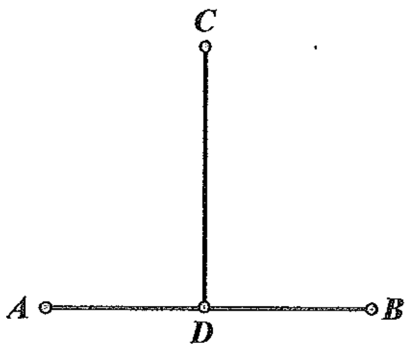
Geometry 22 **Making Conclusions Activity (before proofs)** Name ANSWERS date_____

Mark the diagrams with the given information, then state the conclusion that can be made based on the given reason.

1) If $\overline{CD}$ is the perpendicular bisector of $\overline{AB}$, then...



$\overline{AD}$ ≅ $\overline{DB}$ by definition of bisector

$\overline{CD}$ ⊥ $\overline{AB}$ by definition of perpendicular

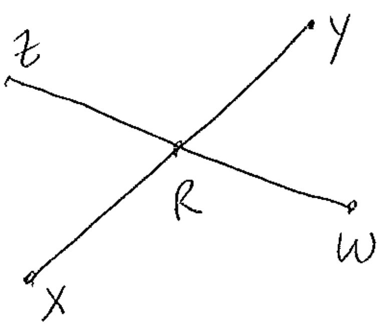
< ADC is a right angle by defn. of perpendicular

< CDB is a right angle by defn. of perpendicular

< ADC and < CDB are supplementary by linear pair postulate

m< ADC + CDB = 180° by definition of supplementary

2) If $\overline{XY}$ intersects $\overline{ZW}$ at point R, then... (draw the diagram yourself this time☺)



< ZRX and < YRW are <u>vertical angles</u> by defn. of vertical <'s

< ZRY and < XRW are Vert. ∡'s by defn. of vertical <'s

****VERTICAL ANGLES THEOREM** says if 2 angles are vertical angles, then they are congruent. Then it follows that...

< ZRX ≅ < YRW by Vertical Angles Theorem

< ZRY ≅ < XRW by Vertical Angles Theorem

m< ZRY = m< XRW by definition of congruent

~~~~~~

< XRZ and < ZRY are linear pair by defn. of linear pr.

< ZRY and < YRW are " by defn. of linear pr.

< YRW and < WRX are " by defn. of linear pr.

< WRX and < XRZ are " by defn. of linear pr.

****LINEAR PAIR PROPERTY** says if 2 angles form a linear pair, then they are supplementary. Which means we can use this reason to state any of the linear pairs are supplementary. Then it follows that...

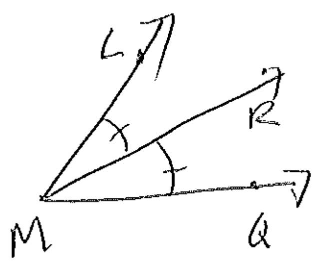
m< XRZ + m< ZRY =180 by defn of supplementary

m< ZRY + m< YRW =180 by defn of ________________

m< YRW + m< WRX =180 by defn of ________________

m< WRX + m< XRZ =180 by defn of ________________
~~~~~~

3) If $\overrightarrow{MR}$ is an angle bisector of < LMQ, then...(again, you draw the diagram)



$\angle LMR \cong \angle RMQ$ by definition of angle bisector

$m\angle LMR = m\angle RMQ$ by definition of congruent

$m\angle LMR + m\angle RMQ = m\angle LMQ$ by Angle Addition Postulate

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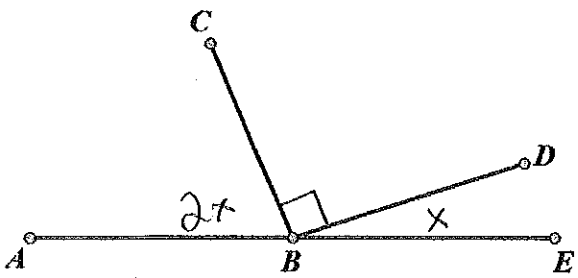
4) If m<DBE = x and m<ABC is twice as much as m<DBE, and $\overline{CB} \perp \overline{BD}$ then... (label the diagram first!)



$\angle CBD$ is a right $\angle$ by defn. of perpendicular

$m\angle CBD = 90°$ by definition of right angle

m<ABC + $m\angle CBD$ + $m\angle DBE$ = $m\angle ABE$ by Angle Addition Post.

