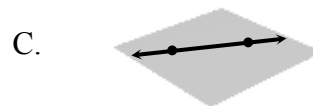
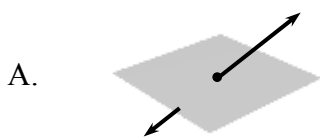


Part I: Multiple Choice. Write the letter of the single, correct answer to each problem on the *left* of the problem. (Each problem is worth 1 point.)

Problems 1-4: Use the following choices:



___ 1. Which picture best illustrates the following postulate?

“The intersection of two planes is a line.”

___ 2. Which picture best illustrates the following postulate?

“If two points are in a plane, then the line containing them is in that plane.”

___ 3. Which picture best illustrates the fact that the intersection of three planes can be a line?

___ 4. Which picture best illustrates the fact that the intersection of a line and a plane can be a single point?

___ 5. Which three points in the figure on the right are *collinear*?

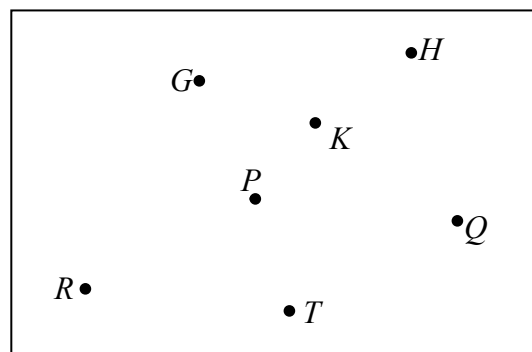
A. G, K and Q

B. H, K and P

C. H, K and R

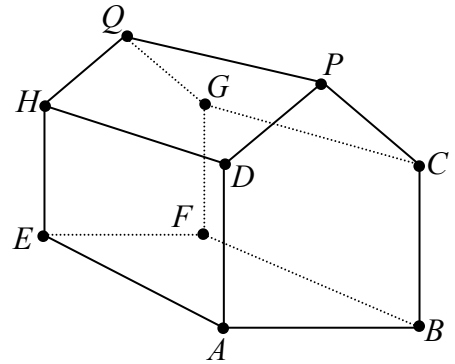
D. K, P and R

E. G, P and T



Problems 6-8:

The figure on the right is a 3-dimensional drawing of a shed with no doors or windows. Its roof, sides and floor are parts of seven different planes. Planes ABC and EFG (containing the front and back walls) are parallel, as are planes ADH and BCG (containing the left and right walls). No other planes determined by the roof, walls or floor of this shed are parallel.

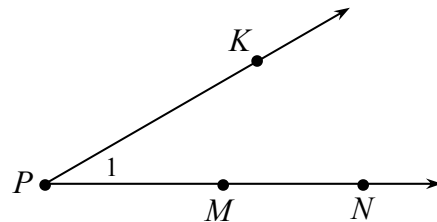


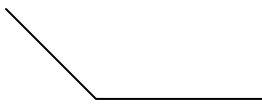
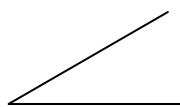
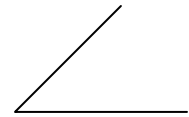
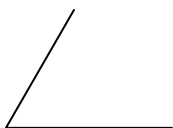
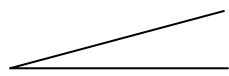
- ___ 6. Which of the following points is *coplanar* with points H , Q and P ?
- A. point A B. point B C. point C D. point D E. point E

- ___ 7. Name the intersection of *plane* HQP with *plane* ABC .
- A. \overleftrightarrow{DP} B. point P C. \overleftrightarrow{CP} D. point C E. \overleftrightarrow{PQ}

- ___ 8. What geometric object is the intersection of \overleftrightarrow{AB} with *plane* HQP ?
- A. a line B. a point C. a plane D. a puppy E. a banana

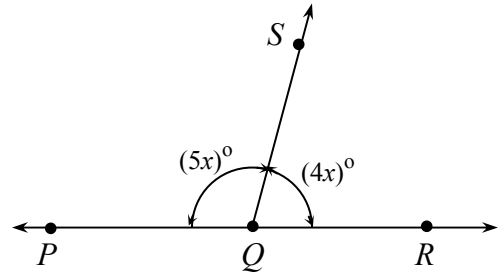
- ___ 9. Which is NOT a valid name for the angle depicted on the right?
- A. $\angle KPN$ B. $\angle MPK$ C. $\angle P$
 D. $\angle KNP$ E. $\angle 1$



- ___ 10. Which of these angles has a measure closest to 30° ?
- A.  B.  C. 
 D.  E. 

