Assignments in Mathematics Class IX (Term I)

6. LINES AND ANGLES

IMPORTANT TERMS, DEFINITIONS AND RESULTS

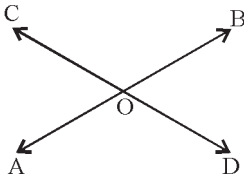
- Two angles are called adjacent angles, if
  (i) they have the same vertex,
  (ii) they have a common arm and
  (iii) their non-common arms are on either side of the common arm.
- Two adjacent angles are said to form a linear pair of angles, if their non-common arms are two opposite rays.
- If a ray stands on a line, then the sum of the adjacent angles so formed is 180°.
- If the sum of two adjacent angles is 180°, then the non-common arms of the angles form a straight line.
- If two lines intersect each other, then the vertically opposite angles are equal.
- If a transversal intersects two parallel lines, then each pair of corresponding angles is equal.
- If a transversal intersects two lines such that a pair of corresponding angles is equal, then the two lines are parallel to each other.
- If a transversal intersects two parallel lines, then each pair of alternate interior angles is equal.
- If a transversal intersects two lines such that a pair of alternate interior angles is equal, then the two lines are parallel.
- If a transversal intersects two parallel lines, then each pair of interior angles on the same side of the transversal is supplementary.
- If a transversal intersects two lines such that a pair of interior angles on the same side of the transversal is supplementary, then the two lines are parallel.
- Lines which are parallel to the same line are parallel to each other.
- The sum of the three angles of a triangle is 180°.
- If a side of a triangle is produced, the exterior angle so formed is equal to the sum of the two interior opposite angles.

SUMMATIVE ASSESSMENT

MULTIPLE CHOICE QUESTIONS [1 Mark]

A. Important Questions

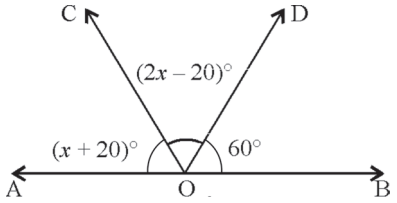
1. Two lines AB and CD intersect at a point O, such that ∠BOC + ∠AOD = 280°. Then ∠AOC + ∠BOD is equal to :



(a) 180°
(b) 80°
(c) 140°
(d) 40°

2. Two adjacent angles on a straight line are in the ratio 6 : 3. The measure of the greater angle is :
(a) 120° (b) 180° (c) 90° (d) 110°

3. In the figure, AOB is a straight line. The measure of ∠COD is equal to :

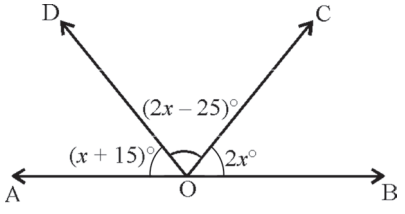


(a) 60° (b) 80° (c) 120° (d) 160°

4. Two supplementary angles differ by 28°. The angles are :
(a) 76°, 104° (b) 72°,108°
(c) 32°, 58° (d) none of these

5. If one of the four angles formed by two intersecting lines is a right angle, then each of the four angles is :
(a) an acute angle (b) a right angle
(c) an obtuse angle (d) none of these

6. In the figure, the value of x is equal to :

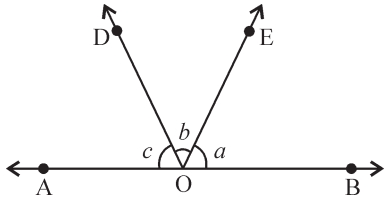


(a) 56° (b) 40° (c) 38° (d) 140°

7. One-third of an angle is equal to its supplement. The measure of this angle is :

(a) 45° (b) 60° (c) 75° (d) 135°

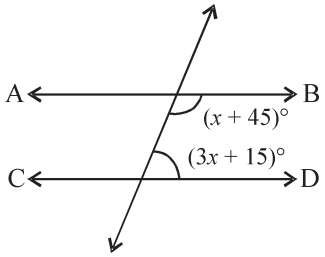
8. In the figure, $a : b : c = 4 : 3 : 5$. If AOB is a straight line, then the values of a, b and c respectively are :



(a) 75°, 45°, 60° (b) 48°, 36°, 60°

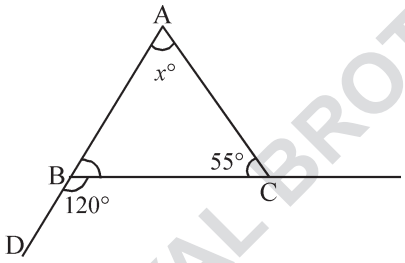
(c) 45°, 75°, 60° (d) 60°, 45°, 75°

9. In the given figure, AB || CD, the value of x is equal to :



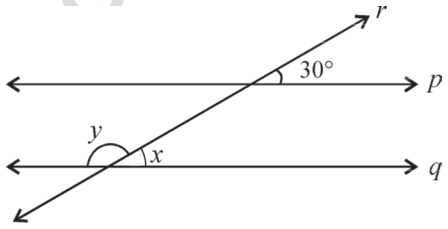
(a) 60° (b) 75° (c) 45° (d) 30°

10. In the given figure, the measure of $x°$ is :



(a) 60° (b) 65° (c) 55° (d) 110°

11. In the given figure, $p \parallel q$ and r is a transversal, the values of x and y respectively are :



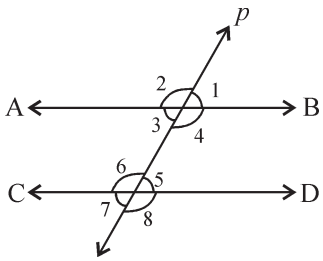
(a) 60°, 30° (b) 60°, 60°

(c) 30°, 150° (d) 60°, 30°

12. In ΔABC, if $\angle ABC = \angle BAC + \angle ACB$, the value of $\angle ABC$ is :

(a) 180° (b) 90° (c) 45° (d) 30°

13. In the figure, AB || CD and p is a transversal. Then $\angle 3 + \angle 6$ is :



(a) 90° (b) 180° (c) 120° (d) 100°

14. Angles of a triangle are in the ratio 2 : 4 : 3. The smallest angle of the triangle is :

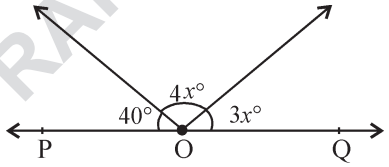
(a) 60° (b) 40° (c) 80° (d) 20°

15. If one angle of a triangle is equal to the sum of the other two angles, then the triangle is :

(a) an isosceles triangle (b) an obtuse triangle

(c) an equilateral triangle (d) a right triangle

16. In the figure, POQ is a line. The value of x is :

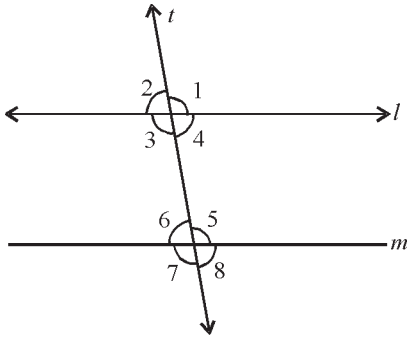


(a) 20° (b) 25° (c) 30° (d) 5°

17. If two interior angles on the same side of a transversal intersecting two parallel lines are in the ratio 2 : 3, then the greater of the two angles is :

(a) 54° (b) 108° (c) 120° (d) 136°

18. In the figure, given that $l \parallel m$ and t is a transversal.If $\angle 1 = (110° - x)$ and $\angle 5 = 4x$, then the measures of $\angle 1$ and $\angle 5$ are :



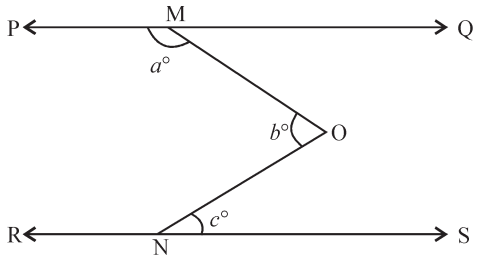
(a) 55°, 55° (b) 22°, 88°

(c) 55°, 88° (d) 88°, 88°

19. If all the three sides of a triangle are produced, then the sum of three exterior angles so formed is equal to :

(a) 180° (b) 360° (c) 540° (d) 270°

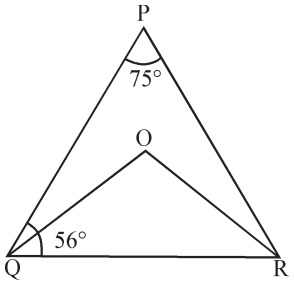
20. In the figure, if PQ || RS, then :



(a) $a° + b° = c°$ (b) $a° + b° + c° = 180°$

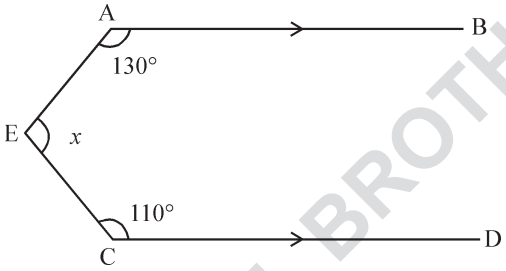
(c) $a° + b° - c° = 180°$ (d) $a° + b° = 90° + c°$

21. In the figure, QO and RO are the bisectors of ∠Q and ∠R respectively. If ∠QPR = 75° and ∠PQR = 56°, the measure of ∠ORQ is :



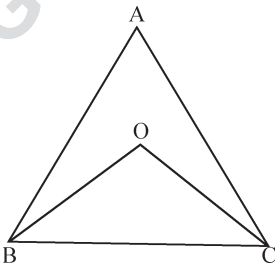
(a) 28° (b) 59° (c) $24\frac{1}{2}°$ (d) $29\frac{1}{2}°$

22. In the figure, AB || CD, the measure of $\angle x$ is :



(a) 120° (b) 55° (c) 65° (d) 70°

23. In the figure, ABC is an equilateral triangle. The bisectors of ∠ABC and ∠ACB meet at O. The measure of ∠BOC is :



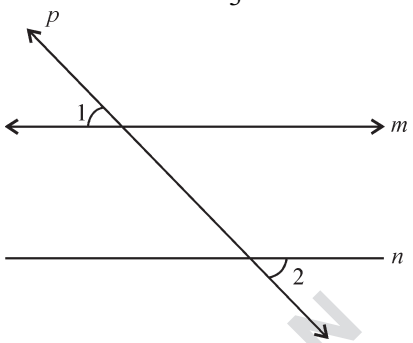
(a) 60° (b) 90° (c) 240° (d) 120°

24. The sum of the bisectors of the angles of a linear pair is always :

(a) less than 90° (b) greater than 90°

(c) equal to 90° (d) none of these

25. In the figure, p is a transversal to the lines m and n. If $\angle 1 = 60°$ and $\angle 2 = \frac{2}{3}$ of a right angle, then :



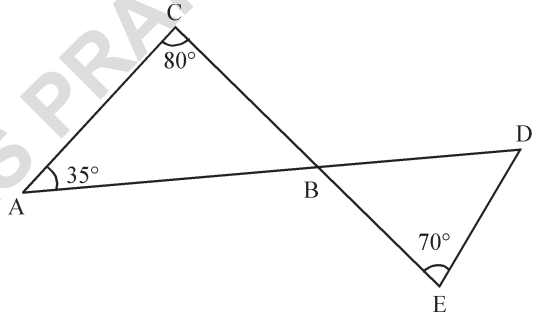
(a) m is parallel to n

(b) m is perpendicular to n

(c) both (a) and (b) are correct.

