

SECTION 3.3: PROVING LINES PARALLEL

Standards:

2.0 - Students write geometric proofs, including proofs by contradiction.

7.0 - Students prove and use theorems involving the properties of parallel lines cut by a transversal, the properties of quadrilaterals, and the properties of circles.

POSTULATES/THEOREMS

If 2 lines are cut by a transversal and

- corresponding angles are \cong
- alternate interior angles are \cong
- same side interior angles are supplementary

THEN THE TWO LINES ARE PARALLEL

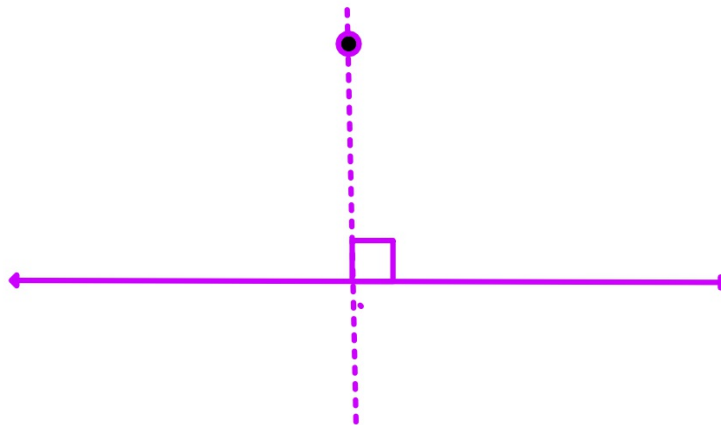
THEOREM

Through a point outside a line, there's exactly
ONE line parallel to the given line



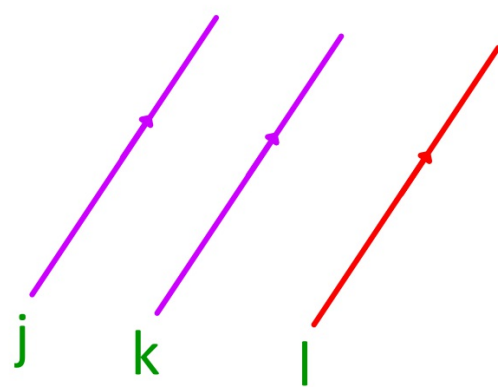
THEOREM

Through a point outside a line, there's exactly ONE line perpendicular to the given line.



THEOREM

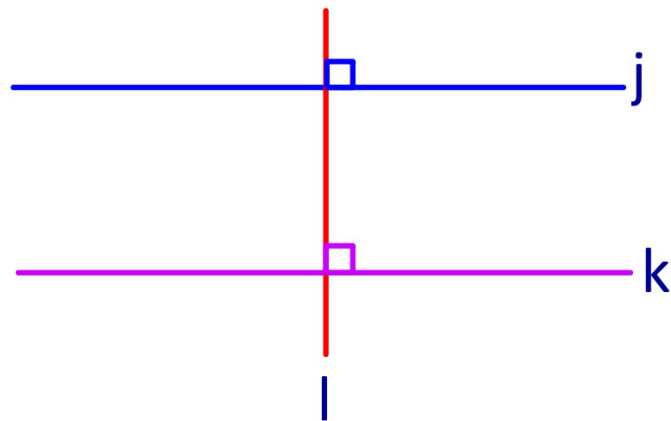
Two lines $//$ to a third line are $//$ to each other.



if $j // k$ and $k // l$
then $j // l$

THEOREM

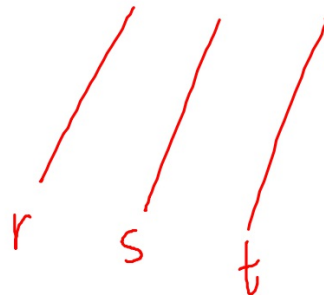
Two lines perpendicular to the same line are parallel



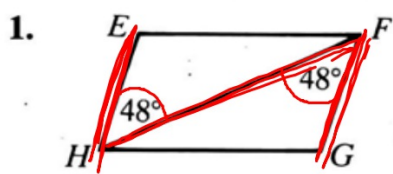
If $j \perp l$ and $k \perp l$, then $j \parallel k$

WAYS TO PROVE TWO LINES ARE PARALLEL

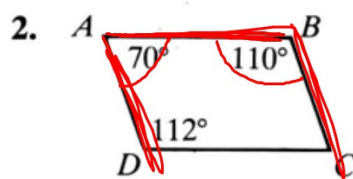
- Show that 2 corresponding angles are \cong
- Show that 2 alternate interior angles are \cong
- Show that 2 same-side interior angles are supplementary
- Show that both lines are \perp to a third line
- Show that both lines are \parallel to a third line.



