CHAPTER

5

Angles

Learning objectives

5.1 Point, Line and Line segment
5.2 Angles
5.3 Types of Angles

5.1 POINT, LINE AND LINE SEGMENT

Point : A point is represented by a dot.

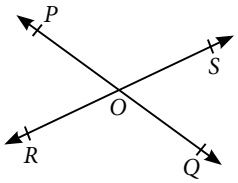
Line : A straight path in space that can be extend in both directions.

Ray : A ray starts from a fixed point and can be extended in the other direction.

Line segment : It is a part of a line that has two end points and has a definite length.

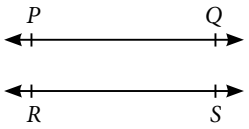
Types of Lines

1. Intersecting Lines : When two lines cross each other and meet at a common point, then the lines are called the intersecting lines.



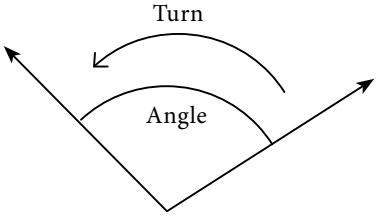
Here, $\overleftrightarrow{PQ}$ and $\overleftrightarrow{RS}$ are intersecting lines and O is the point of intersection.

2. Parallel Lines : Two lines are said to be parallel if they never meet each other (even after extension in any direction).

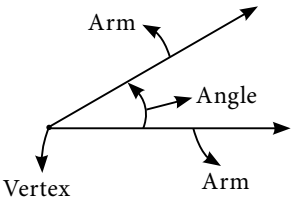


5.2 ANGLES

Whenever two line segments or rays meet at a point, an angle is said to be formed or we can say that the amount of turn between them is called an angle.



Parts of an Angle

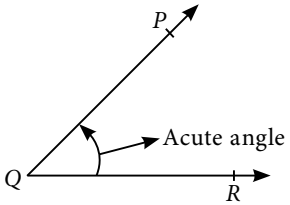


Olympiad Bite

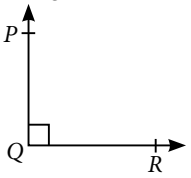
- $\angle$ is symbol used to represent angle.
- The point where the two arms meet is called vertex.

5.3 TYPES OF ANGLES

1. Acute Angle : An angle which measures more than 0° but less than 90°.



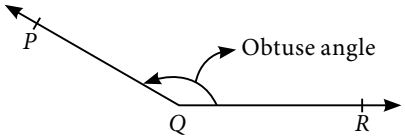
2. Right Angle : An angle which measures exactly 90°.



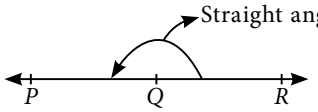
Olympiad Bite

Two lines are said to be perpendicular if the angle between them is 90°.

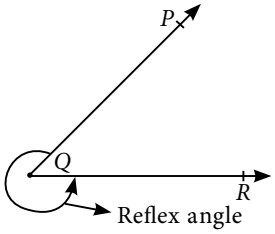
3. Obtuse Angle : An angle which measures more than 90° but less than 180°.



4. Straight Angle: An angle whose measure is exactly 180°.



5. Reflex Angle : An angle which measures more than 180° but less than 360°.



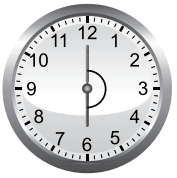
Reading of an angle formed by the hands of a clock

What kind of angles shown in the given clocks ?

Right angle

Acute angle

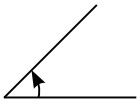
Obtuse angle



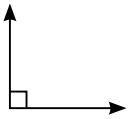
Straight angle

SELF TEST - 1

1. Which of the following angles represents a right angle?

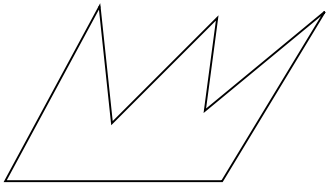
(A) 

(B) 

(C) 

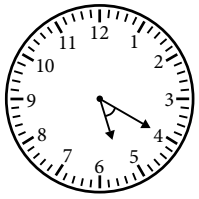
(D) None of these

2. How many angles are less than 90° in the given figure?



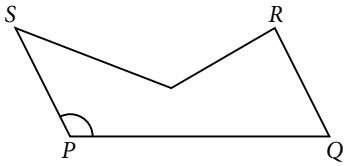
(A) 3 (B) 4
(C) 5 (D) 1

3. The angle formed by the hands of the given clock is _____.



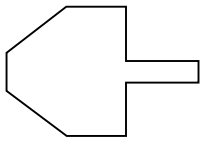
(A) Acute
(B) Right
(C) Straight
(D) Obtuse

