MATHEMATICS

WORKSHEET_210925

Chapter-05, 06, 07 and 08 (ANSWERS)

SUBJECT: MATHEMATICS **MAX. MARKS : 40**

CLASS : IX **DURATION : 1½ hrs**

General Instructions:

(i). **All** questions are compulsory.

(ii). This question paper contains 2**0** questions divided into five Sections A, B, C, D and E.

(iii). **Section A** comprises of **10 MCQs** of **1 mark** each. **Section B** comprises of 4 questions of **2 marks** each. **Section C** comprises of 3 questions of **3 marks** each. **Section D** comprises of 1 question of **5 marks** each and **Section E** comprises of 2 Case Study Based Questions of **4 marks** each.

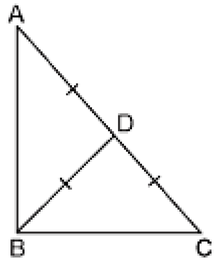
(iv). There is no overall choice.

(v). Use of Calculators is not permitted

SECTION – A

Questions 1 to 10 carry 1 mark each.

1. In the given figure, the measure of ∠ABC is



(a) 60° (b) 30° (c) 45° (d) 90°

Ans: ∆DBC is an isosceles triangle in which DB = DC.

So, ∠DCB = ∠DBC

(∵ Angles opposite to equal sides are equal) ...(i)

Also, AD = DC ⇒ AD = DB

⇒ In ∆ADB, ∠DBA = ∠DAB ...(ii)

Using angle sum property of triangle in u2206ABC, we have

∠CAB + ∠ABC + ∠BCA = 180°

⇒ ∠DAB + ∠ABC + ∠BCD = 180°

⇒ ∠DBA + ∠ABC + ∠DBC = 180° [∵ Using (i) and (ii)]

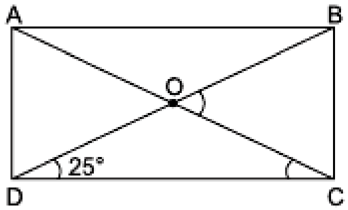
⇒ ∠ABC + ∠ABC = 180° (∵ ∠DBA + ∠DBC = ∠ABC)

⇒ 2∠ABC = 180° ⇒ ∠ABC = 90°

2. A diagonal of a rectangle is inclined to one side of the rectangle at 25°. The acute angle between the diagonals is

(a) 55° (b) 50° (c) 40° (d) 25°

Ans: Given, ∠ODC = 25°



Since ABCD is a rectangle, so diagonals are equal.

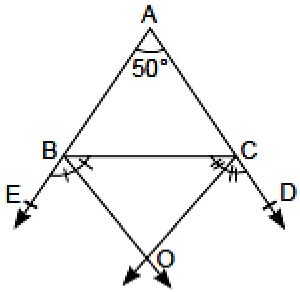
⇒ AC = BD ⇒ $\frac{1}{2}$ AC = $\frac{1}{2}$ BD ⇒ OC = OD

⇒ ∠ODC = ∠OCD (∵ Angles opposite to equal sides are equal)

But ∠BOC = ∠ODC + ∠OCD (u2235 Exterior angle property)

$\Rightarrow \angle BOC = \angle ODC + \angle ODC \Rightarrow \angle BOC = 2\angle ODC$
$\Rightarrow \angle BOC = 2 \times 25° = 50°$
So, the acute angle between the diagonals is 50°.
∴ Correct options is (b).

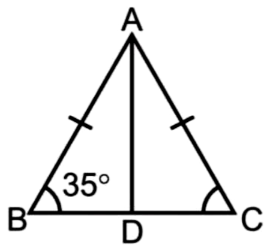
3. In the given figure, measure of ∠BOC is



(a) 50° (b) 65° (c) 60° (d) 55°
Ans: We have ∠ABC + ∠CBO + ∠OBE = 180° (Linear pair axiom)
$\Rightarrow \angle ABC + 2\angle CBO = 180° \Rightarrow \angle CBO = 90° - \frac{\angle ABC}{2}$
Similarly, $\angle BCO = 90° - \frac{\angle ACB}{2}$
Using angle sum property of triangle in DBOC, we have
$\angle BOC = \frac{1}{2}(\angle ABC + \angle ACB)$
Using angle sum property of triangle in DABC, we have
∠ABC + ∠ACB = 130°
So, $\angle BOC = \frac{1}{2} \times 130° = 65°$
Correct option is (b).