___ 11. In the figure on the right, points P , Q and R are collinear. What is the measure of $\angle RQS$?

- A. 40° B. 20° C. 80°
 D. 50° E. 100°

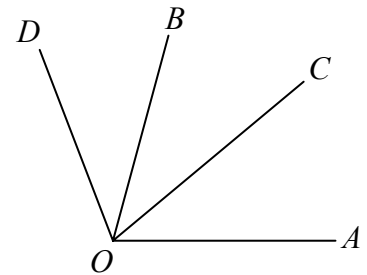


___ 12. If $\angle A$ and $\angle B$ are complementary, $\angle B$ and $\angle C$ are supplementary, and $m\angle A = 64^\circ$, then what is the measure of $\angle C$?

- A. 64° B. 180° C. 26° D. 90° E. 154°

___ 13. In this figure, $m\angle AOB = 70^\circ$, $m\angle COD = 60^\circ$, and $m\angle AOD = 100^\circ$. What is $m\angle COB$?

- A. 10° B. 65° C. 35°
 D. 60° E. 30°



Problems 14-16: Refer to the figure on the right, in which M , R and Q are collinear and $m\angle MRN = 90^\circ$:

___ 14. Which of the following is a *straight angle*?

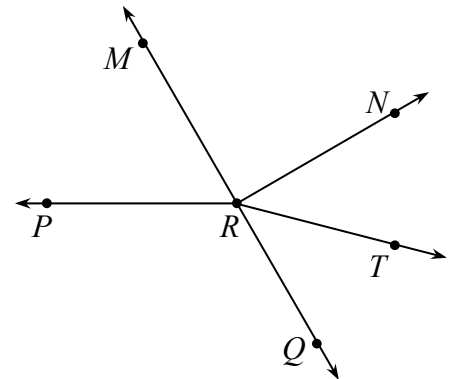
- A. $\angle MRN$ B. $\angle PMR$ C. $\angle MRQ$
 D. $\angle PRN$ E. $\angle NTR$

___ 15. Which of the following is an *obtuse angle*?

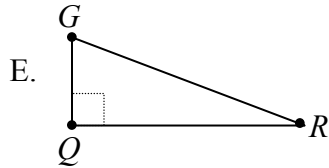
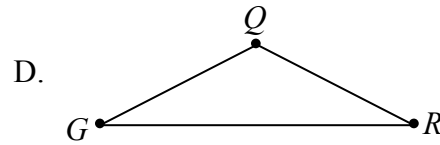
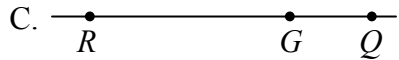
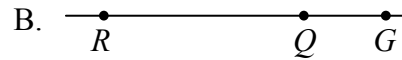
- A. $\angle MRQ$ B. $\angle PRN$ C. $\angle NTR$ D. $\angle MRN$ E. $\angle PMR$

___ 16. Which of the following angles is *adjacent* to $\angle NRT$?

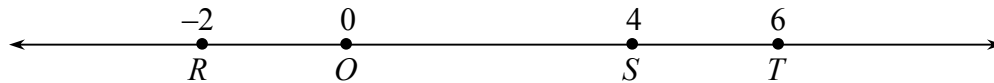
- A. $\angle QRT$ B. $\angle MRT$ C. $\angle PRM$ D. $\angle PRN$ E. $\angle PMR$



___ 17. In which of the following diagrams is it true that $GQ + RQ = GR$?



___ 18. Point P (not shown) on the number line is 5 units from point T and 3 units from point S .



Where is point P located?