4. Angle *P* represents a/an _____ angle.



(A) Reflex
(B) Acute
(C) Obtuse
(D) Straight

5. There are _____ angles inside the given figure.



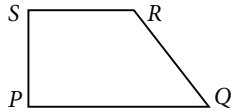
(A) 15
(B) 12
(C) 8
(D) 10

EXERCISE

1. How many angles in the given figure are less than a right angle ?

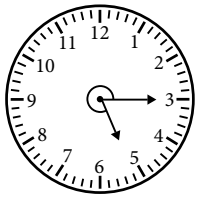
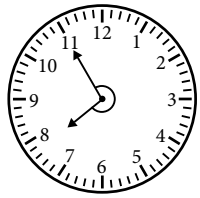
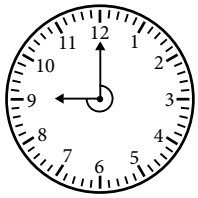
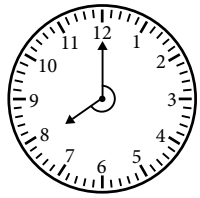
(A) 0 (B) 1
(C) 2 (D) 4

2. Which of the following angles in the given figure is an obtuse angle?

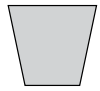


(A) $\angle P$ (B) $\angle Q$
(C) $\angle R$ (D) $\angle S$

3. Which of the following hands of the clock shows $\frac{3}{4}$ of a revolution?

(A) 
(B) 
(C) 
(D) 

4. Which figure appears to have exactly one pair of perpendicular sides?

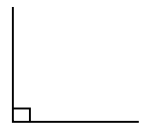
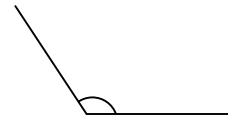
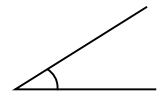
(A) 
(B) 
(C) 
(D) 

5. How many of the given letters have perpendicular lines?

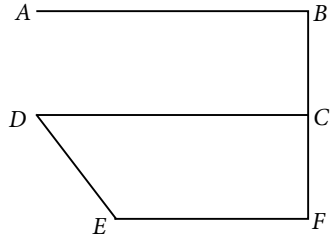
F R A M E

(A) 1 (B) 2
(C) 3 (D) 4

6. Which of the following angles measures less than a right angle?

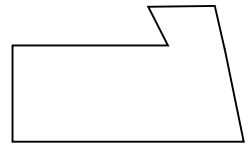
(A) 
(B) 
(C) 
(D) None of these

7. How many pairs of parallel lines are there in the given figure?



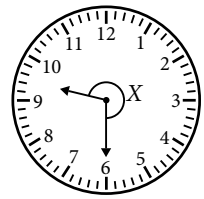
(A) 0 (B) 2
(C) 3 (D) 4

8. The number of acute angles in the given figure is _____.



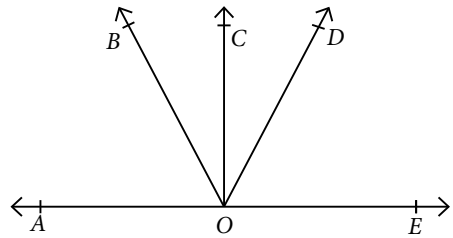
(A) 1 (B) 2
(C) 3 (D) 4

9. The angle X in the given clock is a/an _____ angle.



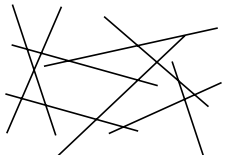
(A) Obtuse (B) Reflex
(C) Acute (D) Straight

10. In the given figure which angle is less than a right angle?



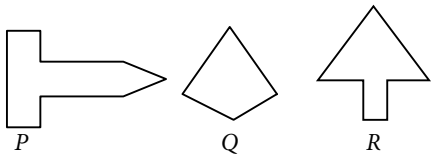
(A) $\angle AOD$ (B) $\angle BOE$
(C) $\angle BOD$ (D) $\angle AOC$

11. How many pairs of parallel lines are there in the given figure?



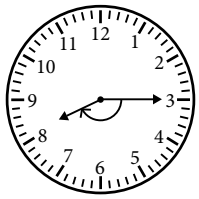
(A) 0 (B) 1
(C) 2 (D) 3

12. How many of the given figures have perpendicular lines?



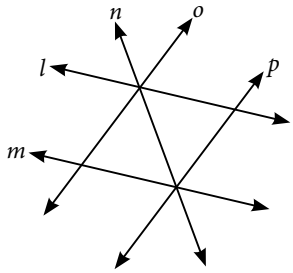
(A) None (B) 1
(C) 2 (D) 3

13. When it is 8 : 15, what kind of angle is formed by the hands of a clock?



(A) Straight (B) Acute
(C) Right (D) Obtuse

14. How many pairs of parallel lines are there in the given figure ?



(A) 0 (B) 1
(C) 2 (D) 3

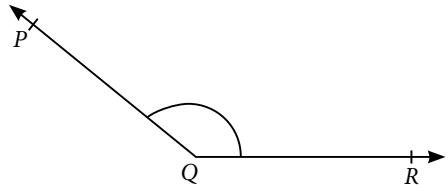
15. An angle which measures 180° is called _____.

