Understanding Quadrilaterals

MATHEMATICAL REASONING

1. ABCD is a rhombus in which the altitude from D to side AB bisects AB. Then $\angle A$ and $\angle B$ respectively, are _____.

(a) 60°, 120° (b) 120°, 60°
(c) 80°, 100° (d) 100°, 80°

2. The exterior angle of a regular polygon is one-third of its interior angle. How many sides does the polygon has?

(a) 10 (b) 8
(c) 9 (d) 13

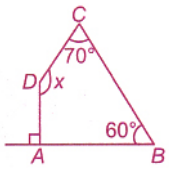
3. If the diagonals of a quadrilateral bisect each other at right angle, then it is a ____.

(a) Kite (b) Parallelogram
(c) Rhombus (d) Rectangle

4. The number of sides of a regular polygon whose each exterior angle has a measure of 30° is ____.

(a) 12 (b) 6
(c) 8 (d) 10

5. In the given figure, the value of x is___.

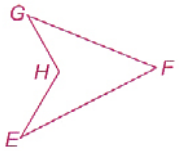


(a) 120° (b) 140°
(c) 160° (d) 130°

6. If each pair of opposite sides of a quadrilateral are equal and parallel, then it is a _____.

(a) Kite
(b) Trapezium
(c) Parallelogram
(d) None of these

7. The given quadrilateral EFGH is a _____.

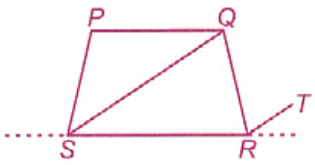


(a) Parallelogram
(b) Concave quadrilateral
(c) Convex quadrilateral
(d) Trapezium

8. The ratio of two sides of a parallelogram is 3:5 and its perimeter is 48 cm. Then, the sides of the parallelogram are ____.

(a) 9 cm, 16 cm
(b) 9 cm, 15 cm
(c) 8 cm, 15 cm
(d) 6 cm, 10 cm

9. In the given figure, line RT is drawn parallel to SQ. If $\angle QPS = 100°$, $\angle POS = 40°$, $\angle PSR = 85°$ and $\angle QRS = 70°$, then $\angle QRT =$ _____ .



(a) 45°
(b) 65°
(c) 85°
(d) 90°

10. Which of the quadrilaterals is NOT a parallelogram?

(a) Rectangle
(b) Square
(c) Kite
(d) Rhombus

11. Which of the following statements is CORRECT?
(a) The diagonals of a parallelogram are equal.
(b) The diagonals of a rectangle are perpendicular to each other.
(c) If the diagonals of a quadrilateral intersect at right angles, it is not necessarily a rhombus.
(d) Every quadrilateral is either a trapezium or a parallelogram or a kite.

12. Four angles of a quadrilateral are in the ratio 1 : 2 : 3 : 4. The difference between the greatest and the smallest angle is
(a) 125° (b) 75°
(c) 108° (d) 120°

13. A trapezium in which non-parallel Sides are equal is said to be _____.
(a) Right trapezium
(b) Equilateral trapezium
(c) Isosceles trapezium
(d) None of these

14. Which of the following can never be the measure of exterior angle of a regular polygon?
(a) 22° (b) 36°
(c) 45° (d) 30°

15. The quadrilateral having only one pair of opposite sides parallel is called a____.
(a) Square
(b) Rhombus
(c) Trapezium
(d) Parallelogram

EVERYDAY MATHEMATICS

16. The theatre in the town is built in the form of a kite. Its perimeter is 100 m. If one of its sides is 20 m, what are the lengths of other sides?
(a) 20 m, 30m, 30m
(b) 30 m, 40 m, 40m
(c) 20m, 40m, 32m
(d) 30 m, 40 m, 50m

17. Vikas's garden is in the form of a parallelogram whose one side is 4.8 cm and other side is $1\frac{1}{2}$ times of this side. He wants to fence his garden four times by a wire. Find the length of the wire required.
(a) 96 cm (b) 108 cm
(c) 132 cm (d) 84 cm

