

1. List the properties of the following figures:

a) parallelogram

- Opposite sides parallel
- opposite sides are  $\cong$
- opposite angles are  $\cong$
- consecutive angles are supplementary
- diagonals bisect each other

b) rectangle-properties of a parallelogram +

- Definition: quadrilateral with 4 right angles
- diagonals are  $\cong$

c) rhombus-properties of a parallelogram +

- Definition: quadrilateral with 4  $\cong$  sides
- diagonals are perpendicular
- diagonals bisect opposite angles

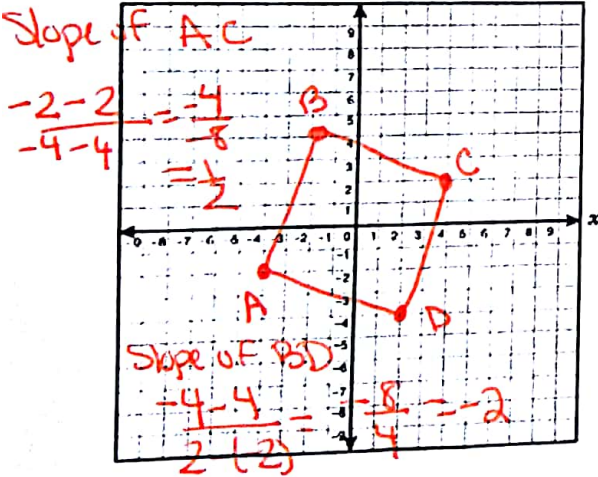
d) square

- All properties of a rhombus and rectangle.

ABCD is a rectangle since diagonals are  $\cong$ , it is also a rhombus since diagonals are perpendicular.

2) Use the diagonals to determine if the parallelogram is a rectangle, rhombus, or square.

A(-4, -2) B(-2, 4) C(4, 2) D(2, -4)



$$BD = \sqrt{(2-(-2))^2 + (-4-4)^2}$$

$$= \sqrt{(4)^2 + (-8)^2}$$

$$= \sqrt{16+64}$$

$$BD = \sqrt{80} = \sqrt{16 \cdot 5} = \sqrt{16} \sqrt{5} = 4\sqrt{5}$$

$$AC = \sqrt{(4-(-4))^2 + (2-(-2))^2}$$

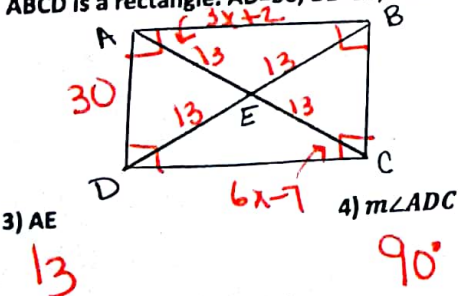
$$= \sqrt{(8)^2 + (4)^2}$$

$$= \sqrt{64+16}$$

$$= \sqrt{80} = 4\sqrt{5}$$

Since it is a rhombus and a rectangle it is also a square.

ABCD is a rectangle. AD=30, DB=26,  $m\angle BAE = (3x + 2)$ ,  $m\angle DCE = (6x - 7)$ . Find each of the following measures.



$$3x+2 = 6x-7$$

$$2 = 3x-7$$

$$9 = 3x$$

$$3 = x$$

5)  $m\angle BAE$

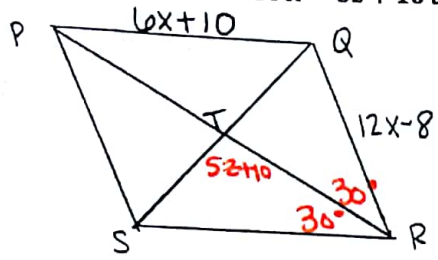
$$3(3)+2$$

$$11^\circ$$

6) BC

$$30$$

PQRS is a rhombus. The  $m\angle STR = 5z + 10$  and the  $m\angle TRS = 30^\circ$ . Find each of the following measures.



$$5z + 10 = 90$$

$$5z = 80$$

$$z = 16$$

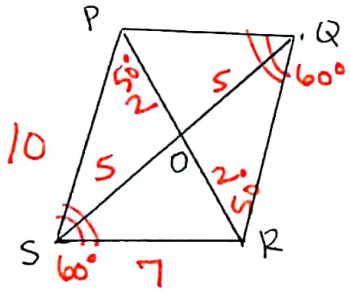
$$6x + 10 = 12x - 8$$

$$18 = 6x$$

$$3 = x$$

- 7) ~~z~~  $z = 16$
- 8)  $x = 3$
- 9) SR  $(3) + 10 = 13 + 10 = 23$
- 10)  $m\angle SRQ = 120^\circ$  ~~120~~  $60^\circ$

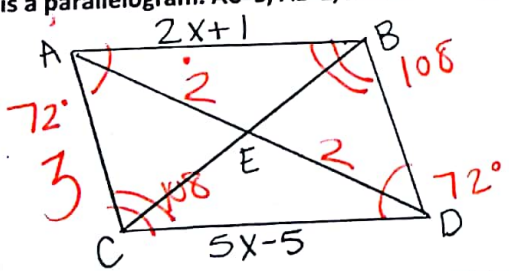
Quadrilateral PQRS is a parallelogram.  $PS=10$ ,  $SR=7$ ,  $OS=5$ ,  $OR=2$ ,  $m\angle PQR = 60^\circ$ ,  $m\angle SPR = 50^\circ$ . Find each of the following measures.



