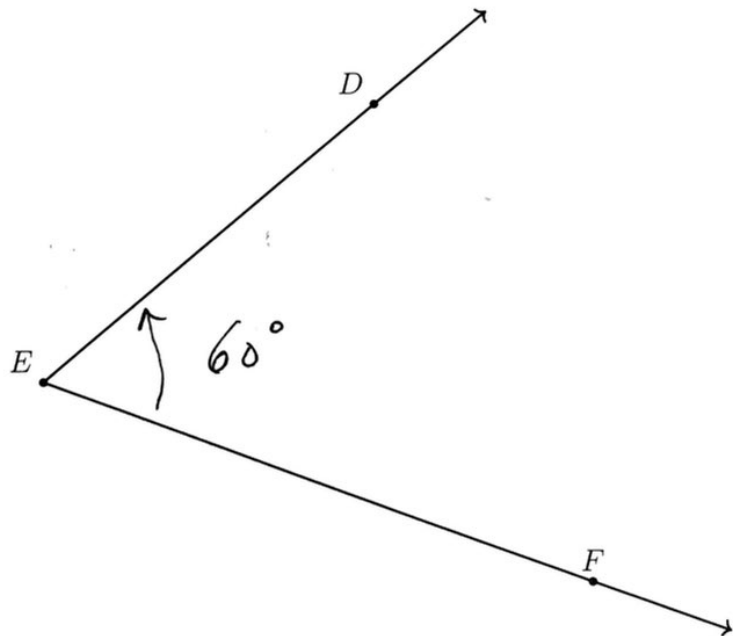
## 2.1 Classwork: Angle measures

1. Use the image of the protractor to measure each of the angles.



2. (a) Write down the name of the angle below using proper geometric notation.  
(b) Find the measure of the angle in degrees with a protractor.  
(c) Is it an acute, obtuse, or right angle?

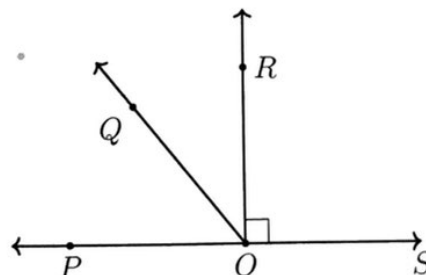
$\angle DEF$



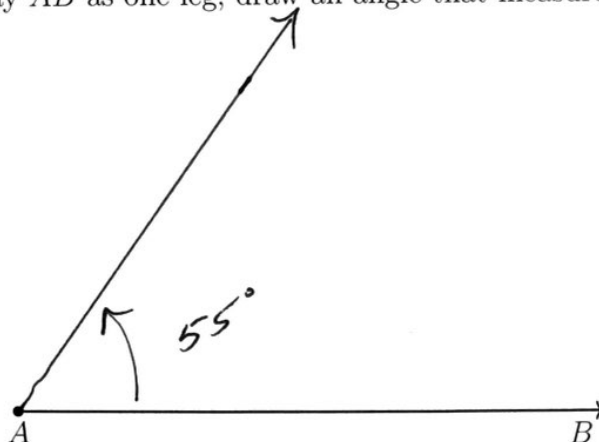
acute  
 $60 < 90$

3. Circle True or False for each statement.

- (a) T (F) Point  $P$  is the vertex  
(b) (T) F  $\overrightarrow{OP}$ ,  $\overrightarrow{OS}$  are opposite rays  
(c) (T) F  $m\angle ROS = 90^\circ$   
(d) T (F)  $\angle QOS$  is an acute angle

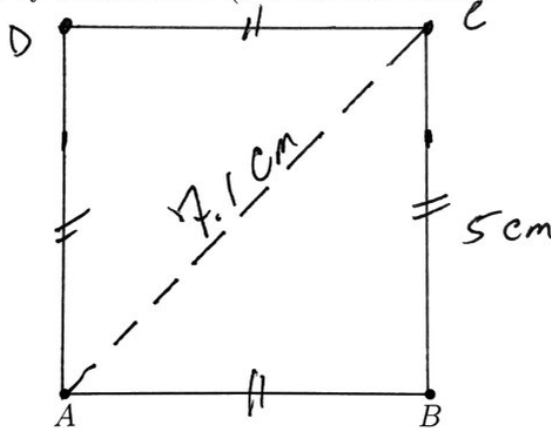


4. Using the given ray  $\overrightarrow{AB}$  as one leg, draw an angle that measures  $55^\circ$ .



5. Draw the square  $ABCD$  having the base  $\overline{AB}$ . (use a straight edge and protractor or square to work accurately)

- (a) Label the vertices  $C$ ,  $D$  and mark the side congruencies with hash marks. Measure and mark the length in centimeters of  $\overline{AB}$ . (label the units)
- (b) Draw the diagonal  $\overline{AC}$  with a dashed line. Measure and label its length rounded to the nearest tenth of a centimeter (nearest millimeter).