$2x$ + 90 + x = 180 by substitution (ready to solve)

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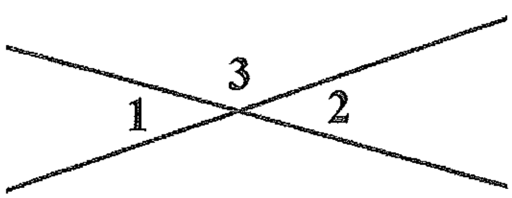
5) For this one, look at the diagram and make as many conclusions with reasons that you can...



$\angle 1$ & $\angle 2$ are vert $\angle$s by Defn. vert $\angle$

$\angle 1 \cong \angle 2$ by Vert. $\angle$ Thm

$\angle 1$ & $\angle 3$ are lin pr. by Definition of Lin. Pr.

$\angle 2$ & $\angle 3$ " by "

$\angle 2$ & $\angle 3$ are supplem. by Lin. Pr. Post

$\angle 1$ & $\angle 3$ are supplem by "

$m\angle 1 = m\angle 3$ by Defn. $\cong$

$m\angle 2 = m\angle 3$ Defn. $\cong$

Name______________________________Period_____Date__________

Geometry 21: Practice with Proofs!

Directions: Complete each of the following proofs.

1. Given: $-2(3x-4)=3x+12$ Prove: $x=-4/9$

Statements	Reasons
1. $-2(3x-4)=3x+12$	1. Given
2. $-6x+8=3x+12$	2 Distrib.
3. $6x=6x$	3 Reflexive
4. $8=9x+12$	4 Addition
5. $-4=9x$	5 Subtraction
6. $-4/9=x$	6 Division
7. $x=-4/9$	7 Symmetric

3. Given: $3(2x+5)=-2(x-6)$ Prove: $x=-3/8$

Statements	Reasons
1. $3(2x+5)=-2(x-6)$	1 Given
2. $6x+15=-2x+12$	2 Distributive
3. $8x+15=12$	3 Addition
4. $8x=-3$	4 Subtraction
5. $x=-3/8$	5 Division

4. Given: $\frac{1}{3}(x-9)=3x+4$ Prove: $x=-\frac{21}{8}$

Note, you may not need all spaces provided

Statements	Reasons
1. $\frac{1}{3}(x-9)=3x+4$	1 Given
2 $x-9=9x+12$	2 Mult.
3 $-9=8x+12$	3 Subtraction $(-x)$
4 $-21=8x$	4 Subtraction
5 $-\frac{21}{8}=x$	5 Division
6 $x=\frac{-21}{8}$	6 Symmetric

2. Given: $9=4x-3(x-2)$ Prove: $x=3$

Statements	Reasons
1. $9=4x-3(x-2)$	1 Given
2. $9=4x-3x+6$	2 Distrib.
3. $9=x+6$	3 Simplify
4. $6=6$	4 Reflexive
5. $3=x$	5 Subtraction
6. $x=3$	6 Symmetric

For the following problems state the property of equality that allows you to justify the conclusion.

5. Given: $x+4=6$

   Conclusion: $x=2$

   Subtraction

6. Given: $\frac{1}{2}x=8$

   Conclusion: $x=16$

   Mult.

7. Given: $x+y+z=10$ and $y=x$

   Conclusion: $y+y+z=10$

   Substitution

8. Given: $x=a$ and $a=6$

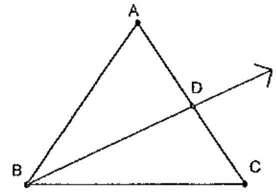
   Conclusion: $x=6$

   transitive

Complete the following Geometric Proofs.

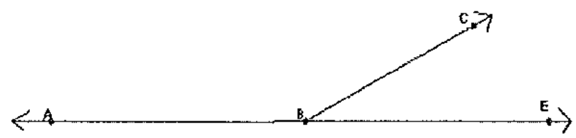
9. Given: $\overrightarrow{BD}$ bisects ∠ABC; m∠ABD + m∠C = 90°

Prove: ∠DBC and ∠C are complementary



Statements	Reasons
1. $\overrightarrow{BD}$ bisects ∠ABC	1) Given
2. ∠ABD ≅ ∠DBC	2) Defn. bisect
3. m∠ABD = m∠DBC	3) Defn. ≅
4. m<ABD + m<C = 90°	4) Given
5. m∠DBC + m∠C = 90°	5) Substitution
6. <DBC & ∠C are complem.	6) Defn. complem.