- A. Between R and O B. Between O and S C. Between S and T
 D. To the left of R E. To the right of T

___ 19. Towns A , B and C are located along a straight highway. Town B is between A and C , and the distance from B to C is 17 miles more than the distance from A to B . If A and C are 95 miles apart, how far is it from town B to town C ?

- A. 42 miles B. 29 miles C. 56 miles D. 45 miles E. 39 miles

___ 20. The process of making a *conjecture* based on a series of observed patterns is known as

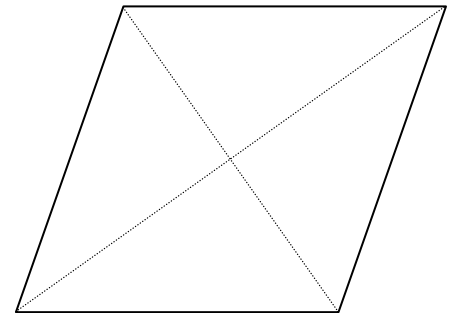
- A. deductive reasoning B. obfuscation C. proof
 D. inductive reasoning E. brawling

___ 21. When a *conjecture* has been proved, it becomes a

- A. postulate B. diagram C. theorem D. definition E. assertion

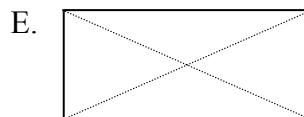
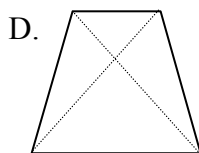
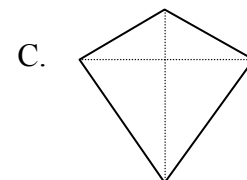
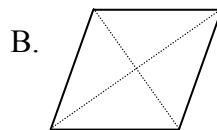
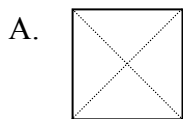
- _____ 22. Which of the following is the *converse* of the statement, “if a quadrilateral is a square, then its four sides are congruent”?
- A. If the four sides of a quadrilateral are congruent, then it is a square.
 - B. If a square is a quadrilateral, then its four sides are congruent.
 - C. If the four sides are congruent, then it is a quadrilateral square.
 - D. If four sides are congruent, then the square is a quadrilateral.
 - E. If a square has four congruent sides, then it is a quadrilateral

- _____ 23. The figure on the right is a rhombus. Which of the following statements about it is NOT true?



- A. Its diagonals bisect each other.
- B. Its diagonals are congruent.
- C. Its diagonals are perpendicular.
- D. Each pair of opposite angles are congruent.
- E. Each pair of consecutive angles are supplementary.

- _____ 24. Which of the following figures is a counterexample to the false statement, “if the diagonals of a quadrilateral are congruent and bisect each other, then the quadrilateral is a square”?



___ 25. Given quadrilateral $ABCD$, which statement would allow the conclusion that $ABCD$ is a parallelogram?

A. $\angle A \cong \angle C$

B. $\overline{AD} \cong \overline{BC}$

C. $m\angle A + m\angle D = 180^\circ$

D. $\overline{AD} \parallel \overline{BC}$



E. None of these

___ 26. Which of the following statements is *always true* regarding a parallelogram?

A. The diagonals are perpendicular to each other.

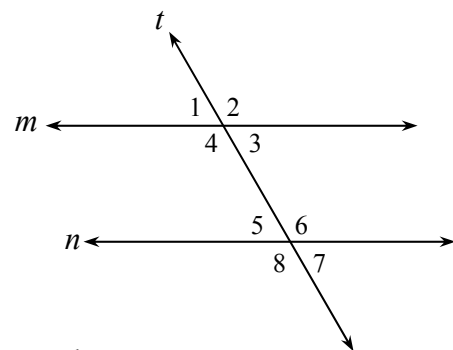
B. The sum of the angles is 180° .

C. Opposite sides are both parallel and congruent.

D. There cannot be a right angle in any parallelogram.

E. Consecutive angles are complementary.

Problems 27-29: In the figure on the right, lines m and n are cut by transversal t .