6. Write the appropriate name for the type of angle depending on its measure in degrees. (acute, right, obtuse, or straight)

(a)  $m\angle = 90$  : right angle

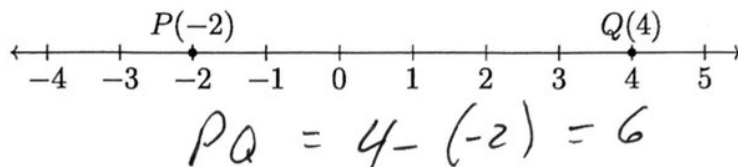
(b)  $90 < m\angle < 180$  : obtuse angle

(c)  $0 < m\angle < 90$  : acute angle

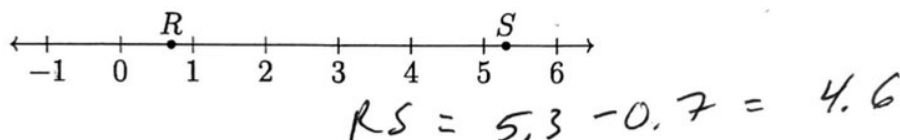
(d)  $m\angle = 180$  : straight angle

## 2.1 Homework: Length and area test review

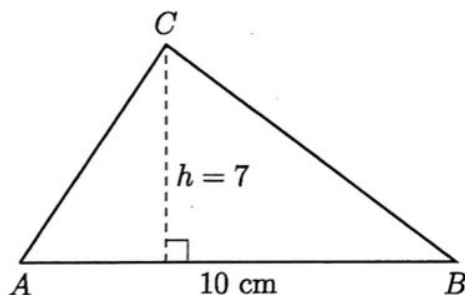
1. Find the distance between
- $P$
- and
- $Q$
- .



2. Find
- $RS$
- , given
- $R = 0.7$
- and
- $S = 5.3$
- .



3. Find the area of
- $\triangle ABC$
- . The altitude
- $h$
- of the triangle is 7 centimeters and the base
- $AB = 10$
- cm. (diagram not to scale)



$$A = \frac{1}{2}(10)(7)$$

$$= 35 \text{ cm}^2$$

4. Solve each equation for
- $x$
- then check your result.

(a)  $(3x + 4) + (x - 2) = 22$

$$4x + 2 = 22$$

$$x = 5$$

$$(3(5) + 4) + (5 - 2) = ? 22$$

$$19 + 3 = 22 \checkmark$$

(b)  $(6x - 21) + (2x - 3) = 5x$

$$8x - 24 = 5x$$

$$3x = 24$$

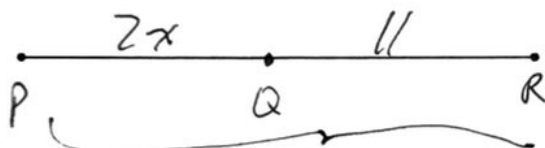
$$x = 8$$

$$(6(8) - 21) + (2(8) - 3) = 5(8)$$

$$27 + 13 = 40 \checkmark$$

Do Not Solve! Complete the diagram of the situation, model with an equation to the right, and circle where it states what to find.

5. The point  $Q$  is on the segment  $\overline{PR}$  with  $PQ = 2x$ ,  $QR = 11$ , and  $PR = 21$ . Find  $x$ .



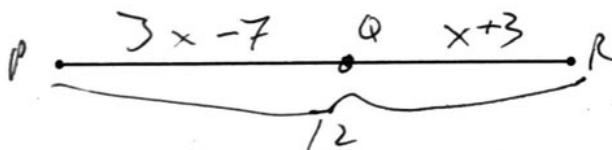
$$2x + 11 = 21$$

6. The point  $Q$  is the midpoint of  $\overline{PR}$ ,  $PQ = 11$ , and  $QR = 2x + 1$ . Find  $x$ .



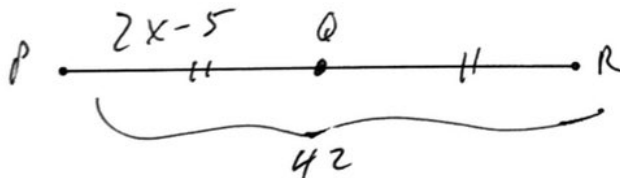
$$11 = 2x + 1$$

7. Given  $\overline{PQR}$ , with  $PQ = 3x - 7$ ,  $QR = x + 3$ , and  $PR = 12$ . Find  $PQ$ .



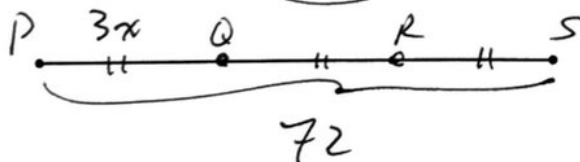
$$(3x - 7) + (x + 3) = 12$$

8. Given that  $Q$  bisects  $\overline{PR}$ .  $PQ = 2x - 5$ ,  $PR = 42$ . Find  $x$ .



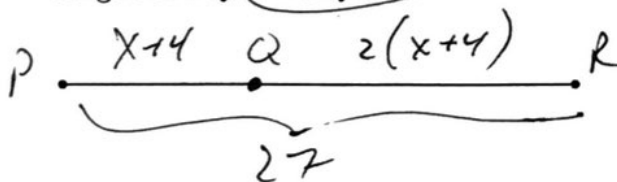
$$2x - 5 = \frac{1}{2}(42)$$

9. Given collinear points  $P$ ,  $Q$ ,  $R$ , and  $S$ . Also,  $PQ = 3x$  and  $PS = 72$ . Furthermore,  $\overline{PQ} \cong \overline{QR} \cong \overline{RS}$ . Find  $x$ .



$$3x = \frac{1}{3}(72)$$

10. The points  $P$ ,  $Q$ , and  $R$  are collinear, with  $PQ = x + 4$  and  $PR = 27$ .  $\overline{QR}$  is twice the length of  $\overline{PQ}$ . Find  $QR$ .