18. A field is in the form of an isosceles trapezium whose perimeter is 215 m. One of its non-parallel side is 50 m. What is the sum of its parallel sides?
(a) 115 m (b) 60 m
(c) 165 m (d) 135 m

19. Rohit has 6 wooden sticks of equal length. He wants to join all of them in such a way that they make a regular polygon, At what internal angle he has to join wooden stick with each other?
(a) 105° (b) 120°
(c) 115° (d) 90°

20. Atul is playing in a playground which is of the form of a parallelogram. He observes that the diagonals of the playground are 80 m and 60 m long. So, the playground is in the shape of _____.
(a) Rectangle (b) Rhombus
(c) Kite (d) Square

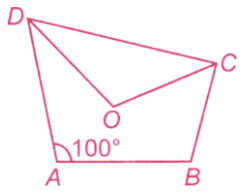
ACHIEVERS SECTION (HOTS)

21. Match the following:

Column – I	Column – II
(P) Diagonals of a rectangle	(1) Bisect each other at right angles
(Q) Diagonals of a square	(2) Bisect each other
(R) Diagonals of a rhombus	(3) Equal and bisect each other
(S) Diagonals of a parallelogram	(4) Equal and bisect each other at right angles.

(a) (P) → (1), (Q) → (2), (R) → (3), (S) → (4)
(b) (P) → (3), (Q) → (4), (R) → (1), (S) → (2)
(c) (P) → (4), (Q) → (2), (R) → (3), (S) → (1)
(d) (P) → (4), (Q) → (3), (R) → (2), (S) → (1)

22. In the given figure (not drawn to scale), DO and CO are the bisectors of $\angle ADC$ and $\angle BCD$ respectively. If $\angle ADC = \angle BCD = 60°$ and $\angle DAB = 100°$, find the measure of $\angle DOC$ and $\angle ABC$ respectively,

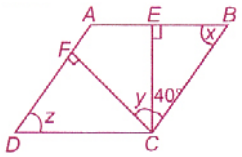


(a) 100°, 160° (b) 110°, 150°
(c) 120°, 140° (d) 110°, 130°

23. Fill in the blanks.
(i) Sum of interior angles of a polygon of n sides is _P_ right angles.
(ii) The measure of at least one _Q_ angle of a concave quadrilateral is more than 180°.
(iii) A quadrilateral which has only one pair of equal opposite angles is _R_.
(iv) Sum of all exterior angles of a polygon of n sides is _S_.

	P	Q	R	S
(a)	4	exterior	kite	$n \times 360°$
(b)	n-2	exterior	trapezium	$n \times 180°$
(c)	2n-4	interior	trapezium	360°
(d)	2	interior	trapezium	180°

24. ABCD is a parallelogram. Find the angles x, y and z in the given figure,



(a) 40°, 50°, 60°
(b) 60°, 60°, 60°
(c) 50°, 50°, 60°
(d) 60°, 70°, 70°

25. Select the INCORRECT statement.
(a) Every rectangle is a trapezium.
(b) A quadrilateral can be drawn if all four sides and one angle is known.
(c) Triangle is a polygon whose sum of exterior angles is double the sum of interior angles.
(d) If diagonals of a quadrilateral are equal, it must be a rectangle.

Answer Key									
1.	A	**2.**	B	**3.**	C	**4.**	A	**5.**	B
6.	C	**7.**	B	**8.**	B	**9.**	B	**10.**	C
11.	C	**12.**	C	**13.**	C	**14.**	A	**15.**	C
16.	A	**17.**	A	**18.**	A	**19.**	B	**20.**	B
21.	B	**22.**	C	**23.**	C	**24.**	C	**25.**	A