4. Given a quadrilateral ABCD, and diagonals AC and BD bisect each other at P such that AP = CP and BP = DP. Also ∠APD = 90°, then quadrilateral is a
(a) rhombus (b) trapezium (c) parallelogram (d) rectangle
Ans: (a) rhombus

5. In the given figure, AD is the median, then ∠BAD is



(a) 35° (b) 70° (c) 110° (d) 55°
Ans: In ΔBAD and ΔCAD, BD = DC (∵ AD is median, so D is mid-point of BC)
AB = AC (Given)
AD = AD (Common)
⇒ ΔBAD ≅ ΔCAD (SSS congruence rule)
⇒ ∠BAD = ∠CAD (CPCT)
Also, ∠ABC = ∠ACB = 35° (∵ AB = AC and ∠B = 35°)
Now, in ΔBAC, we have ∠BAC + ∠ABC + ∠ACB = 180° (∵ Angle sum property of a triangle)
⇒ ∠BAC + 35° + 35° = 180° ⇒ ∠BAC = 110°
⇒ 2∠BAD = 110° ⇒ ∠BAD = 55°
∴ Correct option is (d).

6. Diagonals of a rectangle ABCD intersect at O. If ∠AOB = 70°, then ∠DCO is
(a) 70° (b) 110° (c) 35° (d) 55°
Ans: (d) 55°

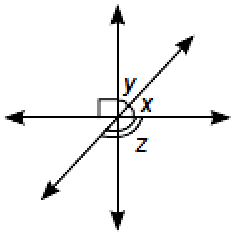
7. Difference between 'postulate' and 'axiom' is
(a) there is no difference
(b) few statements are termed as axioms other postulates
(c) 'postulates' are the assumptions used especially for geometry and 'axioms' are the assumptions used throughout mathematics.
(d) none of these
Ans: (c) 'postulates' are the assumptions used especially for geometry and 'axioms' are the assumptions used throughout mathematics.

8. Two angles of a quadrilateral are 60° and 70° and other two angles are in the ratio 8 : 15, then the remaining two angles are
(a) 140°, 90° (b) 100°, 130° (c) 80°, 150° (d) 70°, 160°
Ans: (c) 80°, 150°

In the following questions 9 and 10, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

9. **Assertion (A):** The quadrilateral formed by joining the midpoints of consecutive sides of a quadrilateral whose diagonals are perpendicular is a rectangle.
Reason (R): The line segment in a triangle joining the midpoint of any two sides of the triangle is said to be parallel to its third side and is also half of the length of the third side and the quadrilateral formed by joining the midpoints of consecutive sides of a quadrilateral is a parallelogram.
Ans: (a) Both A and R are true and R is the correct explanation of A.

10. **Assertion (A):** In the given figure, if the angles x and y are in the ratio 2 : 3, then angle z is 144^0

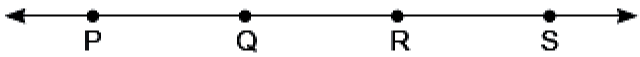


Reason (R): The angles are said to be linear if they are adjacent to each other after the intersection of the two lines. The sum of angles of a linear pair is always equal to 180°.
Ans: (a) Both A and R are true and R is the correct explanation of A.

SECTION – B

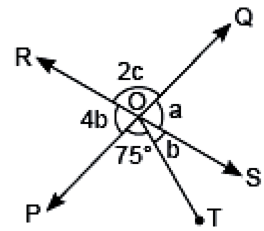
Questions 11 to 14 carry 2 marks each.

11. In the given figure PR = QS, then show that PQ = RS. Name the mathematician whose postulate/axiom is used for the same.



Ans: PR = QS (Given)
Subtracting QR on both sides, we have
⇒ PR – QR = QS – QR ⇒ PQ = RS
We used here Euclid's axiom to prove the result which states that if equals are subtracted from equals, then remainders are equal.

12. In the given figure, two straight lines PQ and RS intersect each other at O. If ∠POT = 75°. Find the value of *a*, *b* and *c*.



Ans: Given: RS is a straight line.

∠ROP + ∠POT + ∠TOS = 180° (Linear pair axiom)

$\therefore$ $4b + 75° + b = 180°$

$\Rightarrow$ $5b = 180° - 75° = 105°$ $\Rightarrow$ $b = 21°$

∠QOS and ∠POR are vertically opposite angles. Therefore, their values are equal.

