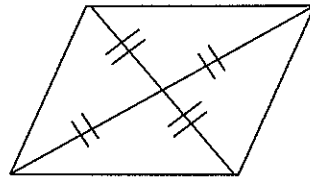1. If a quadrilateral has both pairs of opposite sides parallel, then it must be a _____.

    (A) trapezoid
    (B) square
    (C) parallelogram
    (D) A and C
    (E) B and C

2. The quadrilateral below is most specifically a _____.
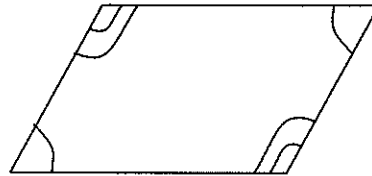
    (A) rhombus
    (B) rectangle
    (C) kite
    (D) parallelogram
    (E) trapezoid

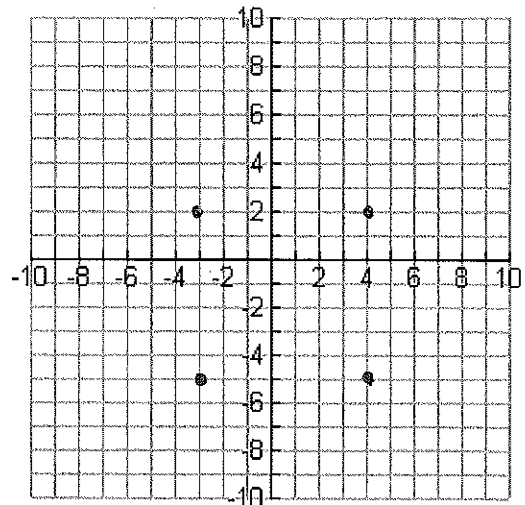3. What are all the possible name(s) of the quadrilateral below?
    I.   rectangle
    II. square
    III. rhombus
    IV. parallelogram

    (A) I and II
    (B) I, III, and IV
    (C) III and IV
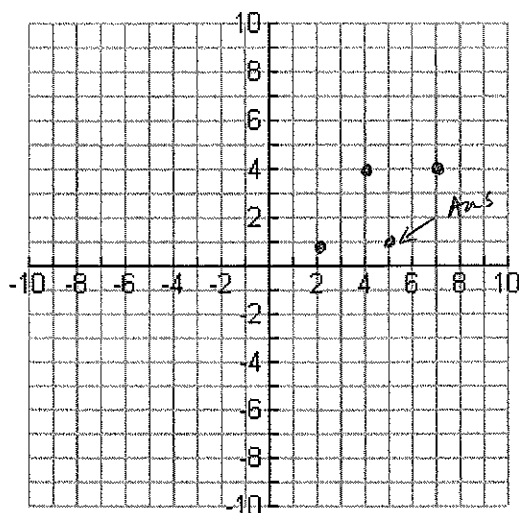   **(D)** IV only
    (E) I, II, III, and IV

4. What is the most precise name for a quadrilateral with vertices (4, 2), (4, -5), (-3, 2) and (-3, -5)?

Square

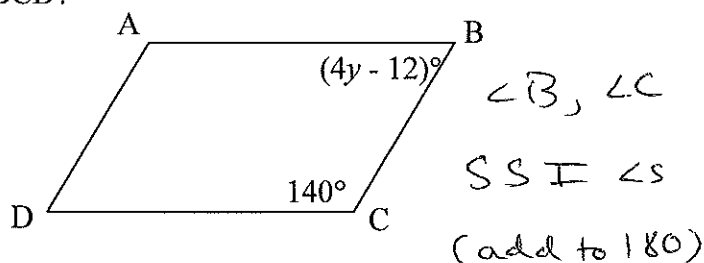**5.** Three coordinate points of a parallelogram are (2, 1), (4, 4), and (7, 4). Find the fourth vertex.

