Module 2
Properties of Quadrilaterals

What this module is about

This module is about the properties of the diagonals of special quadrilaterals. The special quadrilaterals are rectangles, square, and rhombus. The conditions sufficient to guarantee that a quadrilateral is a parallelogram are also discussed in this module.

What you are expected to learn

This module is designed for you to

1. apply inductive/deductive skills to derive the properties of the diagonals of special quadrilaterals
   - rectangle
   - square
   - rhombus
2. verify sets of sufficient conditions which guarantee that a quadrilateral is a parallelogram
3. apply the conditions to prove that a quadrilateral is a parallelogram
4. solve routine and non routine problems

How much do you know

True of False

1. The diagonals of a square are congruent.

2. The diagonals of a rectangle are perpendicular.

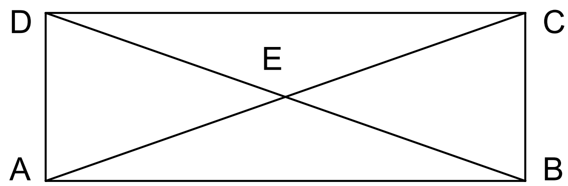
3. The diagonals of a rhombus bisect each other.

4. A square is a rhombus.

5. If both pairs of opposite angles of a quadrilateral are congruent, then the quadrilateral is a parallelogram.

6. If the diagonals of a quadrilateral bisect each other, then the quadrilateral is a parallelogram.

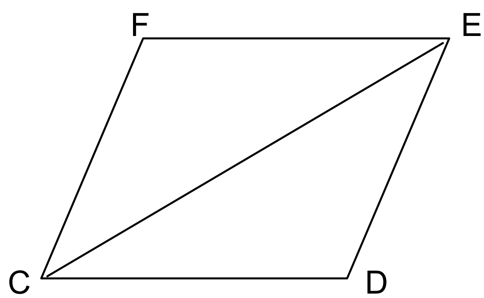
Quadrilateral ABCD is a rectangle. Its diagonals AC and BD intersect at E.



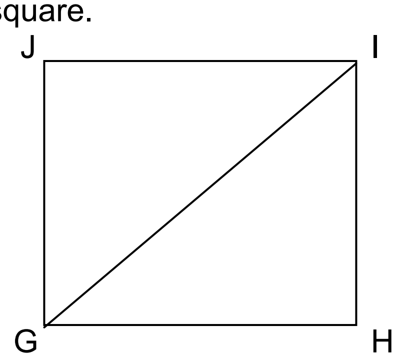
7. If AC = 2(x + 10) and BD = x + 60, what is AC?

8. If AE = 4x – 5 and CE = 10 + x, what is AE?

9. Quadrilateral CDEF is a rhombus. If m∠FCE = 3x - 5 and m∠DCE = 2x, find m∠FCD.



Quadrilateral GHIJ is a square.



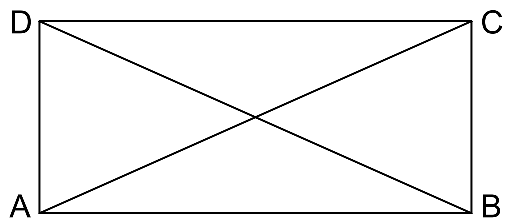
10. If m∠HGI is 3(x + 5), what is x?

What you will do

Lesson 1

The Properties of the Diagonals of Special Quadrilaterals

A diagonal of a quadrilateral is a segment which connects any two non-consecutive vertices. In the following quadrilateral, $\overline{AC}$ and $\overline{BD}$ are the diagonals.



The following are the properties of the diagonals of special quadrilaterals.

1. The diagonals of a rectangle are congruent.
2. The diagonals of a square are congruent.
3. The diagonals of a square are perpendicular
4. Each diagonal of a square bisects a pair of opposite angles.
5. The diagonals of a rhombus are perpendicular.
6. Each diagonal of a rhombus bisects a pair of opposite angles

You can apply inductive skills to derive these properties of the diagonals of special quadrilaterals. In the following activities you need a ruler, a pencil, a protractor and pieces of graphing paper.

1. Do the following activity:

    a. On a graphing paper, draw a rectangle.
    b. Name your rectangle ABCD.
    c. Draw diagonals $\overline{AC}$ and $\overline{BD}$.
    d. Find the lengths of $\overline{AC}$ and $\overline{BD}$. Are their lengths equal? Are the diagonals congruent?

    Conclusion: The diagonals of a rectangle are congruent

2. Do the following activity:
    a. On a graphing paper, draw a square.
    b. Name your square ABCD.
    c. Draw diagonals $\overline{AC}$ and $\overline{BD}$.

d. Find the lengths of the diagonals. Are their lengths equal? Are the diagonals of the square congruent?

Conclusion: The diagonals of a square are congruent.

3. Do the following activity:
   a. Construct a square on a graphing paper
   b. Name your square EFGH.
   c. Draw its diagonals $\overline{EG}$ and $\overline{HF}$.
   d. Label the intersection of the diagonals, M.
   e. Using a protractor, find the measures of ∠HME, and ∠HMG.
   f. What kind of angles are the two angles?
   g. Are the diagonals perpendicular?

Conclusion: The diagonals of a square are perpendicular

4. Do the following activity.
   a. Draw a square on a graphing paper.
   b. Name your square ABCD.
   c. Draw diagonal $\overline{AC}$.
   d. What do you notice? Into how many angles are the two opposite vertex angles divided?
   e. What do you conclude?

Conclusion: Each diagonal of a square bisects a pair of opposite angles.

5. Do the following activity.
   a. Draw a rhombus on a graphing paper.
   b. Name your rhombus ABCD.
   c. Draw the diagonals and name the point of intersection, E.
   d. Find the measures of ∠AED and ∠CED.
   e. What kind of angles are they?
   f. What can you say about the diagonals?

Conclusion: The diagonals of a rhombus are perpendicular.

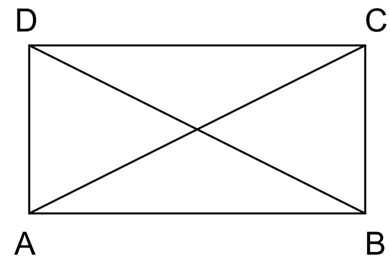
6. Do the following activity.

   a. Draw a rhombus on a graphing paper.
   b. Name your rhombus ABCD.
   c. Draw diagonal $\overline{AC}$.
   d. What do you notice? Into how many angles are the two opposite vertex angles divided?
   e. What do you conclude?

Conclusion: Each diagonal of a rhombus bisects a pair of opposite angles.

These properties of the diagonals of special quadrilaterals can also be proven deductively. Let us prove the first three properties deductively.