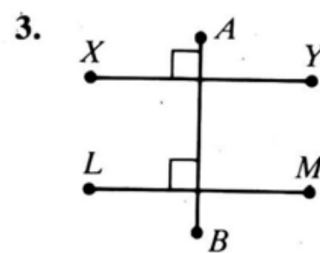
State which segments (if any) must be parallel. State the postulate or theorem that justifies your answer.



EH & FG
alt-int



AD & BC
s-s-int

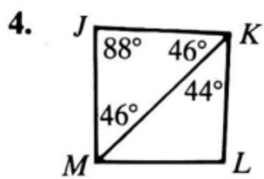


XY & LM
If 2 lines are perp
to a third line, then
they are // to each
other

Answer

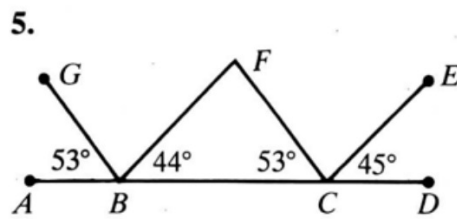
Answer

Answer



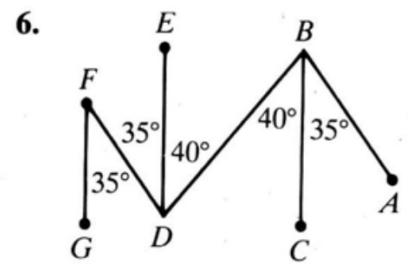
none

Answer



$\overline{BG} \ \& \ \overline{FC}$
corr

Answer

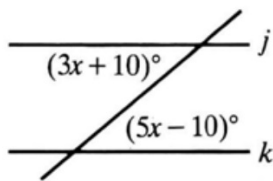


$\overline{FG} \ \& \ \overline{ED}$; $\overline{ED} \ \& \ \overline{BC}$
 $\overline{FD} \ \& \ \overline{BA}$; $\overline{FG} \ \& \ \overline{BC}$
alt-int

Answer

Find the value of x that makes $j \parallel k$.

18.



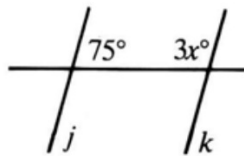
$$3x + 10 = 5x - 10$$

$$20 = 2x$$

$$x = 10$$

Answer

19.



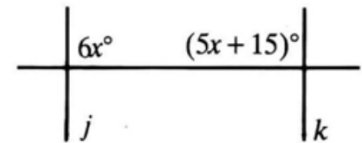
$$75 + 3x = 180$$

$$3x = 105$$

$$x = 35$$

Answer

20.



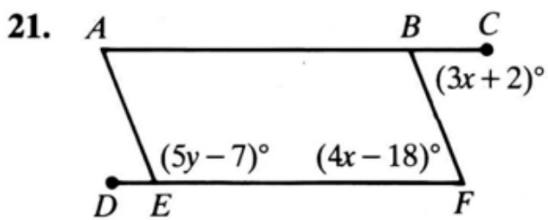
$$6x + 5x + 15 = 180$$

$$11x = 165$$

$$x = 15$$

Answer

Find the values of x and y that make $\overline{AC} \parallel \overline{DF}$ and $\overline{AE} \parallel \overline{BF}$.