$(5, 1)$

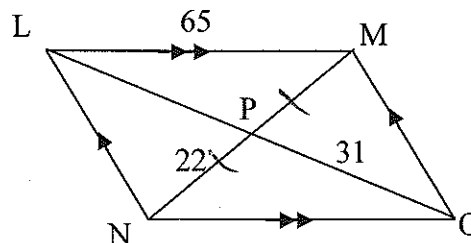**6.** What is the value of the variable in parallelogram ABCD?

(A) $y = 4$
(B) $y = 12$
(C) $y = 13$
(D) $y = 38$
(E) $y = 140$

$\angle B + \angle C = 180$

$4y - 12 + 140 = 180$
$\quad\quad -140 \quad -140$

$4y - 12 = 40$

$\dfrac{4y}{4} = \dfrac{52}{4} \quad\quad y = 13$

$\angle B, \angle C$

SS I $\angle s$

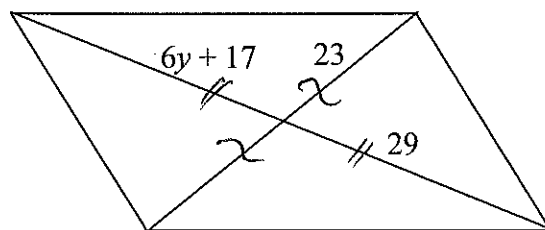(add to 180)

7. What is the length of $\overline{PM}$?

(A) 22
(B) 31
(C) 44
(D) 62
(E) 65

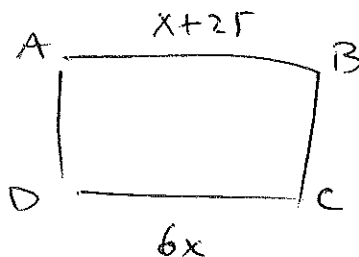**8.** What value of y makes the quadrilateral a parallelogram?

(A) $y = 1$
(B) $y = 2$
(C) $y = 22.33$
(D) $y = 23$
(E) $y = 29$

$6y + 17 = 29$
$\quad -17 \quad -17$
─────────
$\quad 6y = 12$

9. In rectangle ABCD, AB = $x + 25$ and CD = $6x$. Find the value of x.

(A) 1
(B) 4.2
(C) 5
(D) 6
(E) 22.1

$x + 25 = 6x$
$-x \quad\quad -x$
─────────

$\dfrac{25}{5} = \dfrac{5x}{5}$

$5 = x$

10. KLMN is a rectangle. Find the value of *x*.

(A) *x* = 30
(B) *x* = 35
(C) *x* = 75
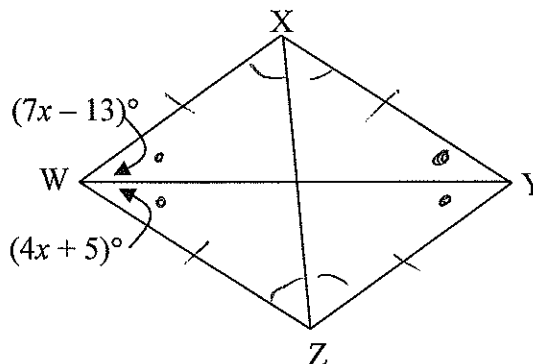(D) *x* = 155
(E) *x* = 450

$2x + 30 = 90$

$2x = 60$

N $\qquad$ 450 $\qquad$ M

75

$(2x + 30)°$

K $\qquad$ L
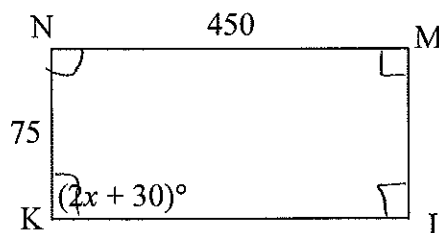
11. WXYZ is a rhombus. What is the value of *x*?

