Linear Pair Theorem

As we have already learned, a straight path always has an angle measure of 180˚. A **linear pair** is a straight path that has been broken into exactly two angles. Because these two angles together form a line, then that means the two angles together must add to equal 180˚.

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| **Given**…means that the problem either tells you or shows you that something is true. | **Linear Pair Theorem**…means that if two angles are a linear pair, then their measures will add to equal 180˚. |
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|  | Given: *x* = 2 and *AB* = 3*x* + 1 $\leftarrow the given problem$Prove: *AB* = 7 $\leftarrow the solution you want to get$ |  |  | Given: $∠LMN and ∠NMP are a linear pair$Prove: $m∠LMN+m∠NMP=180˚$ |  |
|  | *x* = 2 and *AB* = 3*x* + 1  | **GIVEN** |  |  | $$∠LMN and ∠NMP $$$$are a linear pair$$ | Given |  |
|  | *AB* = 3(2) + 1 | Substitution |  |  |  |
|  | *AB* = 7 | Simplify |  |  | $$m∠LMN+m∠NMP=180˚$$ | **LINEAR PAIR THM.** |  |
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We now know the following 10 properties (as well as a few more): Reflexive, Symmetric, Substitution, Simplify, Addition Prop. of Equality, Subtraction Prop. of Equality, Multiplication Prop. of Equality, Division Prop. of Equality, **GIVEN (the setup—what’s told to you or shown to you in the problem)**, and **LINEAR PAIR THEOREM (if two angles are a linear pair, then they add to equal 180˚)**.

The proofs below will only use properties form this list of 10. Be aware that **EVERY STEP** must now have an explanation from our list of properties.

**Fill in the blanks.**

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| 1. |  |  | 2. |  |
| Given: $∠5 and ∠6 are a linear pair. $ $m∠5=25˚$Prove: $m∠6=155˚$ |  | Given:Prove: $m∠ABD=150˚$ |
| $$∠5 and ∠6 are$$$$a linear pair$$ |  |  | $$m∠DBC=30˚$$ |  |
| $$m∠5=25˚$$ |  |  | $$m∠ABD+m∠DBC=180˚$$ |  |
| $$m∠5+m∠6=180˚$$ |  |  | $$m∠ABD+(30˚)=180˚$$ |  |
| $$(25˚)+m∠6=180˚$$ |  |  | $$m∠ABD=150˚$$ |  |
| $$m∠6=155˚$$ |  |  |  |  |

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| 3. |  |  | 4. |  |
| Given: $m∠3=\left(6x-4\right)˚ and x=5$Prove: $m∠3=26˚$ |  | Given: $5=\frac{1}{3}x$Prove: $x=15$ |
| $$m∠3=\left(6x-4\right)˚ and x=5$$ |  |  | $$5=\frac{1}{3}x$$ |  |
| $$m∠3=\left(6\left(5\right)-4\right)˚$$ |  |  | $$15=x$$ |  |
| $$m∠3=26˚$$ |  |  | $$x=15$$ |  |

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| 5. |  |  | 6. |  |
| Given: $4x-7=5x-4$Prove: $5x-4=-19$ |  | Given: $m∠G=\left(x+3\right)˚, m∠H=\left(2x\right)˚$,  $∠G \& ∠H are a linear pair$Prove: $x=59$ |
| $$4x-7=5x-4$$ |  |  | $$m∠G=\left(x+3\right)˚, $$$m∠H=\left(2x\right)˚$, $∠G \& ∠H are a linear pair$ |  |
| $$-7=x-4$$ |  |  | $$m∠G+m∠H=180˚$$ |  |
| $$-3=x$$ |  |  | $$\left(x+3\right)˚+\left(2x\right)˚=180˚$$ |  |
| $$x=-3$$ |  |  | $$\left(3x+3\right)˚=180˚$$ |  |
| $$5x-4=5x-4$$ |  |  | $$\left(3x\right)˚=177˚$$ |  |
| $$5x-4=5(-3)-4$$ |  |  | $$x=59$$ |  |
| $$5x-4=-19$$ |  |  |  |  |

**Solve each problem and explain each step.**

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| 7. |  |  | 8. |  |
| Given: $∠A \& ∠B are a linear pair$, $m∠A=104˚$Prove: $m∠B=76˚$ |  | Given: $m∠LMN=\left(5x\right)˚, m∠NMP=\left(4x\right)˚$ $∠LMN \& ∠NMP are a linear pair$Prove: $x=20$ |
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| 9. |  |  | 10. |  |
| Given: $x=41, and DE=2x+1$Prove: $DE=83$ |  | Given: $5x+8=6x$Prove: $x=8$ |
|  |  |  |  |  |