1. The diagonals of a rectangle are congruent.



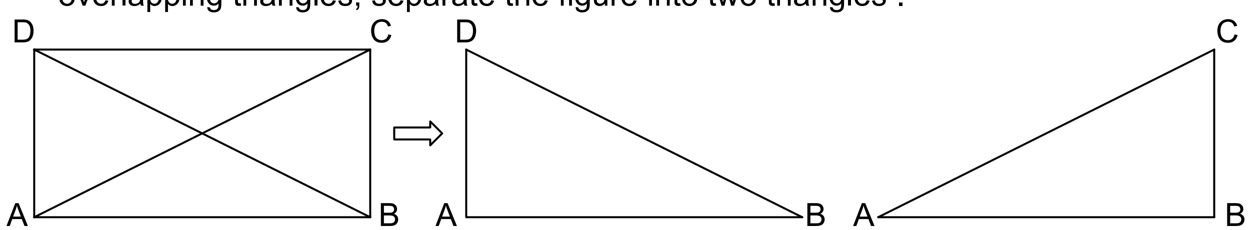
Given: Rectangle ABCD with diagonals $\overline{AC}$ and $\overline{BD}$.

Prove: $\overline{BD} \cong \overline{AC}$

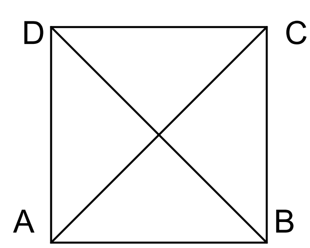
Proof:

Statements	Reasons
1. Rectangle ABCD with diagonals $\overline{AC}$ and $\overline{BD}$	1. Given
2. $\overline{AD} \cong \overline{BC}$ (S)	2. Opposite sides of a parallelogram are congruent (Remember, a rectangle is a parallelogram)
3. $\angle DAB$ and $\angle CBA$ are right angles	3. A rectangle is a parallelogram with four right angles
4. $\angle DAB \cong \angle CBA$ (A)	4. Any two right angles are congruent
5. $\overline{AB} \cong \overline{AB}$ (S)	5. Reflexive Property of Congruence
6. $\Delta DAB \cong \Delta CBA$	6. SAS Congruence
7. $\overline{BD} \cong \overline{AC}$	7. Corresponding Parts of Congruent Triangles are Congruent

Triangles ΔDAB and Δ CBA overlap. If you find difficulty visualizing the two overlapping triangles, separate the figure into two triangles .



2. The diagonals of a square are congruent.



Given: □ABCD is a square with diagonals $\overline{AC}$ and $\overline{BD}$

Prove: $\overline{BD} \cong \overline{AC}$

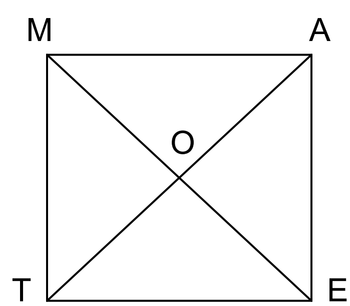
Proof

Statements		Reasons
1. □ABCD is a square with diagonals $\overline{AC}$ and $\overline{BD}$		1. Given
2. $\overline{AD} \cong \overline{BC}$	(S)	2. Opposite sides of a parallelogram are congruent (Remember, a square is a parallelogram)
3. $\angle DAB$ and $\angle CBA$ are right angles		3. A rectangle has four right angles (Remember that a square is a rectangle with four congruent sides and a rectangle has four right angles.)
4. $\angle DAB \cong \angle CBA$	(A)	4. Any two right angles are congruent
5. $\overline{AB} \cong \overline{AB}$	(S)	5. Reflexive Property of Congruence
6. Δ DAB $\cong \Delta$ CBA		6. SAS Congruence
7. $\overline{BD} \cong \overline{AC}$		7. Corresponding Parts of Congruent Triangles are Congruent

3. The diagonals of a square are perpendicular

Given: □TEAM is a square with diagonals $\overline{AT}$ and $\overline{ME}$

Prove: $\overline{ME} \perp \overline{AT}$



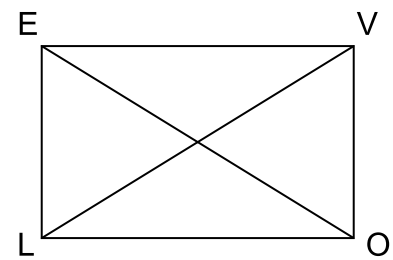
A proof can also be written in paragraph form.

Proof:

Side $\overline{TM}$ and side $\overline{EA}$ are congruent since they are sides of a square. A square is a rectangle with four congruent sides. $\overline{MO} \cong \overline{MO}$ by Reflexive Property of Congruence. The diagonals of a parallelogram bisect each other. Since a square is a parallelogram therefore $\overline{TO} \cong \overline{AO}$. ΔMOT $\cong \Delta$MOA by SSS congruence. Since $\angle$MOT and $\angle$MOA are supplementary and congruent, then each of them is a right angle. Therefore $\overline{ME} \perp \overline{AT}$ by the definition of perpendicular.

Example 1

The figure at the right is a rectangle.
If the diagonal $\overline{LV}$ = 2x and the diagonal $\overline{OE}$ = 12 cm, find x.



Solution:

Step 1. The diagonals of a rectangle are congruent.

$\overline{LV} \cong \overline{OE}$

$\overline{LV} = \overline{OE}$ (Congruent segments have equal lengths)

Step 2. Substitute 2x for $\overline{LV}$ and 12 for $\overline{OE}$. Then solve for x.

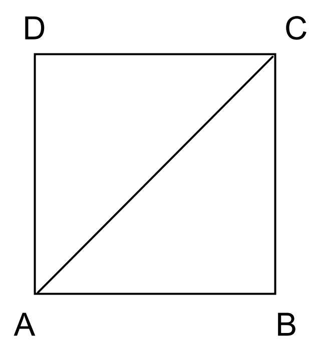
$2x = 12$

$x = 6$

Answer: The value of x is 6 cm.

Example 2

Quadrilateral ABCD at the right is a square.
Find m∠CAB



Solution:

Step 1, Quadrilateral ABCD is a square and a square is a rectangle.

Therefore: m∠DAB = 90.

Step 2. But each diagonal of a square bisects a pair of opposite angles.

Hence: $m\angle CAB = \frac{1}{2}\, m\angle DAB$

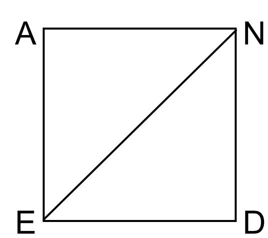
Step 3. Substitute 90 for m∠DAB.

$m\angle CAB = \frac{1}{2}(90)$

$= 45$

Answer: m ∠CAB =45

Example 3 ☐EDNA is a square.