___ 27. $\angle 1$ and $\angle 5$ are:

A. corresponding angles B. vertical angles

C. alternate interior angles D. alternate exterior angles

E. same side exterior angles

___ 28. $\angle 3$ and $\angle 5$ are:

A. corresponding angles B. vertical angles C. alternate interior angles

D. alternate exterior angles E. same side exterior angles

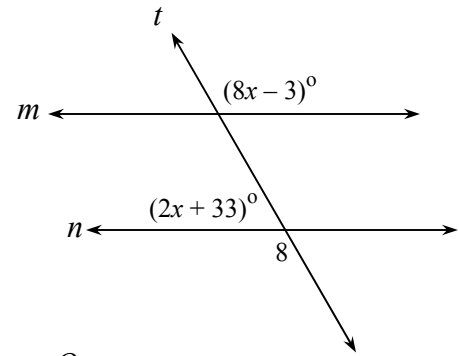
___ 29. $\angle 5$ and $\angle 7$ are:

A. corresponding angles B. vertical angles C. alternate interior angles

D. alternate exterior angles E. same side exterior angles

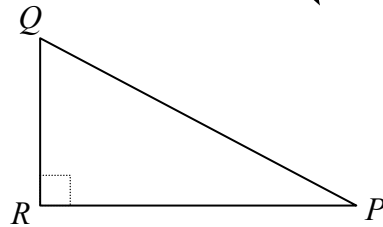
___ 30. In the figure on the right, lines m and n are parallel. Find $m\angle 8$.

- A. 45° B. 117° C. 75°
 D. 135° E. 113°



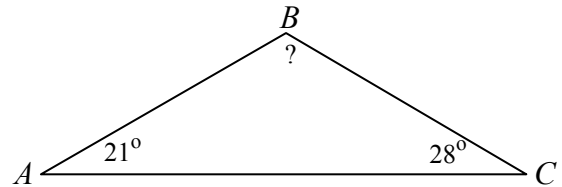
___ 31. In the triangle on the right, $m\angle P = 25^\circ$. What is the measure of $\angle Q$?

- A. 75° B. 105° C. 55°
 D. 25° E. 65°



___ 32. What is the measure of $\angle B$ in this triangle?

- A. 49° B. 41° C. 131°
 D. 139° E. 141°

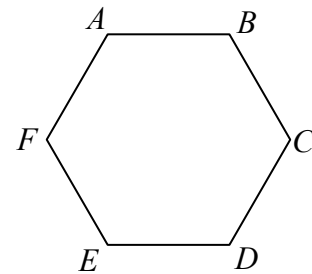


___ 33. In a quadrilateral, two of the angles each have a measure of 110° , and the measure of a third angle is 90° . What is the measure of the remaining angle?

- A. 50° B. 130° C. 90° D. 140° E. None of these

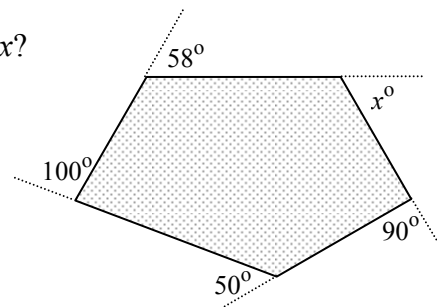
___ 34. $ABCDEF$ is a regular hexagon. What is the measure of $\angle A$?