$$(x + 4) + 2(x + 4) = 27$$

## 2.1 Extension: Absolute value algebra problems

1. Given  $x = -5$  simplify each expression. (try to do them without a calculator)

(a)  $|x + 7| = 2$

(c)  $|x| + |x| = 10$   
 $+5 + 5 =$

(b)  $|x - 7| = 12$

(d)  $3|x + 3| + x =$   
 $3(2) + (-5) = 1$

2. Solve the equation  $2|x + 3| = 20$  twice. (then check both answers)(a) Assume  $|x + 3|$  is positive

$$2(x + 3) = 20$$

$$x + 3 = 10$$

$$x = 7$$

check:

$$2|7 + 3| = 20$$
$$2 \cdot 10 = 20 \checkmark$$

(b) Assume  $|x + 3|$  is negative

$$-2(x + 3) = 20$$

$$x = -13$$

Check:

$$2|-13 + 3| = 20 ?$$
$$2 \cdot 10 = 20 \checkmark$$

3. Find all values of  $x$  satisfying the equation. (show the two cases and checks)

$$|x - 3| + 3 = 11$$

positive

$$|x - 3| = 8$$

$$x - 3 = 8$$

$$x = 11$$

Check:

$$|11 - 3| + 3 = 11$$
$$8 + 3 = 11 \checkmark$$

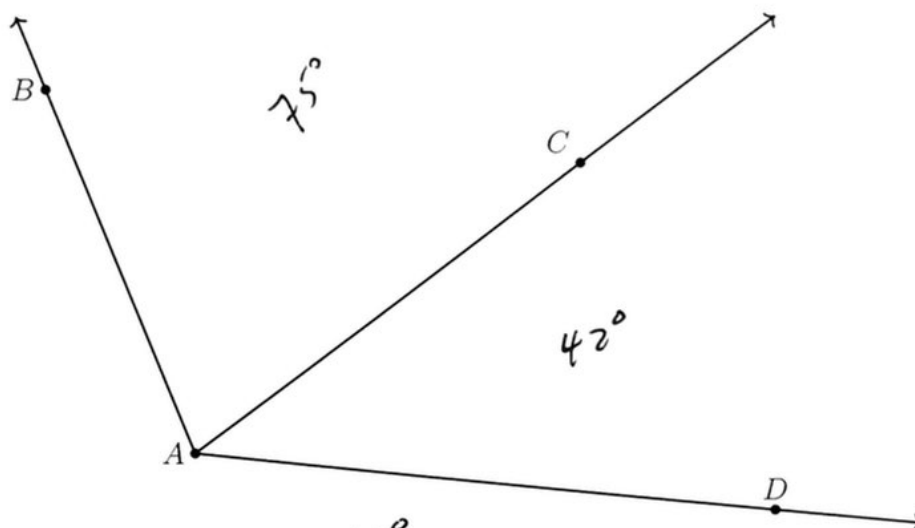
$$x - 3 = -8$$

$$x = -5$$

$$|(-5) - 3| + 3 = 11 ?$$
$$|-8| + 3 = 11 \checkmark$$

## 2.2 Classwork: Angle addition

- Write down the name of the *three* angles shown in the diagram below and their angle measures, using your protractor.



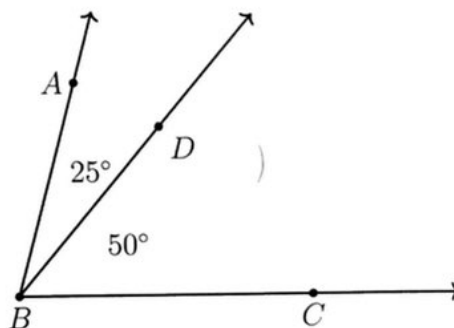
- $\angle CAD$   $42^\circ$
- $\angle BAC$   $75^\circ$
- $\angle BAD$   $118^\circ$

- What do you notice about the angle measures?

They sum  $42 + 75 = 118$

- $m\angle ABD = 25^\circ$ ,  $m\angle DBC = 50^\circ$ . Find  $m\angle ABC$ .

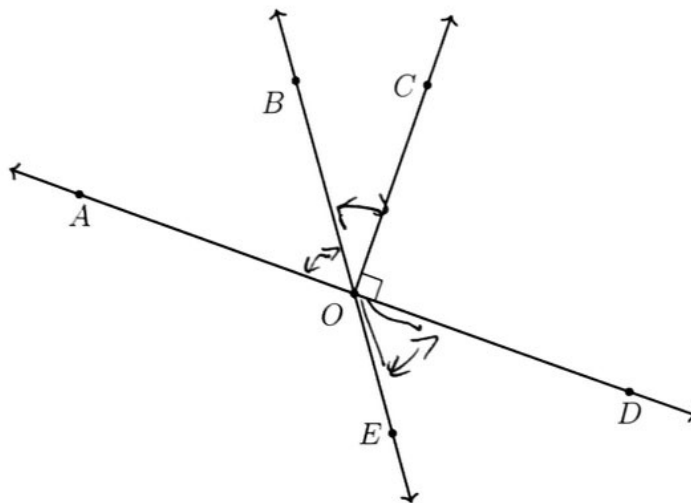
$$m\angle ABC = 25^\circ + 50^\circ = 75^\circ$$



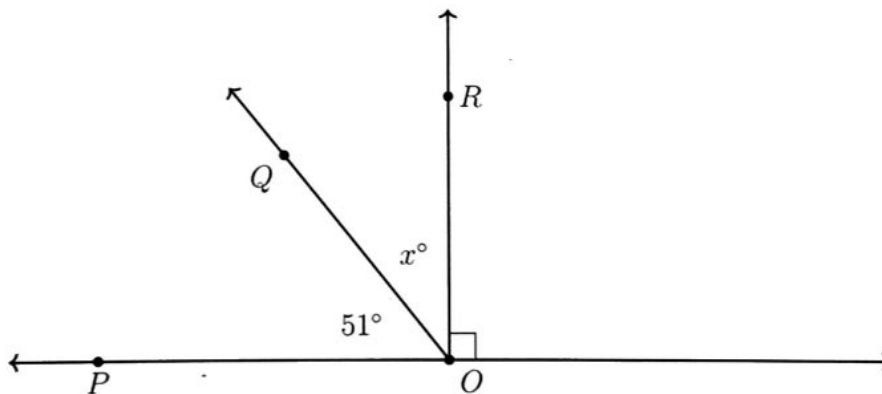
3. Answer based on the diagram below.