If m∠END is 3(x +5), what is x?

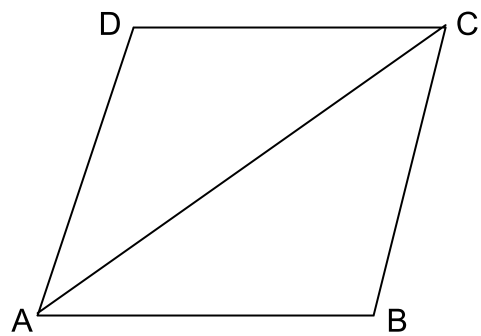
Solution:

a. m$\angle$DCB = 90 since □ ABCD is a square
b. Each diagonal of a square bisects a pair of opposite angles.

Hence: m$\angle$ACB = 45

$3(x + 5) = 45$
$3x + 15 = 45$
$3x = 45 – 15$
$3x = 30$
$x = 10$

Example 4



The figure at the right is a rhombus.
If m $\angle$CAB = 30 , what is the m $\angle$ CAD?

Step 1. Each diagonal of a rhombus bisects pair of opposite angles.

m $\angle$ CAD = m $\angle$CAB

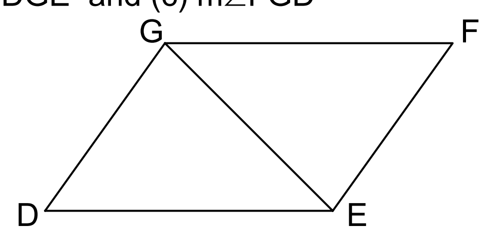
Step 2. Substitute 30 for m $\angle$CAB in the above equation.

m $\angle$ CAD = 30

Answer: The measure of $\angle$ CAD is 30^0.

Example 5

□DEFG is a rhombus. If m$\angle$FGE = 5x – 8 and m$\angle$DGE = 3x + 22, find the measure of (a) m $\angle$FGE (b) m$\angle$DGE and (c) m$\angle$FGD



Solution:

Step 1. Each diagonal of a rhombus bisects a pair of opposite angles.

m$\angle$FGE = m$\angle$DGE
$5x – 8 = 3x + 22$
$5x – 3x = 22 + 8$
$2x = 30$
$x = 15$

Step 2. Substitute 15 for x

a. $m\angle FGE = 5x - 8$
$= 5(15) - 8$
$= 67$

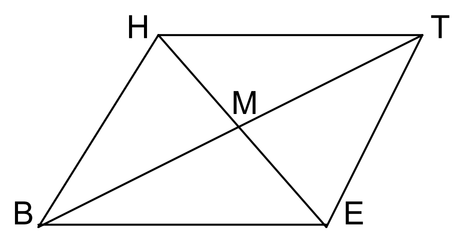
b. $m\angle DGE = 3x + 22$
$= 3(15) + 22$
$= 67$

c. $m\angle FGD = m\angle FGE + m\angle DGE$
$= 67 + 67$
$= 134$

Answers: (a) $m\angle FGE = 67$
(b) $m\angle DGE = 67$
(c) $m\angle FGD = 134$

Example 6

- BETH is a rhombus. If $m\angle TBE = 35$, what is $m\angle HEB$?



Solution:

Step 1. The diagonals of a rhombus are perpendicular. Hence, $\angle BME$ is a right angle and its measure is 90^0.
$m\angle BME = 90$

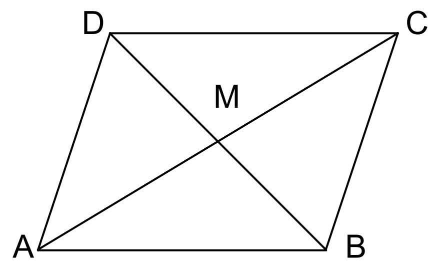
Step 2. The sum of the measures of the angles of a triangle is 180^0
$m\angle TBE + m\angle BME + m\angle HEB = 180$

Step 3. Substitute 35 for $m\angle TBE$ and 90 for $m\angle BME$ in the above equation.
$35 + 90 + m\angle HEB = 180$
$125 + m\angle HEB = 180$
$m\angle HEB = 180 - 125$
$m\angle HEB = 55.$

Answer: $m\angle HEB = 55$

Example 7

- ABCD is a rhombus. If $\overline{AM} = 16$ cm, what is $\overline{CM}$?



Solution:

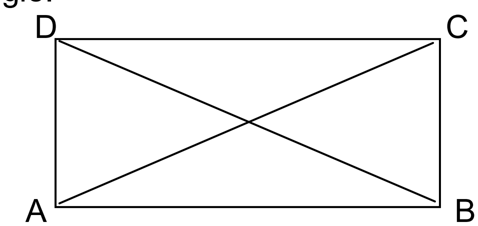
Step 1. The diagonals of a rhombus
Bisect each other.
$\overline{CM} = \overline{AM}$

Step 2. Substitute 16 cm for $\overline{AM}$ in the above equation.
$\overline{CM}$ = 16 cm

Answer: $\overline{CM}$ = 16 cm

Try this out

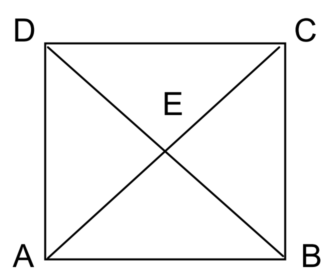
Set A . □ ABCD is a rectangle.



True or False

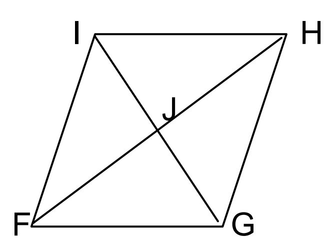
1. The lengths of $\overline{AC}$ and $\overline{BD}$ are equal.
2. Diagonals $\overline{AC}$ and $\overline{BD}$ are perpendicular.
3. The diagonal $\overline{AC}$ bisects $\angle DCB$.
4. A rectangle is a parallelogram.

□ ABCD is a square



5. $\angle EAB \cong \angle EBC$
6. $\angle DEC$ is a right angle.

□ FGHI is a rhombus.

