**Rays, Angles, Simple Closed Figures**

**Exercise 1**

*Read these international words and guess their meaning.*

to deduce [di'dju:s], interior [in'tiәriә] *n,* exterior [eks'tiәriә] n, to classify ['klӕsifai], hypotenuse [hai'pɔtinju:z] *n,* start *n, v,* base *n, v,* 'polygon *n,* parallel ['pӕrәlәl] *a,* parallelogram [,pӕrә'lelәgrӕm] *n,* congruent ['kɔngruәnt] *a,* rhombus ['rɔmbәs] *n,* separate ['seprit] a, to separate ['sepәreit].

**Exercise 2**

*Read these words*

|  |  |
| --- | --- |
| originate [ә'ridӡineit] брать начало  angle ['ӕɧgl] угол  though [ðou] хотя  right 1. прямой; 2. правый, правильный  lie [lai] (lay [lei], lain [lein]) лежать  acute [ә'kju:t] острый  obtuse [әb'tuj:s] тупой  triangle ['traiӕɧgl] треугольник  dis'tinct отчетливый  'evident очевидный  to occur [ә'kә:] иметь место,  случаться  frequently ['fri:kwәntli] часто degree [di'gri:] 1. градус; 2. сте­пень | plane плоскость  'middle 1. середина; 2. средний  'boundary граница  equilateral [i:kwi'lӕtәrәl] рав­носторонний  isosceles [ai'sɔsili:z] равнобед­ренный  leg 1. сторона, катет; 2. ножка (циркуля)  quadrilateral [,kwɔdri'lӕtәrәl] четырехсторонний  rectangle ['rek'tӕɧgl] прямо­угольник  to cross пересекать  to inter'sect пересекаться  to en'close заключать в себе  outside *adv* снаружи; *а* наружный |

**Exercise 3**

*Translate these sentences.*

1. It is evident that there is no hope of our finding a proper solution to the problem at present. 2. We insisted on their following the usual procedure. 3. Without having improved on the properties of this material one cannot expect getting better results. 4. I knew nothing of their having completed the experiment. 5. This results in the product of two or more factors being equal to zero. 6. Besides its being used as an everyday word the term 'work' has a special meaning in mechanics. 7. I did not know anything about your science adviser having spoken at the international congress on mechanics. 8. Euclid's having brought all the known facts about geometry into a logical sequence was very important for the development of geometry. 9. We know of Lobachevsky's having developed a new geometry different from that of Euclid. 10. Upon placing all the elements according to the accepted order we were able to continue the work.

**Exercise 4**

*Ask questions to which the given sentences could be the answers.*

1. It is possible to deduce, therefore, that between any two points on a line there is another point. 2. Two lines originating from the same point form an angle. 3. The point where these lines originate is called a vertex. 4. An angle of 35° is an acute angle. 5. An angle having 105° is an obtuse angle. 6. A triangle is a closed geometric figure having three sides. 7. A triangle having all sides of equal length is referred to as an equilateral triangle. 8. A triangle containing one right angle is referred to as a right triangle.

**Exercise 5**

a) *Read the text below without consulting the dictionary;*

b) *After you have read the text, analyze the sentences you find difficult to understand and translate them. Pay special attention to sentences 1, 4, 6, 7, 12, 15, 26, 28, 32, 38. Consult the dictionary whenever necessary*

**Rays, Angles, Simple Closed Figures**

1. You certainly remember that by extending a line segment in one direction we obtain a ray. 2. Below is a picture of such an extension.



3. The arrow indicated that you start at point *M,* go through point *N,* and on without end. 4. This results in what is called ray *MN*, which is denoted by the symbol *.* 5. Point *M* is the endpoint in this case. 6. Notice that the letter naming the endpoint of a ray is given when first naming the ray.

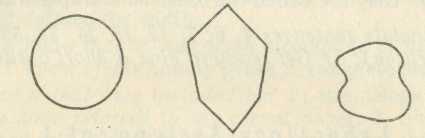
7. From what you already know you may deduce that drawing two rays originating from the same endpoint forms an angle. 8. The common point of the two rays is the vertex of the angle.



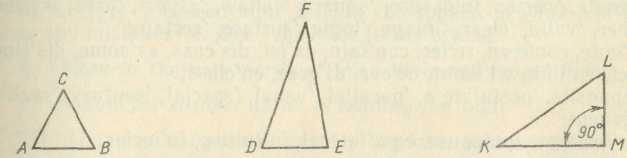
9. Angles though open figures, separate the plane into three distinct sets of points: the interior, the exterior, and the angle. 10. The following symbol ∠ is frequently used in place of the word *angle.* The angle pictured above could be named in either of the following ways: a) angle *LMN* (or ∠*LMN);* b) angle *NML* (or ∠*NML).* 12. The letter naming the vertex of an angle occurs as the middle letter in naming each angle. 13. Look at the drawing below.