(A) 4
(B) 6
(C) 16
(D) 17.1
(E) 90

$7x - 13 = 4x + 5$
$-4x \qquad -4x$
_____
$3x - 13 = 5$
$\quad +13 \ +13$
_____
$3x = 18$

X

$(7x - 13)°$

W $\qquad$ Y

$(4x + 5)°$

Z

12. Which is sufficient to prove that a quadrilateral is a rhombus?

(A) The diagonals bisect each other.
(B) The diagonals are perpendicular.
(C) A pair of opposite sides is congruent and parallel.
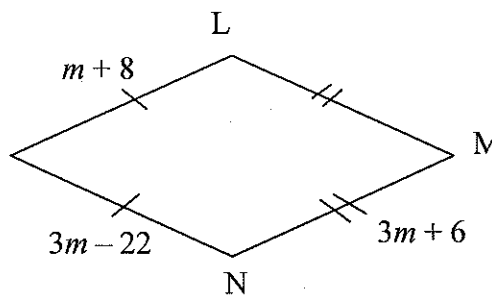(D) All four sides are congruent.
(E) None of the above

13. In kite KLMN, find the value of *m*.

(A) -1
(B) 15
(C) 20
(D) 41.8
(E) 48.5

$m + 8 = 3m - 22$
$-m \qquad -m$
_____
$8 = 2m - 22$
$+22 \qquad +22$
_____
$\dfrac{30}{2} = \dfrac{2m}{2}$ $\qquad 15 = m$

L

$m + 8$

K

$3m - 22$

M

$3m + 6$

N

14. Find the m∠1 and m∠2 in the quadrilateral below.

(A) ∠1 = 90°, ∠2 = 25°
(B) ∠1 = 90°, ∠2 = 56°
(C) ∠1 = 56°, ∠2 = 90°
(D) ∠1 = 25°, ∠2 = 56°
(E) ∠1 = 56°, ∠2 = 34°

25°

1 2

34°

34°
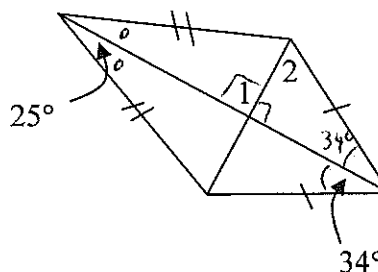
Kite!

$180 - 90 - 34$
$= 56°$

15. What value of x would make quadrilateral ABCD a trapezoid?

    (A) 30

    (B) 40

    (C) 44

    (D) 60

    (E) 80

[handwritten work:]
$$\angle A + \angle B = 180$$
$$2x + 3x - 40 = 180$$
$$5x - 40 = 180$$
$$5x = 220$$

[figure: quadrilateral ABCD with $2x°$ at A, $(3x-40)°$ at B, parallel marks AD and BC]
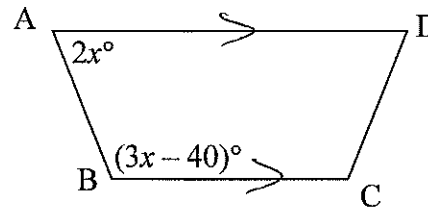
16. In the isosceles trapezoid ABCD, find $m\angle B$.

    (A) 58°

    (B) 61°

    (C) 90°

    (D) 122°

    (E) 180°

[figure: isosceles trapezoid with 122° at D, 58° at B]
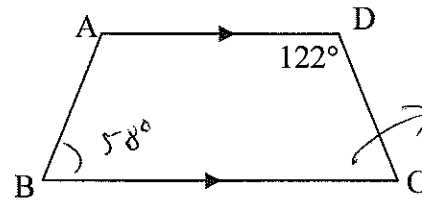
[handwritten:] $180 - 122 = 58$

$$\angle B \cong \angle C$$

17. The diagonals of a square must _____.

    (A) bisect each other

    (B) be perpendicular

    (C) be congruent

    (D) A and B

    (E) A, B, C

Target 6C: Know and utilize the methods for proving that a quadrilateral is a parallelogram