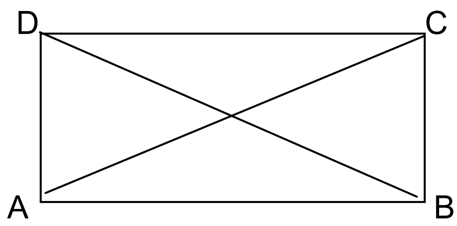


7. $m\angle FIG = m\angle HIG$
8. The sum of $m\angle JFG$ and $m\angle JGF$ is 45.
9. $\Delta FIG \cong \Delta HGI$

10. The diagonal $\overline{FH}$ bisects the rhombus into two congruent triangles.

Set B

□ ABCD is a rectangle

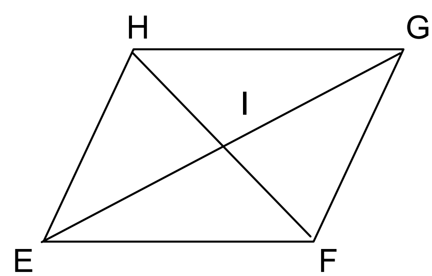


Find the indicated measure

1. $\overline{AC}$ = 15 dm. Find $\overline{BD}$
2. $\overline{BD}$ = 23 cm. Find $\overline{AC}$

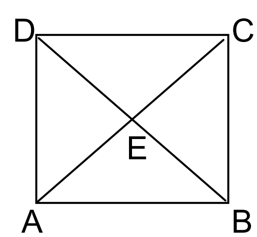
□ EFGH is a rhombus

Find the indicated measure.



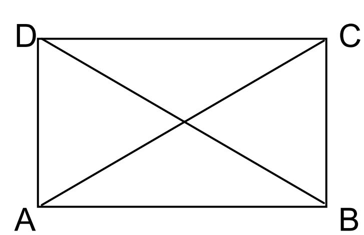
3. m∠HGE = 35. Find m∠FGE.
4. m∠HEI = 20. Find m∠FEI.
5. m∠IEF = 30. Find m∠IFE
6. m∠IHE = 58. Find m∠IEH
7. m∠IEF = 20. Find m∠IEF + m∠EIF
8. m∠IGH = 25. Find m∠IGH + m∠HIG

9. If □ ABCD is a square, then m∠ACB = ________
10. If □ ABCD is square, then m∠ DEC =___________



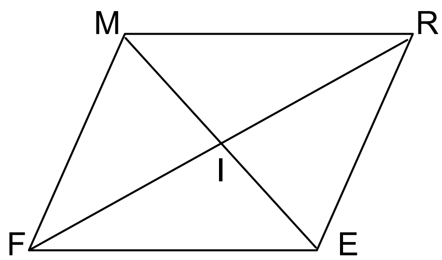
Set C

□ ABCD is a rectangle with diagonals $\overline{AC}$ and $\overline{BD}$.



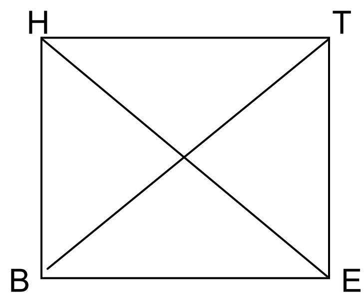
1. $\overline{AC}$ = 2x + 15, $\overline{BD}$ = 3x + 10. Find $\overline{AC}$.
2. $\overline{BD}$ = 6x + 5, $\overline{AC}$ = 5x + 14. Find $\overline{BD}$.

 FERM is a rhombus.



3. If m∠IFE = x +20, m∠IEF = x + 26 ,find x.
4. If m∠IMR = 4x + 20, m∠IRM = 2x + 10, find x.
5. m∠IFE + m∠IEF = __________
6. m∠IMR + m∠IRM = _________

 BETH is a square.



7. If $\overline{HM}$ = x + 15, $\overline{HE}$ = 40, what is x?
8. If $\overline{EM}$ = x + 9, $\overline{HE}$ = 30, what is x?
9. If $\overline{BM}$ = x + 12, $\overline{EM}$ = 2x – 20, what is x?
10. If $\overline{HM}$ = 44 – x, $\overline{TM}$ = 4 + 3x, what is x?

Lesson 2

Conditions for a Parallelogram

The following are some conditions which guarantee that a given quadrilateral is a parallelogram.

1. If both pairs of opposite sides of a quadrilateral are congruent, then the quadrilateral is a parallelogram.
2. If both pairs of opposite angles of a quadrilateral are congruent, then the quadrilateral is a parallelogram.
3. If one pair of opposite sides of a quadrilateral are both congruent and parallel, then the quadrilateral is a parallelogram.
4. If the diagonals of a quadrilateral bisect each other, then the quadrilateral is a parallelogram.

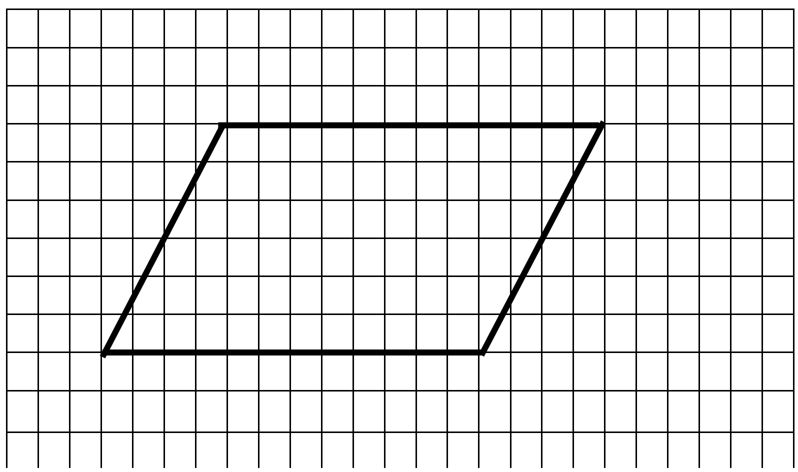
5. If the non-opposite angles of a quadrilateral are supplementary, then the quadrilateral is a parallelogram.

You can verify these sets of sufficient conditions which guarantee that a quadrilateral is a parallelogram. In the following activities you need a pencil, a ruler, a protractor and pieces of bond paper and graphing paper.

1. If both pairs of opposite sides of a quadrilateral are congruent, then the quadrilateral is a parallelogram.

Do this activity:

a. On a graphing paper, draw a quadrilateral such that both pairs of opposite sides are congruent. (See the illustration.)



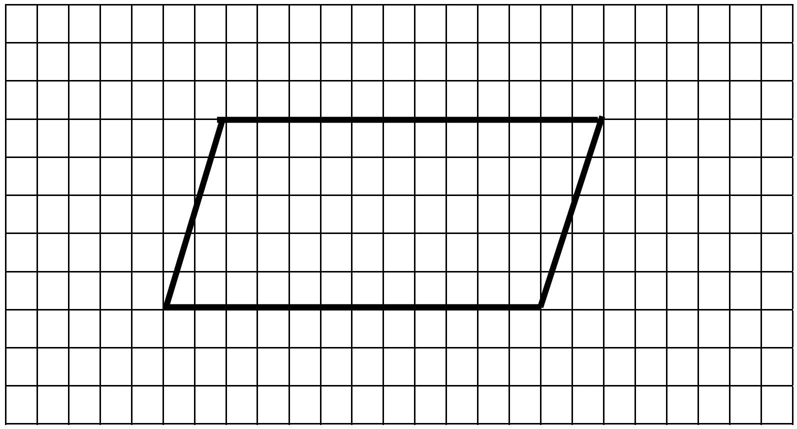
b. Are the opposite sides equidistant? Find this out by using a ruler.

c. Are both pairs of sides parallel? (Remember, parallel lines are everywhere equidistant.)

d. Can you now conclude that the quadrilateral is a parallelogram? Why?