10. Given: m∠ABC = 5y - 3
m∠CBE = 2y + 1



Prove: y = 26

Statements	Reasons
1. m<ABC = 5y - 3 m<CBE = 2y + 1	1. Given
2. <*ABC* and <*CBE* form a linear pair	2. Definition of Linear Pair (you get this from the picture)
3. <ABC and <CBE are supplementary	3. Linear Pair Property
4. m<ABC + m<CBE = 180 ~~Supplem.~~	4. Defn. Supplementary
5. 5y - 3 + 2y + 1 = 180	5. Substitution
6. 7y - 2 = 180	6. Simplify
7. 7y = 182	7. Add. Prop. Eq.
8. y = 26	8. Divis. Prop. Eq.

ANSWERS

Geometry Proofs Worksheet
After lesson #2.5

Name the property of equality that justifies each statement:

1. If $3x + 7 = 12$, then $3x = 5$ — Subtraction
2. If $2(x+5) = 13$, then $2x + 10 = 13$ — Distributive

3) If $5x = 7$, then $x = \frac{7}{5}$ — Division
4) If $AB = CD$, then $AB + EF = CD + EF$ — Addition
5) If $m\angle A + m\angle B = 180$ and $m\angle B = 30$, then $m\angle A + 30 = 180$ — Substitution
6) If $x + 4 = -3$, then $x = -7$ — Subtraction
7) If $y = 2x + 3$ and $x = 2$, then $y = 7$ — Substitution
8) If $\frac{1}{2}m\angle F = \frac{1}{2}m\angle G$, then $m\angle F = m\angle G$ — Multiplication
9) If $AB + BC = AC$ and $AC = EF + GH$, then $AB + BC = EF + GH$ — Substitution
10) If $m\angle A = 90$ and $m\angle B = 90$, then $m\angle A = m\angle B$ — Substitution
11) $m\angle A = m\angle A$ — Reflexive
12) If $m\angle 1 = m\angle 2$, then $m\angle 2 = m\angle 1$ — Symmetric
13) If $AB + BC = 12$, then $BC = 12 - AB$ — Subtraction
14) If $x + y = 9$ and $x - y = 12$, then $2x = 21$ — Addition
15) If $AB - CD = EF - CD$, then $AB = EF$ — ~~Subtra~~ Addition
16) If $5 = x$, then $x = 5$ — Symmetric
17) If $\frac{1}{2}x = 9$, then $x = 18$ — Mult.
19) If $2AB = 2CD$, then $AB = CD$ — Division

Given: $\frac{2}{3}x = -8$ Prove: $x = -12$

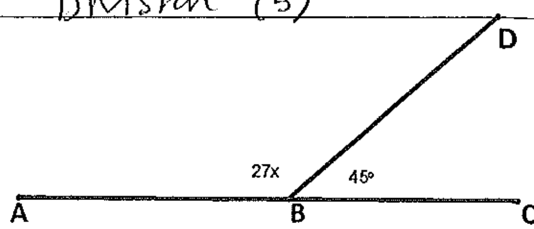
Statement	Reason
$\frac{2}{3}x = -8$	Given
$2x = -24$	Mult.
$x = -12$	Division

Given: $2x - 7 = \frac{1}{3}x - 2$ Prove: $x = 3$

Statement	Reason
$2x - 7 = \frac{1}{3}x - 2$	Given
$3(2x - 7) = 3(\frac{1}{3}x - 2)$	Multiplication
$6x - 21 = x - 6$	Distributive
$5x - 21 = -6$	Subtraction (x)
$5x = 15$	Addition (21)
$X = 3$	Division (5)

Given: m< ABD = 27x ; m<DBC = 45

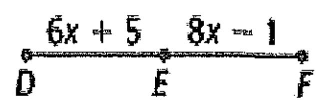
Prove: 5 = x



Statement	Reason
1) m<ABD = 27x , m<DBC = 45	1) given
2) <ABD and <DBC form a linear pair	2) Defn. Lin. pr.
3) <ABD & <DBC are supplementary	3) Linear Pair Postulate
4) $m\angle ABD + m\angle DBC = 180°$	4) Defn. supplementary
5) $27x + 45 = 180$	5) substitution POE
6) $45 = 45$	6) Reflexive
7) $27x = 135°$	7) Subtraction (45)
8) $X = 5$	8) Division (27)
9) $5 = x$	9) Symmetric