(d) none of these

26. In the given figure, the value of ∠BDE is :

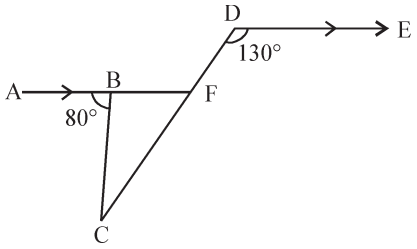


(a) 65° (b) 75° (c) 45° (d) 35°

27. 50% of an angle is the supplement of 110°. The value of the angle is :

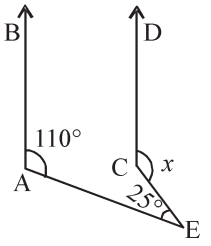
(a) 35° (b) 125° (c) 109° (d) 140°

28. In the figure, AB || DE, the value of ∠BCD is :



(a) 80° (b) 130° (c) 50° (d) 30°

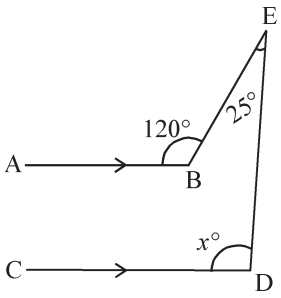
29. In the figure, if AB || CD, the value of x is :



(a) 85° (b) 135°

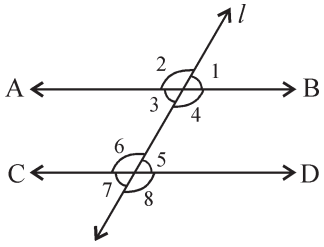
(c) 110° (d) none of these

30. In the figure, AB || CD. If ∠ABE = 120° and ∠BED = 25°, the value of x is :



(a) 145° (b) 75° (c) 90° (d) 115°

31. In the given figure, AB || CD and l is a transversal. If ∠2 = 2 × ∠ 1, then the measure of ∠7 is :



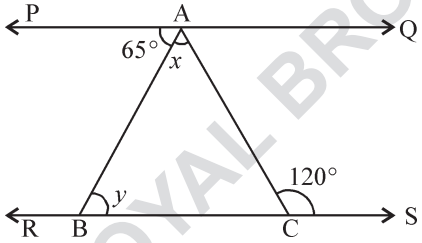
(a) 90° (b) 60° (c) 120° (d) 75°

32. The complement of an angle is one fourth of itself. The angle and its complement are :

(a) 36°, 144° (b) 18°, 72°

(c) 72°, 18° (d) none of these

33. In the given figure, if PQ || RS, then the values of x and y are :



(a) $x = 65°$, $y = 55°$ (b) $x = 55°$, $y = 65°$

(c) $x = 55°$, $y = 115°$ (d) $x = 125°$, $y = 65°$

34. The angles of a triangle are in the ratio 5 : 3 : 7. The triangle is :

(a) an acute angled triangle

(b) an obtuse angled triangle

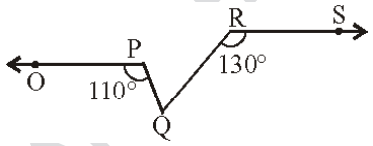
(c) a right triangle

(d) an isosceles triangle

35. If one of the angles of a triangle is 130°, then the angle between the bisectors of the other two angles can be :

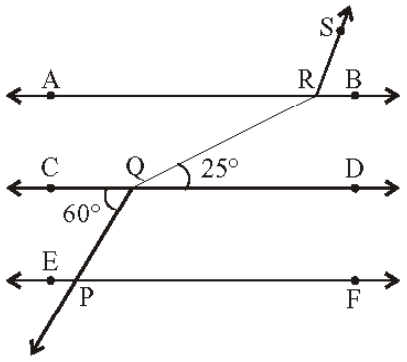
(a) 50° (b) 65° (c) 145° (d) 155°

36. In the figure , if OP || RS, ∠OPQ = 110° and ∠QRS = 130°, then ∠PQR is equal to :



(a) 40° (b) 50° (c) 60° (d) 70°

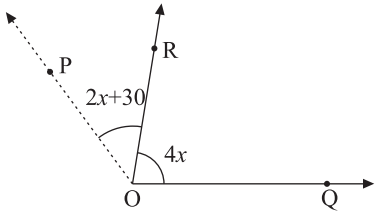
37. In the figure if AB || CD || EF, PQ || RS, ∠RQD = 25° and ∠CQP = 60°, then ∠QRS is equal to :



(a) 85° (b) 145° (c) 60° (d) 110°

B. Questions From CBSE Examination Papers

1. In the given figure, the value of x which makes POQ a straight line is : **[T-I (2010)]**



(a) 35 (b) 30 (c) 25 (d) 40

2. The angle which is equal to 8 times its complement is : **[T-I (2010)]**

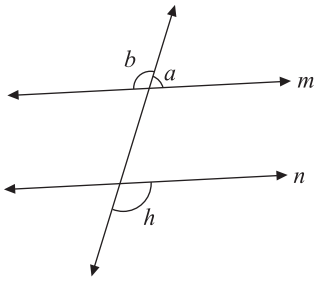
(a) 80°

(b) 72°

(c) 90°

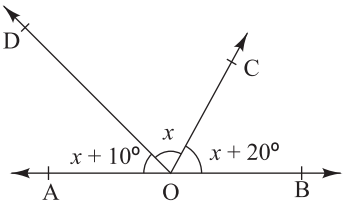
(d) 88°

3. In the figure, if $m \| n$ and $\angle a : \angle b = 2 : 3$, then measure of $\angle h$ is :**[T-I (2010)]**



(a) 72° (b) 108° (c) 120° (d) 150°

4. In the figure, value of x is : **[T-I (2010)]**



(a) 50° (b) 40° (c) 60° (d) 70°

5. An exterior angle of a triangle is 80° and the interior opposite angles are in the ratio 1 : 3. Measure of each interior opposite angle is : **[T-I (2010)]**

(a) 30°, 90° (b) 40°, 120°

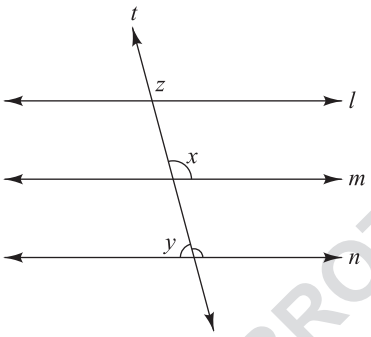
(c) 20°, 60° (d) 30°, 60°

6. The complementary angles are in the ratio 1 : 5. Find the measures of the angles : **[T-I (2010)]**

(a) 15°, 75° (b) 75°, 15°

(c) 12°, 60° (d) 60°, 12°

7. In the given figure, $l \parallel m \parallel n$, If $x : y = 5 : 4$, then the measure of angle z is : **[T-I (2010)]**



(a) 40° (b) 50° (c) 90° (d) 80°

8. The complement of an angle m is : **[T-I (2010)]**

(a) m (b) $90° + m$

(c) $90° - m$ (d) $m \times 90°$

9. If the measure of an angle is twice the measure of its supplementary angle, then the measure of the angle is : **[T-I (2010)]**

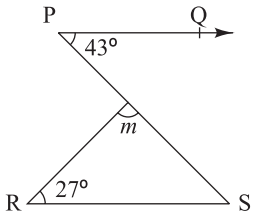
(a) 60° (b) 90°

(c) 120° (d) 130°

10. If two interior angles on the same side of a transversal intersecting two parallel lines are in the ratio 2 : 3, then the larger of two angles is : **[T-I (2010)]**

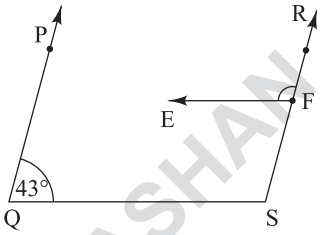
(a) 72° (b) 108° (c) 54° (d) 36°

11. In the given figure, if PQ||RS, then the measure of m is : **[T-I (2010)]**



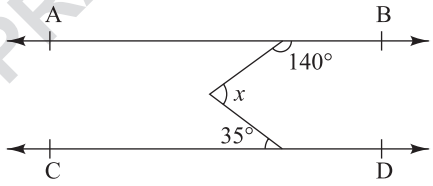
(a) 110° (b) 100° (c) 90° (d) 137°

12. In the given figure, PQ||RS and EF||QS. If $\angle PQS = 60°$, then the measure of $\angle RFE$ is : **[T-I (2010)]**



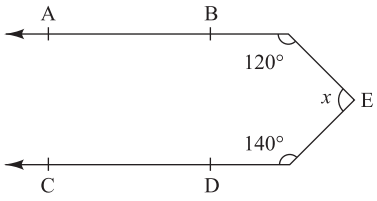
(a) 115° (b) 120° (c) 60° (d) 180°

13. In the figure, AB||CD, the value of x is : **[T-I (2010)]**



(a) 35° (b) 40° (c) 60° (d) 75°

14. In the figure, AB and CD are parallel to each other. The value of x is : **[T-I (2010)]**



(a) 90° (b) 100°

(c) 120° (d) 140°

15. Find the measure of the angle which is complement of itself. **[T-I (2010)]**

(a) 30° (b) 90°

(c) 45° (d) 180°

16. Two lines are respectively perpendicular to two perpendicular lines. Then these two lines to each other are : **[T-I (2010)]**