2. If both pairs of opposite angles of a quadrilateral are congruent, then the quadrilateral is a parallelogram.

a. On a graphing paper, with the aids of a ruler and a protractor, construct an quadrilateral such that both pairs of opposite angles are congruent. (See illustration)



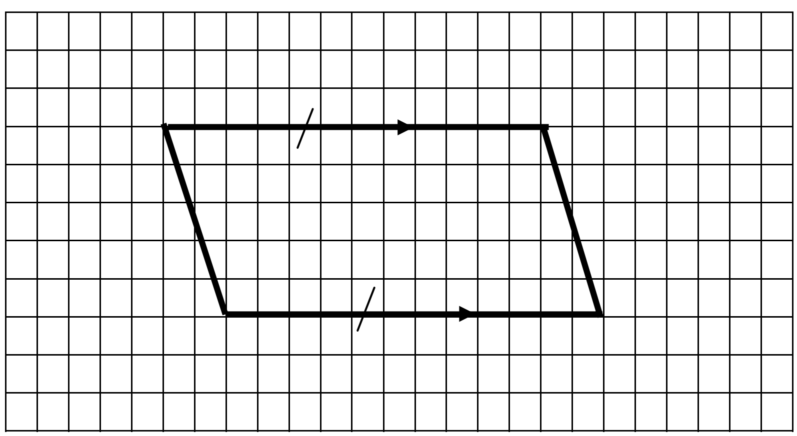
b. Are the opposite sides congruent?
c. Can you now conclude that the quadrilateral is a parallelogram? Why?

3. If one pair of opposite sides of a quadrilateral are both congruent and parallel, then the quadrilateral is a parallelogram.

Do this activity

a. On a graphing paper, draw a quadrilateral such that one pair of opposite sides are both congruent and parallel.

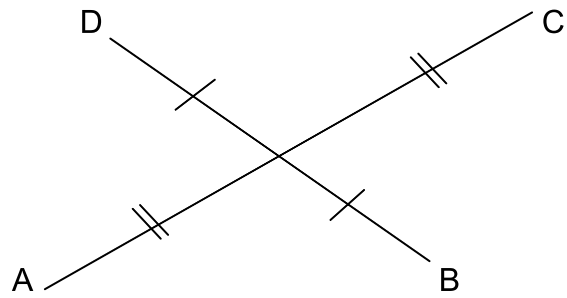
(See illustration below)



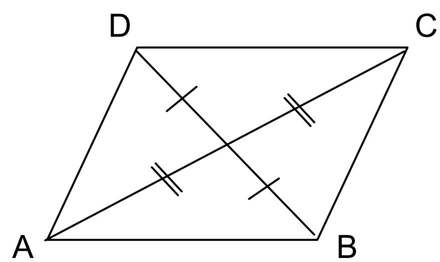
b. Are the other two opposite sides congruent?
c. Can you now conclude that the quadrilateral is a parallelogram? Why?

4. If the diagonals of a quadrilateral bisect each other, then the quadrilateral is a parallelogram.

a. On a bond paper, draw segments $\overline{AC}$ and $\overline{BD}$ bisecting each other. (See the illustration below.)



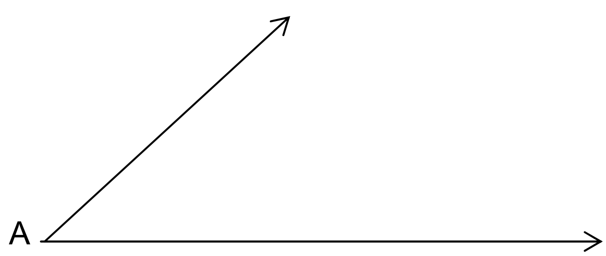
b. Connect A to B, B to C, C to D and D to A .



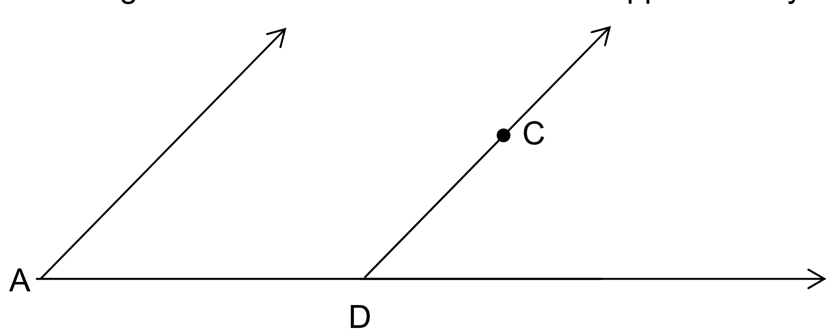
c. Using a ruler, find the lengths of $\overline{AB}$ and $\overline{CD}$. Are they equal?
d. Using a ruler, find the lengths of $\overline{AD}$ and $\overline{BC}$. Are the lengths equal?
e. What kind of quadrilateral is □ ABCD?

5. If the non-opposite angles of a quadrilateral are supplementary, then the quadrilateral is a parallelogram.

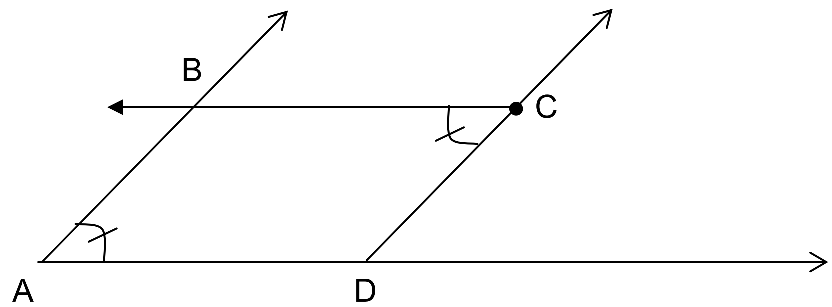
   a. On a bond paper, draw angle A. (See the illustration below.)



   b. Draw angle ADC such that its measure is supplementary to that of angle A.



c. Draw angle DCB such that its measure is equal to that of angle A.