- 11) QR  $10$
- 12) PQ  $7$
- 13) QS  $10$
- 14) OP  $2$

- 15)  $m\angle PSR = 60^\circ$
- 16)  $m\angle QPS = 120^\circ$
- 17)  $m\angle QRP = 50^\circ$
- 18)  $m\angle RPO = 70^\circ$

ABDC is a parallelogram.  $AC=3$ ,  $AE=2$ ,  $m\angle ACD = 108^\circ$ . Find each of the following measures.



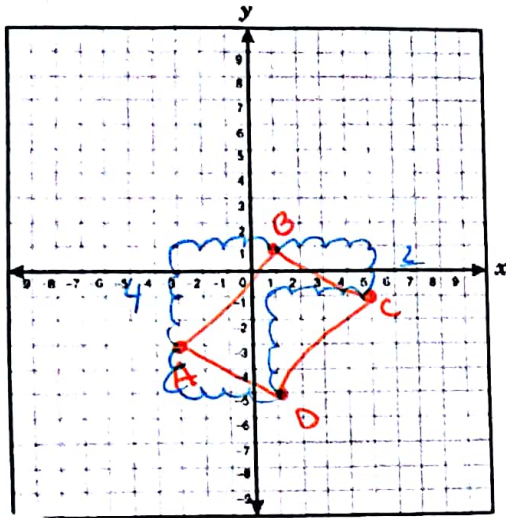
$$2x + 1 = 5x - 5$$

$$6 = 3x$$

$$2 = x$$

- 19)  $m\angle BDC = 72^\circ$
- 20) AB  $2(2) + 1 = 5$
- 21)  $m\angle BAC = 72^\circ$
- 22) DE  $2$
- 23) BD  $3$
- 24)  $m\angle ABD = 108^\circ$

25. Prove the following quadrilateral with vertices A(-3, -3) B(1, 1) C(5, -1) and D(1, -5) is a parallelogram



Slope of  $\overline{AB} = \frac{4}{4} = 1$

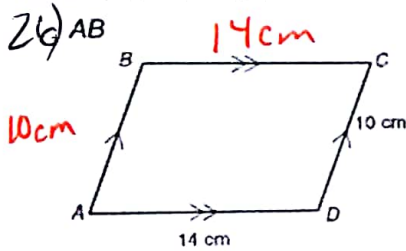
Slope of  $\overline{DC} = \frac{4}{4} = 1$

Slope of  $\overline{BC} = -\frac{2}{4} = -\frac{1}{2}$

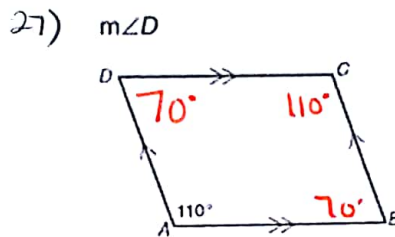
Slope of  $\overline{AD} = -\frac{2}{4} = -\frac{1}{2}$

Since opposite sides are  $\parallel$ , the quadrilateral is a parallelogram.

Find each measure.



$AB = 10 \text{ cm}$



$\angle D = 70^\circ$

Find each measure in  $\square LMNP$ .

28)  $ML = 12 \text{ m}$

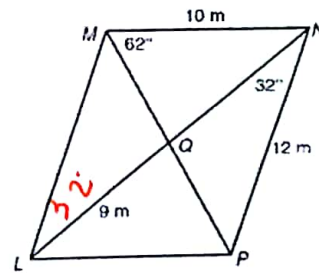
29)  $LP = 10 \text{ m}$

30)  $m\angle LPM = 62^\circ$

31)  $LN = 18 \text{ m}$

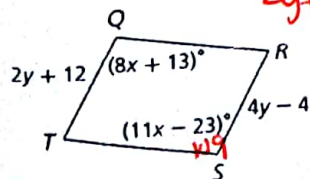
32)  $m\angle MLN = 32^\circ$

33)  $QN = 9 \text{ m}$



QRST is a parallelogram. Find each measure.

$\angle Q = 8(12) + 13 = 109^\circ$



$2y + 12 = 4y - 4$   
 $16 = 2y$   
 $8 = y$

$8x + 13 = 11x - 23$   
 $13 = 3x - 23$   
 $36 = 3x$   
 $12 = x$

34)  $TQ = 2(8) + 12 = 16 + 12 = 28$

35)  $m\angle T = 71^\circ$