Given: E is the midpoint of $\overline{DF}$

Prove: $x = 3$



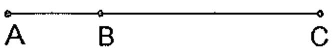
Statements	Reasons
1. $DE = 6x + 5$ and $EF = 8x - 1$	1. Given
2. E is the midpoint of $\overline{DF}$	2. Given
3. $\overline{DE} \cong \overline{EF}$	3. Defn. midpt.
4. $DE = EF$	4. Defn. $\cong$
5. $6x + 5 = 8x - 1$	5. Substitution
6. $5 = 2x - 1$	6. Subtraction (6x)
7. $6 = 2x$	7. Addition (1)
8. $3 = x$	8. Division (2)
9. $x = 3$	9. Symmetric

♡ Geometry

PROOFS: *Practice using Postulates and Definitions in Proofs* Name ANSWERS

(ch 1 & 2 ~ seg. add. post., angle add. post, lin. prs., suppl., compl., midpoint, bisect, vertical angles, right angles)

SEGMENT ADDITION POSTULATE:

If  then, AB + BC = AC

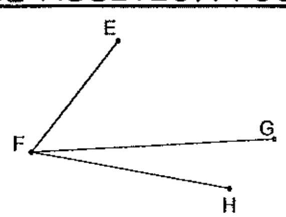
Proof using Segment Addition Postulate;

Given: AB = CD

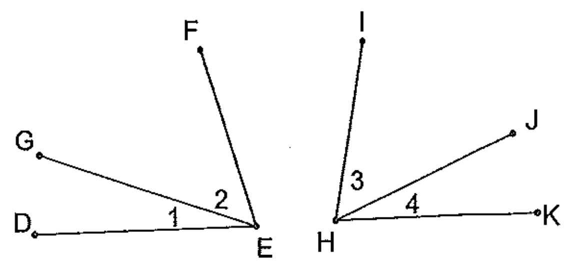
Prove: $\overline{AC} \cong \overline{BD}$

STATEMENTS	REASONS
1) AB = CD	1) Given
2) AB + BC = CD + BC	2) Add. POE (BC)
3) AB + BC = AC BC + CD = BD	3) Segment Addition Postulate
4) AC = BD	4) Substitution
5) $\overline{AC} \cong \overline{BD}$	5) Defn. $\cong$

ANGLE ADDITION POSTULATE:

If  then m<EFG + m<GFH = m<EFH

Proof using Angle Addition Postulate:



Given: $<DEF \cong <IHK$; $<1 \cong <3$

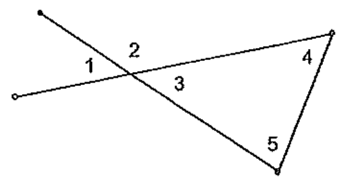
Prove: $<2 \cong <4$

STATEMENTS	REASONS
1) <DEF ≅ <IHK ; <1 ≅ <3	1) given
2) m<DEF = m<IHK ; m<1 = m<3	2) defn. congruence
3) m<1 + m<2 = m<DEF ; m<3 + m<4 = m<IHK	3) angle addition postulate
4) m<1 + m<2 = m<3 + m<4	4) Substitution
5) m<1 + m<2 = m<1 + m<4	5) Substitution
6) m<2 = m<4	6) Subtraction (m<2)
7) <2 ≅ <4	7) definition of congruence

LINEAR PAIRS:

Definition of Linear pair (the definition just describes what they look like, so…diagram)
Linear Pair Postulate; If 2 <'s form a linear pair, then they are supplementary

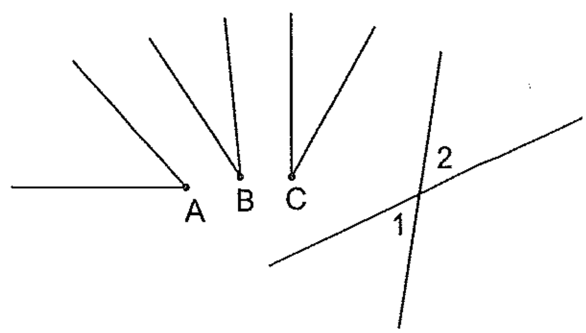
Proof using LINEAR PAIRS



Given: diagram at right
Prove: m<2 = m<4 + m<5

Statements	Reasons
1)	1) given
2) <2 and <3 form a linear pr.	2) Defn. Lin. Pr.
3) <2 ; <3 are supplem.	3) Linear Pair Postulate
4) m<2 + m<3 = 180	4) Defn. supplem.
5) m<3 + m<4 + m<5 = 180	5) triangle sum theorem (the 3 <'s of a triangle add up to 180)
6) m<2 + m<3 = m<3 + m<4 + m<5	6) Substitution
7) m<2 = m<4 + m<5	7) subtraction POE