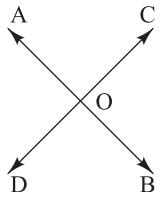
(a) parallel

(b) perpendicular

(c) inclined at same acute angle

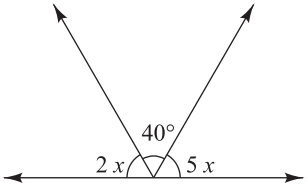
(d) intersecting at 110°

17. In the figure, lines AB and CD intersect at O. If $\angle AOD : \angle DOB = 4 : 5$, then $\angle COB$ is : **[T-I (2010)]**



(a) 80° (b) 100° (c) 90° (d) 70°

18. In the figure, the value of x is : **[T-I (2010)]**

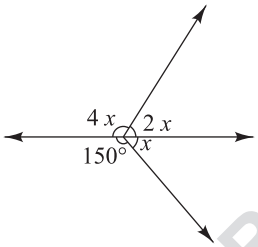


(a) 30° (b) 10° (c) 20° (d) 40°

19. Measure of an angle which is supplement to itself is : **[T-I (2010)]**

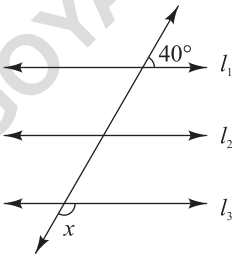
(a) 45° (b) 30° (c) 90° (d) 180°

20. In the figure, value of x is : **[T-I (2010)]**



(a) 20° (b) 40° (c) 30° (d) 50°

21. Given lines l_1, l_2 and l_3 in figure are parallel. The value of x is : **[T-I (2010)]**

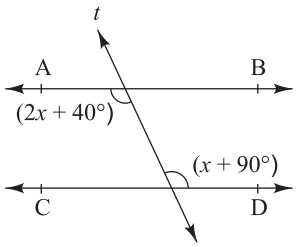


(a) 40° (b) 140° (c) 50° (d) 80°

22. The complement of $(90° - a)$ is : **[T-I (2010)]**

(a) $-a°$ (b) $90° + a$ (c) $90° - a$ (d) $a°$

23. In the figure, AB||CD and t is a transversal, the value of x is equal to : **[T-I (2010)]**



(a) 50° (b) 70° (c) 35° (d) 20°

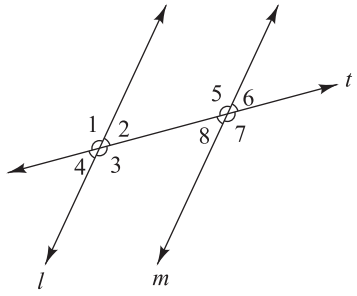
24. If l, m, n are lines in the same plane such that l intersects m and $n||m$, then l and n are : **[T-I (2010)]**

(a) parallel
(b) intersecting
(c) always perpendicular
(d) always intersecting at 60°

25. If two supplementary angles are in the ratio 2 : 7, then the angles are : **[T-I (2010)]**

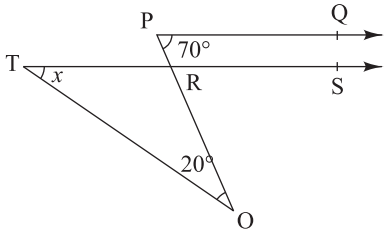
(a) 35° 145° (b) 70°, 110°
(c) 40°, 140° (d) 50°, 130°

26. From the figure, identify the incorrect statement, given that $l||m$ and t is the transversal. **[T-I (2010)]**



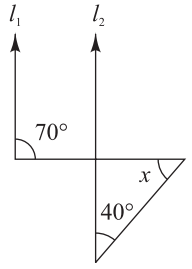
(a) $\angle 2$ and $\angle 5$ are supplementary
(b) $\angle 2$ and $\angle 3$ are supplementary
(c) $\angle 2$ and $\angle 8$ are supplementary
(d) $\angle 2$ and $\angle 1$ are supplementary

27. In the figure, PQ||RS, $\angle QPR = 70°$, $\angle ROT = 20°$. Find the value of x. **[T-I (2010)]**



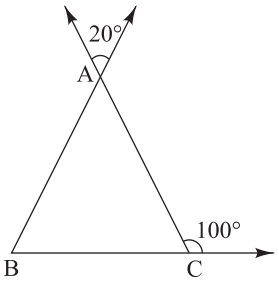
(a) 20° (b) 70° (c) 110° (d) 50°

28. In the figure, $l_1 \| l_2$. The value of x is : **[T-I (2010)]**



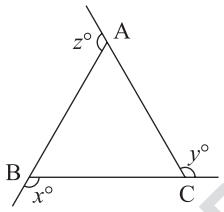
(a) 70° (b) 30° (c) 40° (d) 50°

29. In the given figure, the measure of $\angle ABC$ is : **[T-I (2010)]**



(a) 80° (b) 20° (c) 100° (d) 60°

30. In the figure, if $x°$, $y°$ and $z°$ are exterior angles of ΔABC, then $x° + y° + z°$ is : **[T-I (2010)]**



(a) 180° (b) 360° (c) 270° (d) 90°

31. The angles of a triangle are in the ratio 2 : 3 : 4. The angles are : **[T-I (2010)]**

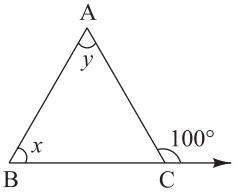
(a) 20°, 60°, 80° (b) 80°, 40°, 60°

(c) 40°, 60°, 80° (d) 60°, 40°, 80°

32. In a triangle ABC, if $\angle A = 53°$ and $\angle C = 44°$, then the value of $\angle B$ is : **[T-I (2010)]**

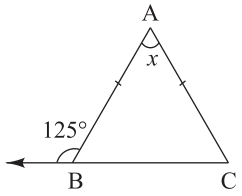
(a) 73° (b) 83° (c) 93° (d) 46°

33. In the figure, the value of $(\angle x + \angle y)$ is : **[T-I (2010)]**



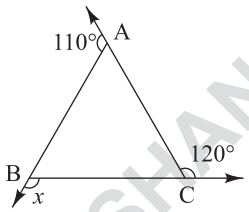
(a) 80° (b) 100° (c) 120° (d) 60°

34. In the figure, if AB = AC, find x. **[T-I (2010)]**



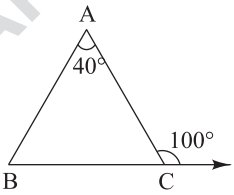
(a) 55° (b) 110° (c) 50° (d) 70°

35. In the figure, the value of x is : **[T-I (2010)]**



(a) 120° (b) 130° (c) 110° (d) 100°

36. In the figure, measure of $\angle ABC$ is : **[T-I (2010)]**



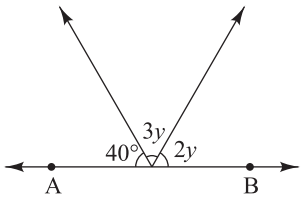
(a) 60° (b) 70° (c) 80° (d) 50°

37. An exterior angle of a triangle is 80° and the interior opposite angles are in the ratio 1 : 3. Measure of each interior opposite angle is : **[T-I (2010)]**

(a) 30°, 90° (b) 40°, 120°

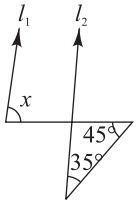
(c) 20°, 60° (d) 30°, 60°

38. In the figure, the value of y is : **[T-I (2010)]**



(a) 28° (b) 32° (c) 36° (d) 44°

39. In the figure, $l_1 \| l_2$, the value of x is : **[T-I (2010)]**

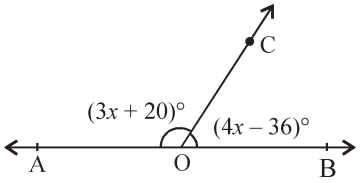


(a) 80° (b) 100° (c) 110° (d) 70°

A. Important Questions

1. Can a triangle have all angles less than 60° ? Give reasons for your answer.

2. In the figure, what value of x will make AOB a straight line ?



3. A transversal intersects two lines in such way that the two interior angles on the same side of the tansversal are equal. Will the two lines always be parallel ?

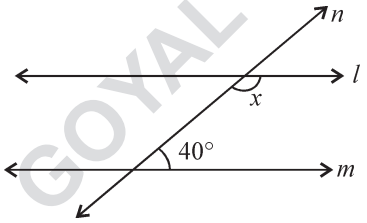
4. How many triangle can be drawn having its angles as 50°, 67° and 63° ? Give reasons for your answer.

5. Find the measure of an angle if seven times its complement is 10° less than three times its supplement.

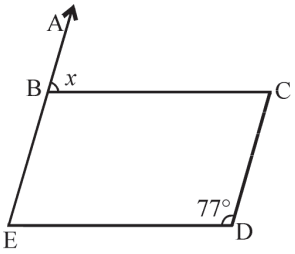
6. Let OA, OB, OC and OD are rays in the anti-clockwise direction such that ∠AOB = ∠COD = 100°, ∠BOC = 82° and ∠AOD = 78°. Is it true to say that AOC and BOD are lines ?

7. The sum of two angles of a triangle is equal to its third angle. Determine the measure of the third angle.

8. In the figure, find the value of x for which the lines l and m are parallel.

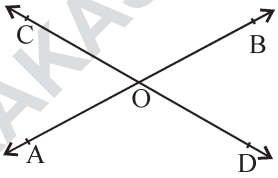


9. In the figure, find the value of x, if AB || CD and BC || ED.

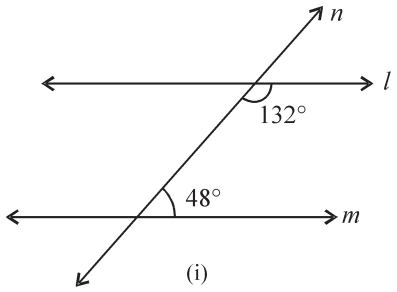


10. Two adjacent angles are equal. Is it necessary that each of these angles will be a right angle ? Justify your answer.

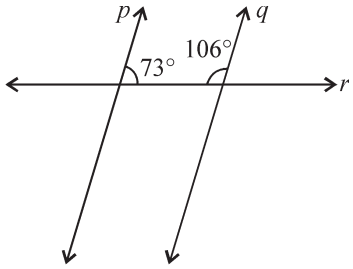
11. Two lines AB and CD intersect at a point O such that ∠BOC + ∠AOD = 280°, as shown in the given figure. Find all the four angles.