HINTS & EXPLANATIONS

1. (a): In the given figure, ABCD is a rhombus and $DP \perp AB$ such that $AP = PB$.
Join BD.
Let AB = BC = CD
= AD = 2a
So, AP = a = PB
In ΔAPD,
$DP^2 = AD^2 - AP^2$ (Pythagoras theorem)
$= (2a)^2 - a^2 = 4a^2 - a^2 = 3a^2$
In ΔDPB we have
$BD^2 = DP^2 + PB^2 = 3a^2 + a^2 = 4a^2$
$\therefore BD = 2a$
So, $AB = BO = AD = 2a$
$\therefore \Delta ABD$ is an equilateral triangle.
$\therefore \angle A = 60°$ and $\angle ABD = 60°$
Similarly, ΔBDC is an equilateral triangle and $\angle DBC = 60°$
Now,
$\angle ABC = \angle ABD + \angle DBC = 60° + 60° = 120°$
So, $\angle A = 60°$ and $\angle B = 120°$.

2. (b): Let n be the number of sides of the polygon.
Then,

Each exterior angle $=\left(\frac{360}{n}\right)^{\circ}$

And each interior angle $=\left(\frac{2n-4}{n}\times 90\right)^{\circ}$

According to question, we have

Exterior angle $=\frac{1}{3}$ (Inferior angle)

$\Rightarrow\left(\frac{360}{n}\right)^{\circ}=\frac{1}{3}\left(\frac{2n-4}{n}\times 90\right)^{\circ}$

$\Rightarrow 2n-4=12\Rightarrow 2n16\Rightarrow n=8$

3. (c) : The diagonals of a rhombus bisect each other at right angles,

4. (a): Exterior angle of a regular polygon $=30°$
Let the number of sides be n.

Then, $30°=\left(\frac{360}{n}\right)^{\circ}\Rightarrow n=\frac{360°}{30°}\Rightarrow n=12$

5. (b): In the given figure, $\angle DAB=90°$
Now, in quadrilateral ABCD. we have
$\angle DAB+\angle ABC+\angle BCO+\angle CDA=360°$
$\Rightarrow 90°+60°+70°+x=360°$
$\Rightarrow x=360°-220°=140°$

6. (c) :

7. (b) The given quadrilateral EFGH is a concave quadrilateral as interior angle at H is greater than 180°.

8. (b): Let ABCD be the parallelogram in which AB=3x cm and BC=5x cm. Since opposite sides of a parallelogram are equal,
$\therefore$ AB=DC=3x cm and $BC=AD=5x\ cm$
Perimeter of the parallelogram $=48\ cm$
$\Rightarrow AB+BC+CD+DA=48cm$
$\Rightarrow(3x+5x+3x+5x)=48cm$
$\Rightarrow 16x=48\Rightarrow x=3$
$\therefore$ Length of the sides $=(3\times 3)cm=9cm$ and
$(5\times 3)cm=15cm$
$(3x+5x+3x+5x)=48$ cm
$\Rightarrow 16x=48\Rightarrow x=3$
$\therefore$ Length of the sides $=(3\times 3)\ cm$=9cm
and $(5\times 3)cm=15\ cm$.

9. (b) ; In ΔPQS, we have
$\angle PSQ=180°-(100°+40°)=180°-140°=40°$
Also, $\angle PSR=85°$ or $40°+\angle QSR=85°$
$\therefore\angle QSR=85°-40°=45°$
A s SQ||RT
$\therefore\angle QSR=\angle TRU=45°$
(corresponding angles)
So, $\angle QRT=180°-(70°+45°)$ (linear pair)
$=180°-115°=65°$

10. (c) :

11. (c) :

12. (c): Let the angles be x, 2x, 3x and 4x.
Sum of the angles of a quadrilateral $=360°$
$=x+2x+3x+4x=360°$
$\Rightarrow 10x=360°\Rightarrow x=36°$
$\therefore$ Required difference
$=4x-x=3x=3\times 36°=108°$

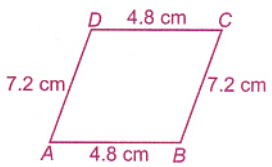
13. (c) :

14. (a) :

15. (c) :

16. (a) : Let ABCD be the theatre in which AB = AD = 20 m and let SC = CD = x m
Perimeter of the theatre =100 m
$\Rightarrow 100=AB+BC+CD+DA$
$100=(20+x+x+20)m$
$\Rightarrow 40+2x=100\Rightarrow(20+x)=50$
$\Rightarrow x=30m$
So, AB = AD = 20 m and BC = CD = 30 m

17. (a) ; Let ABCD be the garden in which $AB=CD=4.8\ cm$.