(A) Acute angle (B) Obtuse angle
(C) Reflex angle (D) Straight angle

16. The sum of three right angles is _____.

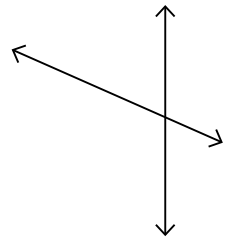
(A) 160° (B) 360°
(C) 270° (D) 90°

17. The approximate measure of the angle shown in the given figure is _____.



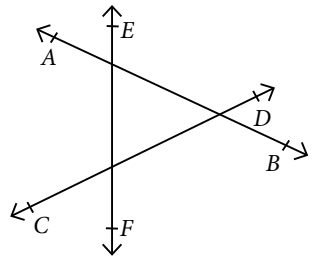
(A) 90° (B) 210°
(C) 180° (D) 120°

18. The given pair of lines represents _____.



(A) Parallel lines (B) Perpendicular lines
(C) Intersecting lines (D) None of these

19. How many pair of intersecting lines are there in the given figure?



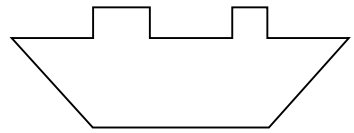
(A) 1 (B) 2
(C) 3 (D) 4

20. How many of the given letters have parallel lines?

MERIT

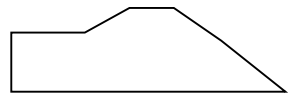
(A) 2 (B) 3
(C) 4 (D) 5

21. The number of right angles inside the given figure is _____.



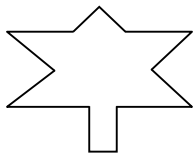
(A) 4 (B) 5
(C) 6 (D) 7

22. There are _____ acute angles inside the given figure.



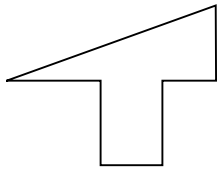
(A) 0 (B) 1
(C) 2 (D) 4

23. Total number of angles inside the given figure is _____.



(A) 13 (B) 12
(C) 10 (D) 8

24. How many acute angles are there in the given figure?



(A) 2 (B) 4
(C) 6 (D) None of these

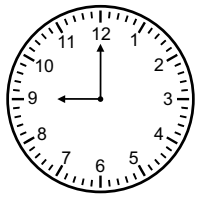
25.  has _____ pair(s) of parallel lines.

(A) Two (B) Four
(C) Three (D) None of these

26. How many right angles are there in a straight angle?

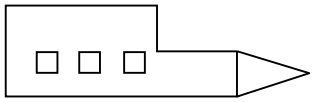
(A) 5 (B) 4
(C) 2 (D) 1

27. The smaller angle shown in the clock is a/an _____ angle.



(A) Acute (B) Straight
(C) Right (D) Reflex

28. The number of pair of perpendicular lines in the given figure is _____.



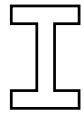
(A) 10 (B) 6
(C) 12 (D) None of these

29. Reflex angle is the angle which measures more than _____ and less than _____.

(A) 90°, 180°
(B) 360°, 180°
(C) 180°, 90°
(D) 180°, 360°

30. Which of the following letters do not have any pair of perpendicular lines?

(A)  (B) 

(C)  (D) 

Achievers Section (HOTS)

31. Read the statements carefully and state 'T' for true and 'F' for false.

(i) The hands of a clock form an acute angle at 7 : 05 p.m.
(ii) The hands of a clock form an obtuse angle at 6 : 30 p.m.
(iii) The hands of a clock form a straight angle at 6 : 00 a.m.

	(i)	(ii)	(iii
(A)	T	F	F
(B)	T	T	F
(C)	F	F	T
(D)	F	T	T

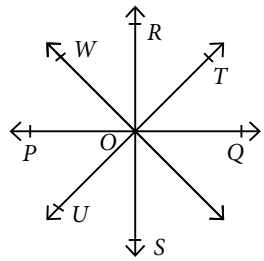
32. Read the statements carefully and select the correct option.

Statement-1 : An angle measures less than 90°, is called an acute angle.

Statement-2 : An angle measures greater than 90°, is always an obtuse angle.

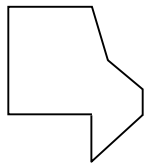
(A) Both Statement-1 and Statement-2 are false.
(B) Both Statement-1 and Statement-2 are true.
(C) Statement-1 is true but Statement-2 is false.
(D) Statement-1 is false but Statement-2 is true.

