Section 3.3 - Day 2 - Proving Lines are Parallel

Congruent, supplementary or no conclusion?

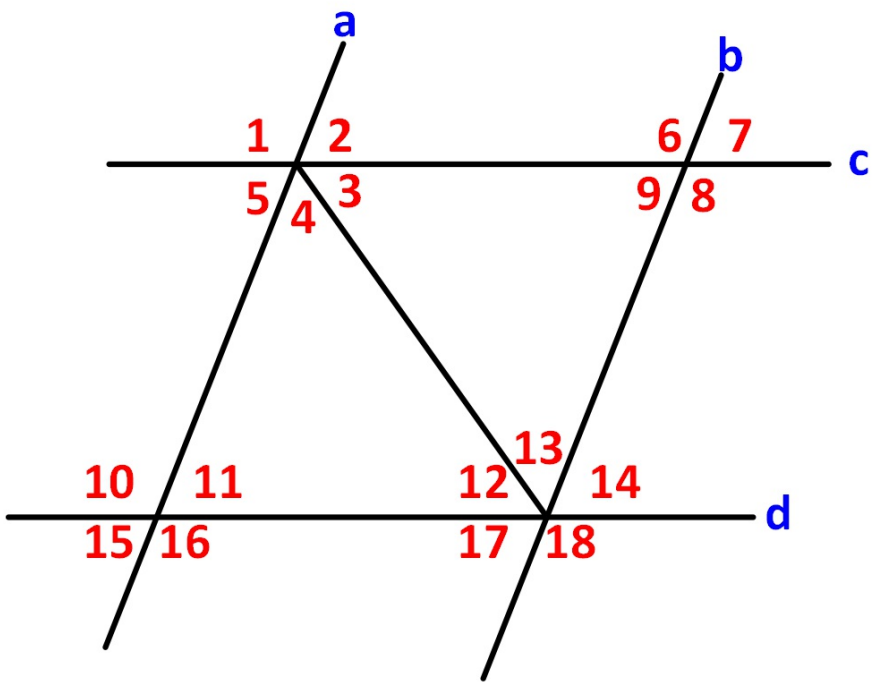
If a // b,

$\angle 3$ & $\angle 12$

$\angle 2$ & $\angle 7$

$\angle 2$ & $\angle 14$

$\angle 16$ & $\angle 17$



If c // d

$\angle 2$ & $\angle 11$

$\angle 2$ & $\angle 7$

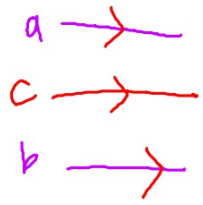
$\angle 8$ & $\angle 14$

$\angle 3$ & $\angle 12$

If 2 lines are cut by a transversal and

- corresponding angles are ≅
- alternate interior angles are ≅
- same side interior angles are supplementary

THEN THE TWO LINES ARE PARALLEL

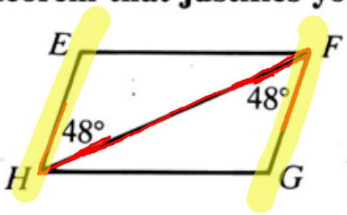


Ways to show two lines are parallel

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

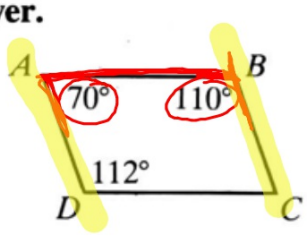
State which segments (if any) must be parallel. State the postulate or theorem that justifies your answer.

1.



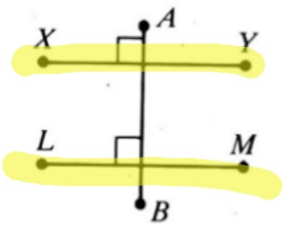
EH & FG
alt-int

2.



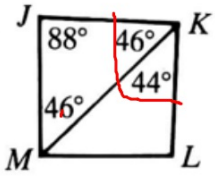
IF SSI = 180
THEN // cut by trans
SSI → //

3.



