2) Use what you know about vertically opposite angles, angles on a straight line and angles around a point to help you calculate each angle represented by a letter.

not drawn to scale

a)

125°

c

b

b)

e

d

38°

c)

22°

f

d)

h

37°

k

103°

j

g

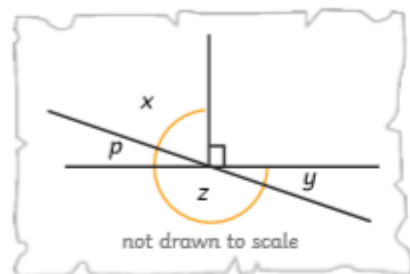**1)** True or false? Tick the box next to each statement if it is true or cross it if it is false.

a

d   b

c

not drawn to scale
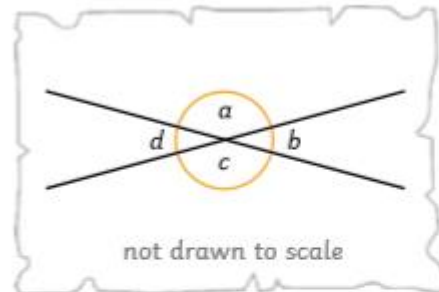
☐ Angles a and b are equal.

☐ d + a = 180°

☐ Angles b and d are equal.

☐ c + a = 180°

☐ Angles a and c are equal.

☐ a + b + c + d = 360°
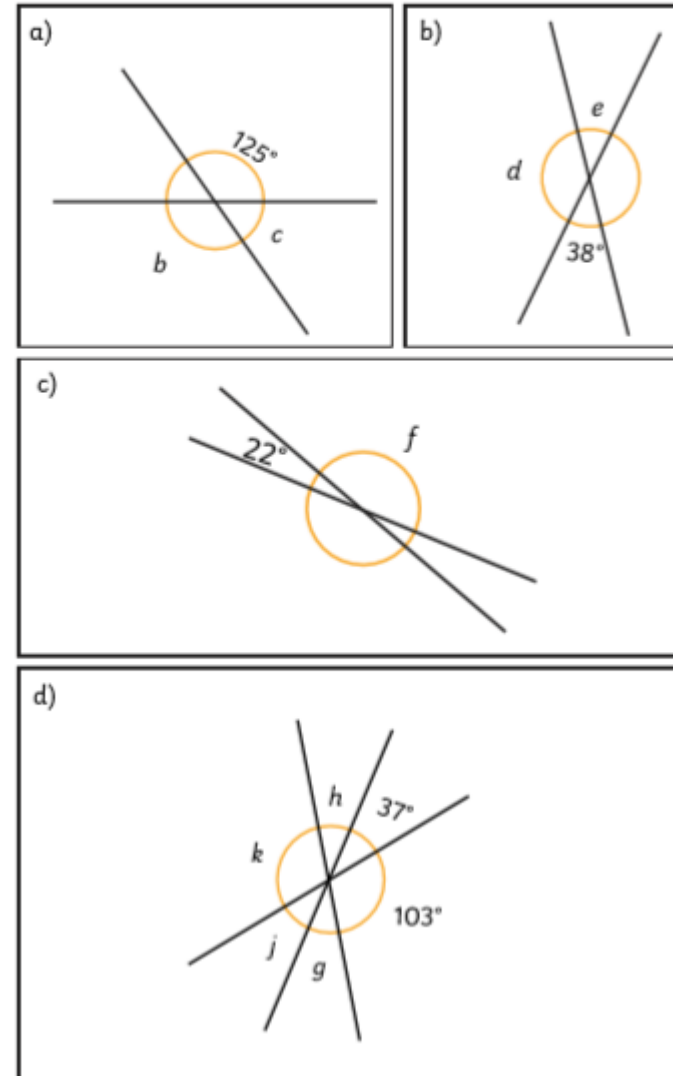
1) Angle y is 42°. Use this fact to work out all the remaining angles.

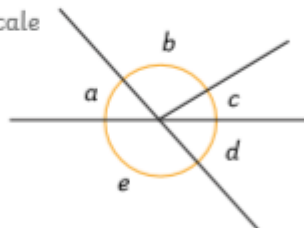not drawn to scale

$p =$ _____

$x =$ _____

$z =$ _____

2) Mia and Surinder are given a challenge by their teacher.

One at a time, choose to reveal the size of one angle until you are able to calculate the value of all of the remaining angles in the diagram.

not drawn to scale

Mia, "I would only need to know the sizes of angles a and then d to calculate all of the other angles in the shape."

Surinder, "If I know the size of angle d followed by angle c, I will be able to calculate all of the other angles in the shape."

Is either child correct? Explain your answer below. If you would like to explain using a diagram, please use an additional sheet of paper.

