Introduction to Flow Chart Proofs

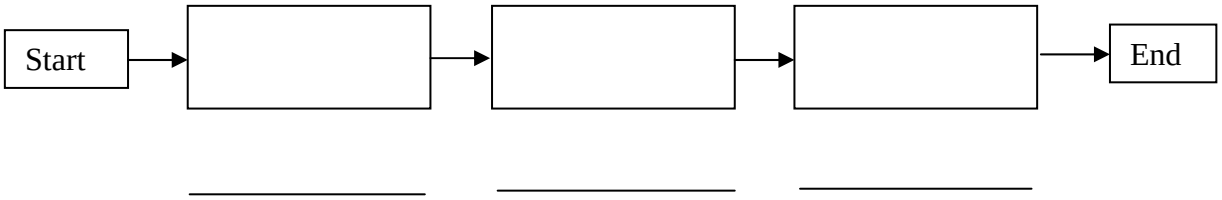
A **flow chart** proof is a concept map that shows the statements and reasons needed for a proof in a structure that helps to indicate the logical order. Statements, written in the logical order, are placed in the boxes. The reason for each statement is placed under that box.

1. a. Cut out the individual boxes of statements and reasons at the bottom of the page.

   b. Arrange the statements and reasons to prove the following conditional:

   If 3x 15 = 150 then x = 55.

   c. Copy the statements and reasons in the proper order on the flowchart displayed below. Place the statements in the boxes and the reasons on the lines below the boxes.



_____ _____ _____

   d. What is the statement in the first box? How does it relate to the conditional?

   e. What is the statement in the last box? How does it relate to the conditional?

Cut out:

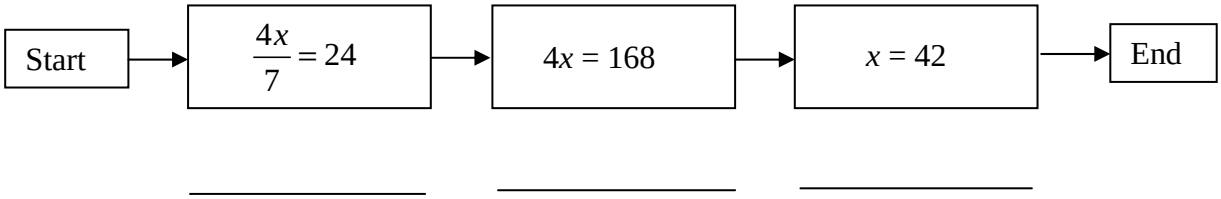
$x = 55$	Addition Property of Equality	$3x = 165$
Division Property of Equality	$3x \quad 15 = 150$	Given equation

Introduction to Flow Chart Proofs (Continued)

2. Prove the following conditional:

$$\textit{If } \frac{4x}{7} = 24\textit{, then } x = 42.$$

a. The statements are already entered into the flowchart. Write the correct reasons below each box.



_____ _____ _____

b. What is the statement in the first box? How does it relate to the conditional?

c. What is the statement in the last box? How does it relate to the conditional?

3. Prove the following conditional:

If 3x + 28 = 58, then x = 10.

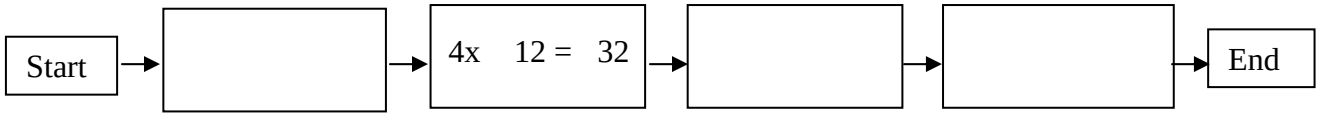
Write the correct statements and reasons in the flowchart to prove the conditional above.

_____ _____ _____

4. Given the conditional:

If 5x 12 = x 32, then x = -5.

Write the correct statements and reasons in the flowchart to prove the conditional above.