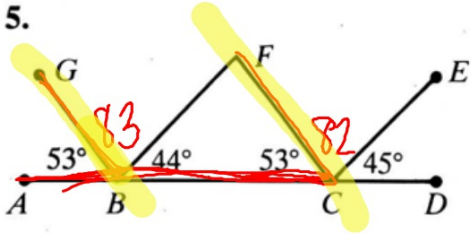
XY & LM
If 2 lines are perp to a third line, then they are // to each other

4.



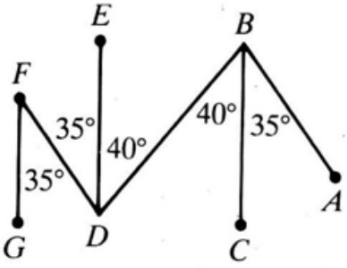
none

5.



BG & FC
corr

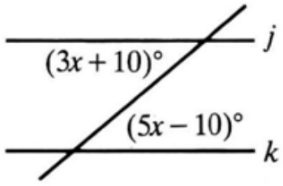
6.



FG & ED; ED & BC
FD & BA; FG & BC
alt-int

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

18.

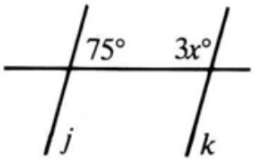


$3x + 10 = 5x - 10$

$20 = 2x$

$x = 10$

19.

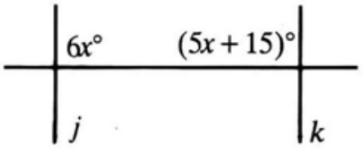


$75 + 3x = 180$

$3x = 105$

$x = 35$

20.



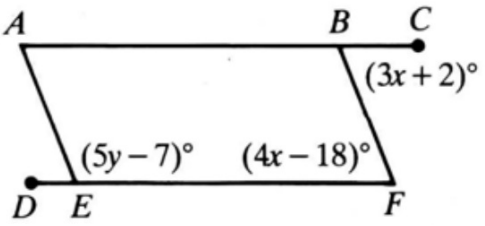
$6x + 5x + 15 = 180$

$11x = 165$

$x = 15$

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

21.



3x + 2 = 4x - 18

x = 20

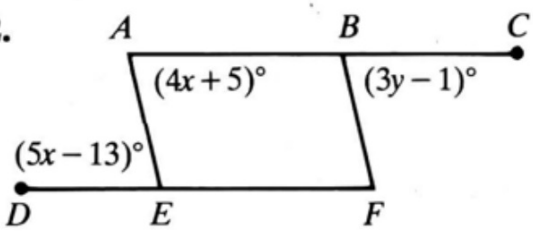
5y - 7 = 4(20) - 18 = 180

5y + 55 = 180

5y = 125

y = 5

22.



