

# Puzzle levels

## LEVEL ONE

Name a Line

$\overleftrightarrow{CE}$  or  $\overleftrightarrow{BE}$  or  $\overleftrightarrow{CB}$

Name a Line Segment

$\overline{BD}$

Name a Ray

$\overrightarrow{BE}$  or  $\overrightarrow{BC}$

Name a Plane

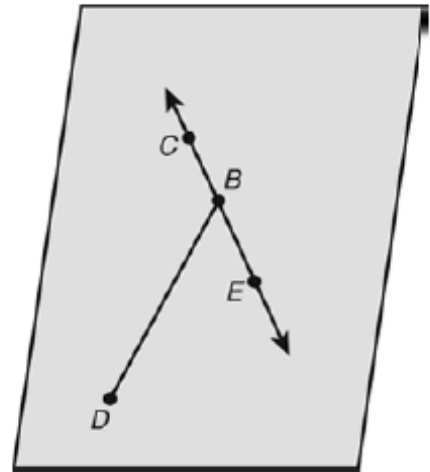
plane CDB

Name three Collinear points

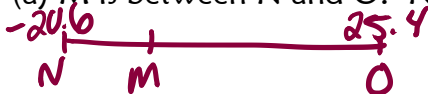
C, B, E

Name a pair of Opposite Rays

$\overrightarrow{BC}$  and  $\overrightarrow{BE}$



(a) M is between N and O. N is -20.6 and O is at 25.4. Find the distance between ON.



$$ON = |-20.6 - 25.4| = |-46| = 46$$

(b) Explain how you found the distance in the previous question.

absolute value of the difference of the coordinates

## LEVEL TWO



(a)  $AM = 3x - 14$ ,  $MB = 6x - 8$ , and  $AB = 32$ . Determine whether or not M is a midpoint of Segment AB.

$$\textcircled{1} 3x - 14 + 6x - 8 = 32$$

$$9x - 22 = 32$$

$$9x = 54$$

$$\boxed{x = 6}$$

$$\textcircled{2} \text{ Check to see if } AM = MB$$

$$AM = 3(6) - 14 = 4$$

$$MB = 6(6) - 8 = 28$$

NO  $AM \neq MB$  so M is not a midpt.

(b) M is the midpoint of AB.  $AM = 20x - 3$  and  $AB = 12x + 78$ . Find MB.

$$2(20x - 3) = 12x + 78$$

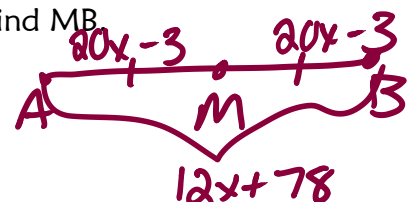
$$40x - 6 = 12x + 78$$

$$28x = 84$$

$$\boxed{x = 3}$$

$$MB = 20(3) - 3$$

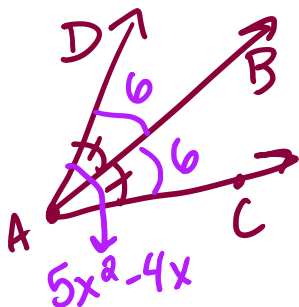
$$\boxed{MB = 57}$$



### LEVEL THREE

(a) What is the different between an "angle bisector" and a ray that is in the "interior" of an angle ?

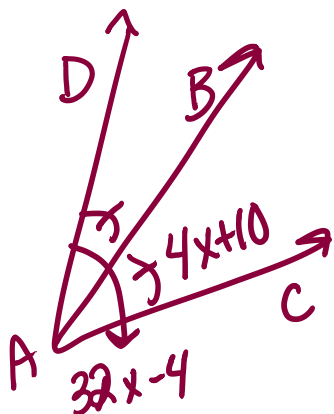
(b)  $\overline{AB}$  bisects  $\angle DAC$ .  $\angle DAC = 5x^2 - 4x$  and  $\angle BAC = 6$ . Find  $x$ . (Hint: Draw a diagram!!)