[$\because$ Opposite sides of a parallelogram are equal]

Now,

$$BC = 1\frac{1}{2} \times 4.8cm = \frac{3}{2} \times 4.8cm = 7.2cm$$

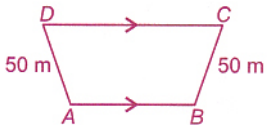
$\therefore BC = DA = 7.2cm$

[Opposite sides of a parallelogram are equal]

Now, length of wire required $= 4 \times$ perimeter of parallelogram ABCD

$= 4 \times (4.8 + 7.2 + 4.8 + 7.2)cm = 96cm$

18. (a): Let ABCD be the field which is in the form of an isosceles trapezium.



AD = 50 m [Given] $\therefore BC = 50\ m$

[Non-parallel sides of an isosceles trapezium are of equal length]

Perimeter of trapezium ABCD

$= AB + BC + CD + DA$

$\Rightarrow 215 = (AB + CD) + 50 + 50$

$\Rightarrow 215 = 100 + (AB + CD)$

$\Rightarrow (AB + CD) = 215 - 100 = 115m$

$\therefore$ Sum of parallel sides $= 115\ m$

19. (b): Each interior angle $= \left(\frac{2n-4}{n} \times 90\right)^o$

where n=number of sides of the polygon

Here, n = 6

$\therefore$ Each interior angle $= \left(\frac{(2\times 6)-4}{6} \times 90\right)^o$

$= \left(\frac{8}{6} \times 90\right)^o = 120°$

20. (b) : In rectangle and square, diagonals are of equal length.

Also, kite is not a parallelogram.

So, option (b) is correct.

21. (b) :

22. (c) : In ΔOCD, We have

$\angle DOC + \angle ODC + \angle DCO = 180°$

[Angle sum property]

$\Rightarrow \angle DOC + 30° + 30° = 180°$

$\angle DOC = 180° - 60° = 120°$

Now, in quadrilateral ABCD, we have

$\angle DAB + \angle ADC + \angle BCD + \angle ABC = 360°$

$\Rightarrow 100° + 60° + 60° + \angle ABC = 360°$

$\Rightarrow 220° + \angle ABC = 360°$

$\Rightarrow \angle ABC = 360° - 220° = 140°$

23. (c) :

24. (c) : Since, ABCD is a parallelogram

$\therefore \angle ADC = \angle ABC \Rightarrow x = z$ ...(i)

Now in right triangle EBC, we have

$\angle BEC + \angle EBC + \angle ECB = 180°$

$\Rightarrow 90° + x + 40° = 180°$

$\Rightarrow x = 180° - 130° = 50°$

From (i), $x = z = 50°$

Now, in ΔFCD, we have

$\angle CFD + \angle FDC + \angle FCD = 180°$

[Angle sum property]

$\Rightarrow 90° + 50° + \angle FCD = 180°$

$\Rightarrow 140° + \angle FCD = 180°$

$\Rightarrow \angle FCD = 180° - 140° = 40°$

Also, in parallelogram ABCD, we have

$\angle ADC + \angle DCB = 180°$

$\Rightarrow 50° + (\angle FCD + y + 40°) = 180°$

$\Rightarrow 50° + 40° + y + 40° = 180°$

$\Rightarrow y = 180° - 130° \Rightarrow y = 50°$

$\therefore x = y = z = 50°$

25. (a) :