3) Dara and Conor each think of a different strategy to find angle z. Whose strategy will work? Whose won't? Explain your answer fully.
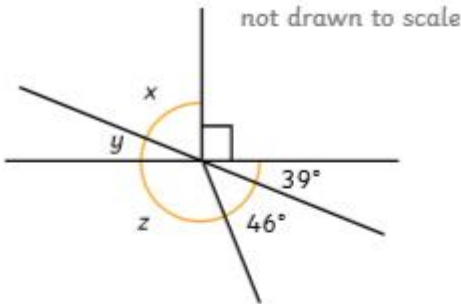
not drawn to scale
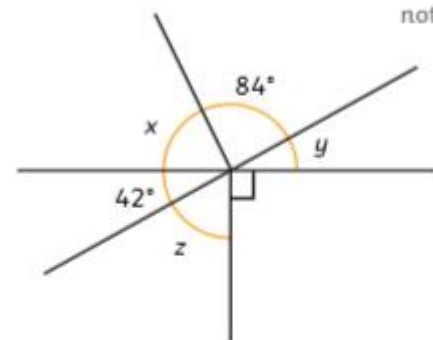
Dara, "As I know that vertically opposite angles are equal, I think that angle z must equal 84°."
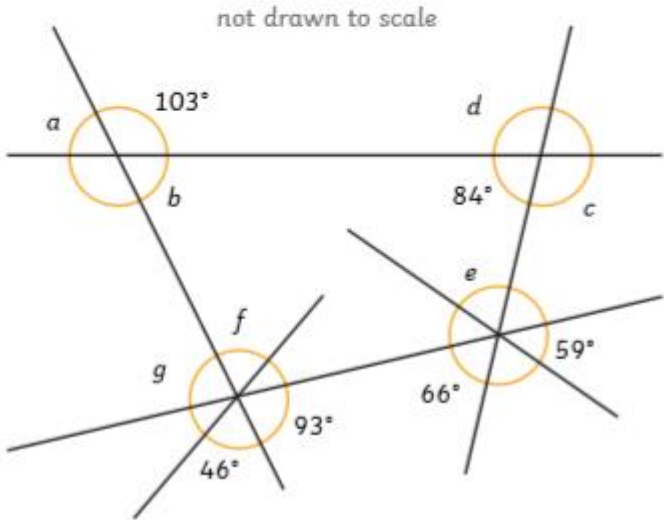
Conor, "I disagree with Dara. I think that because angles on a straight line measure 180°, angle z measures 48°."
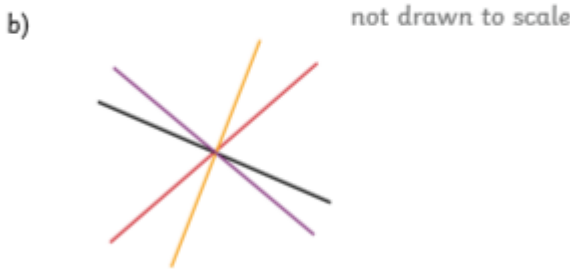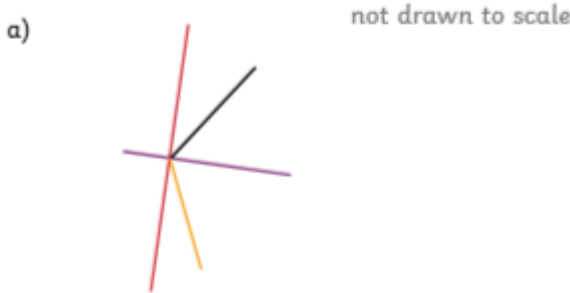
1) Calculate the missing angles.

not drawn to scale

x

y

39°

z

46°

2) Calculate the value of each angle represented by a letter.

not drawn to scale

103°

a

b

d

84°

c

e

f

59°

g

66°

93°

46°

3) In each drawing below, there are four straight lines that meet at a point.

a)

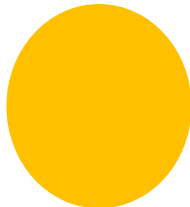not drawn to scale

b)

not drawn to scale

For each drawing, what is the fewest number of angles you need to measure with a protractor before you are able to use what you know about vertically opposite angles, angles on a straight line and angles around a point to help you calculate the value of the remaining angles? Prove it!

ANSWERS

1) False
   True
   True
   False
   True
   True

2) a) angle b = 125°
      angle c = 55°
   b) angle d = 142°
      angle e = 38°
   c) angle f = 158°

   d) angle g = 40°
      angle h = 40°
      angle j = 37°
      angle k = 103°
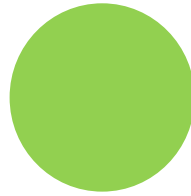
1) $p = 42°$
   $x = 48°$
   $z = 138°$

2) Mia's strategy would not work. Angles a and d are equal as they are opposite angles. She could work out angle e as $e + a = 180°$, however her method would still leave angles b and c unknown.

   Surinder's strategy would work. By revealing angle d, he would be able to calculate the value of angle e as angles $d + e = 180°$. By revealing angle d, he would also know the value of the equal, opposite angle a. If he then knows angle c, he would be able to calculate the value of the only remaining angle, angle b.

3) Dara is incorrect. Angle z is not actually vertically opposite the 84° angle so this strategy will not work.

   Conor is correct. By adding the 90° angle and the 42° together and then subtracting the result from 180°, we find that angle z measures 48°.

1) angle *x* = 51°
   angle *y* = 39°
   angle *z* = 95°

2) *a* = 77°
   b = 77°
   c = 96°
   d = 96°
   e = 55°
   f = 46°
   g = 93°

3) a) The fewest number of angles that would need to be measured with a protractor would be two angles (either the angle between red and yellow or purple and yellow and the angle between black and purple or black and red). The others could then be calculated.

   b) As there are four angles that make up a straight line, you would need to measure three angles. Once you know the three angles on a straight line, you could use the fact that opposite angles are the same to work out the rest of the angles around the point.