$$\begin{aligned} 5x^2 - 4x &= 6 + 6 \\ 5x^2 - 4x &= 12 \\ 5x^2 - 4x - 12 &= 0 \\ (5x + 6)(x - 2) &= 0 \end{aligned}$$

$$\begin{aligned} 5x + 6 &= 0 & x - 2 &= 0 \\ 5x &= -6 & \boxed{x = 2} \\ \boxed{x = \frac{-6}{5}} & & & \end{aligned}$$

(c)  $\overline{AB}$  bisects  $\angle DAC$ .  $\angle DAC = 32x - 4$  and  $\angle BAC = 4x + 10$ . Find  $\angle DAC$ . (Hint: Draw a diagram!!)



$$\begin{aligned} 2(4x + 10) &= 32x - 4 \\ 8x + 20 &= 32x - 4 \\ 24 &= 24x \\ \boxed{1} &= x \end{aligned}$$

$$\begin{aligned} \angle DAC &= 32(1) - 4 \\ \angle DAC &= \boxed{28^\circ} \end{aligned}$$

### LEVEL FOUR

(a) Write the definition of supplementary and complementary angles.

(b) If  $\angle OIL = 6x - 7$ , write an expression for the supplement and complement of angle  $\angle OIL$ .

$$\begin{aligned} \text{SUPP: } 180 - (6x - 7) \\ \boxed{187 - 6x} \end{aligned}$$

$$\begin{aligned} \text{COMP: } 90 - (6x - 7) \\ \boxed{97 - 6x} \end{aligned}$$

(c) The ratio of two supplementary angles is 3:7. Find the measures of both angles.

$$\begin{aligned} 3x + 7x &= 90 \\ 10x &= 90 \\ x &= 9 \end{aligned}$$

$$\begin{aligned} 3(9) &= 27^\circ \\ 7(9) &= 63^\circ \end{aligned}$$

(d) The complement of an angle is 5 more than  $\frac{1}{4}$  of the supplement of the angle. Find the angle.

$$\begin{aligned} \text{angle} &= x \\ \text{COMP} &= 90 - x \\ \text{SUPP} &= 180 - x \end{aligned}$$

$$\begin{aligned} 90 - x &= 5 + \frac{1}{4}(180 - x) \\ 90 - x &= 5 + 45 - \frac{1}{4}x \\ 90 - x &= 50 - \frac{1}{4}x \\ 40 - x &= -\frac{1}{4}x \\ \underline{+x} \quad \underline{+x} & \end{aligned}$$

$$\boxed{53.\overline{3} = x}$$

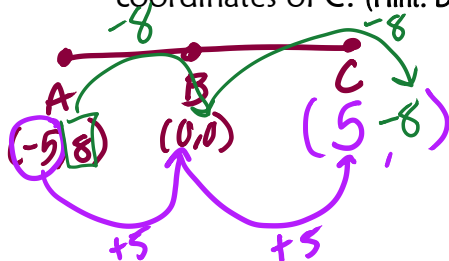
## LEVEL FIVE

(a) Write the midpoint and distance formula – try to do this without looking in your notes!

$$\text{midpt: } \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

(b) B is the midpoint of AC. A has coordinates of (-5, 8) and B has coordinates of (0, 0). Find the coordinates of C. (Hint: Draw a diagram!!)



$$\boxed{C(5, -8)}$$

$$\begin{aligned} \frac{-5 + x}{2} &= 0 & \frac{8 + y}{2} &= 0 \\ -5 + x &= 0 & 8 + y &= 0 \end{aligned}$$

$$\boxed{x = 5}$$

$$\boxed{y = -8}$$

(c) Find the distance between the points (-7, 2) and (-1, 0).

$$d = \sqrt{(0 - 2)^2 + (-1 - 7)^2}$$

$$d = \sqrt{(-2)^2 + (-6)^2}$$

$$d = \sqrt{4 + 36}$$

$$d = \sqrt{40} = \boxed{2\sqrt{10}}$$

## LEVEL SIX

(a)  $\angle MOP = x^2 - 12x$  and  $\angle HAT = -35$ .  $\angle HAT$  is complementary to  $\angle SIP$  and  $\angle SIP$  is complementary to  $\angle MOP$ . Find  $x$ . (Hint: Draw a diagram!!)