33. Study the given figure and select the correct option.



(A) $\angle POW$ - Acute angle
(B) $\angle WOU$ - Obtuse angle
(C) $\angle TOP$ - Straight angle
(D) $\angle QOS$ - Acute angle

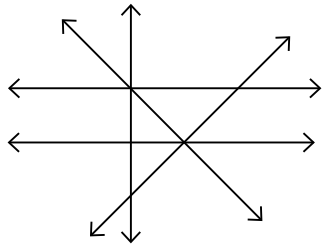
34. Study the given figure and fill in the blanks.



(i) There are _____ angles which are less than a right angle in the given figure.
(ii) There are _____ angles inside the given figure.
(iii) There are _____ obtuse angles in the given figure.

	(i)	**(ii)**	**(iii)**
(A)	2	8	3
(B)	1	8	2
(C)	1	8	3
(D)	2	8	2

35. Study the given figure and answer the following questions.



(p) Number of pair of parallel lines is/are_____.
(q) Number of pair of perpendicular lines are _____.

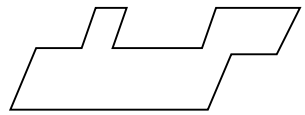
	(p)	(q)
(A)	2	3
(B)	2	4
(C)	1	4
(D)	1	3

SOF IMO 2019 QUESTIONS

1. What kind of angle is formed by the hands of the clock at 2:30 hours?

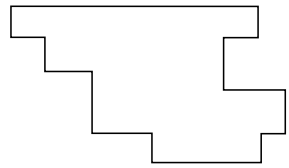
(A) Acute
(B) Obtuse
(C) Right
(D) Reflex *(Level-1)*

2. How many angles are greater than right angle in the given figure?



(A) 5
(B) 6
(C) 4
(D) None of these *(Level-1)*

3. How many angles inside the given figure are equal to three right angles?



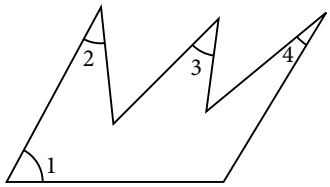
(A) 4 (B) 6
(C) 3 (D) 7 *(Level-2)*

HINTS & EXPLANATIONS

SELF TEST-1

1. (C)

2. (B) :



3. (A)

4. (C)

5. (D)

EXERCISE

1. (A) : There is no angle in the given figure which is less than a right angle.

2. (C) : $\angle R$ is an obtuse angle.

3 (C)

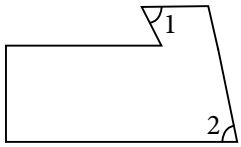
4. (D)

5. (D) : Letters F, R, M and E have perpendicular lines.

6. (C)

7. (C) : Pair of parallel lines are (*AB*, *DC*), (*AB*, *EF*) and (*DC*, *EF*).

8. (B) :



9. (B)

10. (C) : $\angle BOD$ is less than a right angle.

11. (C)

12. (C) : Figure *P* and *R* have perpendicular lines.

13. (D)

14. (C) : Pair of parallel lines are (*l*, *m*) and (*o*, *p*).

15. (D)

16. (C) : Measure of 1 right angle = 90°

$\therefore$ Sum of 3 right angles = 90° + 90° + 90° = 270°

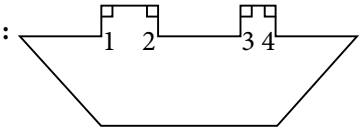
17. (B)

18. (C)

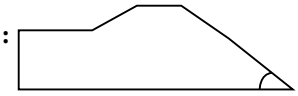
19. (C) : Pair of intersecting lines are (*EF*, *AB*), (*CD*, *EF*) and (*AB*, *CD*).

20. (D) : Letters *M*, *E*, *I* and *T* have parallel lines.

21. (A) :

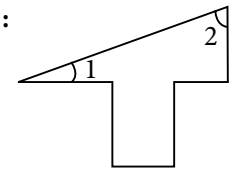


22. (B) :



23. (A) : There are 13 angles inside the given figure.

24. (A) :



25. (D)

26. (C) : Measure of a straight angle = 180°
= 90° + 90° = 2 right angles.

27. (C)

28. (D)

29. (D)

30. (D)

31. (C)

32. (C)

33. (A)

34. (C)

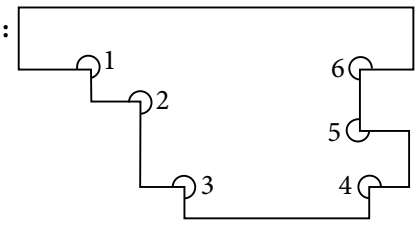
35. (D)

SOF IMO 2019 QUESTIONS

1. (B)

2. (D)

3. (B) :



There are 6 angles inside the given figure which are equal to three right angles *i.e.*, 270°.