Discovering Geometry using GeoGebra

Sections:

1. The protractor axiom
2. Vertically opposite angles
3. Isosceles triangles
4. Alternate angles
5. Angles in a triangle
6. Corresponding angles
7. Exterior angles
8. Opposite sides and angles in a parallelogram
9. Diagonals in a parallelogram

GeoGebra

Student instructions:

- Print this workbook
- Open the supporting dynamic software file for each section and use it to discover answers the questions
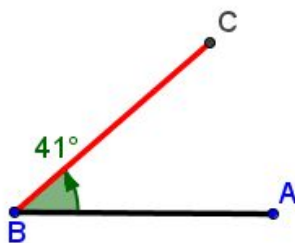- Fill in your answers in this workbook

http://jcmaths.weebly.com/geometry-theorems--corollaries.html

Protractor Axiom
Student Activity Axiom

Use in connection with interactive file "Axiom"

1. Drag the slider to the right what do you notice?

    _____

2. Drag the slider to the left. What do you notice?

    _____

3. Drag the slider to make the measure of the angle ABC = 45°. What do you think is the measure of the reflex angle ABC? _____

4. Drag the slider to make the measure of the angle ABC = 180°, notice that text: "The angle ABC is NOT a straight angle" disappears . What can you conclude?

    _____

5. Drag the slider to make the measure of the angle ABC = 90°. What is the name given to an angle of this measure?

    _____

6. When you drag the slider along the full line from left to right, how many degrees will the point C have travelled? _____

7. When you drag the slider to make the angle ABC = 180°. What can we say about the points A, B and C? _____

8. Drag the slider to make the measure of the angle ABC = 120°. Give a name for this type of angle. _____

9.   Drag the slider to make the measure of the angle ABC = 38°. Give a name for this type of angle. _____

Student Activity Theorem 1
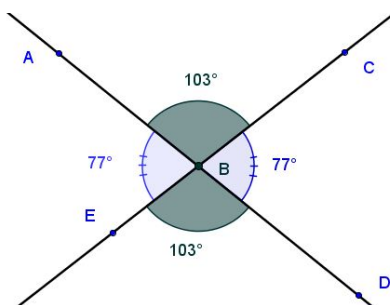
1. Drag the point C to make the measure of angle CBA equal to 90°. What do you notice about the measure of the angle EBD? _____

2. When the measure of the angle CBA is 90° What do notice about the measures of the angles EBD, ABE and CBD.

   _____

3. What conclusion can be drawn from adding all the angles in question 2?

   _____

4. Drag the point C to make the measure of the angle CBD equal to 70°. Write down the measures of the angles ABE, ABC and EBD.
   ABE = _____, ABC = _____ and EBD = _____

5. Drag the point C to make the measure of the angle ABE 60°. Is the measure of the angle CBD the same? _____

   What is the measure of the angle ABC? _____ Is the measure of the angle EBD equal to the measure of the angle ABC? _____

6. Drag the point C to make the measure of the angle ABC 130°. Is the measure of the angle EBD the same? _____

   What is the measure of the angle ABE?_____ Is the measure of the angle CBD equal to the measure of the angle ABE? _____

7. By dragging the point C make the measure of the angle ABC 93°. When you add the measure of angle ABC to the measure of angle CBD what answer do you get?_____

   What does this tell you about the points A, B and D?_____

Student Activity Theorem 2
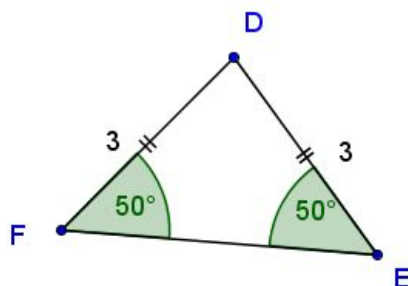
1. Drag the point D to make the measure of the angle DEF 50°.

    What is the measure of the angle DFE? _____ . Are the two angles equal in

    measure? _____

    Write down the lengths of the sides DE and DF. Are these lengths equal? _____

2. Drag the point D to make the length of the side DE = 4.
    What is the length of the side DF? _____ .
    Are the two sides equal? _____
    Write down the measures of the angles DEF and DFE.
    DEF = _____,   DFE = _____
    Are the measures of the two angles equal? _____

3. Drag the point D to make the measure of the angle DFE = 70°. What is the measure
    of the angle DEF? _____ . Are the two angles equal in measure? _____
    Write down the lengths of the sides DF and DE. Are these lengths equal? _____

4. Drag the point D to make the length of the side DF = 8.
    What is the length of the side DE? _____ .
    Are the two sides equal? _____
    Write down the measures of the angles DFE and DEF.
    DFE = _____,   DEF = _____
    Are the measures of the two angles equal? _____

5. What conclusion can be drawn from the answers in questions 1, 2, 3, and 4 when

    (i) the sides are equal:

Student Activity Theorem 3

Use in connection with interactive file "Theorem 3"
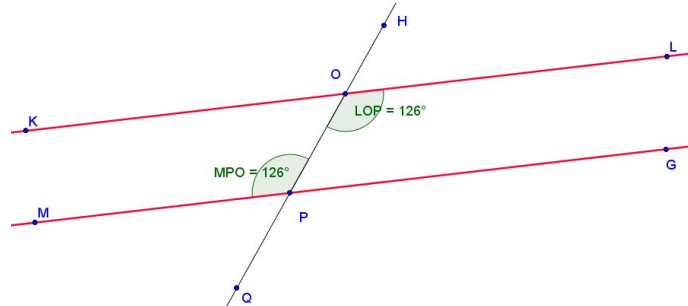
1. What do you notice about the measure of the angles LOP and MPO?

   _____

   Drag the point H to make the measure of the angle LOP = 100° .
   Write down the measure of the angle MPO. MPO = _____
   Are the measures of the two angles LOP and MPO equal in measure? _____.

2. Drag the point H to make the measure of the angle MPO = 73°.
   What is the measure of the angle LOP? _____ .
   Are the measures of the two angles MPO and LOP equal? _____

3. The angles LOP and MOP are called ALTERNATE angles. Drag the point H to various positions. Are these angles LOP and MOP always equal? _____

4. Click on Tick Box 1 to show the wording of this theorem. Are the lines *a* and *b* parallel in this case?   _____

5. Name another pair of alternate angles in the diagram.
   (i) _____ (ii) _____
   Write down the measure of these angles (i) _____ (ii)_____
   Are the measures of these angles equal? _____

6. Click on Tick Box 2 to show the wording of the converse of this theorem.

Student Activity Theorem 4

Use in connection with interactive file "Theorem 4"
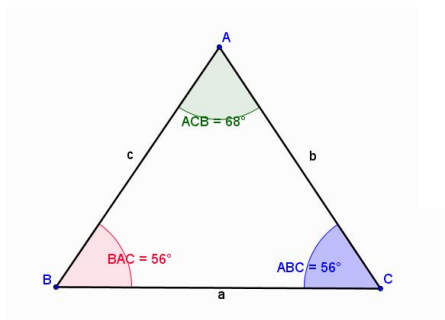

Give all answers correct to the nearest degree.

1. What shape is ABC?   _____

2. How many sides make up the shape ABC?   _____

3. Move the point B, so that the angle ABC equals 58°. What are the measures of the
    angle BCA and BAC.   BCA = _____.   BAC = _____.

4. When angle ABC equals 58° what is the sum of the measures of the angles ABC, BCA
    and BAC? Measure of ABC + Measure of BCA + Measure of BAC = _____

5. Move the point C, so that the angle BCA equals 60°.
     Read the values of the angle ABC and BAC.   ABC = _____.   BAC = _____.

6. When the angle BCA equals 60°, what is the sum of the values of the angles BCA, ABC
    and BAC?   Measure of ABC + Measure of BCA + Measure of BAC = _____

7. Click on the Tick Box on the interactive file to reveal the wording of this theorem.
     Did you come to this conclusion? _____.

8. What is the measure of the angle ABC in each of the following triangles?
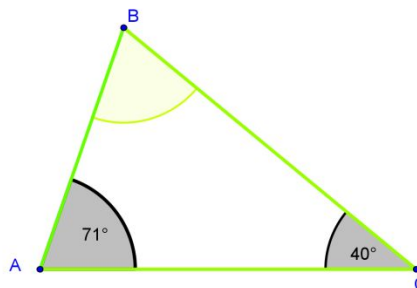
Student Activity Theorem 5
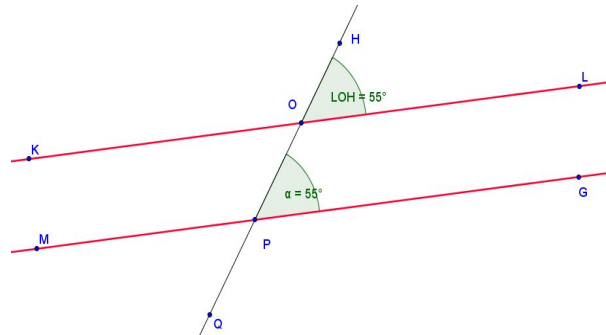
1. What do you notice about the measure of the angles
    LOH and GPO? _____
    Drag the point H to make the measure of the angle LOH = 30° .
    Write down the measure of the angle GPO. GPO = _____
    Are the measures of the two angles LOH and GPO equal in measure? _____.