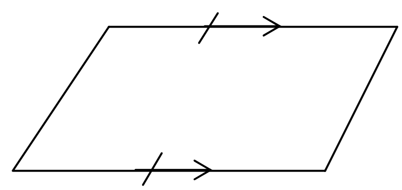


d. Find the measure of angle CBA. Is it equal to the measure of angle ADC? Are ∠A and ∠B supplementary? How about ∠B and ∠C? How about ∠D and ∠C? Why/

e. What kind of quadrilateral is □ ABCD?

Example 1

Determine whether the figure is a parallelogram. Identical “tick marks” indicate that the sides are congruent and identical “arrowheads” indicate the lines are parallel.



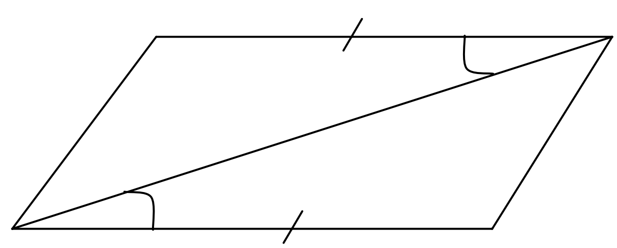
Solution:

If one pair of opposite sides of a quadrilateral are both congruent and parallel, then the quadrilateral is a parallelogram.

Hence the geometric figure is a parallelogram.

Example 2

Determine whether the figure is a parallelogram.



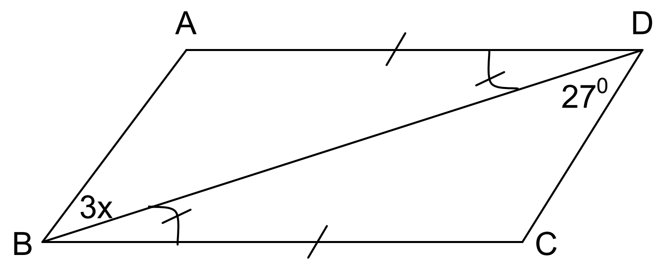
Solution:

A pair of alternate interior angles are congruent, therefore a pair of opposite sides are parallel. These parallel sides are also congruent. As can be seen in the figure, they have the same length.

Hence the figure is a parallelogram.

Example 3.

Find the value of x for which ▱ABCD is a parallelogram.



Solution:

If two lines are cut by a transversal and a pair of alternate interior angles are congruent, then the lines are parallel.

$\overline{AD} \parallel \overline{BC}$ since $\angle ADB \cong \angle CBD$

$\overline{CD} \parallel \overline{AB}$ if $3x = 27$

$x = 9$

Hence the value of x should be 9.

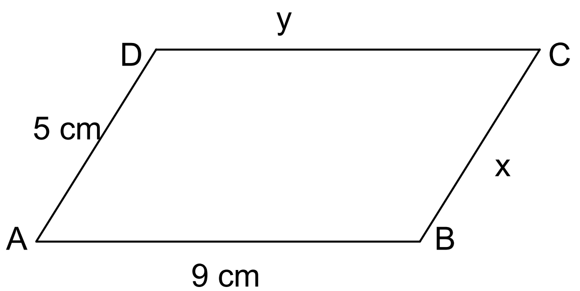
Try this out

Set A

True or False

1. If both pairs of opposite sides of a quadrilateral are congruent, then the quadrilateral is a parallelogram.
2. If both pairs of opposite angles of a quadrilateral are congruent, then the quadrilateral is a parallelogram.
3. If one pair of opposite sides of a quadrilateral are parallel, then the quadrilateral is a parallelogram.
4. If the diagonals of a quadrilateral bisect each other, then the quadrilateral is a parallelogram.
5. If the opposite angles of a quadrilateral are supplementary , then the quadrilateral is a parallelogram.

□ ABCD is a quadrilateral. $\overline{AD}$ = 5 cm and $\overline{AB}$ = 9 cm.

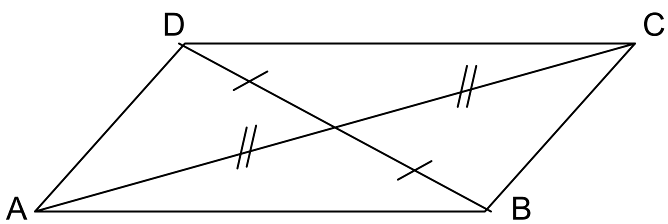


6. □ ABCD is a parallelogram if x = 5 cm and y = 9 cm.
7. □ ABCD is a parallelogram if m∠C = 60 and m∠B = 120.
8. □ ABCD is a parallelogram if $\overline{AB}$ // $\overline{DC}$.
9. □ ABCD is a parallelogram if m∠B ≅m∠D
10. □ ABCD is a parallelogram if $\overline{AB} \cong \overline{DC} \cong \overline{AD} \cong \overline{BC}$.

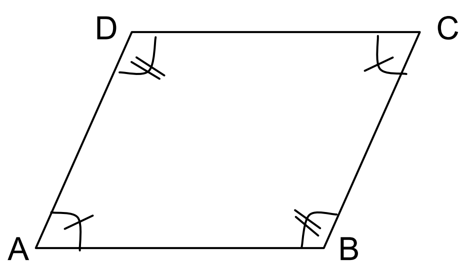
Set B.

Determine whether each quadrilateral is a parallelogram. Identical "tick marks" indicate that the sides or angles are congruent and identical "arrowheads" indicate the lines are parallel.

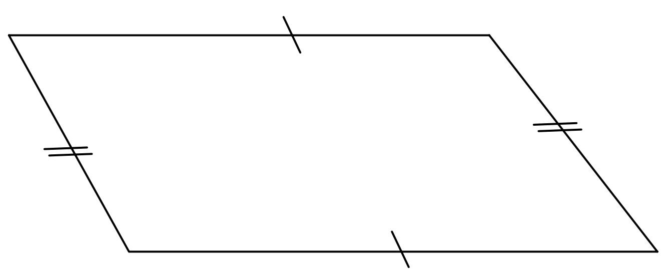
1.



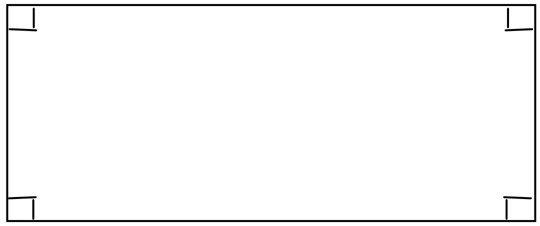
2.