5x - 13 = 4x + 5

x = 18

4(18) + 5 = 3y - 1

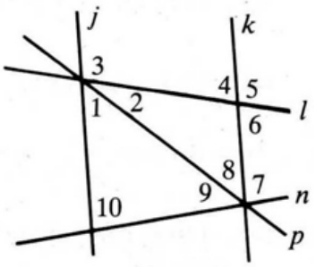
78 = 3y

y = 26

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

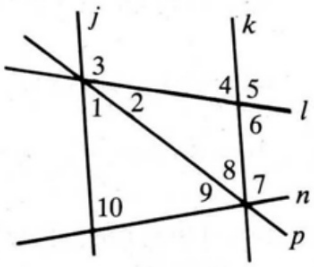
1) $\angle 1 \cong \angle 8$

j //k



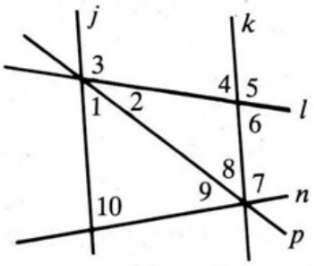
2) $\angle 4 \cong \angle 6$

none



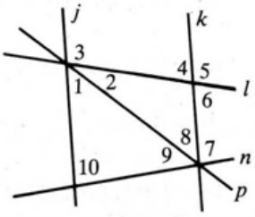
3) $\angle 10 \cong \angle 7$

j //k

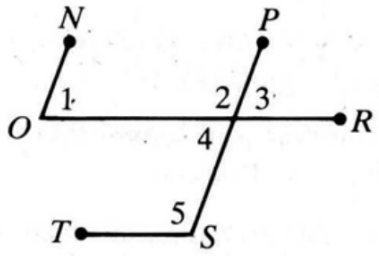


4) $m(\angle 3) + m(\angle 4) = 180$

j //k



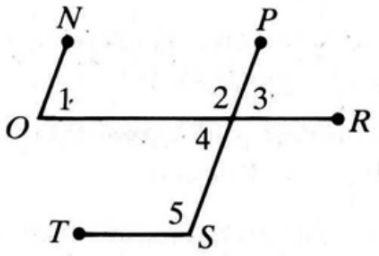
9) $\angle 2 \cong \angle 5$



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

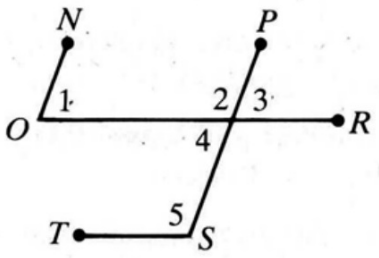
10) $\angle 3 \cong \angle 5$

none



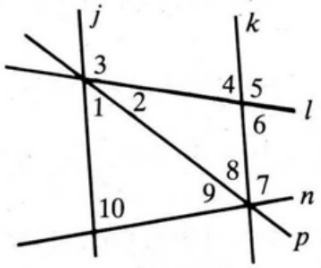
11) $\angle 4$ is supplementary to $\angle 5$

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



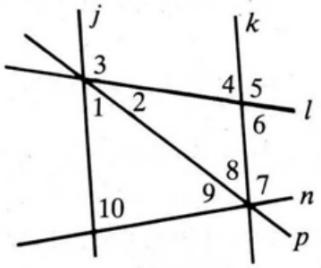
5) $\angle 5 \cong \angle 3$

j //k



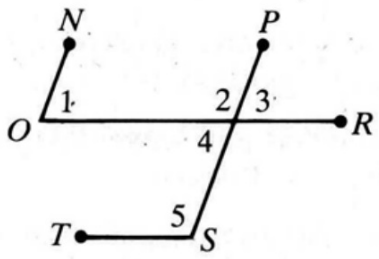
6) $\angle 6 \cong \angle 7$

none



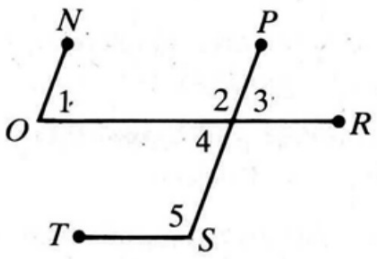
7) $\angle 1 \cong \angle 3$

$\overleftrightarrow{ON}$ // $\overleftrightarrow{SP}$



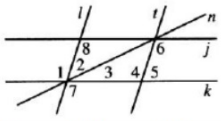
8) $\angle 1 \cong \angle 4$

$\overleftrightarrow{ON}$ // $\overleftrightarrow{SP}$

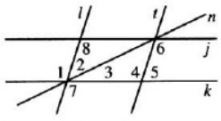


1-10: What two lines (if any) are parallel if the given information is true?

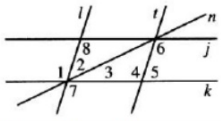
1) $m(\angle 1) = m(\angle 4)$



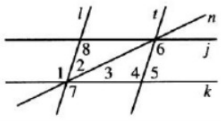
2) $m(\angle 6) = m(\angle 4)$



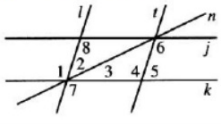
3) $m(\angle 2) + m(\angle 3) = m(\angle 5)$



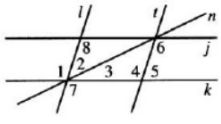
4) $m(\angle 2) + m(\angle 3) + m(\angle 8) = 180$



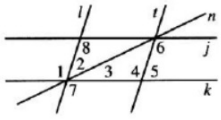
5) $\angle 6 \cong \angle 8$



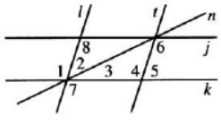
6) $\angle 7 \cong \angle 1$



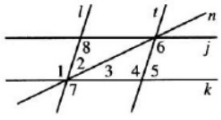
7) $m(\angle 1) = m(\angle 8) = 75$



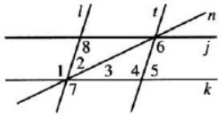
8) $\angle 5$ and $\angle 6$ are supplementary



9) $\angle 4$ and $\angle 5$ are supplementary



10) $\angle 2$ and $\angle 3$ are complementary and $m(\angle 5) = 90$

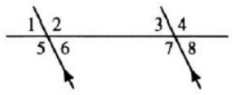


11-12: Complete with *always, sometimes,* or *never*.