- A. 108° B. 72° C. 120°
 D. 60° E. 144°

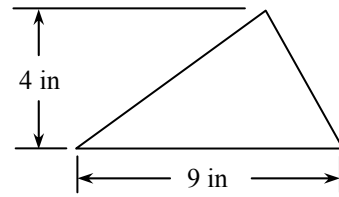


___ 35. In the pentagon at the right, what is the value of x ?

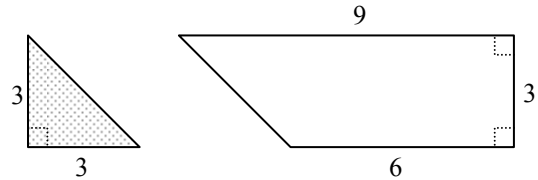
- A. 62 B. 118 C. 58
 D. 158 E. 82



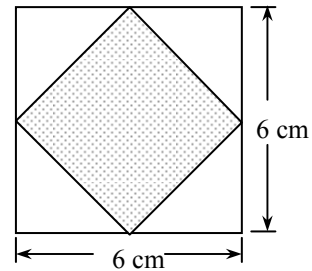
36. What is the area of the triangle on the right?
- A. 18 in^2 B. 36 in^2 C. 24 in^2
 D. 13 in^2 E. 26 in^2



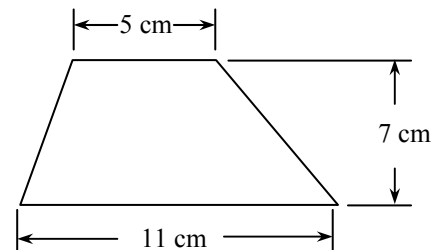
37. How many triangles of the shape and size of the shaded triangle can the trapezoid on the right be divided into?
- A. three B. seven C. four
 D. five E. six



38. What is the area of the shaded square on the right?
- A. 24 cm^2 B. 9 cm^2 C. 18 cm^2
 D. 12 cm^2 E. 72 cm^2

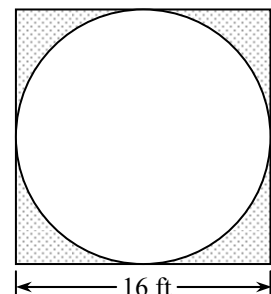


39. What is the area of the trapezoid on the right?
- A. 48 cm^2 B. 56 cm^2 C. 112 cm^2
 D. 96 cm^2 E. 20 cm^2



40. A square has an area of 196 in^2 . What is the *perimeter* of that square?
- A. 24 in B. 48 in C. 56 in D. 392 in E. 28 in

41. Which is closest to the area of the shaded region in the figure on the right?
- A. 206 ft^2 B. 23 ft^2 C. 548 ft^2
 D. 137 ft^2 E. 55 ft^2

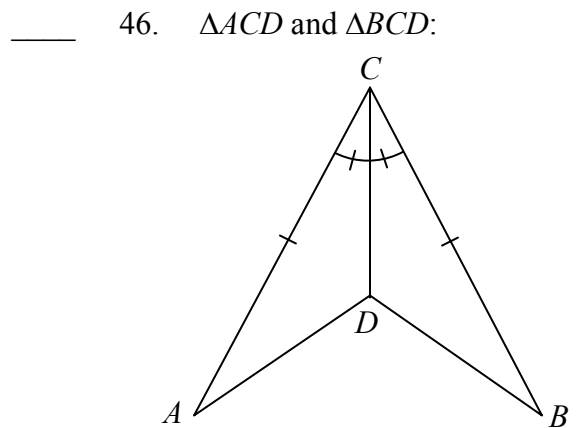
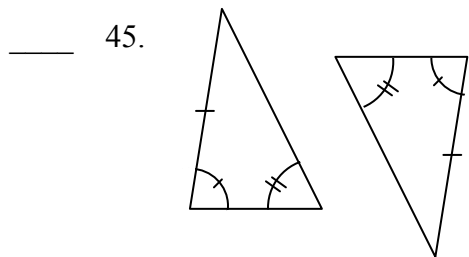
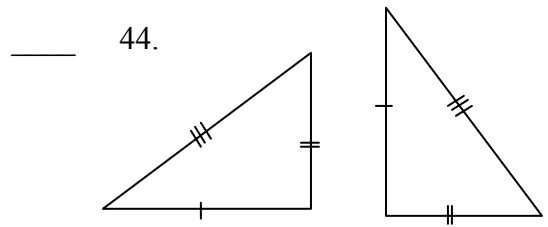
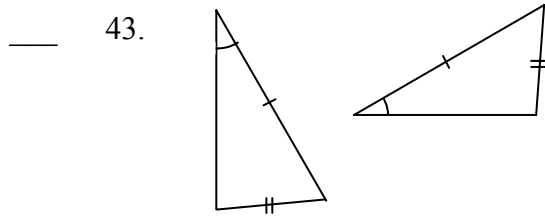


___ 42. If the slope a certain line is $-\frac{2}{3}$, then which of the following is the slope of a line *perpendicular* to that line?