(a) Name an angle that is supplementary to  $\angle AOB$ :  $\angle BOD$

(b) Name an angle that is complementary to  $\angle DOE$ :  $\angle BOC$



4.  $\angle POQ$  and  $\angle QOR$  are complementary angles. Given  $m\angle POQ = 51^\circ$ , find  $m\angle QOR$ .



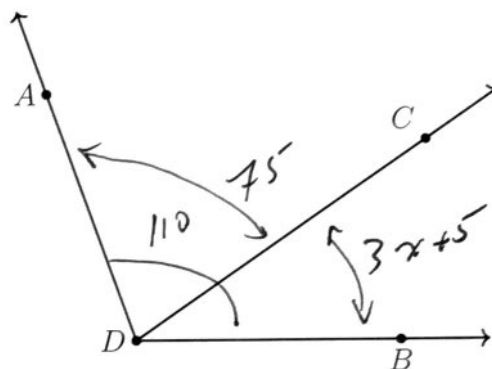
$$51 + x = 90$$

$$x = 39$$

5. Given  $m\angle ADB = 110^\circ$ ,  $m\angle ADC = 75^\circ$ , and  $m\angle BDC = 3x + 5$ . Find  $x$ .

- Label the diagram.
- Write an equation.
- Solve for  $x$ .

$$\begin{aligned}(3x + 5) + 75 &= 110 \\ 3x &= 30 \\ x &= 10\end{aligned}$$



- Check your answer

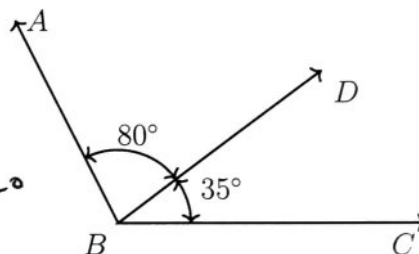
$$\begin{aligned}(3(10) + 5) + 75 &= 110 \\ 110 &= 110 \checkmark\end{aligned}$$

6. Apply the Angle Addition postulate. Write an equation to support your work.

Given  $m\angle ABD = 80^\circ$  and  
 $m\angle DBC = 35^\circ$ .

Find  $m\angle ABC$ .

$$m\angle ABC = 80 + 35 = 115^\circ$$



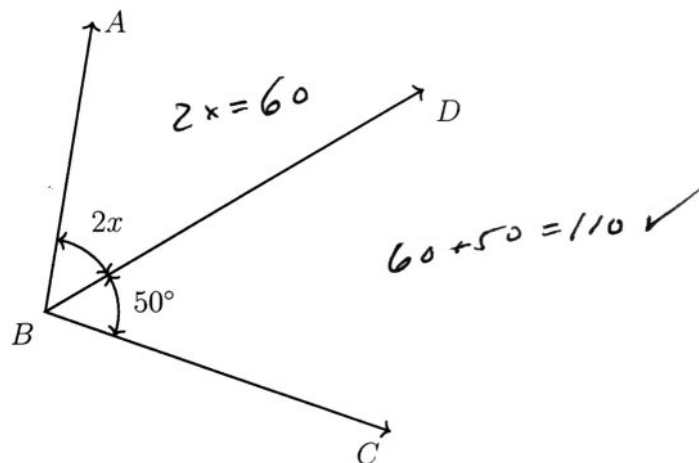
7. Given the angle measures and situation shown, write an equation and solve for  $x$ .

$m\angle ABD = 2x$

$m\angle DBC = 50^\circ$

$m\angle ABC = 110^\circ$

$$\begin{aligned}2x + 50 &= 110 \\ 2x &= 60 \\ x &= 30\end{aligned}$$

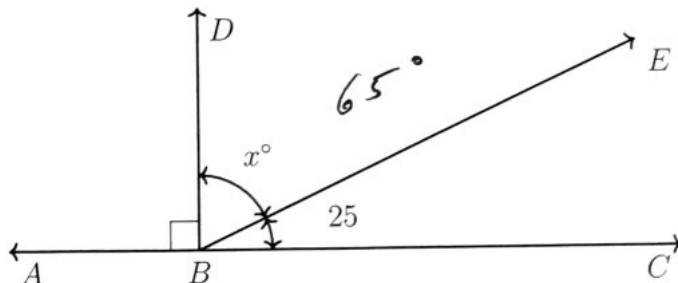




8. The ray  $\overrightarrow{BD}$  makes a  $90^\circ$  angle with the line  $\overleftrightarrow{ABC}$ , and  $m\angle DBE = x^\circ$ ,  $m\angle EBC = 25^\circ$ .

Find  $x$ . Start by writing an equation to support your work.

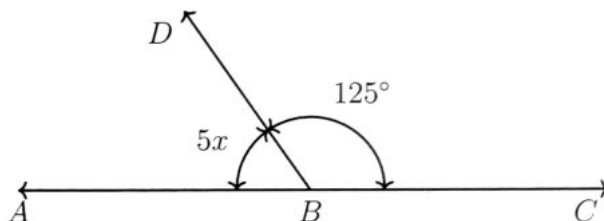
$$\begin{aligned} x + 25 &= 90 \\ x &= 65^\circ \end{aligned}$$



9. Two supplementary angles have measures  $m\angle ABD = 5x$  and  $m\angle DBC = 125^\circ$ .

Write an equation, then solve for  $x$ .