$$3x + 2 = 4x - 18$$

$$x = 20$$

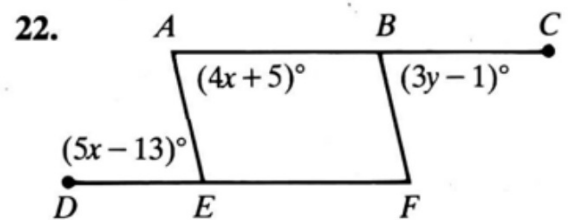
$$5y - 7 = 4(20) - 18 = 180$$

$$5y + 55 = 180$$

$$5y = 125$$

$$y = 5$$

Answer



$$5x - 13 = 4x + 5$$

$$x = 18$$

$$4(18) + 5 = 3y - 1$$

$$78 = 3y$$

$$y = 26$$

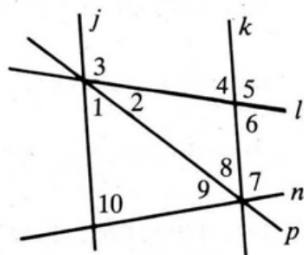
Answer

In each exercise, some information is given. Name the lines (if any) that must be parallel. If there are no such lines, write *none*.

1) $\angle 1 \cong \angle 8$



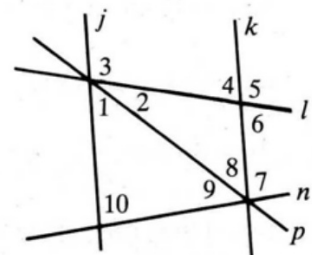
$j // k$



2) $\angle 4 \cong \angle 6$



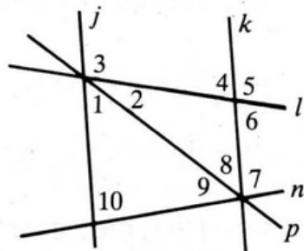
none



3) $\angle 10 \cong \angle 7$



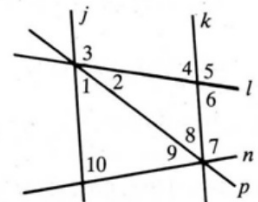
$j // k$



4) $m(\angle 3) + m(\angle 4) = 180$



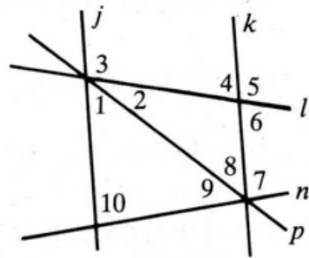
$j // k$



5) $\angle 5 \cong \angle 3$



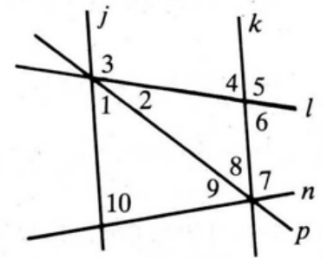
$j // k$



6) $\angle 6 \cong \angle 7$



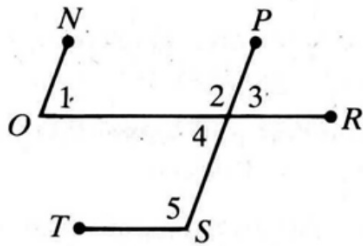
none



7) $\angle 1 \cong \angle 3$



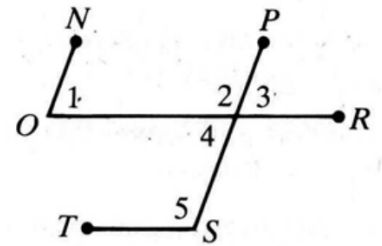
$ON // SP$



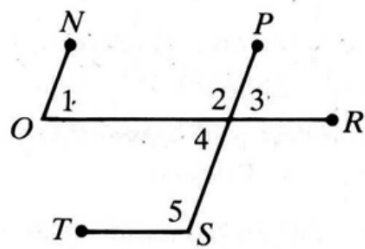
8) $\angle 1 \cong \angle 4$



$ON // SP$



9) $\angle 2 \cong \angle 5$

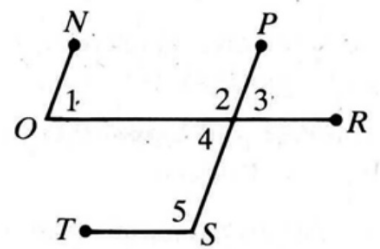


$\overleftrightarrow{OR} \parallel \overleftrightarrow{TS}$

10) $\angle 3 \cong \angle 5$



none



11) $\angle 4$ is supplementary to $\angle 5$



$\overleftrightarrow{OR} \parallel \overleftrightarrow{TS}$