12. In the following figures, which of the two lines are parallel and why ?



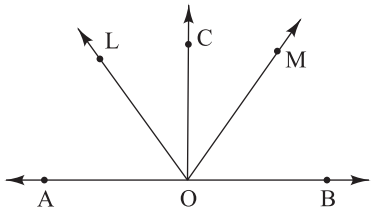
(i)



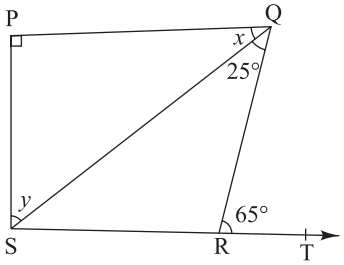
(ii)

B. Questions From CBSE Examination Papers

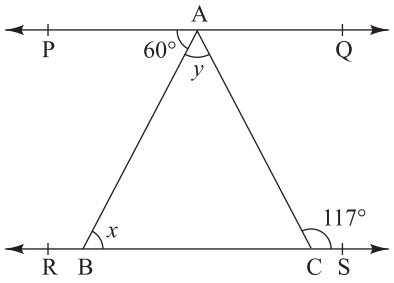
1. In the figure, ray OC stands on the line AB, ray OL and ray OM are angle bisectors of ∠AOC and ∠BOC respectively. Prove that ∠LOM = 90°.
[T-I (2010)]



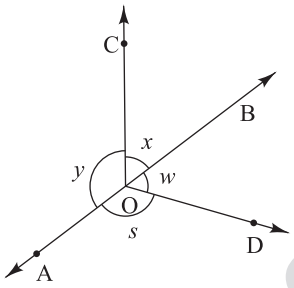
2. In the figure, PQ||SR, ∠SQR = 25°, ∠QRT = 65°, find x and y : **[T-I (2010)]**



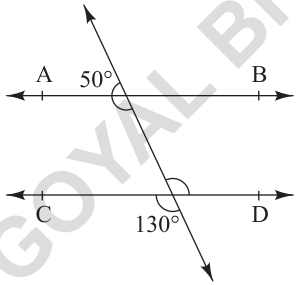
3. In the figure, if PQ||RS, ∠PAB = 60° and ∠ACS = 117°, then find $(x - y)$. **[T-I (2010)]**



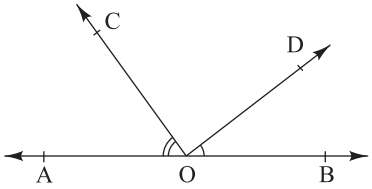
4. If $x + y = s + w$, prove that AOB is a straight line. **[T-I (2010)]**



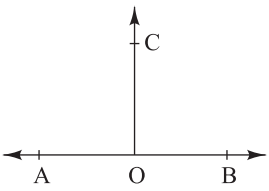
5. In the figure, find the values of x and y. **[T-I (2010)]**



6. In the figure, OA, OB are opposite rays and ∠AOC + ∠BOD = 90°. Find ∠COD. **[T-I (2010)]**

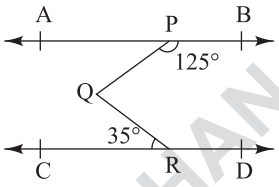


7. In the figure, if a ray OC stands on line AB such that ∠AOC = ∠COB, then show that ∠AOC = 90°. **[T-I (2010)]**

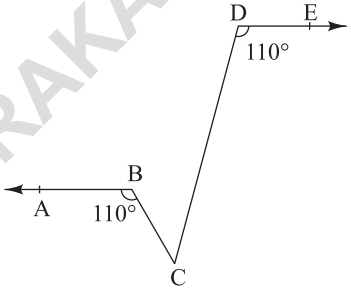


8. If two lines are perpendicular to the same line, prove that they are parallel to each other. **[T-I (2010)]**

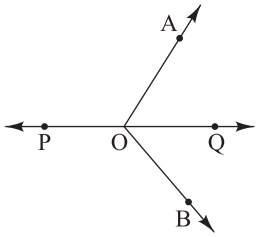
9. In the figure, if AB||CD, then find ∠PQR. **[T-I (2010)]**



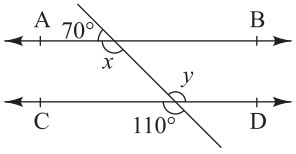
10. In the figure, if AB||DE, then find the measure of ∠BCD. **[T-I (2010)]**



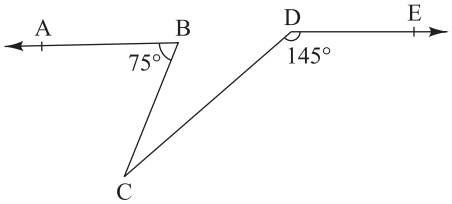
11. In the figure, OQ bisects ∠AOB. OP is a ray opposite to ray OQ. Prove that ∠POA = ∠POB. **[T-I (2010)]**



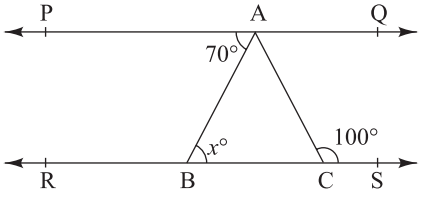
12. In the figure, find x and y and then show that AB||CD. **[T-I (2010)]**



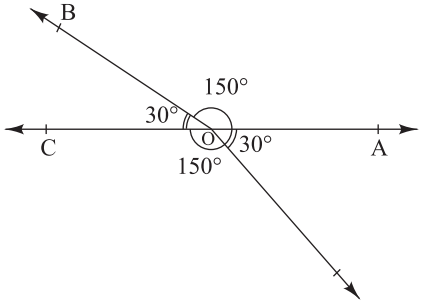
13. In the figure, AB||DE, ∠ABC = 75° and ∠CDE = 145°, then find ∠BCD. **[T-I (2010)]**



14. In the figure, PQ||RS, ∠PAB = 70° and ∠ACS = 100°. Find the value of x. **[T-I (2010)]**



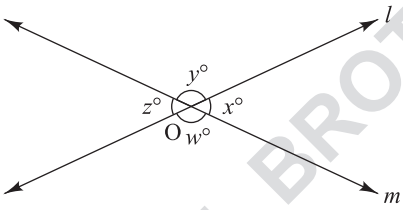
15. If OA, OB, OC and OD are the rays such that ∠AOB = ∠COD = 150°, ∠BOC = 30° and ∠AOD = 30°. Is it true that AOC and BOD are straight lines ? Justify your answer. **[T-I (2010)]**



16. Lines PQ and RS intersect each other at point O. If ∠POR : ∠ROQ = 5 : 7, find all the remaining angles. **[T-I (2010)]**

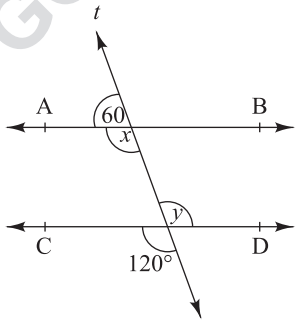
17. In the figure, lines l and m intersect each other at O. If $x = 40°$, then find the values of y, z and w.

[T-I (2010)]

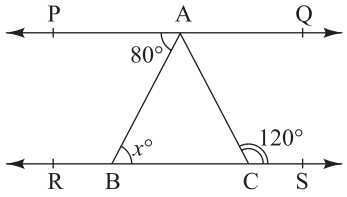


18. If l, m, n are three lines such that $l \parallel m$ and $n \perp l$, then prove that $n \perp m$. **[T-I (2010)]**

19. In the figure, find the values of x and y and then show that AB||CD. **[T-I (2010)]**

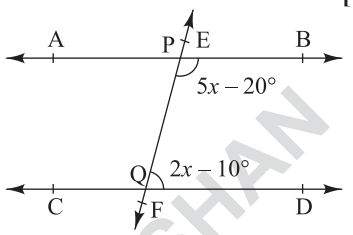


20. In the figure, PQ||RS, ∠PAB = 80° and ∠ACS = 120°. Find the value of x. **[T-I (2010)]**

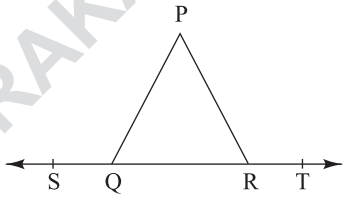


21. If the complement of an angle is one-third of its supplement, find the angle. **[T-I (2010)]**

22. In the figure, if AB||CD, then find the value of x. **[T-I (2010)]**

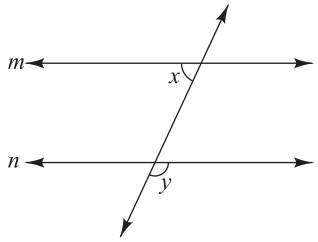


23. In the figure, if ∠PQR = ∠PRQ, then prove that ∠PQS = ∠PRT. **[T-I (2010)]**

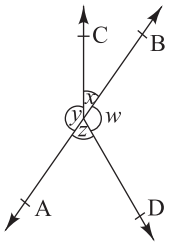


24. In the figure, $x = 61°$ and $y = 118°$. Is $m \parallel n$?

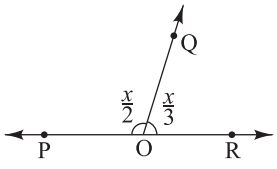
[T-I (2010)]



25. In the figure, if $x \neq y = w + z$, then prove that AOB is a line. **[T-I (2010)]**

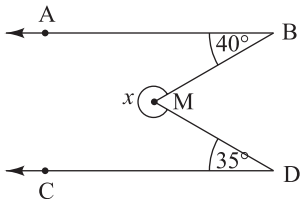


26. In the figure, ∠POQ and ∠ROQ form a linear pair. Find the measure of x. **[T-I (2010)]**

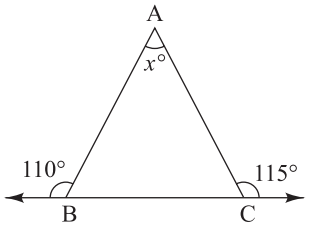


27. In the figure, AB||CD, find the value of x.

[T-I (2010)]