$$\begin{aligned} 5x + 125 &= 180 \\ 5x &= 55 \\ x &= 11 \end{aligned}$$

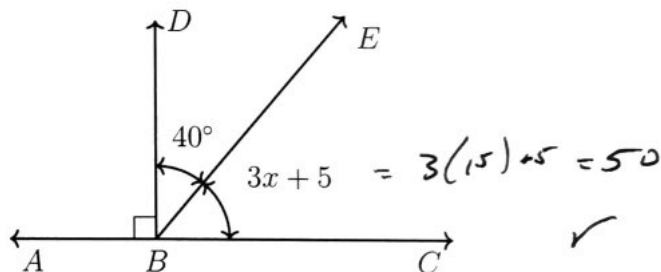


10. Given the angle measures and perpendicular situation shown,  $\overrightarrow{BD} \perp \overleftrightarrow{ABC}$ . Find  $x$ .

$$m\angle DBE = 40^\circ$$

$$m\angle EBC = 3x + 5^\circ$$

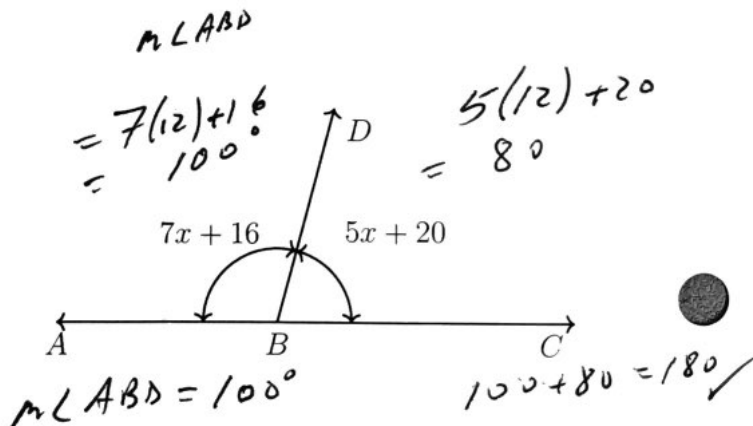
$$\begin{aligned} (3x + 5) + 40 &= 90 \\ 3x &= 45 \\ x &= 15^\circ \end{aligned}$$



11. A linear pair have measures  $m\angle ABD = 7x + 16^\circ$  and  $m\angle DBC = 5x + 20^\circ$ .

Find  $m\angle ABD$ .

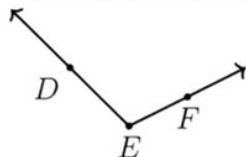
$$\begin{aligned} (7x + 16) + (5x + 20) &= 180 \\ 12x + 36 &= 180 \\ 12x &= 144 \\ x &= 12 \end{aligned}$$



## 2.2 Homework: Angle addition

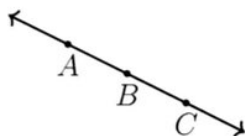
1. The size of an angle is its "measure," which can be from  $0^\circ$  to  $360^\circ$

(a) Write down the name of this angle. Start with an angle symbol  $\angle$ .



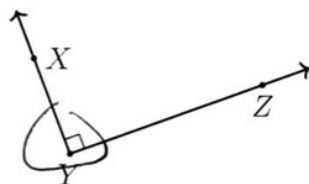
$\angle DEF$

(b) What is the degree measure made by these two opposite rays,  $\overrightarrow{BA}$  and  $\overrightarrow{BC}$ ?



$180^\circ$

(c) What is the degree measure of the angle,  $m\angle XYZ$ ?



$90^\circ$

2. Given the diagram, answer each using proper notation, including the angle symbol  $\angle$ .

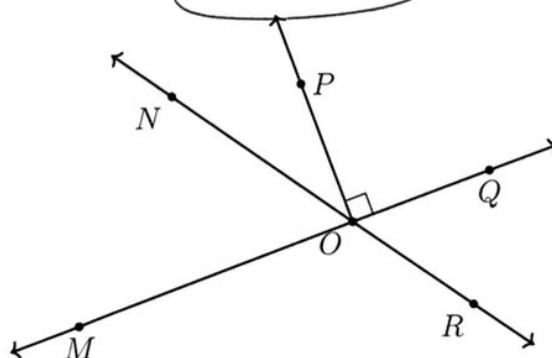
(a) Name the ray opposite to  $\overrightarrow{OR}$ :  $\overrightarrow{ON}$

(b) What is the measure of  $\angle POM$ ?  $90^\circ$

(c) Name a right angle:  $\angle POQ$

(d) Name the angle ~~adjacent~~ vertical to  $\angle QOR$ :  $\angle POQ$

(e) Spicy: Are  $\angle NOP$  and  $\angle QOR$  complementary, supplementary, or neither?



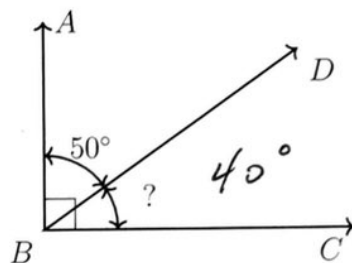
### Angle addition situations

3. Apply the Angle Addition postulate. Write an equation to support your work.

Given  $m\angle ABD = 50^\circ$ ,  $m\angle ABC = 90^\circ$ .