14. Ray *PA ()* and ray *PB ()* form a right angle, which means that the angle has a measure of 90° (degrees). 15. Since ** (except for point *P)* lies in the *interior* of ∠*APB,* we speak of ∠*CPA* being less than a right angle and call it an acute angle with a degree measure less than 90°. 16. Since ** (except for point *P)* lies in the exterior of ∠*LAPB,* we say that ∠*APD* is greater than a right angle and call it an obtuse angle with a degree measure greater than 90°. 17. A simple closed figure is any figure drawn in a plane in such a way that its boundary never crosses or intersects itself and encloses part of the plane. 18. The following are examples of simple closed figures. 19. Every simple closed figure separates the plane into three distinct sets of points. 20. The interior of the figure is the set of all points in the part of the plane enclosed by the figure. 21. The exterior of the figure is the set of points in the plane which are outside the figure. 22. And finally, the simple closed figure itself is still another set of points.

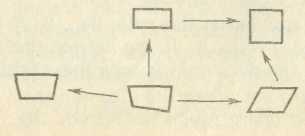


23. A simple closed figure formed by line segments is called a polygon. 24. Each of the line segments is called a side of the polygon.



25. Polygons may be classified according to the measures of the angles or the measure of the sides. 26. This is true of triangles – geometric figures having three sides – as well as of quadrilaterals, having four sides.

1. In the picture above you can see three triangles.
2. Δ*ABC* is referred to as an equilateral triangle. 29. The sides of such a triangle all have the same linear measure. 30. Δ*DEF* is called an isosceles triangle which means that its two sides have the same measure. 31. You can see it in the drawing above. 32. Δ*LMK* being referred to as a right triangle means that it contains one right angle. 33. In Δ*MKL,* ∠*M* is the right angle, sides *MK* and *ML* are called the legs, and side *KL* is called the hypotenuse. 34. The hypotenuse refers only to the side opposite to the right angle of a right triangle. Below you can see quadrilaterals.



35. A parallelogram is a quadrilateral whose opposite sides are parallel. 36. Then the set of all parallelograms is a subset of all quadrilaterals. Why? 37. A rectangle is a parallelogram in which all angles are right angles. 38. Therefore we can speak of the set of rectangles being a subset of the set of parallelograms. 39. A square is a rectangle having four congruent sides as well as four right angles. 40. Is every square a rectangle? Is every rectangle a square? Why or why not? 41. A rhombus is a parallelogram in which the four sides are congruent. 42. Thus, it is evident that opposite sides of a rhombus are parallel and congruent. 43. Is defining a square as a special type of rhombus possible? 44. A trapezoidal has only two parallel sides. 45. They are called the bases of a trapezoidal.

**Exercise 6**

*Follow the speaker as he is reading the words. Mind the stress.*

'angle, 'vertex, 'measure, 'square, 'follow, 'aspect, 'area, 'system, 'neither, 'valid, 'clear, 'image, 'logic, 'surface, 'certain;

a'cute, con'cern, re'fer, con'tain, ex'ist, dis'cuss, as'sume, dis'tinct, di'rect, wi'thin, wi'thout, oc'cur, di'gree, en'close;

'opposite, 'postulate *a,* 'parallel, 'usual, 'special, 'century, 'realize, 'congruent;

ex'terior, hy'potenuse, equi'lateral, in'tuitive, in'terior.

**Exercise 7**

*Read these words after the speaker and guess the meaning of the italicized words.*

to deduce–*deductive*–*deduction;* to classify–*classification;* congruent–*congruous*–*congruence;* to separate–*separately*–*separation;* to originate–*origin*–*original;* distinct–*distinction*–*indistinct*– *distinctly*–*indistinctly;* triangle–*triangular;* rectangle–*rectangular;* to occur–*occurence;* outside–*inside;* to intersect–*intersection;* base– *baseless;* opposite–*to oppose*–*opposition;* measure-–*measurement*– *measurable*–*measurability*–*immeasurable;* common–*uncommon*– *commonly;* valid–*invalid*–*validity.*

**Exercise 8**

*Listen to the questions and write down your answers (+ -*).

1. Do you remember how we form a ray? 2. Do we extend a line segment in two directions when we form a ray? 3. Will two rays originating from the same endpoint form an angle? 4. Do angles sepa­rate the plane into 2 distinct sets of points? 5. Is the obtuse angle less than the right angle? 6. Is the right angle greater than the acute angle? 7. Are triangles classified according to the measures of their angles? 8. Can any triangle be referred to as equilateral? 9. Does a right triangle contain three right angles? 10. Are opposite sides of a quadrilateral always parallel?

**Exercise 9**

*Read these words and stress them properly.*

origin, triangle, deduce, exterior, opposite, certainly, segment *n,* below, above, define, enclose, special, extend, extension, refer, concern, hypotenuse, parallel, classify, acute, obtuse, equilateral, rectangle, evident, intersect, occur, middle, boundary, distinct.

**Exercise 10**

*Read these groups of words and translate them.*

an uncertain position, to direct the investigation, direct methods, formalization of the results obtained, deductive reasoning, the immeasurable greatness, to lessen the importance, the evidence of these facts, the occurrence of such phenomena, the validity of his statement, the acuteness of the situation.