2. Drag the point H to make the measure of the angle LOH = 100°.
    What is the measure of the angle GPO? _____ .
    Are the measures of the two angles LOH and GPO equal? _____

3. The angles LOH and GOP are called CORRESPONDING angles. Drag the point H to
    various positions. Are these angles LOH and GOP always equal? _____

4. Click on Tick Box to show the wording of this theorem. Are the lines *a* and *b*
    parallel?_____

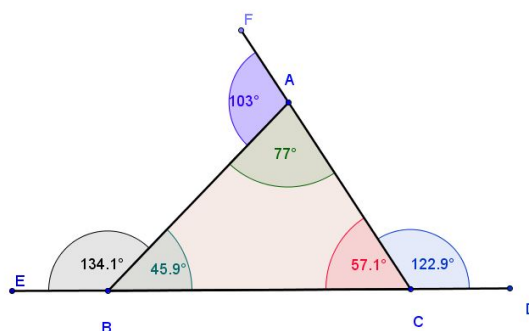5. Name another pair of corresponding angles in the diagram.
    (i) _____ (ii) _____
    Write down the measure of these angles (i) _____ (ii)_____
    Are the measures of these angles equal? _____

Student Activity Theorem 6

Use in connection with interactive file "Theorem 6"

Give all answers correct to the nearest degree.

1. Drag the point A to make the measure of the angle EBA = 130°
   What is the measure of the angle BAC? _____ .
   What is the measure of the angle BCA? _____ .
   What is the sum of the measures of the angles BAC and BCA?
   Measure of the angle BAC + Measure of BCA = _____
   Is this sum equal to the measure of the angle EBA? _____

2. Drag the point A to make the measure of the angle DCA = 100° .
   What is the measure of the angle CBA? _____ .
   What is the measure of the angle CAB? _____ .
   What is the sum of the measures of the angles CBA and CAB?
   Measure of the angle CBA + Measure of CAB = _____
   Is this sum equal to the measure of the angle DCA? _____

3. Drag the point A to make the measure of the angle FAB = 110°.
   What is the measure of the angle ABC? _____ .
   What is the measure of the angle ACB? _____ .
   What is the sum of the measures of the angles ABC and ACB?_____
   Measure of the angle ABC + Measure of ACB = _____
   Is this sum equal to the measure of the angle FAB? _____

4. Drag the point A to make the measure of the angle DCA = 84°.
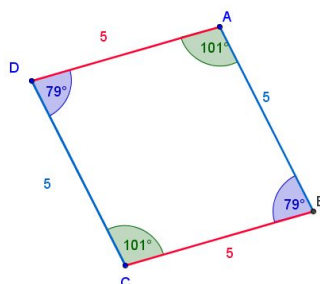   What is the measure of the angle CBA? _____ .
   What is the measure of the angle CAB? _____ .
   What is the sum of the measures of the angles CBA and CAB?_____
   Measure of the angle CBA + Measure of CAB = _____
   Is this sum equal to the measure of the angle DCA? _____

Student Activity Theorem 9

1. In the diagram ABCD is a parallelogram. Drag the point A to the right and then write down the lengths of the following line segments

   [AB] = _____

   [DC] = _____

   [DA] = _____

   [BC] = _____

   What can be concluded from these measurements?

   _____

2. In the diagram ABCD is a parallelogram. Drag the point D to the left and then write down the lengths of the following line segments

   [AB] = _____

   [DC] = _____

   [DA] = _____

   [BC] = _____

   What can be concluded from these measurements?

   _____

3. In the diagram ABCD is a parallelogram. Drag the point A to the right and then write down the measures of the following angles
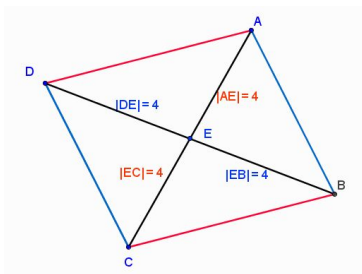
   DAB = _____

   DCB =_____

   ADC =_____

   ABC =_____

   What can be concluded from these measurements?

   _____

Student Activity Theorem 10

Use in connection with interactive file "Theorem 10"

1. ABCD is a parallelogram. Drag the point D to the left and then write down the lengths of the following line segments

   [AE] = _____

   [EC] = _____

   [DE] = _____

   [EB] = _____

   Is the length of [AE] = the length of [EC]? _____

   Is the length of [DE] = the length of [EB]? _____

2. ABCD is a parallelogram. Drag the point A to the right and then write down the lengths of the following line segments

   [AE] = _____

   [EC] = _____

   [DE] = _____

   [EB] = _____

   Is the length of [AE] = the length of [EC]? _____

   Is the length of [DE] = the length of [EB]? _____

3. ABCD is a parallelogram. Drag the point A to make the length of [AE] = 3

   Is the length of [AE] = [EC]?   _____

   Is the length of [DE] = [EB]?   _____

4. Write down in your own words what conclusion can be drawn from the answers to questions 1, 2 and 3 _____

   _____

5. Click on the Tick Box on the interactive file to reveal the wording of this theorem.

   Did you come to this conclusion? _____.