Find  $m\angle DBC = x$

$$\begin{aligned} 50 + x &= 90 \\ x &= 40^\circ \end{aligned}$$



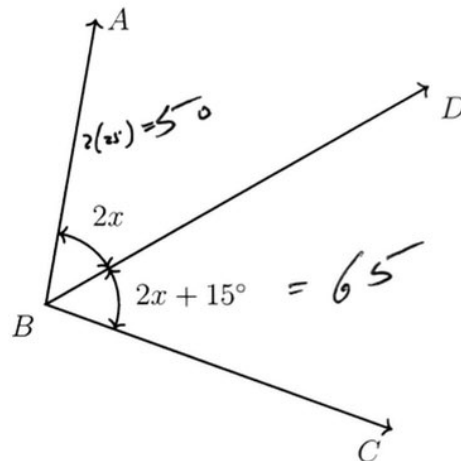
4. Given the angle measures and situation shown, write an equation and solve for  $x$ .

$$m\angle ABD = 2x$$

$$m\angle DBC = 2x + 15^\circ$$

$$m\angle ABC = 115^\circ$$

$$\begin{aligned} 2x + (2x + 15) &= 115 \\ 4x &= 100 \\ x &= 25 \end{aligned}$$

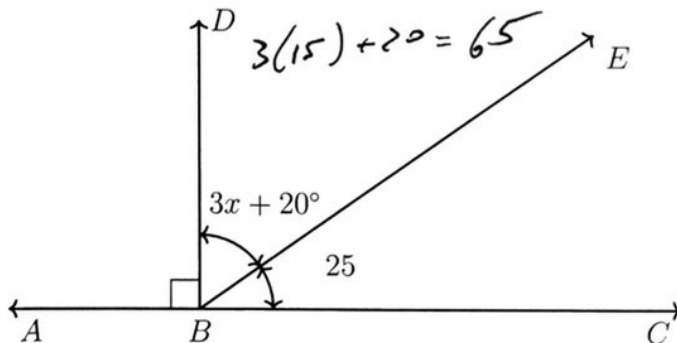


$$50 + 65 = 115$$

5. The ray  $\overrightarrow{BD}$  makes a  $90^\circ$  angle with the line  $\overleftrightarrow{AC}$ , and  $m\angle DBE = 3x + 20^\circ$ ,  $m\angle EBC = 25^\circ$ .

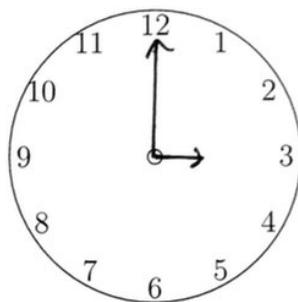
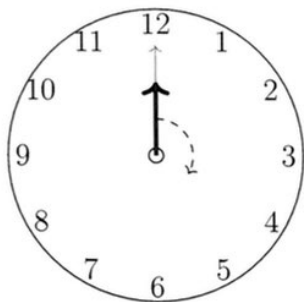
Find  $x$ , writing an equation to support your work.

$$\begin{aligned} (3x + 20) + 25 &= 90 \\ 3x &= 45 \\ x &= 15 \end{aligned}$$



## 2.2 Extension: Clock problems

1. A clock face is shown with both hands vertical, pointing at the 12, indicating 12:00.
  - (a) Draw the positions of the minute and hour hands at 3:00 on the second clock.
  - (b) What angle is made by the two hands at 3:00?

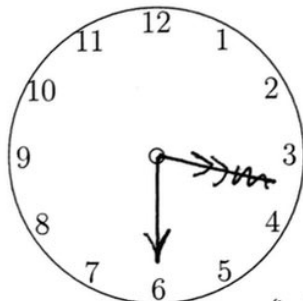


90°

2. How many degrees does the minute hand move in an hour?  $360^\circ$
3. How many degrees does the hour hand move in an hour?  $\frac{360}{12} = 30^\circ$
4. How many minutes does it take the minute hand to move 15 minutes?  $15$
5. How many minutes does it take the hour hand to move 15 minutes?  $3(60) = 180 \text{ minutes}$
6. Write an expression to model the angle measure the minute hand makes versus vertical after  $t$  minutes.

$$\text{angle} = t \frac{360}{60} = 6t$$

7. Mark the positions of the minute and hour hands at 3:30. What angle is made now?



$$\begin{aligned} & \downarrow - \frac{1}{2} \left( \frac{360}{12} \right) = 15^\circ \\ \angle &= 90 - 15 = 75^\circ \end{aligned}$$

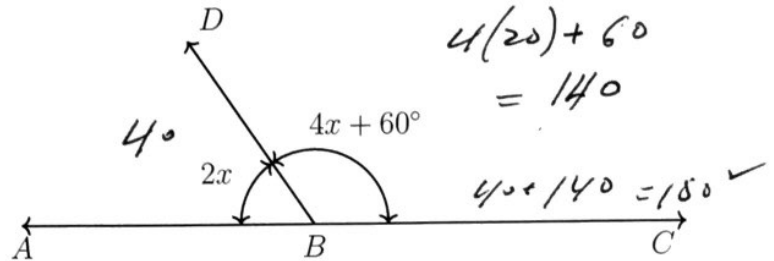
8. Two supplementary angles have measures  $m\angle ABD = 2x$  and  $m\angle DBC = 4x + 60^\circ$ .

Write an equation, then find  $x$ .

$$2x + (4x + 60) = 180$$

$$6x = 120$$

$$x = 20$$



9. Given the perpendicular situation shown,  $\overrightarrow{BD} \perp \overrightarrow{AC}$  and angle measures given.

Find  $x$ .