- A. $\frac{2}{3}$ B. 2 C. $-\frac{3}{2}$ D. $\frac{3}{2}$ E. -3

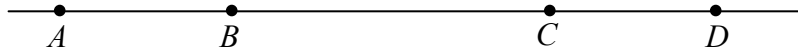
Problems 43-46: Use the following choices for the two triangles given.

- A. The triangles are congruent by **SAS**.
 B. The triangles are congruent by **ASA**.
 C. The triangles are congruent by **SSS**.
 D. The triangles are congruent by **SAA**.
 E. The triangles might not be congruent.



Part II: Written. Show all work. (Each problem is worth 5 points.)

47. In the figure below, $AC = BD$, $AB = CD$, $BC = 2CD$, and $AD = 132$. What is the length of AC ?

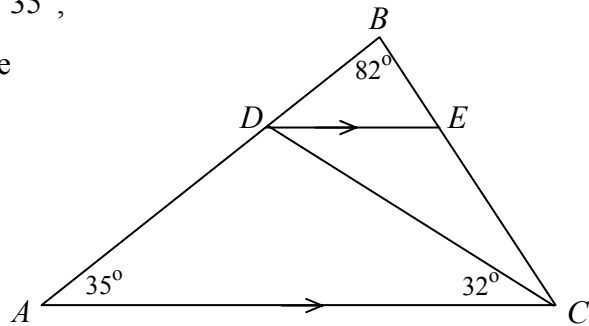


48. In $\triangle ABC$, $\overline{DE} \parallel \overline{AC}$, $m\angle B = 82^\circ$, $m\angle A = 35^\circ$, and $m\angle ACD = 32^\circ$. Find the indicated angle measures:

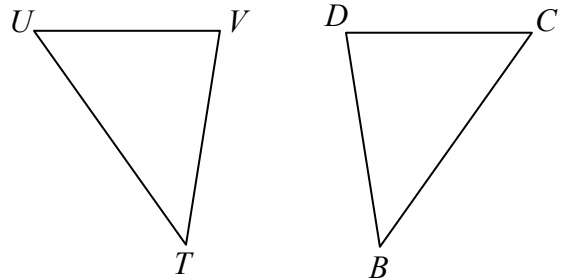
$m\angle BDE =$ _____

$m\angle EDC =$ _____

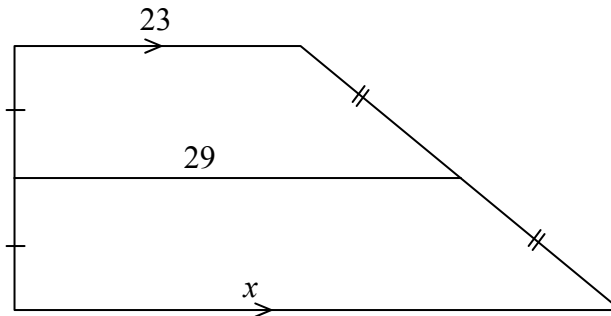
$m\angle ECD =$ _____



49. If $\triangle TUV \cong \triangle BCD$, $m\angle V = x^\circ$, $CD = y$, $m\angle D = 80^\circ$, and $UV = 13$, find the values of x and y .