COMPLEMENTARY ANGLES:



Given: $\angle B \cong \angle C$
<A and <B are complementary
<2 and <C are complementary
Prove: $m\angle A = m\angle 1$

STATEMENTS	REASONS
1) ∠B ≅ ∠C ; <A ; <B complem. ; <2 ; <C complem.	1) given
2) m<B = m<C	2) Defn. ≅
3) m<A + m<B = 90 m<2 + m<C = 90	3) definition of complementary
4) m<A + m<B = m<2 + m<C	4) Substitution POE
5) m<A + m<B = m<2 + m< B	5) substitution
6) m<A = m<2	6) Subtraction POE
7) <1 and <2 are vertical angles	7) Defn. Vert. ∡'s
8) ∠1 ≅ ∠2	8) Vertical angles theorem
9) m<1 = m<2	9) Defn. ≅
10) m<1 = m < A	10) Substitution
11) m<A = m<1	11) Symmetric

Name ANSWERS Period______Date__________

Geometry **Practice with 2.5 – Reasoning in Algebra and Geometry**

1. **Write a conclusion that can be drawn from each of the following statements.**

a. $\angle A \cong \angle B$

$m\angle A = m\angle B$

b. $EF = GH$

$\overline{EF} \cong \overline{GH}$

c. l bisects $\overline{AB}$ at point M

$\overline{AM} \cong \overline{MB}$

d. $\angle$A is a right angle $m\angle A = 90°$

e. $\angle 1$ and $\angle 2$ are supplementary

$m\angle 1 + m\angle 2 = 180°$

f. $\angle 1$ and $\angle 2$ form a linear pair

$\angle 1$ & $\angle 2$ supplem.

g. $\overline{AB} \perp \overline{BC}$ $\angle ABC$ is a rt. $\angle$ ($m\angle ABC = 90°$)

h. $\angle 1$ and $\angle 2$ are vertical angles

$\angle 1 \cong \angle 2$

i. $m\angle 1 = 50$, $m\angle 2 = 40$, $m\angle 3 = m\angle 1$

$m\angle 3 = 50°$

j. $\angle ABC$ and $\angle XYZ$ are congruent and supplementary

$\angle ABC$ & $\angle XYZ$ are rt $\angle$'s

k. C is the midpoint of $\overline{AB}$

$\overline{AC} \cong \overline{CB}$

2. **State the property that justifies each statement.**

a. If $\angle 1 \cong \angle 2$ and $\angle 2 \cong \angle 3$, then $\angle 1 \cong \angle 3$. Trans. Prop. $\cong$

b. $XY = XY$ Reflexive POE

c. If $5 = x$, then $x = 5$. Symmetric POE

d. If $2x + 5 = 11$, then $2x = 6$. Subtraction POE (5)

e. If $a + 10 = 20$, then $a = 10$. Subtraction POE (10)

f. If $\frac{x}{3} = -15$, then $x = -45$. Mult. Prop. $\cong$ (3)

g. If $4x - 5 = x + 12$, then $4x = x + 17$. Addition POE (5)

h. If $\frac{1}{5}BC = \frac{1}{5}DE$, then $BC = DE$. Mult. POE (5)

i. If $5(x + 7) = -3$, then $5x + 35 = -3$. Distributive Prop.

j. If $m\angle 1 = 25°$ and $m\angle 2 = 25°$, then $m\angle 1 = m\angle 2$. Substitution POE

k. If $\overline{AB} \cong \overline{BC}$ and $\overline{BC} \cong \overline{CD}$, then $\overline{AB} \cong \overline{CD}$. Transitive Prop. $\cong$

l. If $3(x - \frac{2}{3}) = 4$, then $3x - 2 = 4$ Distributive Prop

3. Fill in the reason that justifies each step.

a. $0.25x + 2x + 12 = 39$ — Given

$2.25x + 12 = 39$ — a. Simplify

$2.25x = 27$ — b. Subtraction (12)

$225x = 2700$ — c. Mult. POE (100)