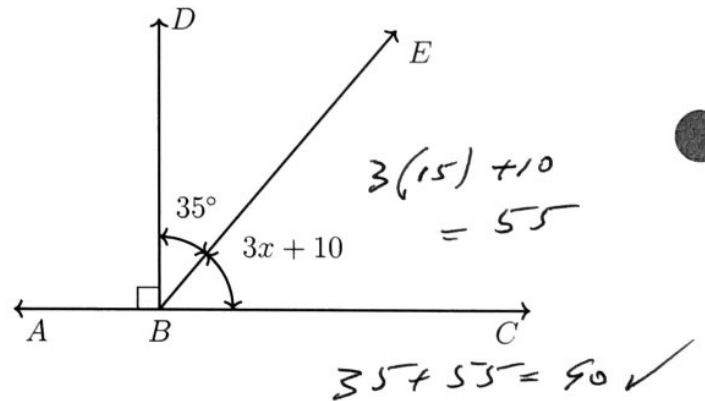
$$m\angle DBE = 35^\circ$$

$$m\angle EBC = 3x + 10^\circ$$

$$35 + (3x + 10) = 90$$

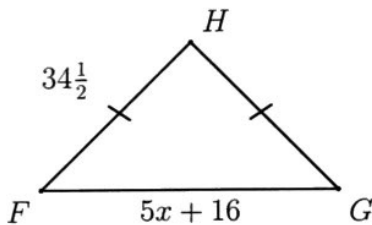
$$3x = 45$$

$$x = 15$$



10. The perimeter of the isosceles  $\triangle FGH$  is 115 and  $\overline{FH} \cong \overline{GH}$ . Given  $FG = 5x + 16$  and  $FH = 34\frac{1}{2}$ .

Write an equation to find  $x$ , then solve and check.



$$5(6) + 16 = 46$$

$$34\frac{1}{2} + 34\frac{1}{2} + 46 = 115?$$

$$115 = 115 \checkmark$$

$$P = 2(34\frac{1}{2}) + 5x + 16 = 115$$

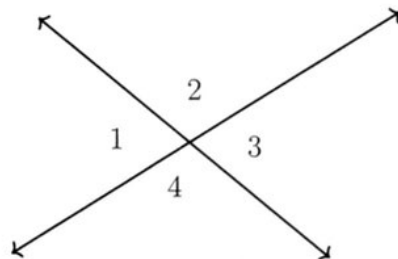
$$= 69 + 16 + 5x = 115$$

$$5x = 30$$

$$x = 6$$

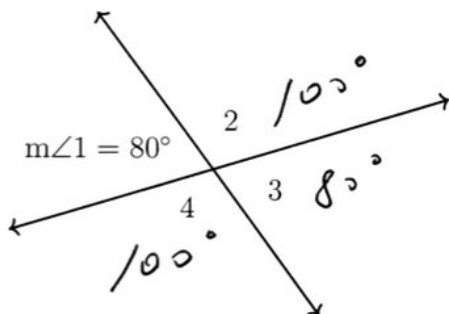
### 2.3 Classwork: Vertical angles

1. As shown below, two lines intersect making four angles:  $\angle 1$ ,  $\angle 2$ ,  $\angle 3$ , and  $\angle 4$ .

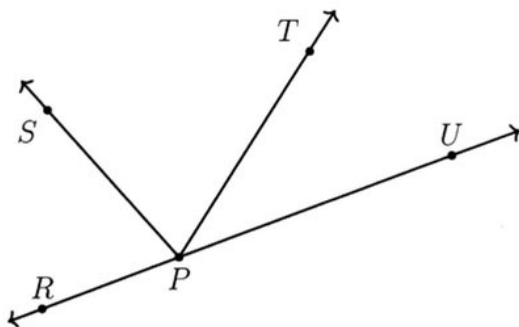


- (a) Which angle is opposite  $\angle 1$ ?  $\angle 3$   
 (b) Name an angle that is adjacent to  $\angle 4$ .  $\angle 1$   
 (c) True or false,  $\angle 2$  and  $\angle 4$  are vertical angles. True

2. Two lines intersect with  $m\angle 1 = 80^\circ$ . Find and mark the measures of  $\angle 2$ ,  $\angle 3$ , and  $\angle 4$ .



3. Given the situation in the diagram, answer each question. Circle True or False.



- (a) True or False:  $\overrightarrow{RP}$  and  $\overrightarrow{UP}$  are opposite rays.  
 (b) True or False:  $\angle TPR$  is an obtuse angle.  
 (c) True or False:  $\angle RPS$  and  $\angle SPU$  are supplementary angles.  
 (d) True or False:  $\angle RPS$  and  $\angle SPT$  are adjacent angles.

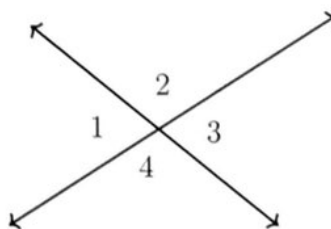
4. Identify the true statements

(a)  $\angle 1 \cong \angle 2$

(b)  $\angle 2 \cong \angle 4$

(c)  $m\angle 1 + m\angle 4 = 180^\circ$

(d)  $m\angle 2 + m\angle 3 = 90^\circ$

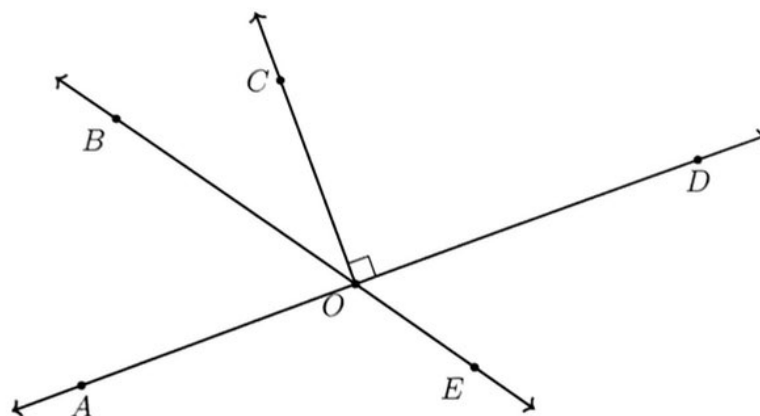


5. Measure the required angles of the diagram below and answer the questions.

(a)  $m\angle AOB = 55^\circ$      $m\angle BOC = 35^\circ$      $m\angle DOE = 55^\circ$