$\angle HAT$  is comp to  $\angle SIP$

$\angle SIP$  is comp to  $\angle MOP$

So,  $\angle HAT \cong \angle MOP$

$$x^2 - 12x = -35$$

$$x^2 - 12x + 35 = 0$$

$$(x - 7)(x - 5) = 0$$

$$\boxed{x = 7} \quad \boxed{x = 5}$$

(b) Given:  $m\angle 4 = 2x + 5$  and  $m\angle 5 = x + 30$

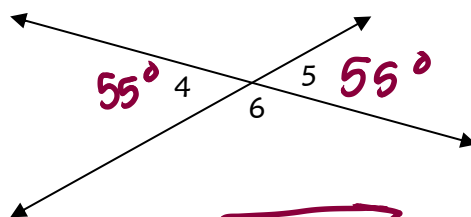
Find:  $m\angle 6$

$m\angle 4 = m\angle 5$  \* Vertical  $\angle$ 's

$$2x + 5 = x + 30$$

$$x + 5 = 30$$

$$\boxed{x = 25}$$



$$m\angle 6 = 180 - 55 = \boxed{125^\circ}$$

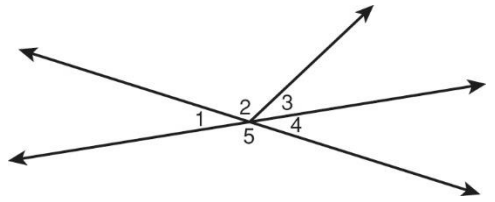
$\angle 5$  and  $\angle 6$  are a Linear Pair

## LEVEL SEVEN

(a) Name a pair of adjacent angles: answers vary

Name a linear pair:  $\angle 4$  and  $\angle 5$  or  $\angle 1$  and  $\angle 5$

Name vertical angles:  $\angle 1$  and  $\angle 4$  only



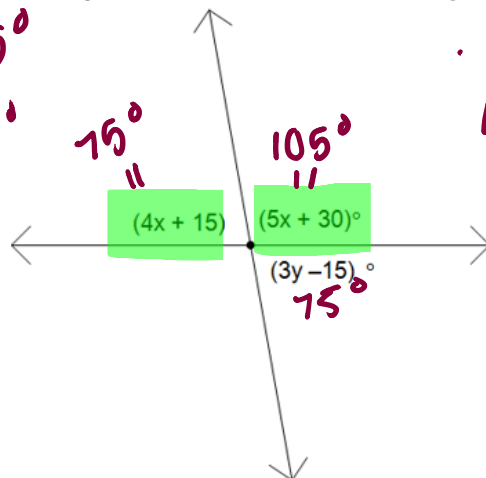
(b) Determine whether each statement is always, sometimes or never true.

1. If two angles are complementary, then they are adjacent. sometimes
2. If two angles are a linear pair, then they are adjacent. always
3. If two angles are vertical angles then they are adjacent. never
4. If two angles are supplementary then one angle is acute and one angle is obtuse. always

## LEVEL EIGHT \*\*\* this should be the LAST level you do!

Using the diagram to the below find the value of  $x$  and  $y$ .

$$4(15) + 15 = 75^\circ$$
$$5(15) + 30 = 105^\circ$$



①  $4x + 15 + 5x + 30 = 180$   
 $9x + 45 = 180$   
 $9x = 135$   
 $x = 15$

Linear Pair angles

②  $3y - 15 = 75$  \* vertical angles  $\cong$   
 $\begin{array}{r} 3y - 15 = 75 \\ +15 \quad +15 \\ \hline 3y = 90 \end{array}$   
 $y = 30$