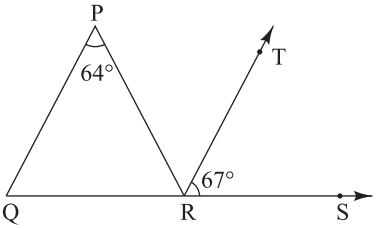


28. In the figure, find the value of x. **[T-I (2010)]**

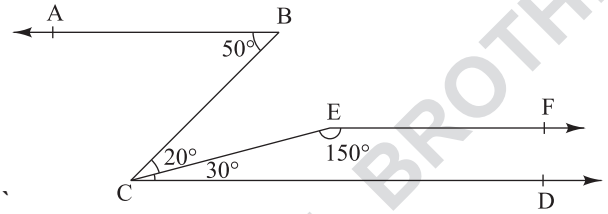


29. In the figure, find the value of $\angle QRP$ when QP||TR.

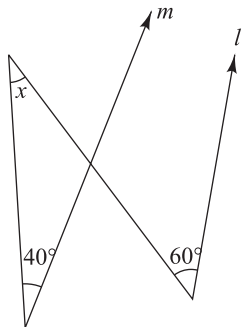
[T-I (2010)]



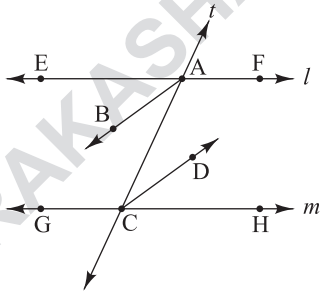
30. In the figure, prove that AB||EF. **[T-I (2010)]**



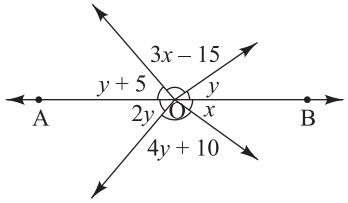
31. In the given figure, if $l \parallel m$, then find the value of x. **[T-I (2010)]**



32. AB and CD are the bisectors of the two alternate interior angles formed by the intersection of a transversal t with parallel lines l and m (shown in the figure). Show that AB||CD. **[T-I (2010)]**



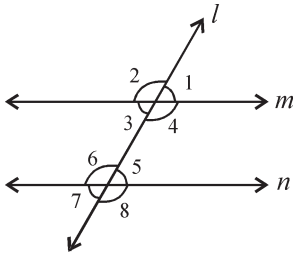
33. In the figure, if $y = 20°$, prove that the line AOB is a straight line. **[T-I (2010)]**



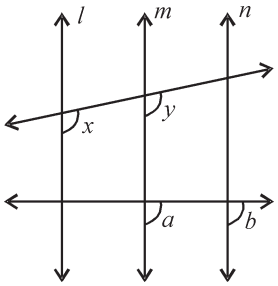
SHORT ANSWER TYPE QUESTIONS **[3 Marks]**

A. Important Questions

1. In the figure, $\angle 1 = 60°$ and $\angle 6 = 120°$. Show that the lines m and n are parallel.



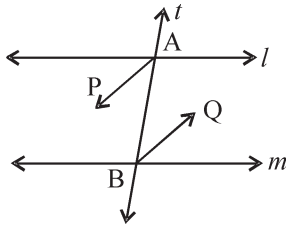
2. In the figure, $x = y$ and $a = b$. Prove that $l \parallel m$.



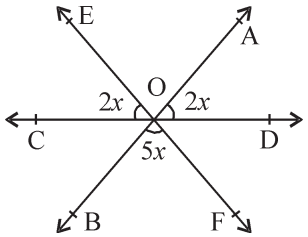
3. In ΔABC, if $\angle A - \angle B = 15°$, $\angle B - \angle C = 30°$, find $\angle A$, $\angle B$ and $\angle C$.

4. A triangle ABC is right angled at A. L is a point on BC such that AL $\perp$ BC. Prove that $\angle BAL = \angle ACB$.

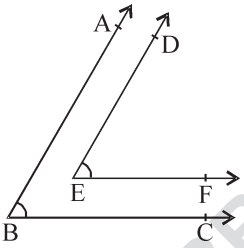
5. In the figure, bisectors AP and BQ of the alternate interior angles are parallel. Show that $l \parallel m$.



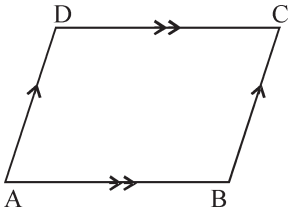
6. In the figure, AB, CD and EF are three lines concurrent at O. Find the value of x.



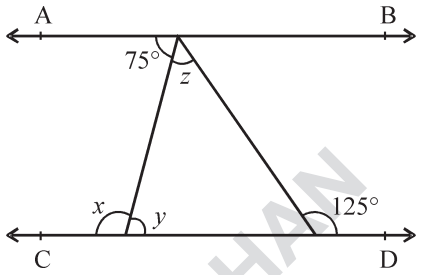
7. In the figure, BA || ED and BC || EF. Show that $\angle ABC = \angle DEF$.



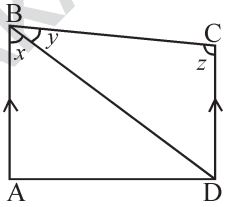
8. In the figure, ABCD is a quadrilateral in which AB || DC and AD || BC. Prove that $\angle ADC = \angle ABC$.



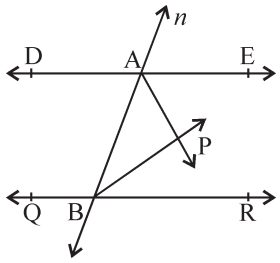
9. In the given figure, if AB || CD, find the values of x, y and z.



10. In the given figure, AB || DC. If $x = \frac{4}{3}y$ and $y = \frac{3}{8}z$, find the values of x, y and z.



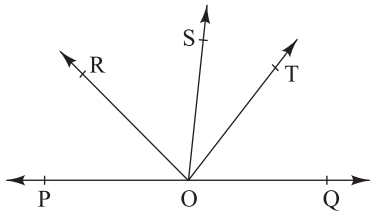
11. In the figure, DE || QR and AP and BP are bisectors of $\angle EAB$ and $\angle RBA$ respectively. Find $\angle APB$.



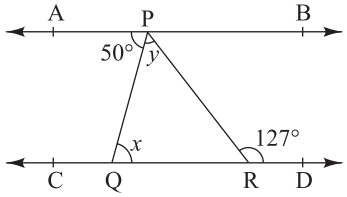
12. In a triangle ABC, $\angle B = 45°$, $\angle C = 55°$ and bisector of $\angle A$ meets BC at a point D. Find $\angle ADB$ and $\angle ADC$.

B. Questions From CBSE Examination Papers

1. In the figure, ray OS stands on a line POQ. Ray OR and ray OT are angle bisectors of $\angle POS$ and $\angle SOQ$ respectively. If $\angle POS = x$, find $\angle ROT$. **[T-I (2010)]**

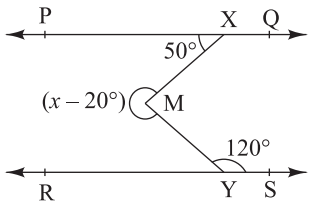


2. In the figure, if AB||CD, $\angle APQ = 50°$ and $\angle PRD = 127°$, find x and y. **[T-I (2010)]**

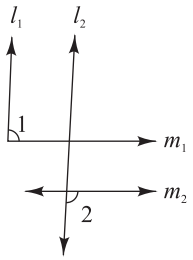


3. Prove that if two lines intersect, the vertically opposite angles are equal. **[T-I (2010)]**

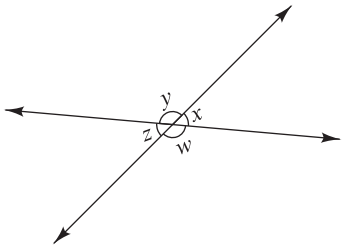
4. In the figure, if PQ||RS and ∠PXM = 50° and ∠MYS = 120°, find the value of x. **[T-I (2010)]**



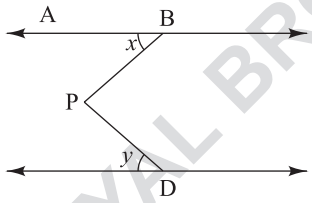
5. In the figure, $l_1 \parallel l_2$ and $m_1 \parallel m_2$. Prove that ∠1 + ∠2 = 180° **[T-I (2010)]**



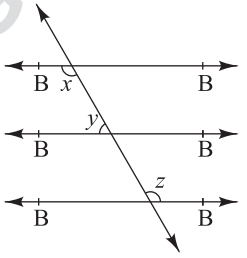
6. In the figure, if $x : y = 3 : 7$, then find the values of x, y, z and w. **[T-I (2010)]**



7. In the figure, lines AB and CD are parallel and P is any point between the two lines. Prove that ∠DPB = $x + y$. **[T-I (2010)]**

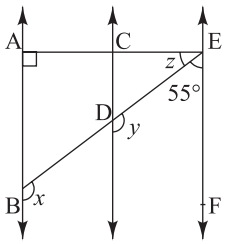


8. In the figure, AB||CD, CD||EF and $y : z = 3 : 7$, find the measures of x, y and z. **[T-I (2010)]**

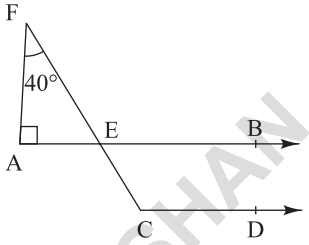


9. In the figure, AB||CD and CD||EF. Also EA⊥AB. If ∠BEF = 55°, find the values of x, y and z.

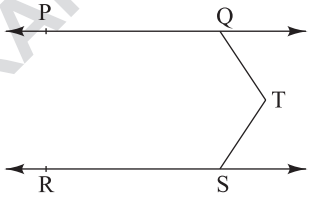
[T-I (2010)]



10. In the figure, if AB||CD, ∠FAE = 90° and ∠AFE = 40°, then find ∠ECD. **[T-I (2010)]**

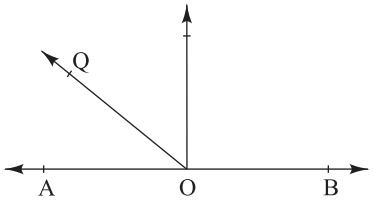


11. In the figure, PQ||RS and T is any point as shown in the figure, then show that ∠PQT + ∠QTS + ∠RST = 360°. **[T-I (2010)]**