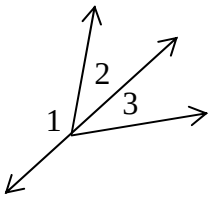
_____ _____ Addition Property _____

Introduction to Flow Chart Proofs (Continued)

5. The flowchart proof can be used to show the logical process in a proof of a geometric idea. For example, given the following conditional:

   If 1 and 2 are supplementary and 2 3, then m 1 + m 3 = 180 .

   a. State the given and prove for this conditional.

   Given:

   Prove:

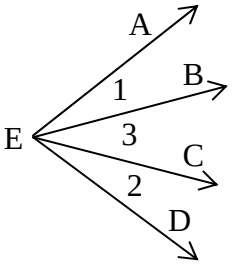
   b. Sort the slips of paper from the envelope into statements and reasons. Then arrange the statements and reasons on the flowchart to give a logical proof of the conditional.

   c. What is the statement in the first box? How does it relate to the conditional?

   d. What is the statement in the last box? How does it relate to the conditional?

6. Prove the following conditional:

   If m 1 = m 2, then m AEC = m BED.

   a. State the given and prove for this conditional.

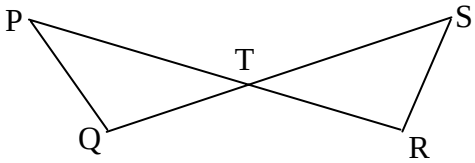
   Given:

   Prove:

   b. Sort the slips of paper from the envelope into statements and reasons. Then arrange the statements and reasons on the flowchart to give a logical proof of the conditional.

7. Prove the following conditional:

   If $\overline{\text{PR}}$ *and* $\overline{\text{QS}}$ *bisect each other at T, then* $\Delta\text{PQT} \cong \Delta\text{RST}$.

   a. State the given and prove for this conditional.

   Given:

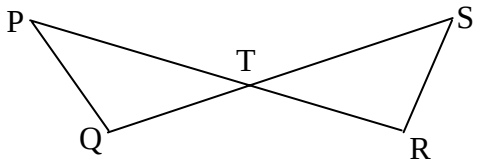
   Prove:

   b. Sort the slips of paper from the envelope into statements and reasons. Then arrange the statements and reasons on the flowchart to give a logical proof of the conditional.

Introduction to Flow Chart Proofs (Continued)

8. Prove the following conditional:

   If $\overline{PR}$ *and* $\overline{QS}$ *bisect each other at T, then* $\angle P \cong \angle R$.



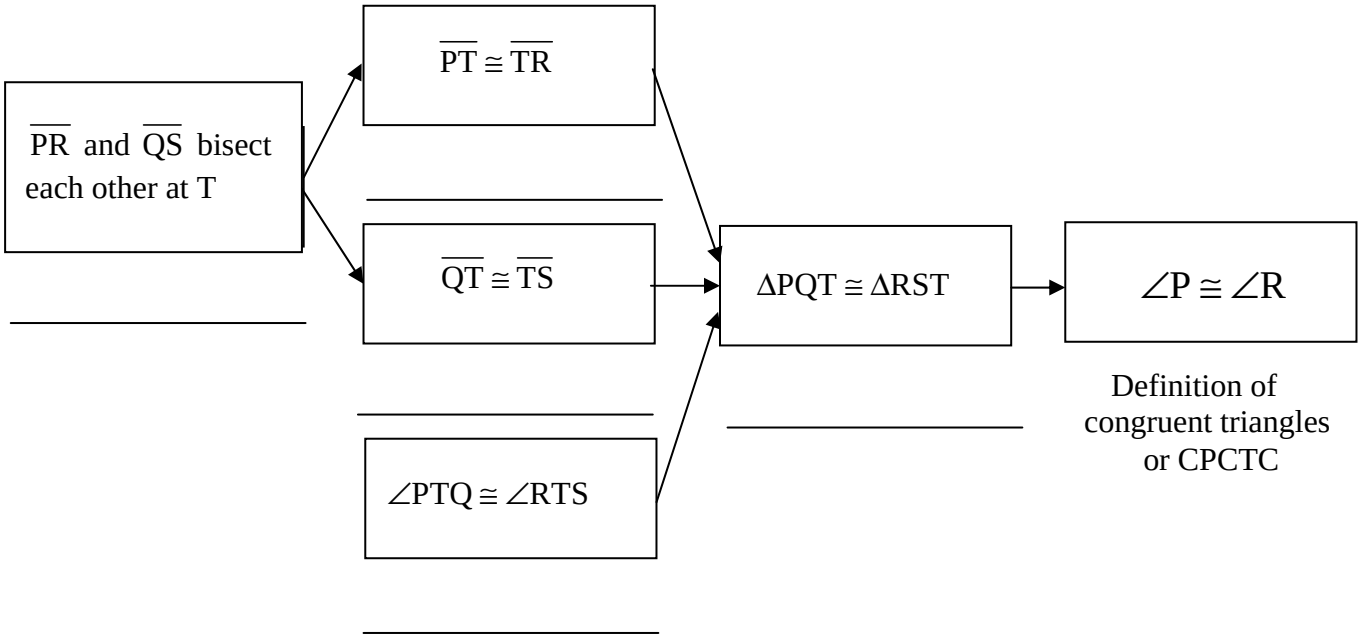
   a. Complete the following:

      Given:

      Prove:

   b. Mark the information that is given on the diagram.

   c. Complete the missing parts of the flow chart proof.



Introduction to Flow Chart Proofs (Continued)

9. If A and B are complementary and B and C are complimentary, then A C.

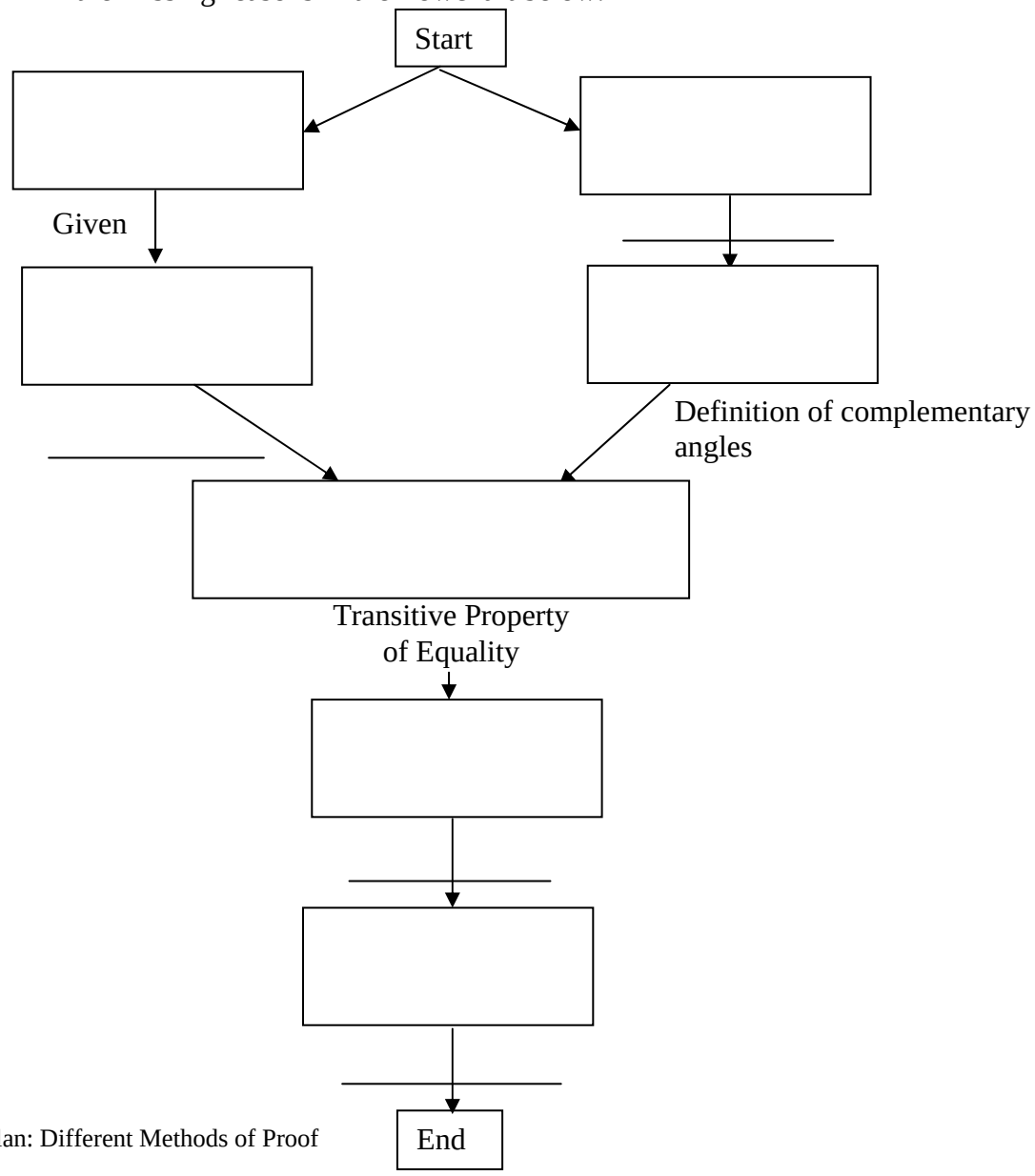
   a. Draw a diagram for this conditional.