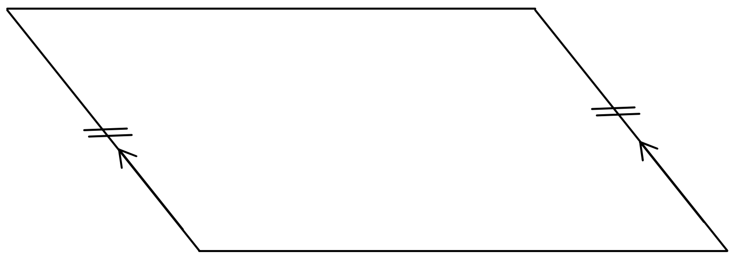
3.



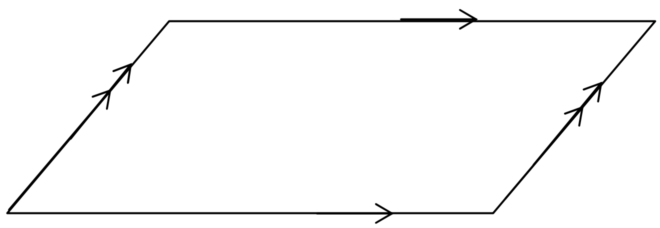
4.



5.



6.



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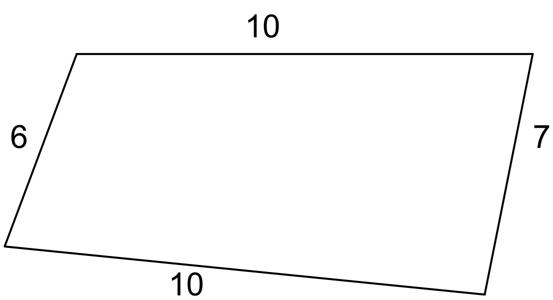

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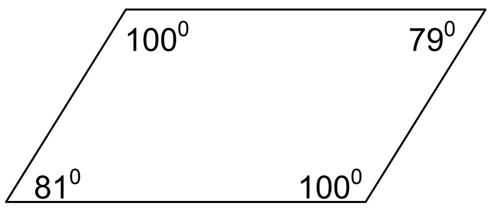

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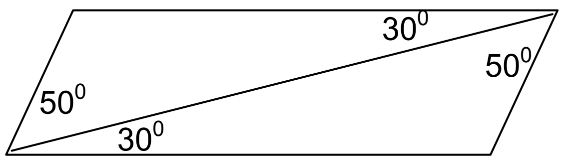

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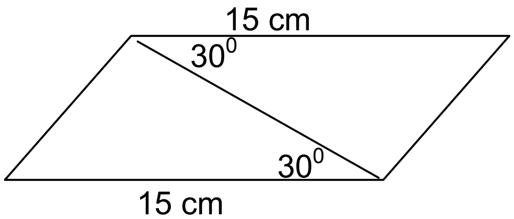
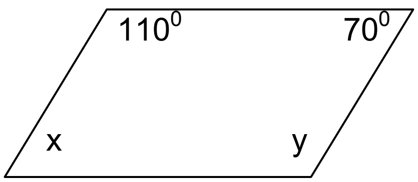


Set C.

What values of x and y guarantee that each quadrilateral is a parallelogram.

1.

2



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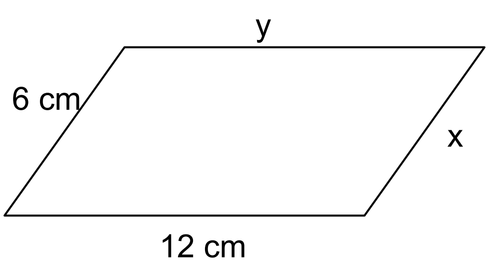

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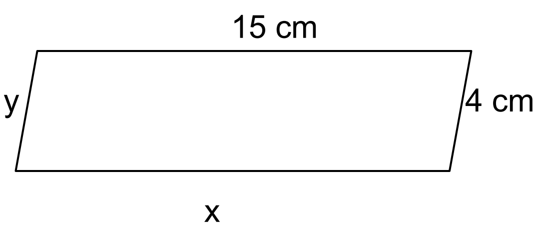

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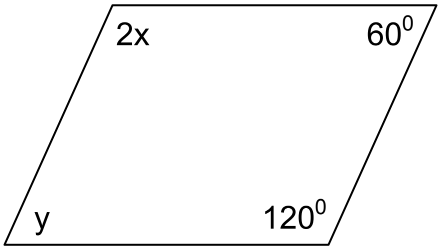

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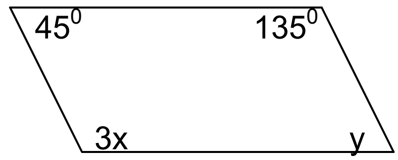

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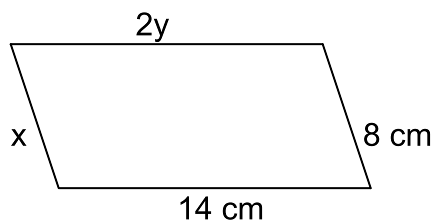

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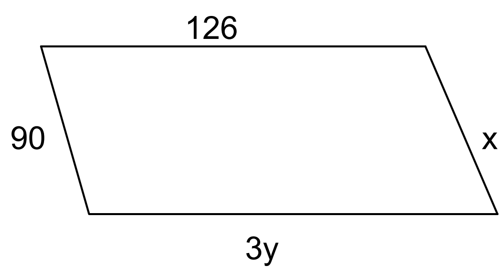

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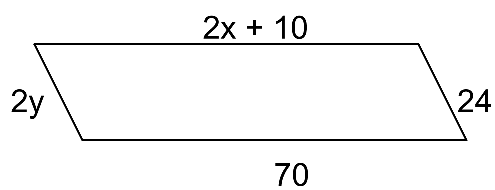

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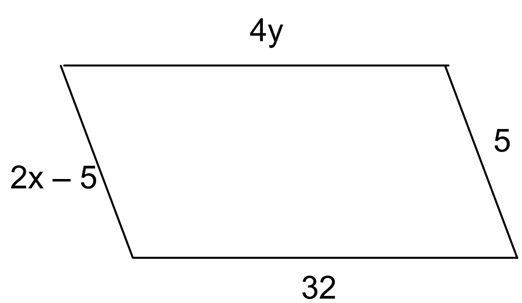
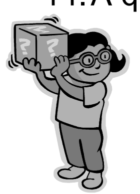


Let's summarize

1. A diagonal of a quadrilateral is a segment which connects any two non-consecutive vertices.
2. The diagonals of a rectangle are congruent.
3. The diagonals of a square are congruent.
4. The diagonals of a square are perpendicular
5. Each diagonal of a square bisects a pair of opposite angles.
6. The diagonals of a rhombus are perpendicular.
7. Each diagonal of a rhombus bisects a pair of opposite angles
8. A square is a special type of rhombus.
9. If both pairs of opposite sides of a quadrilateral are congruent, then the quadrilateral is a parallelogram.
10. If both pairs of opposite angles of a quadrilateral are congruent, then the quadrilateral is a parallelogram.
11. If one pair of opposite sides of a quadrilateral are both congruent and parallel, then the quadrilateral is a parallelogram.
12. If the diagonals of a quadrilateral bisect each other, then the quadrilateral is a parallelogram.
13. If the non-opposite angles of a quadrilateral are supplementary, then the quadrilateral is a parallelogram.
14. A quadrilateral is a parallelogram if both pairs of opposite side are parallel



What have you learned

Multiple Choice. Choose the letter of the correct answer.