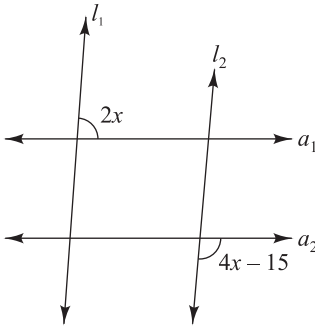


12. In the figure, POQ is a line, ray OR is perpendicular to line PQ. OS is another ray lying between rays OP and OR. Prove that $\angle ROS = \frac{1}{2}(\angle QOS - \angle POS)$

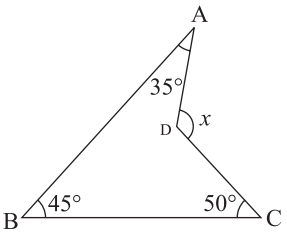
[T-I (2010)]



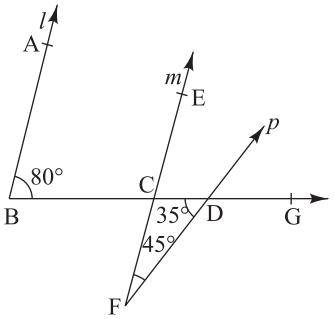
13. In the figure, $l_1 \parallel l_2$ and $a_1 \parallel a_2$. Find the value of x. **[T-I (2010)]**



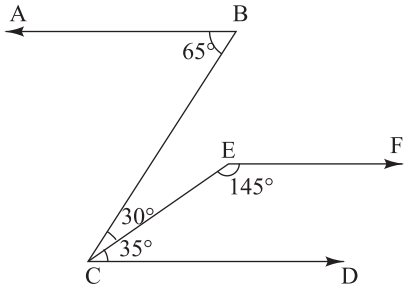
14. In the figure, find the value of x. **[T-I (2010)]**



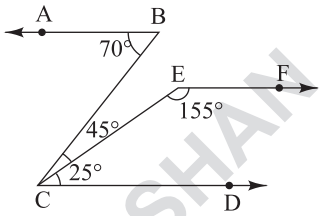
15. In the figure, prove that $l \parallel m$. **[T-I (2010)]**



16. In the the figure, prove that AB||EF. **[T-I (2010)]**



17. In the figure, show that AB || EF. **[T-I (2010)]**



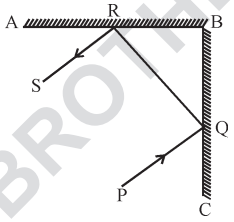
LONG ANSWER TYPE QUESTIONS [4 Marks]

A. Important Questions

1. A transversal intersects two parallel lines. Prove that the bisectors of any pair of corresponding angles so formed are parallel.

2. Prove that the sum of the angles of a triangle is 180°.

3. In the figure, AB and BC are two plane mirrors perpendicular to each other. Prove that the incident ray PQ is parallel to ray RS.

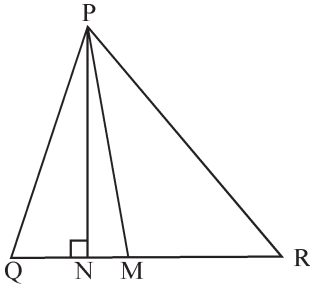


4. If two parallel lines are intersected by a transversal, then prove that the bisectors of the interior angles form a rectangle.

5. Bisectors of angles B and C of a triangle ABC intersect each other at the point O. Prove that BOC = 90° + $\frac{1}{2}$ ∠A.

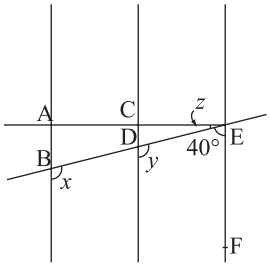
6. Prove that a triangle must have atleast two acute angles.

7. In the figure, ∠Q > ∠R and M is a point on QR such that PM is the bisector of ∠QPR. If the perpendicular from P on QR meets QR at N, prove that ∠MPN = $\frac{1}{2}$ (∠Q − ∠R)

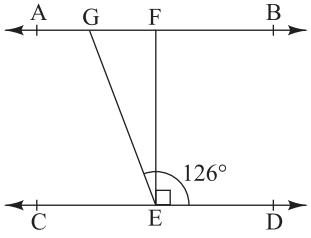


B. Questions From CBSE Examination Papers

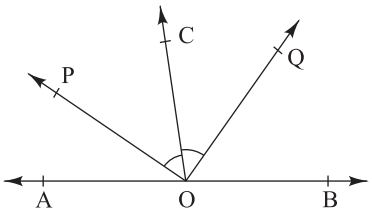
1. In the figure, AB||CD and CD||EF. Also EA⊥AB. If ∠BEF = 40°, then find x, y, z. **[T-I (2010)]**



2. In the figure, if AB||CD, EF⊥CD and ∠GED = 126°, find ∠AGE, ∠GEF and ∠FGE. **[T-I (2010)]**

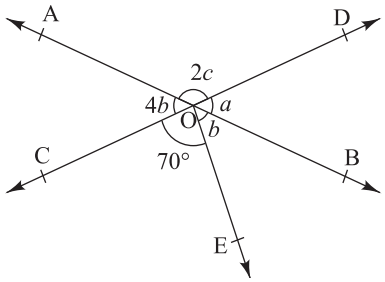


3. In the figure, OP bisects ∠AOC, OQ bisects ∠BOC and OP ⊥ OQ. Show that points A, O and B are collinear. **[T-I (2010)]**

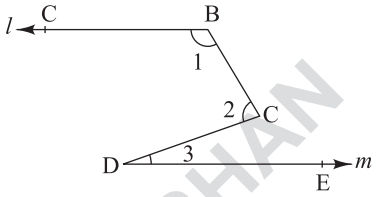


4. P is a point equidistant from two lines l and m intersecting at a point A. Show that AP bisects the angle between them. **[T-I (2010)]**

5. In the figure, two straight lines AB and CD intersect each other at O. If ∠COE = 70°, find the values of a, b and c. **[T-I (2010)]**



6. In the figure, $l \parallel m$, show that ∠1 + ∠2 – ∠3 = 180° **[T-I (2010)]**



FORMATIVE ASSESSMENT

Activity

Objective : To find by paper folding :

(i) the mid-point of a line segment
(ii) the perpendicular bisector of a line segment
(iii) the bisector of an angle
(iv) the perpendicular to a line from a point given outside it
(v) the perpendicular to a line at a point given on the line
(vi) the median of a triangle

Materials Required : White sheets of paper, geometry box, a pair of scissors, etc.

Procedure :

1. On a white sheet of paper, draw a line segment AB. Fold the line sigment AB such that points A and B coincide. Unfold it and mark the point of intersection of AB and the crease as O.

Measure OA and OB.

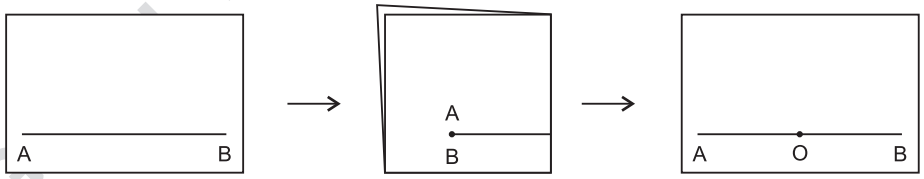


Figure-1

2. On a sheet of paper, draw a line segment AB. Fold the line segment AB such that points A and B coincide. Unfold it and draw a line along the crease, which intersects AB at O. Measure OA, OB and ∠BOC.

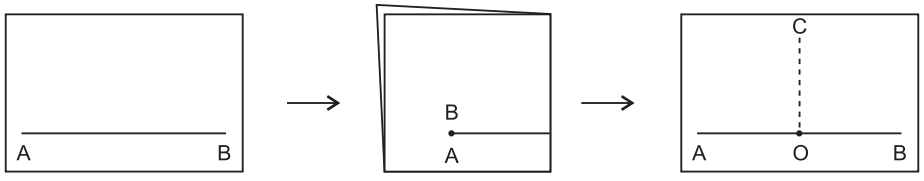


Figure-2

3. Draw an angle ABC on a white sheet of paper and cut it out. Fold the angular cut out such that the folding line passes through vertex B and the arms BA and BC coincide with each other. Unfold it and draw a line BD along the crease. Using protractor measure ∠ABD and ∠CBD.

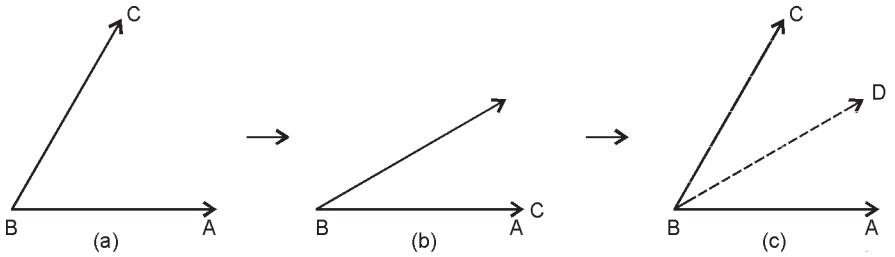


Figure-3

4. Draw a line segment AB and take a point O outside it. Fold the line segment such that B falls along BA and the folding line passes through O. Unfold it and draw a line along the crease, which intersects AB at C. Measure ∠OCB.

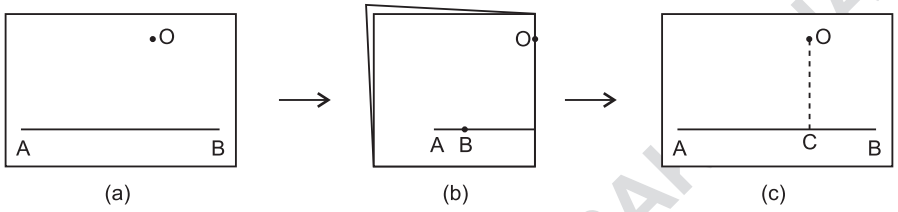


Figure-4

5. Draw a line segment AB and take a point O on it. Fold the line segment such that B falls on BA and the folding line passes through O. Unfold it and draw a line segment OC along the crease. Measure ∠BOC.