50. Find the value of x :

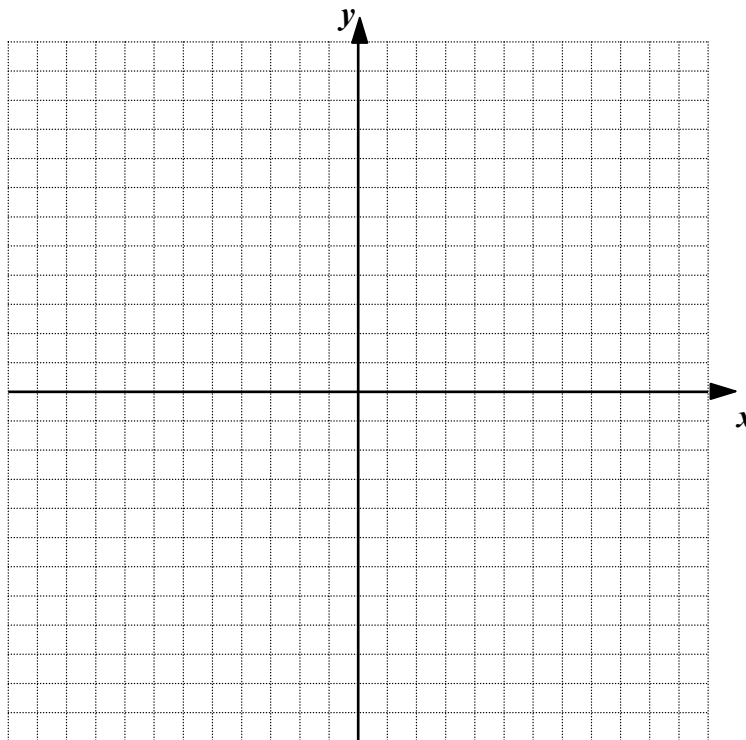


Problems 51-52: The vertices of quadrilateral $EFGH$ have the following coordinates:

$$E = (6, -3) \quad F = (10, 11) \quad G = (-10, 5) \quad H = (0, -7)$$

Points M , N , P , and Q are the midpoints of sides \overline{EF} , \overline{FG} , \overline{GH} , and \overline{HE} , respectively.

51. Draw quadrilateral $EFGH$, give the coordinates of its midpoints, and draw quadrilateral $MNPQ$:



Give the coordinates of the midpoints:

$$M = \text{midpoint of } \overline{EF} = \underline{\hspace{2cm}}$$

$$N = \text{midpoint of } \overline{FG} = \underline{\hspace{2cm}}$$

$$P = \text{midpoint of } \overline{GH} = \underline{\hspace{2cm}}$$

$$Q = \text{midpoint of } \overline{EH} = \underline{\hspace{2cm}}$$

52. (a) Prove that quadrilateral $MNPQ$ is a parallelogram by showing its opposite sides have the same slopes:

$$\text{slope of } \overline{MN} = \underline{\hspace{2cm}}, \quad \text{slope of } \overline{PQ} = \underline{\hspace{2cm}},$$

$$\text{slope of } \overline{NP} = \underline{\hspace{2cm}}, \quad \text{slope of } \overline{MQ} = \underline{\hspace{2cm}}$$

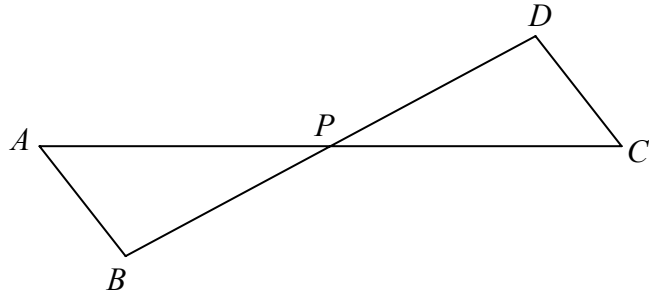
(b) Is $MNPQ$ a rectangle?

Why or why not?

53. Mark the diagram and supply the missing reasons for the proof:

Given: $\overline{AB} \parallel \overline{CD}$, P bisects \overline{AC}

Prove: $\overline{AB} \cong \overline{CD}$



Proof:

Statement:	Reason:
$\overline{AB} \parallel \overline{CD}$	Given
$\angle BAP \cong \angle PCD$	
P bisects \overline{AC}	Given
$\overline{AP} \cong \overline{PC}$	
$\angle APB \cong \angle CPD$	
$\triangle APB \cong \triangle CPD$	
$\overline{AB} \cong \overline{CD}$	