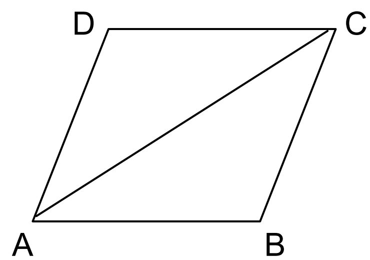
1. A parallelogram is a rhombus if
   A. The diagonals bisect each other
   B. The diagonals are perpendicular.
   C. Two consecutive angles are supplementary.
   D. The opposite sides are parallel.

2. Which of the following is sufficient to guarantee that a quadrilateral is a parallelogram?
   A. The diagonals are perpendicular
   B. A pair of adjacent sides are congruent
   C. Two consecutive angles are congruent
   D. The diagonals bisect each other

3. □ ABCD is a rectangle. if diagonal $\overline{AC}$ = 2x + 6 and diagonal $\overline{BD}$ = 10, what is x?

A. 1 C. 3
B. 2 D. 4

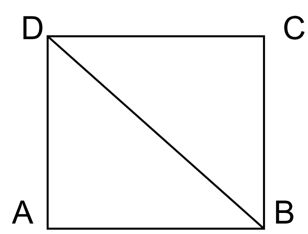
4. □ ABCD is a rhombus.



If m∠DCA = 2(x+8) and m∠BCA = 3x + 9, what is m∠DCB?

A. 40 C. 60
B. 50 D. 70

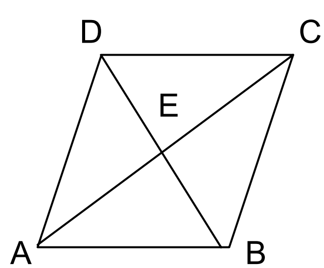
5. □ ABCD is a square.



If m∠ABD = 3(x + 10), what is x?

A. 1 C. 5
B. 3 D. 7

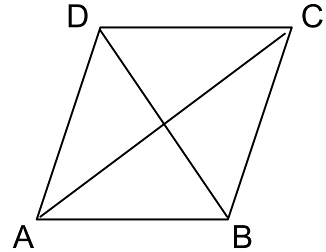
6. □ ABCD is a rhombus. Diagonals $\overline{AC}$ and $\overline{BD}$ intersect each other at E.



If AE = 12 and CE = 3x, what is x?

A. 2 C. 6
B. 4 D. 8

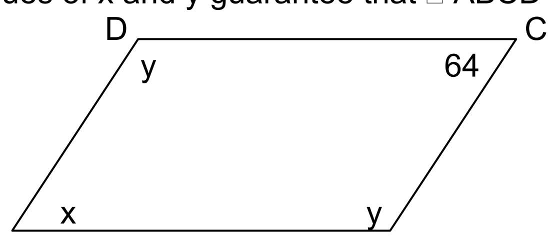
7. □ ABCD is a rhombus . Diagonals $\overline{AC}$ and $\overline{BD}$ intersect at E.



What is m∠AED?

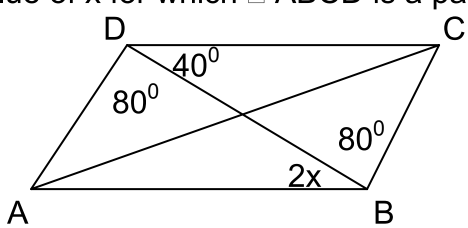
A. 30
B. 45
C. 60
D. 90

8. What values of x and y guarantee that □ ABCD is a parallelogram.



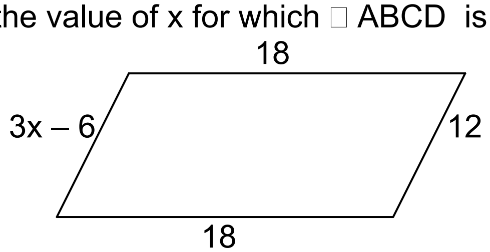
A. x = 64 , y = 116
B. x = 32, y = 116
C. x = 64, y = 64
D. x = 32, y = 64

9. Find the value of x for which □ ABCD is a parallelogram.



A. 10
B. 20
C. 30
D. 40

10. Find the value of x for which □ ABCD is a parallelogram.



A. 8
B. 6
C. 4
D. 2

Answer Key

How much do you know

1. True
2. False
3. True
4. True
5. True
6. True
7. $\overline{AC} = 100$
8. $\overline{AE} = 15$
9. $m\angle FCD = 20$
10. $x = 10$

Lesson 1

Set A

1. True
2. False
3. False
4. True
5. True
6. True
7. True
8. False
9. True
10. True

Set B

1. 15
2. 23
3. 35
4. 20
5. 60
6. 32
7. 110
8. 115
9. 45
10. 90

Set C

1. $\overline{AC} = 25$
2. $\overline{BD} = 59$
3. $x = 22$
4. $x = 10$
5. 90
6. 90
7. $x = 5$
8. $x = 6$
9. $x = 32$
10. $x = 10$

Lesson 2

Set A

1. True
2. True
3. False
4. True
5. False
6. True
7. True
8. True
9. True
10. False

Set B

1. Parallelogram
2. Parallelogram
3. Parallelogram
4. Parallelogram
5. Parallelogram
6. Parallelogram
7. Not a parallelogram
8. Not a parallelogram
9. Parallelogram
10. Parallelogram

Set C

1. $x = 50^0$
   $y = 130^0$
2. $x = 70^0$
   $y = 110^0$
3. $x = 6$ cm
   $y = 12$ cm
4. $x = 15$ cm
   $y = 4$ cm
5. $x = 60^0$
   $y = 60^0$
6. $x = 45^0$
   $y = 45^0$
7. $x = 8$ cm
   $y = 7$ cm
8. $x = 90$ units
   $y = 42$ units
9. $x = 30$ units
   $y = 12$ units
10. $x = 5$ units
    $y = 8$ units

What have you learned

1. B
2. D
3. B
4. C
5. C
6. B
7. D
8. A
9. B
10. B