11) Two skew lines are _____ parallel.

12) In a plane, two lines perpendicular to a third line are _____ _____ parallel.

13-15: Refer to the diagram below.

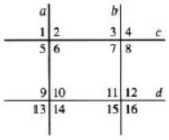


13) Name a pair of congruent alternate interior angles.

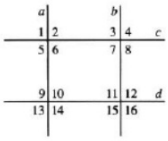
14) Name a pair of supplementary same-side interior angles.

15) Name a pair of congruent corresponding angles.

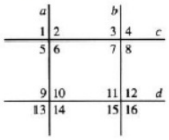
16) If $m(\angle 8) + m(\angle 12) = 180$, then ___ || ___.



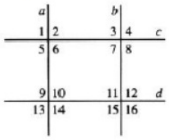
17) If $c \parallel d$ and $m(\angle 6) = 90$, then $m(\angle 5) =$ _____ and $m(\angle 9) =$ _____.



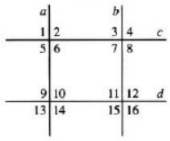
18) If $\angle 7 \cong \angle 15$ then ___ || ___.



19) If $\angle 11 \cong \angle 14$ then ___ || ___.



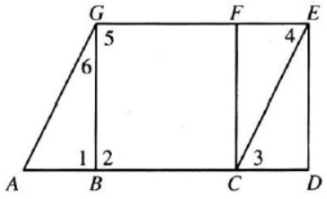
20) If $a \parallel b$, name all angles congruent to $\angle 1$.



Proving Lines Parallel

For use after Section 3–3

Use the information given to name the segments that must be parallel. If there are no such segments, write *none*.

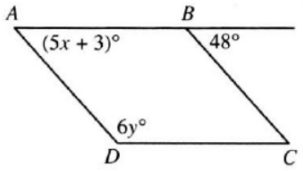


Exs. 1–9

1. $m\angle A = m\angle 3$ _____
2. $m\angle 3 = m\angle 4$ _____
3. $\overline{GB} \parallel \overline{FC}$ and $\overline{ED} \parallel \overline{FC}$ _____
4. $m\angle 3 + m\angle AGF = 180$ _____
5. $m\angle D + m\angle 2 = 180$ _____
6. $\angle D \cong \angle 1$ _____
7. $m\angle 6 + m\angle 5 = 180 - m\angle A$ _____
8. $\overline{GB} \perp \overline{AD}$ and $\overline{ED} \perp \overline{AD}$ _____
9. $\angle 5 \cong \angle 1$ _____

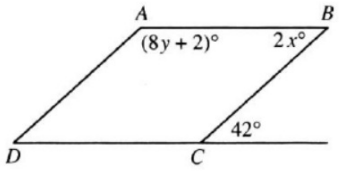
Find the values of x and y that make $\overline{AB} \parallel \overline{DC}$ and $\overline{AD} \parallel \overline{BC}$.

10.



$x =$ _____, $y =$ _____

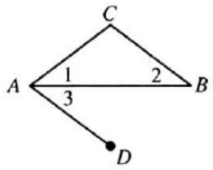
11.



$x =$ _____, $y =$ _____

Supply the statements or reasons needed to complete the proof.

12. Given: $\overrightarrow{AB}$ bisects $\angle CAD$;
$\angle 1 \cong \angle 2$
Prove: $\overline{AD} \parallel \overline{BC}$



Proof:

Statements	Reasons
1. $\overrightarrow{AB}$ bisects $\angle CAD$.	1. _____
2. $\angle 3 \cong \angle 1$	2. _____
3. _____	3. Given
4. $\angle 3 \cong \angle 2$	4. _____
5. $\overline{AD} \parallel \overline{BC}$	5. _____
	_____