(b) Name an angle that is vertical to  $\angle DOE$ :  $\angle AOB$

(c) Name an angle that is complementary to  $\angle AOB$ :  $\angle BOC$



6. Angles  $APC$  and  $CPD$  form a linear pair.  $m\angle APC = 10x + 15$  and  $m\angle CPD = 3x - 4$ . Find  $m\angle CPD$ . Check your answer for full credit.

$$(10x + 15) + (3x - 4) = 180$$

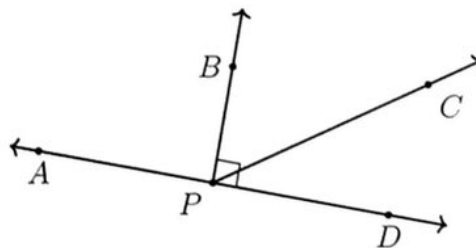
$$13x + 11 = 180$$

$$13x = 169$$

$$x = 13$$

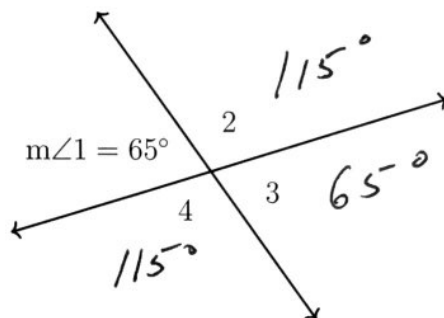
$$[10(13) + 15] + [3(13) - 4] = 180?$$

$$145 + 35 = 180 \checkmark$$



### 2.3 Homework: Vertical angles

1. Two lines intersect with  $m\angle 1 = 65^\circ$ . Find the measures of  $\angle 2$ ,  $\angle 3$ , and  $\angle 4$ , marking them on the diagram.

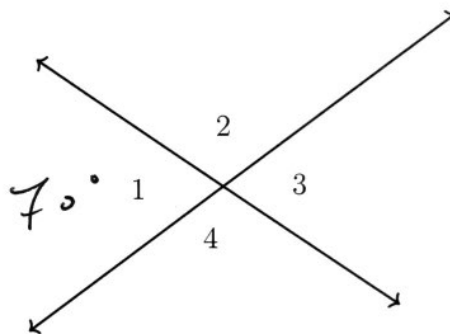


2. As shown below, two lines intersect making four angles:  $\angle 1$ ,  $\angle 2$ ,  $\angle 3$ , and  $\angle 4$ .

Given  $m\angle 1 = 70^\circ$ .

- (a) Find  $m\angle 3$

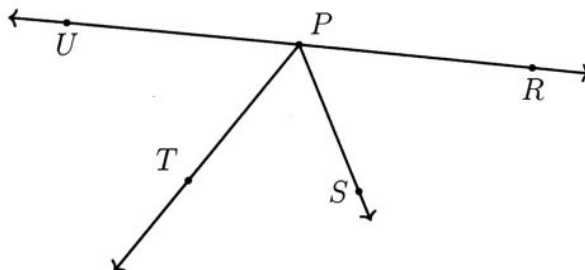
70°



- (b) Find  $m\angle 4$

110°

3. Given the situation in the diagram, answer each question. Circle True or False.



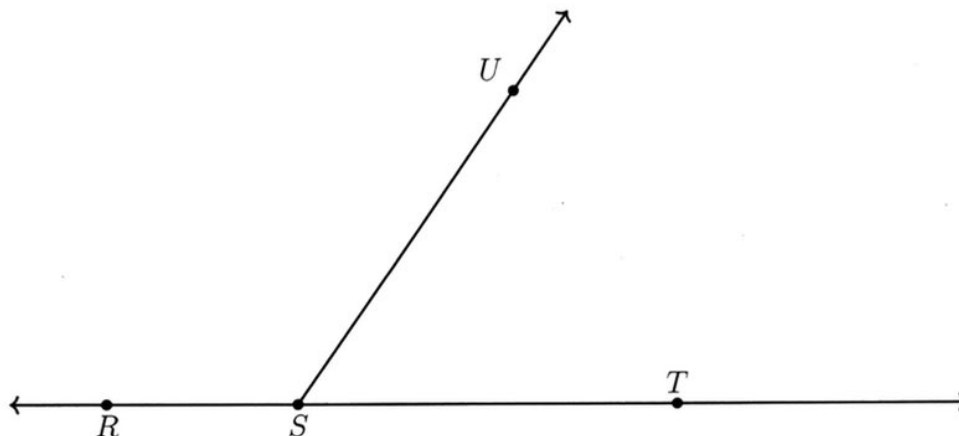
- (a) True or False:  $\overrightarrow{RP}$  and  $\overrightarrow{UP}$  are opposite rays.  
 (b) True or False:  $\angle TPR$  is supplementary to  $\angle TPU$ .  
 (c) True or False:  $\angle RPS$  and  $\angle TPS$  are complementary angles.  
 (d) True or False:  $\angle RPS$  and  $\angle TPU$  are vertical angles.



4. Find the measure of the angle in degrees and the given segment's length in centimeters.

(a)  $m\angle UST = 56^\circ$  (b)  $SU = 5.2 \text{ cm}$

(c) Name a pair of opposite rays:  $\overrightarrow{SR}, \overrightarrow{ST}$



5. Given the diagram below.

(a) Name an angle that is vertical to  $\angle DOE$ :  $\angle AOB$

(b) Name the ray that is opposite to  $\overrightarrow{OB}$ :  $\overrightarrow{OE}$

(c) Name an angle that is complementary to  $\angle AOB$ :  $\angle BOC$