$\Rightarrow$ $a = 4b = 4 \times 21° = 84°$

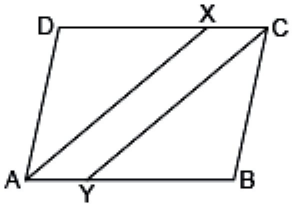
$\Rightarrow$ $2c + a = 180°$

$\Rightarrow$ $2c + 84° = 180°$

$\Rightarrow$ $2c = 180° - 84° = 96°$ $\Rightarrow$ $c = \frac{96^0}{2} = 48°$

Hence, $a = 84°$, $b = 21°$ and $c = 48°$.

13. In the given figure, ABCD is a parallelogram and line segments AX and CY bisect the angles A and C respectively. Show that AX || CY.



Ans: AX bisects ∠A

$\therefore$ $\angle XAB = \frac{1}{2}\angle DAB$ ...(i)

CY bisects ∠C.

$\therefore$ ∠XCY = ∠DCB ...(ii)

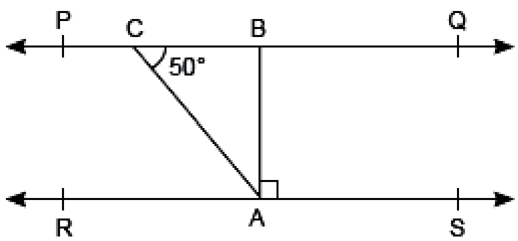
Also, ∠DAB = ∠DCB (Opposite angles of parallelogram)

$\Rightarrow$ $\frac{1}{2}\angle DAB = \frac{1}{2}\angle DCB$

$\Rightarrow$ ∠XAB = ∠XCY

$\Rightarrow$ XC || AY (Parts of parallel lines are parallel)

14. In the given figure PQ || RS, BA ⊥ RS and ∠BCA = 50° find ∠BAC and ∠CAS.



Ans: Given: PQ || RS, CA is transversal

BCA = CAR = 50° (Alternate interior angles)

Now, CAR + BAC + BAS = 180° (Linear pair axiom)

50° + BAC + 90° = 180° [BA ⊥ RS]

BAC = 180° – 140° = 40°

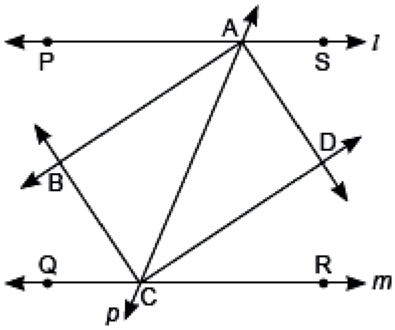
CAS = BAC + BAS = 40° + 90° = 130°

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. Two parallel lines *l* and *m* are intersected by a transversal *p*. Show that the quadrilateral formed by the bisectors of interior angles is a rectangle.

Ans:



We have ∠PAC = ∠ACR (Alternate interior angles as *l* || *m* and *p* is transversal)

$\frac{1}{2}\angle PAC = \frac{1}{2}\angle ACR$

⇒ ∠BAC = ∠ACD (As BA and DC are bisectors of ∠PAC and ∠ACR respectively)

But these are alternate angles. This shows that AB || CD

Similarly, BC || AD

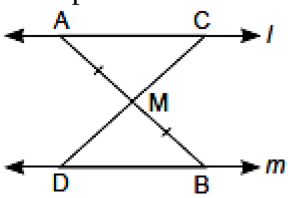
⇒ Quadrilateral ABCD is a parallelogram. ...(i)

Now, ∠PAC + ∠CAS = 180° (Linear pair axiom)

⇒ $\frac{1}{2}\angle PAC + \frac{1}{2}\angle CAS = 90°$ ⇒ ∠BAC + ∠CAD = 90° ⇒ ∠BAD = 90° ...(ii)

From (i) and (ii), we can say that ABCD is a rectangle.

16. In the given figure, *l* || *m* and M is the mid-point of line segment AB. Prove that M is also the mid-point of any line segment CD having its end points C and D on *l* and *m* respectively.