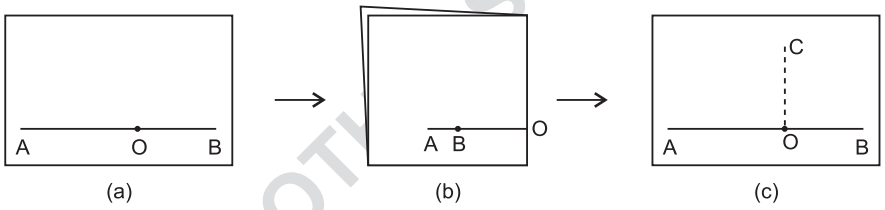


Figure-5

6. On a white sheet of paper, draw a triangle ABC and cut it out. Using the method given in step 1, mark the mid points D, E and F of BC, AC and AB respectivety. Join A to D, B to E and C to F.

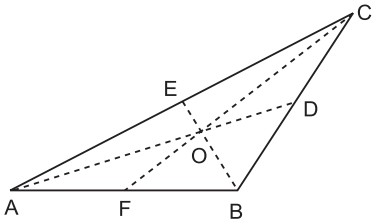


Figure-6

Observations :

1. In figure 1(c), we see that OA = OB.

Hence, O is the mid point of AB.

2. In figure 2(c), OA = OB and ∠BOC = 90°

Hence, OC is the perpendicular bisector of AB.

3. In figure 3(c), ∠CBD = ∠ABD or BD bisects ∠ABC.

4. In figure 4(c), ∠OCB = 90°. Hence, OC is perpendicular to the line segment AB from O.

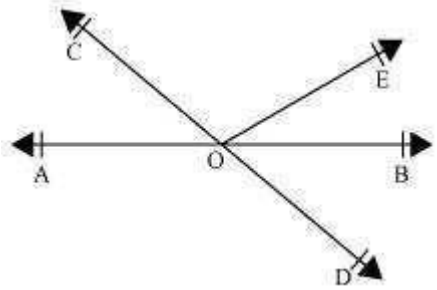
5. In figure 5(c), ∠COB = 90°. Hence, OC is perpendicular to AB at O.

6. In figure 6, D, E and F are mid points of sides BC, AC and AB respectively. So, AD, BE and CF are the medians of ΔABC. These three medians pass through a common point O, which is called the centroid of ΔABC.

Class IX Chapter 6 – Lines and Angles Maths

Exercise 6.1 Question 1:

In the given figure, lines AB and CD intersect at O. If $\angle AOC + \angle BOE = 70°$ and $\angle BOD = 40°$, find∠ BOE and reflex∠ COE.



Answer:

AB is a straight line, rays OC and OE stand on it.

$\therefore \angle AOC + \angle COE + \angle BOE = 180°$

$\Rightarrow (\angle AOC + \angle BOE) + \angle COE = 180°$

$\Rightarrow 70° + \angle COE = 180°$

$\Rightarrow \angle COE = 180° - 70° = 110°$

Reflex $\angle COE = 360° - 110° = 250°$

CD is a straight line, rays OE and OB stand on it.

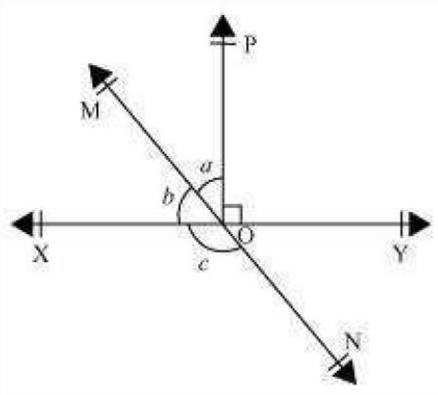
$\therefore \angle COE + \angle BOE + \angle BOD = 180°$

$\Rightarrow 110° + \angle BOE + 40° = 180°$

$\Rightarrow \angle BOE = 180° - 150° = 30°$

Question 2:

In the given figure, lines XY and MN intersect at O. If∠ POY = $90°$ and a:b = 2 : 3, find c.



Answer:

Let the common ratio between a and b be x. ∴

a = 2x, and b = 3x

XY is a straight line, rays OM and OP stand on it.

∴ ∠ XOM + ∠ MOP + ∠ POY = 180º

b + a + ∠ POY = 180º

3x + 2x + 90º = 180º

5x = 90º x = 18º a =

2x = 2 × 18 = 36º b =

3x= 3 ×18 = 54º

MN is a straight line. Ray OX stands on it.

∴ b + c = 180º (Linear Pair)

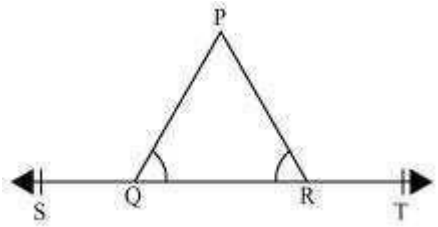
54º + c = 180º c = 180º –

$54^o = 126^o$

$\therefore c = 126^o$

Question 3:

In the given figure, $\angle PQR = \angle PRQ$, then prove that $\angle PQS = \angle PRT$.



Answer:

In the given figure, ST is a straight line and ray QP stands on it.

$\therefore \angle PQS + \angle PQR = 180^o$ (Linear Pair)

$\angle PQR = 180^o - \angle PQS$ (1)

$\angle PRT + \angle PRQ = 180^o$ (Linear Pair)

$\angle PRQ = 180^o - \angle PRT$ (2)

It is given that $\angle PQR = \angle PRQ$.

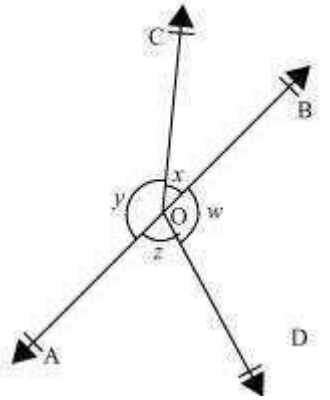
Equating equations (1) and (2), we obtain

$180^o - \angle PQS = 180^o - \angle PRT$

$\angle PQS = \angle PRT$

Question 4:

In the given figure, if $x+y=w+z,$



Answer:

It can be observed that, x + y + z + w then prove that AOB is a line.

= 360º (Complete angle) It is given

that, x + y = z + w ∴ x + y + x + y

= 360º

2(x + y) = 360º x

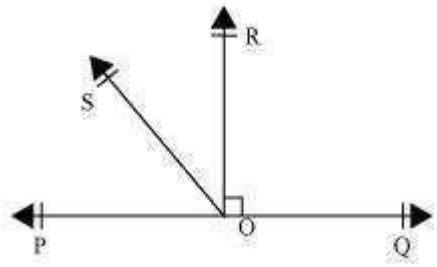
+ y = 180º

Since x and y form a linear pair, AOB is a line.

Question 5:

In the given figure, POQ is a line. Ray OR is perpendicular to line PQ. OS is another ray lying between rays OP and OR. Prove that

$\angle ROS = \frac{1}{2}(\angle QOS - \angle POS).$



Answer:

It is given that OR PQ ⊥

∴ ∴POR = 90º

∴ ∴POS + ∴SOR = 90º

∴ROS = 90º − ∴POS … (1)

∴QOR = 90º (As OR ∴ PQ)

∴QOS − ∴ROS = 90º

∴ROS = ∴QOS − 90º … (2)

On adding equations (1) and (2), we obtain

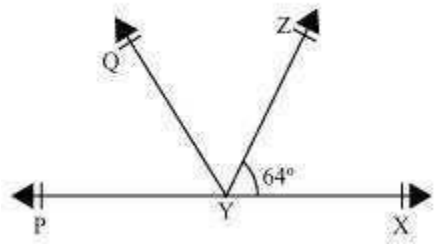
∴ROS = ∴QOS − ∴POS 2

∴ROS = $\frac{1}{2}$∴QOS − ∴POS) (

Question 6:

It is given that ∴XYZ = 64° and XY is produced to point P. Draw a figure from the given information. If ray YQ bisects ∴ZYP, find ∴XYQ and reflex ∴QYP.

Answer:



It is given that line YQ bisects ∴PYZ.

Hence, ∴QYP = ∴ZYQ

It can be observed that PX is a line. Rays YQ and YZ stand on it.

∴ ∴XYZ + ∴ZYQ + ∴QYP = 180º

∴ 64º + 2 ∴QYP = 180º

∴ 2 ∴QYP = 180º − 64º = 116º

∴ ∴QYP = 58º

Also, ∴ZYQ = ∴QYP = 58º

Reflex ∴QYP = 360º − 58º = 302º

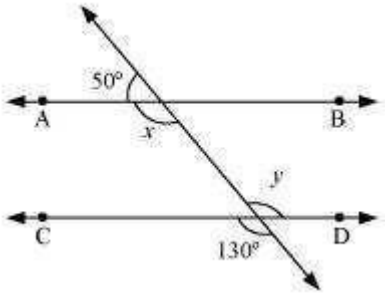
∴XYQ = ∴XYZ + ∴ZYQ

= 64º + 58º = 122º

Exercise 6.2 Question

1:

In the given figure, find the values of x and y and then show that AB || CD.



Answer:

It can be observed that, 50º

+ x = 180º (Linear pair) x =

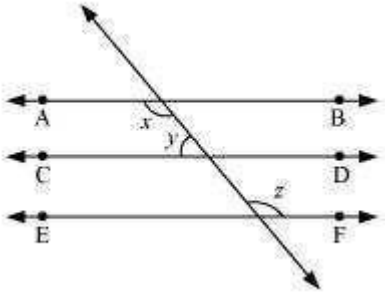
130º … (1)

Also, y = 130º (Vertically opposite angles)

As x and y are alternate interior angles for lines AB and CD and also measures of these angles are equal to each other, therefore, line AB || CD.

Question 2:

In the given figure, if AB || CD, CD || EF and y: z = 3: 7, find x.



Answer:

It is given that AB || CD and CD || EF

∴ AB || CD || EF (Lines parallel to the same line are parallel to each other)

It can be observed that x = z
(Alternate interior angles) … (1)

It is given that y: z = 3: 7
Let the common ratio between y and z be a. ∴

y = 3a and z = 7a

Also, x + y = 180º (Co-interior angles on the same side of the transversal) z

+ y = 180º [Using equation (1)]

7a + 3a = 180º

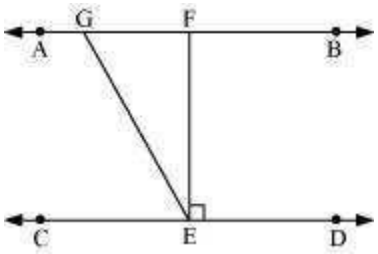
10a = 180º a =

18º ∴ x = 7a = 7 × 18º =

126º

Question 3:

In the given figure, If AB || CD, EF ∴ CD and ∴GED 126º, find ∴AGE, ∴GEF and = ∴FGE.