18. Opposite sides of a parallelogram must _____.

    (A) bisect each other

    (B) be parallel

    (C) be congruent

    (D) bisect the angles of the parallelogram

    (E) B and C

19. ABCD is a parallelogram because _____.
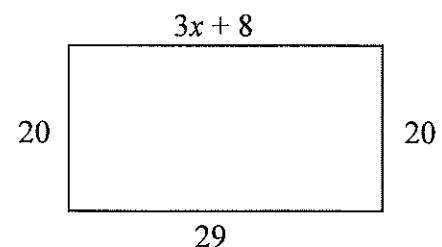
    (A) both pairs of opposite sides are parallel

    (B) the diagonals bisect each other

    (C) both pairs of opposite sides are congruent

    (D) both pairs of opposite angles are congruent

    (E) one pair of opposite sides is congruent and parallel

[figure: parallelogram ABCD with diagonals marked with tick marks]
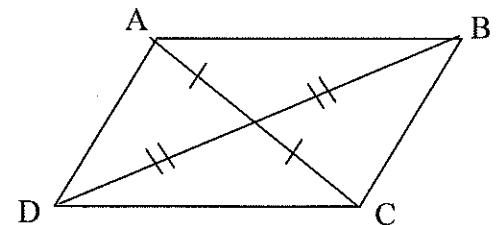
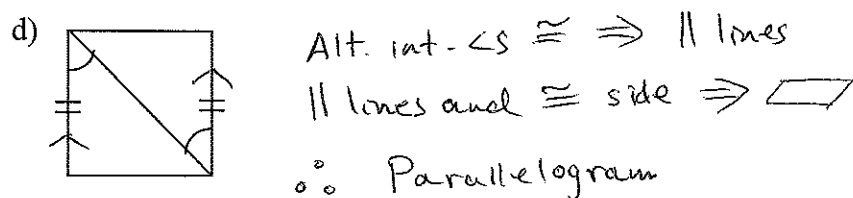**20.** For what value of x makes the figure a parallelogram.

    (A) 4

    (B) 7

    (C) 20

    (D) 29

    (E) 47.7

[handwritten work:]
$$3x + 8 = 29$$
$$-8 \quad -8$$
$$3x = 21$$

[figure: rectangle with $3x + 8$ on top, 29 on bottom, 20 on both left and right sides]

21. Give the most descriptive name for each quadrilateral. Justify your answer.

a)

Rectangle;
diagonals ≅

b)

Isos. Trapezoid;
≅ legs

c)

Rhombus;
4 sides ≅

d)

Alt. int. ∠s ≅ ⟹ ‖ lines
‖ lines and ≅ side ⟹ ▱
∴ Parallelogram
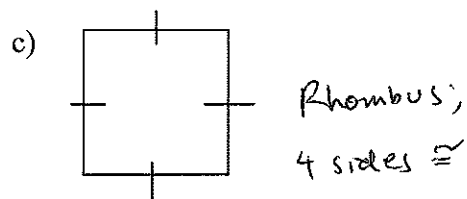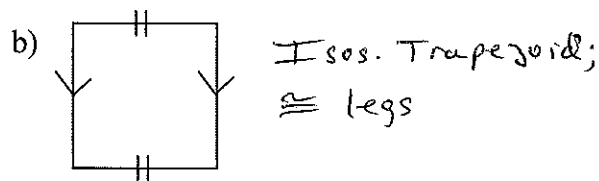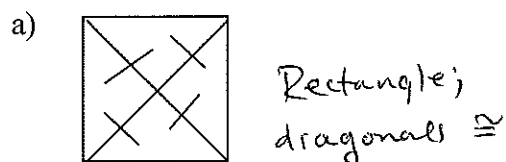
22. Given: *QUAD* is a parallelogram

Prove: opposite sides are congruent
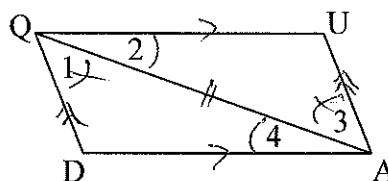
Statements	Reasons
① QUAD ▱	① Given
② $\overline{QU} \parallel \overline{DA}$ $\overline{QD} \parallel \overline{UA}$	② ▱ ⟹ both pairs of opp sides ‖
③ ∠2 ≅ ∠4 ∠1 ≅ ∠3	③ ‖ lines ⟹ Alt. int. ∠s ≅
④ $\overline{QA} \cong \overline{QA}$	④ Reflexive property
⑤ △QUA ≅ △ADQ	⑤ ASA
⑥ $\overline{QD} \cong \overline{AU}$ $\overline{QU} \cong \overline{AD}$	⑥ CPCTC

23. Know how to prove the following methods for parallelograms:

2 If both pairs of opposite sides of a quadrilateral are congruent, then the quadrilateral is a parallelogram (converse of a property).