$x = 12$ — d. Division POE (225)

b. $m\angle ABC = 80$ — Given

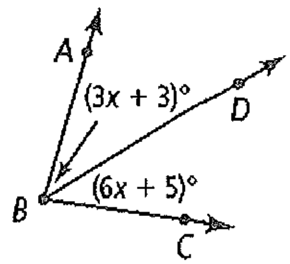
$m\angle ABD + m\angle DBC = m\angle ABC$ — Angle Addition Postulate

$(3x + 3) + (6x + 5) = 80$ — a. Substitution POE

$9x + 8 = 80$ — b. Simplify

$9x = 72$ — c. Subtraction POE

$x = 8$ — d. Division POE



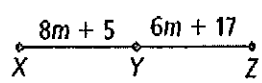
c. $XY = YZ$ — Given

$8m + 5 = 6m + 17$ — a. Given (diagram)

$2m + 5 = 17$ — b. Subtraction (6m)

$2m = 12$ — c. Subtraction (5)

$m = 6$ — d. Division POE (2)



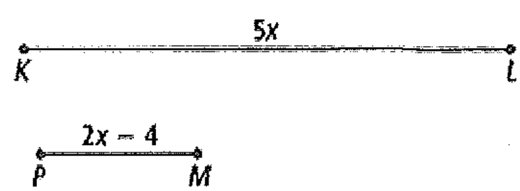
d. $KL=3(PM)$ — Given

$5x = 3(2x - 4)$ — a. Substitution

$5x = 6x - 12$ — b. Distributive

$-x = -12$ — c. Subtraction

$x = 12$ — d. Multiplication



4. **Name the property of equality or congruence that justifies going from the first statement to the second statement.**

a. $\overline{XY} \cong \overline{TZ}$
$\overline{TZ} \cong \overline{XY}$ Symmetric Prop. $\cong$

b. $3(x+2)=15$
$3x+6=15$ Distributive

c. $4n+6-2n=9$
$2n+6=9$ Simplify

d. $\angle A \cong \angle B$ and $\angle B \cong \angle C$
$\angle A \cong \angle C$ Transitive Prop. $\cong$

5. **Complete the following algebraic proofs.**

a. Given: $\frac{8-3x}{4}=32$ Prove: $x=-40$

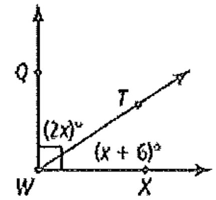
Statements	Reasons
1. $\frac{8-3x}{4}=32$	1. Given
2. $8-3x=128$	2. Mult. POE (4)
3. $-3x=120$	3. Subtraction Prop. of Eq.
4. $x=-40$	4. Division POE

b. Given: $\frac{1}{5}x+3=2x-24$ Prove: $x=15$

Statements	Reasons
1. $\frac{1}{5}x+3=2x-24$	1. Given
2. $x+15=10x-120$	2. Multiplication Prop. of Eq.
3. $15=9x-120$	3. Subtraction Prop. of Eq.
4. $135=9x$	4. Add. Prop. Eq.
5. $15=x$	5. Division Prop. of Eq.
6. $x=15$	6. Symmetric Property of Eq.

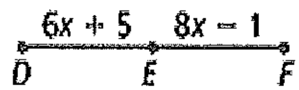
6. **Complete the following proofs.**

a. Given: $\angle QWT$ and $\angle TWX$ are complementary
Prove: $x = 28$



Statements	Reasons
1. $\angle QWT$ and $\angle TWX$ are complementary	1. Given
2. $m\angle QWT = (2x)°$ and $m\angle TWX = (x+6)°$	2. Given
3. $m\angle QWT + m\angle TWX = 90°$	3. Defn. complem.
4. $2x + x + 6 = 90°$	4. Substitution
5. $3x + 6 = 90°$	5. Simplify
6. $3x = 84$	6. Subtraction
7. $x = 28$	7. Division

Given: E is the midpoint of $\overline{DF}$; DE = 6x + 5 ; EF = 8x - 1
Prove: $x = 3$



Statements	Reasons
1. $DE = 6x + 5$ and $EF = 8x - 1$	1. Given
2. E is the midpoint of $\overline{DF}$	2. Given
3. $\overline{DE} \cong \overline{EF}$	3. Defn. midpt.
4. $DE = EF$	4. Defn. $\cong$
5. $6x + 5 = 8x - 1$	5. Substitution
6. $5 = 2x - 1$	6. Subtraction (6x)
7. $6 = 2x$	7. Addition (1)
8. $3 = x$	8. Division (2)
9. $x = 3$	9. Symmetric