Ans: Given *l* || *m* and AB is transversal

⇒ ∠CAM = ∠DBM (Alternate interior angles)

Now, in ΔAMC and ΔBMD,

∠CAM = ∠DBM (As proved above)

AM = BM (M is mid-point of AB)

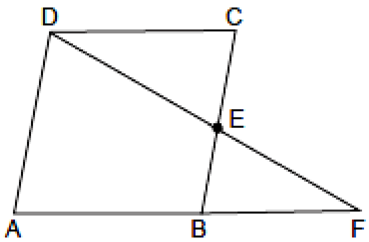
∠AMC = ∠BMD (Vertically opposite angles)

⇒ ΔAMC ≅ ΔBMD (ASA congruence rule)

⇒ CM = DM (CPCT)

⇒ M is mid-point of CD.

17. ABCD is a parallelogram and E is the mid-point of side BC. DE and AB on producing meet at F. Prove that AF = 2AB.

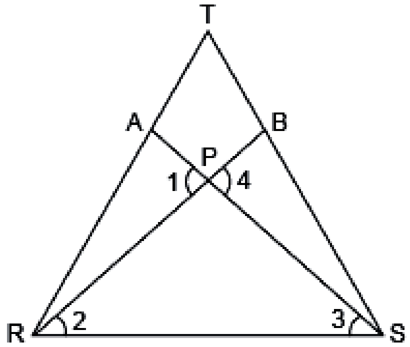


Ans: In ΔDCE and ΔBFE,
CE = EB (E is mid-point of BC)
∠DCE = ∠FBE (Alternate interior angles as CD | | AF)
∠DEC = ∠BEF (Vertically opposite angles)
∴ ΔDCE ≅ ΔBFE (ASA congruence rule)
∴ DE = EF (CPCT)
⇒ E is mid-point of DF.
In ΔADF,
E is mid-point of DF. (Proved above)
and AD | | BE (As AD | | BC)
⇒ B is mid-point of AF. (By converse of mid-point theorem)
∴ AB = BF
⇒ AF = 2AB

SECTION – D

Questions 18 carry 5 marks.

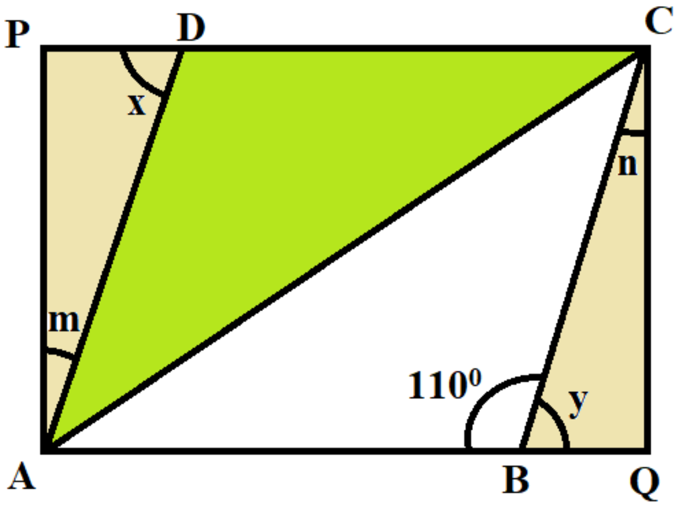
18. In the given figure, it is given that RT = TS, 1 = 2 2 and 4 = 2 3. Prove that ΔRBT ≅ ΔSAT



Ans: In ΔTRS,
RT = TS (Given)
⇒ ∠TRS = ∠TSR (Angles opposite to equal sides are equal) ...(i)
Now, SA and RB intersect at a point. Let it be P.
So, ∠1 = ∠4 (Vertically opposite angles)
⇒ 2∠2 = 2∠3
⇒ ∠2 = ∠3 ...(ii)
Now, in ΔRPS,
∠2 = ∠3 (Proved above)
⇒ SP = RP (Sides opposite to equal angles are equal) ...(iii)
Again from (i),
∠TRS = ∠TSR
⇒ ∠ARP + ∠2 = ∠BSP + ∠3
⇒ ∠ARP = ∠BSP (As ∠2 = ∠3) ...(iv)
Now, in ΔARP and ΔBSP, ∠ARP = ∠BSP (From (iv))
RP = SP (From (iii))
∠1 = ∠4 (Vertically opposite angles)
⇒ ΔARP ≅ ΔBSP (ASA congruence rule)
⇒ AR = BS (CPCT)
But RT = TS (Given)
⇒ RT – AR = TS – BS
⇒ AT = BT ...(v)
Now, in ΔRBT and ΔSAT RT = ST (Given)
∠T = ∠T (Common)
BT = AT (From (v))
⇒ ΔRBT ≅ ΔSAT (SAS congruence rule)

Questions 19 to 20 carry 4 marks each.