Answer:

It is given that,

AB || CD

EF ∴ CD

∴GED = 126º

∴ ∴GEF + ∴FED = 126º

∴ ∴GEF + 90º = 126º

∴ ∴ GEF = 36º

∴AGE and ∴GED are alternate interior angles.

∴ ∴ AGE = ∴GED = 126º
However, ∴AGE + ∴FGE = 180º (Linear pair)

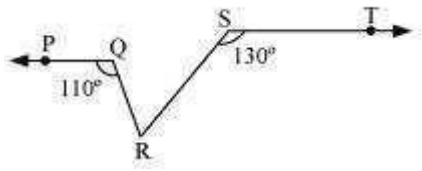
∴ 126º + ∴FGE = 180º
∴ ∴FGE = 180º − 126º = 54º

∴ ∴AGE = 126º, ∴GEF = 36º, ∴FGE = 54º

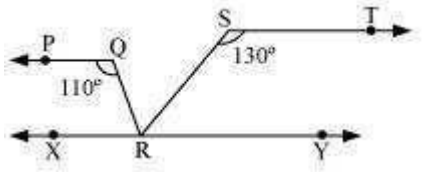
Question 4:

In the given figure, if PQ || ST, ∴PQR = 110º and ∴RST = 130º, find ∴QRS.

[Hint: Draw a line parallel to ST through point R.]



Answer:



Let us draw a line XY parallel to ST and passing through point R.

∴PQR + ∴QRX = 180º (Co-interior angles on the same side of transversal QR)

∴ 110º + ∴QRX = 180º

∴ ∴QRX = 70º

Also,

∴RST + ∴SRY = 180º (Co-interior angles on the same side of transversal SR)

º + ∴SRY = 180º 130

∴SRY = 50º

XY is a straight line. RQ and RS stand on it.

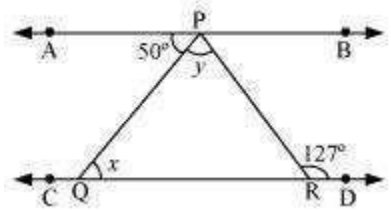
∴ ∴ QRX + ∴QRS + ∴SRY = 180º

º + ∴QRS + 50º = 180º 70

∴QRS = 180º − 120º = 60º

Question 5:

In the given figure, if AB || CD, ∴APQ = 50º and ∴PRD = 127º, find x and y.



Answer:

∴APR = ∴PRD (Alternate interior angles)

50º + y = 127º y =

127º − 50º y =

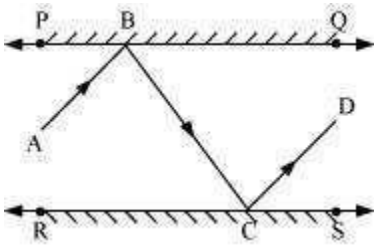
77º

Also, ∴APQ = ∴PQR (Alternate interior angles)

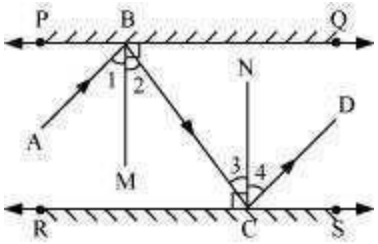
50º = x ∴ x = 50º and y = 77º

Question 6:

In the given figure, PQ and RS are two mirrors placed parallel to each other. An incident ray AB strikes the mirror PQ at B, the reflected ray moves along the path BC and strikes the mirror RS at C and again reflects back along CD. Prove that AB || CD.



Answer:



Let us draw BM ∴ PQ and CN ∴ RS.

As PQ || RS,
Therefore, BM || CN

Thus, BM and CN are two parallel lines and a transversal line BC cuts them at B and

C respectively.

∴ ∴ = ∴3 (Alternate interior angles) 2

However, ∴1 = ∴2 and ∴3 = ∴4 (By laws of reflection)

∴ ∴1 = ∴2 = ∴3 = ∴4

Also, ∴1 + ∴2 = ∴3 + ∴4

∴ABC = ∴DCB

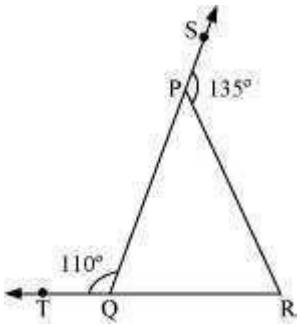
However, these are alternate interior angles. ∴

AB || CD

Exercise 6.3 Question

1:

In the given figure, sides QP and RQ of ΔPQR are produced to points S and T respectively. If ∴SPR = 135º and ∴PQT = 110º, find ∴PRQ.



Answer:

It is given that,
∴SPR = 135º and ∴PQT = 110º

∴SPR + ∴QPR = 180º (Linear pair angles)

∴ 135º + ∴QPR = 180º

∴ ∴QPR = 45º

Also, ∴PQT + ∴PQR = 180º (Linear pair angles)

∴ 110º + ∴PQR = 180º

∴ ∴ PQR = 70º

As the sum of all interior angles of a triangle is 180º, therefore, for ΔPQR,

∴QPR + ∴PQR + ∴PRQ = 180º

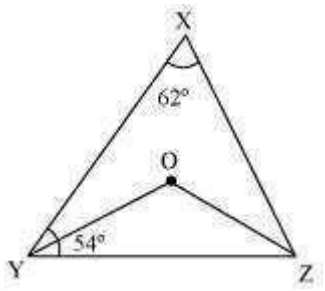
∴ 45º + 70º + ∴PRQ = 180º

∴ ∴PRQ = 180º − 115º

∴ ∴PRQ = 65º

Question 2:

In the given figure, ∴X = 62º, ∴XYZ = 54º. If YO and ZO are the bisectors of ∴XYZ and ∴XZY respectively of ΔXYZ, find ∴OZY and ∴YOZ.



Answer:

As the sum of all interior angles of a triangle is 180º, therefore, for ΔXYZ,

∴X + ∴XYZ + ∴XZY = 180º

º + 54º + ∴XZY = 180º 62

∴XZY = 180º − 116º

∴XZY = 64º

∴OZY = $\frac{64}{2}$ 32º (OZ is the angle bisector of ∴XZY) =

Similarly, ∴OYZ = $\frac{54}{2}$ = 27º

Using angle sum property for ΔOYZ, we obtain

∴OYZ + ∴YOZ + ∴OZY = 180º

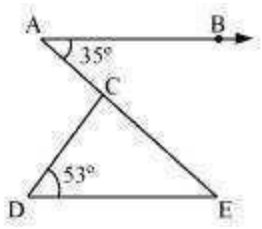
º + ∴YOZ + 32º = 180º 27

∴YOZ = 180º − 59º

∴YOZ = 121º

Question 3:

In the given figure, if AB || DE, ∴BAC = 35º and ∴CDE = 53º, find ∴DCE.



Answer:

AB || DE and AE is a transversal.
∴BAC = ∴CED (Alternate interior angles)

∴ ∴CED = 35º

In ΔCDE,

∴CDE + ∴CED + ∴DCE = 180º (Angle sum property of a triangle)

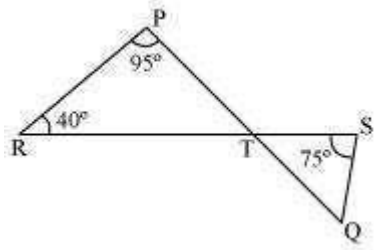
º + 35º + ∴DCE = 180º 53

∴DCE = 180º − 88º

∴DCE = 92º

Question 4:

In the given figure, if lines PQ and RS intersect at point T, such that ∴PRT = 40º, ∴RPT = 95º and ∴TSQ = 75º, find ∴SQT.



Answer:

Using angle sum property for ΔPRT, we obtain

∴PRT + ∴RPT + ∴PTR = 180º

º + 95º + ∴PTR = 180º 40

∴PTR = 180º − 135º

∴PTR = 45º

∴STQ = ∴PTR = 45º (Vertically opposite angles)

∴STQ = 45º

By using angle sum property for ΔSTQ, we obtain

∴STQ + ∴SQT + ∴QST = 180º

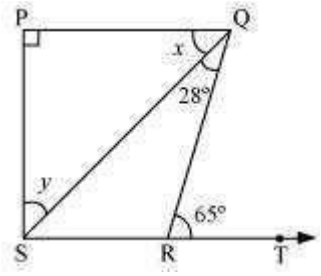
º + ∴SQT + 75º = 180º 45

∴SQT = 180º − 120º

∴SQT = 60º

Question 5:

In the given figure, if PQ ∴PS, PQ || SR, ∴SQR = 2º and ∴QRT = 65º, then find 8 the values of x and y.



Answer:

It is given that PQ || SR and QR is a transversal line.

∴PQR = ∴QRT (Alternate interior angles) x

+ 28º = 65º x = 65º − 28º x = 37º

By using the angle sum property for ΔSPQ, we obtain

∴SPQ + x + y = 180º

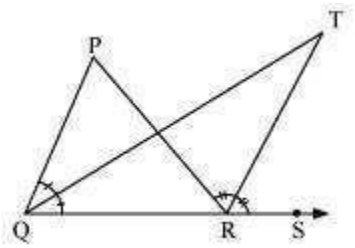
90º + 37º + y = 180º y

= 180º − 127º y = 53º

∴x = 37º and y = 53º

Question 6:

In the given figure, the side QR of ΔPQR is produced to a point S. If the bisectors of ∴PQR and ∴PRS meet at point T, then prove that ∴QTR= $\frac{1}{2}$ ∴QPR.



Answer:

In ΔQTR, ∴TRS is an exterior angle.

∴∴ QTR + ∴TQR = ∴TRS

∴QTR = ∴TRS − ∴TQR (1)

For ΔPQR, ∴PRS is an external angle.

∴∴ QPR + ∴PQR = ∴PRS
∴QPR + 2∴TQR = 2∴TRS (As QT and RT are angle bisectors)

∴QPR = 2(∴TRS − ∴TQR)

∴QPR = 2∴QTR [By using equation (1)]

$\therefore$ QTR = $\frac{1}{2}$ $\therefore$ QPR