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

4 If the diagonals of a quadrilateral bisect each other, then the quadrilateral is a parallelogram (converse of a property).

Note: The proof of method 2 and 3 was done in our notes (posted on the website). The proof of method 4 was done as a warm up.

24. A and B are equidistant from C and D. $\angle C = 8m - 30$, $\angle D = 3m + 40$, $AC = 4m - 2$ and $DB = 9m + 1$. What is the perimeter of ACBD?
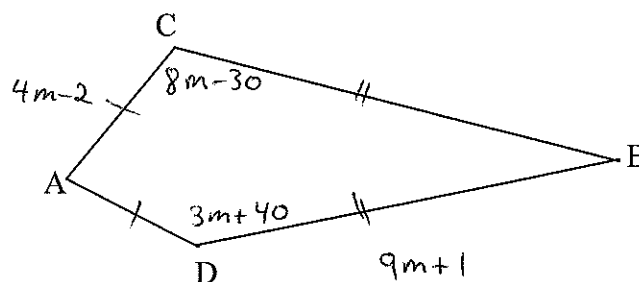
CADB kite $\Rightarrow$ $\angle C \cong \angle D$

$\therefore$ $8m - 30 = 3m + 40$

$\quad -3m \qquad\qquad -3m$

$\overline{\qquad\qquad\qquad\qquad}$

$\quad 5m - 30 = 40$

$\qquad +30 \quad +30$

$\overline{\qquad\qquad\qquad\qquad}$

$\qquad \dfrac{5m}{5} = \dfrac{70}{5}$

$\qquad m = 14$

C

$4m-2$ $\diagdown$ $8m-30$ $\qquad$ $\#$

A $\diagup$ $\qquad\qquad\qquad$ B

$\qquad$ $3m+40$ $\quad \#$

D $\qquad\qquad$ $9m+1$

$AC = 4(14) - 2 = 54$ $\quad \therefore$ $AD = 54$

$DB = 9(14) + 1 = 127$ $\quad \therefore$ $CB = 127$

Perimeter $= 54 + 54 + 127 + 127 = 362$

25. Given: QU≅AD

$\quad \Big\langle$ QU = 3y + 7
$\qquad$ AD = 4y - 3
$\qquad$ UA = 2y + 10
$\qquad$ QD = 37

Q $\qquad$ $\dashv$ $\qquad$ U

37 $\diagdown$

D $\qquad$ $\dashv$ $\qquad$ A
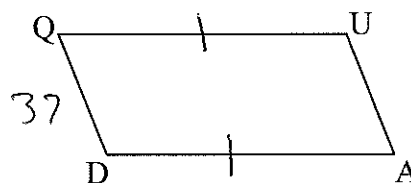
Is QUAD a rhombus? Justify your answer.

$3y + 7 = 4y - 3$

$-3y \qquad\quad -3y$

$\overline{\qquad\qquad\qquad}$

$\quad 7 = y - 3$

$\quad +3 \qquad +3$

$\overline{\qquad\qquad\qquad}$

$\quad 10 = y$

$QU = 3(10) + 7 = 37$

$AD = 4(10) - 3 = 37$

$UA = 2(10) + 10 = 30$

$QD = 37$

$\therefore$ QUAD is <u>NOT</u> a rhombus because not all sides are $\cong$.

26. Review the polygonal notes: translations, reflections, rotations, mapping a quad onto itself, estimating an angle of rotation, steps involved in determining the line of symmetry, etc.