19. In the middle of the city, there was a park ABCD in the form of a parallelogram form so that AB = CD, AB||CD and AD =BC, AD || BC. Municipality converted this park into a rectangular form by adding land in the form of ΔAPD and ΔBCQ. Both the triangular shape of land were covered by planting flower plants.



(a) Show that ΔAPD and ΔBQC are congruent. (2)

OR

What is the value of ∠m? (2)

(b) Which side is equal to PD? (1)

(c) Show that ΔABC and ΔCDA are congruent. (1)

Ans: (a) In ΔAPD and ΔBQC

AD = BC (given)

AP = CQ (opposite sides of rectangle)

∠APD = ∠BQC =90°

By RHS criteria ΔAPD ≅ ΔCQB

OR

In ΔAPD

∠APD + ∠PAD + ∠ADP = 180°

⇒ 90° + (180° - 110°) + ∠ADP = 180° (angle sum property of /)

⇒ ∠ADP = m = 180°- 90° - 70° = 20 °

⇒ ∠ADP = m = 20°

(b) ΔAPD ≅ ΔCQB

Corresponding part of congruent triangle

side PD = side BQ

(c)ln ΔABC and ΔCDA

AB = CD (given)

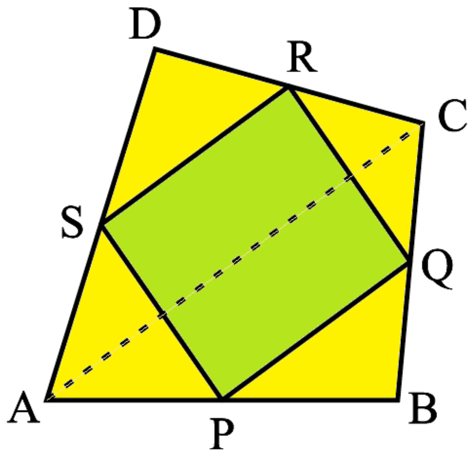
BC = AD (given)

AC = AC (common)

By SSS criteria ΔABC ≅ ΔCDA

20. Activity-based learning- ensures active engagement of learner with concepts and instructional materials. Learning is hands-on and experiential, providing learners the opportunity of learning through manipulation of materials and objects.

Teachers model the process, and students work independently to copy it. Kumar sir Maths teacher of class 9th wants to explain the properties of parallelograms in a creative way, so he gave students yellow colored paper in the shape of a quadrilateral and then ask the students to make a parallelogram from it by using paper folding and coloured it with green colour.



(a) How can a parallelogram be formed by using paper folding? (2)
(b) (i) If ∠RSP = 30°, then find ∠RQP. (1)
(ii) If SP = 3 cm, Find the RQ. (1)

OR

(b) Find the value of ∠R and ∠S if ∠P : ∠Q = 1 : 4. (2)
Ans:
(a) By joining mid points of sides of a quadrilateral one can make parallelogram.
Now, S and R are mid points of sides AD and CD of ΔADC, P and Q are mid points of sides AB and BC of ΔABC, then by mid-point theorem SR || AC and SR = ½AC
Similarly PQ || AC and PQ = ½AC.
Therefore SR || PQ and SR = PQ
A quadrilateral is a parallelogram if a pair of opposite sides is equal and parallel.
Hence PQRS is parallelogram.
(b) (i) ∠RQP = 30° (Opposite angles of a parallelogram are equal.)
(ii) RQ = 3cm (Opposite side of a parallelogram are equal.)

OR

(b) Since PQRS is a parallelogram, opposite angles are equal.
⇒ ∠P = ∠R and ∠Q = ∠S
Also, ∠P : ∠Q = 1 : 4
⇒ ∠P = ∠R = k and ∠Q = ∠S = 4k
Now, ∠P + ∠Q + ∠R + ∠S = 360° (Angle sum property of quadrilateral)
⇒ k + 4k + k + 4k = 360°
⇒ 10k = 360°
⇒ k = 36°
Hence, ∠R = k = 36° and ∠S = 4k = 144°.