

- Q1.** Give a definition of the following term. Are there other terms that need to be defined first? What are they, and how might you define them?

"Parallel lines"

- Q2.** Give a definition of the following term. Are there other terms that need to be defined first? What are they, and how might you define them?

"Perpendicular lines"

- Q3.** Give a definition of the following term. Are there other terms that need to be defined first? What are they, and how might you define them?

"Line segment"

- Q4.** Give a definition of the following term. Are there other terms that need to be defined first? What are they, and how might you define them?

"Radius of a circle"

- Q5.** If A , B and C are three points on a line, and B lies between A and C (see figure), then prove that $AB + BC = AC$.

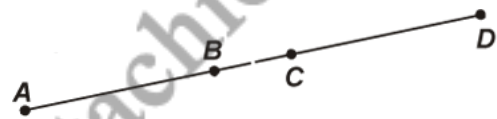


- Q6.** Prove that an equilateral triangle can be constructed on any given segment.

- Q7.** If a point C lies between two points A and B such that $AC = BC$, then prove that $AC = \frac{1}{2} AB$. Explain by drawing the figure.

- Q8.** In Question 4, point C is called a mid-point of line segment AB . Prove that every line segment has one and only one mid-point.

- Q9.** In figure, if $AC = BD$, then prove that $AB = CD$.



- Q10.** Why is axiom 5, in the list of Euclid's axioms, considered a 'universal truth'? (Note that the question is not about the fifth postulate.)

- Q11.** How would you rewrite Euclid's fifth postulate so that it would be easier to understand?

- Q12.** Does Euclid's fifth postulate imply the existence of parallel lines? Explain.

- Q13.** Which of the following statements are true and which are false? Give reasons for your answers.

(i) If two circles are equal, then their radii are equal.

(ii) In figure, if $AB = PQ$ and $PQ = XY$, then $AB = XY$.



- Q14.** Give a definition of the following term. Are there other terms that need to be defined first? What are they, and how might you define them?

"Square"

Q15. Consider the following statement: There exists a pair of straight lines that are everywhere equidistant from one another. Is this statement a direct consequence of Euclid's fifth postulate? Explain

Q16. Consider two 'postulates' given below:

- (i) Given any two distinct points A and B , there exists a third point C which is in between A and B .
- (ii) There exist at least three points that are not on the same line.

Do these postulates contain any undefined terms? Are these postulates consistent? Do they follow from Euclid's postulates? Explain.

Q17. Which of the following statements are true and which are false? Give reasons for your answers.

- (i) Only one line can pass through a single point.
- (ii) There are an infinite number of lines which pass through two distinct points.
- (iii) A terminated line can be produced indefinitely on both the sides.

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S1. Try yourself.

S2. Try yourself.

S3. Try yourself.

S4. Try yourself.

S5. Proved.

S6. Proved.

S7.

	$AC = BC$	
So,	$AC + AC = BC + AC$	(Equals are added to equals)
<i>i.e.,</i>	$2AC = AB$	($BC + AC$ coincides with AB)
Therefore,	$AC = \frac{1}{2} AB.$	

S8. Make a temporary assumption that different points C and D are two mid-points of AB . Now, you show that points C and D are not two different points.

S9.

	$AC = BD$	(Given) ... (i)
	$AC = AB + BC$	(Point B lies between A and C) ... (ii)
	$BD = BC + CD$	(Point C lies between B and D) ... (iii)

Substituting (ii) and (iii) in (i), you get

$$AB + BC = BC + CD$$

So, $AB = CD$ (Subtracting equals from equals)

S10. Since, this is true for any thing in any part of the world, this is a universal truth.

S11. Any formulation the student gives should be discussed in the class for its validity.

S12. If a straight line l falls on two straight lines m and n such that sum of the interior angles on one side of l is two right angles, then by Euclid's fifth postulate the line will not meet on this side of l . Next, you know that the sum of the interior angles on the other side of line l will also be right angles. Therefore, they will not meet on the other side also. So, the lines m and n never meet and are, therefore, parallel.

S13. (i) True. If you superimpose the region bounded by one circle on the other, then they coincide. So, their centres and boundaries coincide. Therefore, their radii will coincide.

(ii) True. The first axiom of Euclid.

S14. Try yourself.

S15. Take any line l and a point P not on l . Then, by play fair's axiom, which is equivalent to the fifth postulate, we know that there is a unique line m through P which is parallel to l .

Now, the distance of a point from a line is the length of the perpendicular from the point to the line. This distance will be the same for any point on m from l and any point on l from m . So, these two lines are everywhere equidistant from one another.

- S16.** There are several undefined terms which the student should list. They are consistent, because they deal with two different situations – (i) says that given two points A and B , there is a point C lying on the line in between them; (ii) says that given A and B , you can take C not lying on the line through A and B .
- S17.** (i) False. This can be seen visually by the student.
(ii) False. This contradicts Axiom 5.1.
(iii) True. (Postulate 2)

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