   b. State the given and prove for this conditional in terms of the diagram.

      Given:

      Prove:

   c. Fill in the missing reasons in the flowchart below.



Introduction to Flow Chart Proofs (Continued)

Statements and Reasons for problem 5 flowchart proof

1 and 2 are supplementary	Given
m 1 + m 3 = 180	Definition of congruent angles
m 1 + m 2 = 180	Substitution property of equality
2 3	Definition of supplementary angles
m 2 = m 3	Given

Statements and Reasons for problem 6 flowchart proof

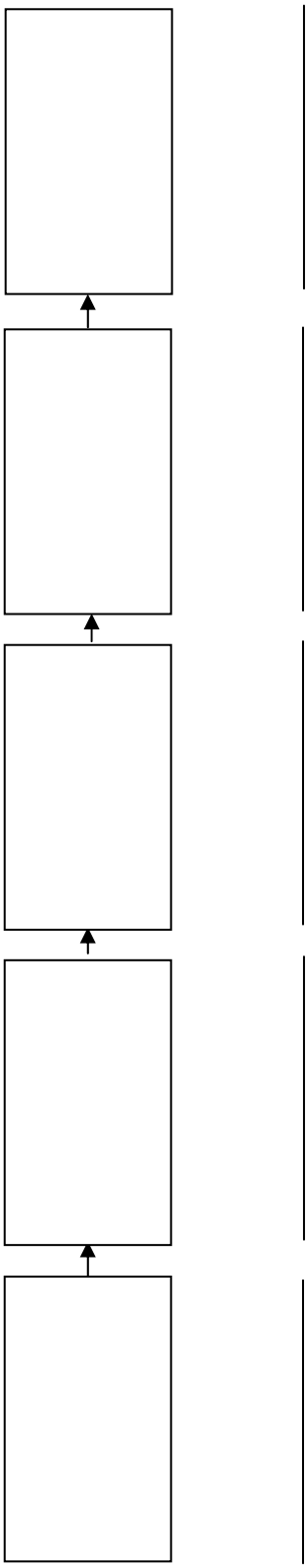
m 1 = m 2	Angle addition postulate
m 1 + m 3 = m 2 + m 3	Substitution property of equality
m AEC = m 1 + m 3 m BED = m 2 + m 3	Given
m AEC = m BED	Addition property of equality

Statements and Reasons for problem 7 flowchart proof

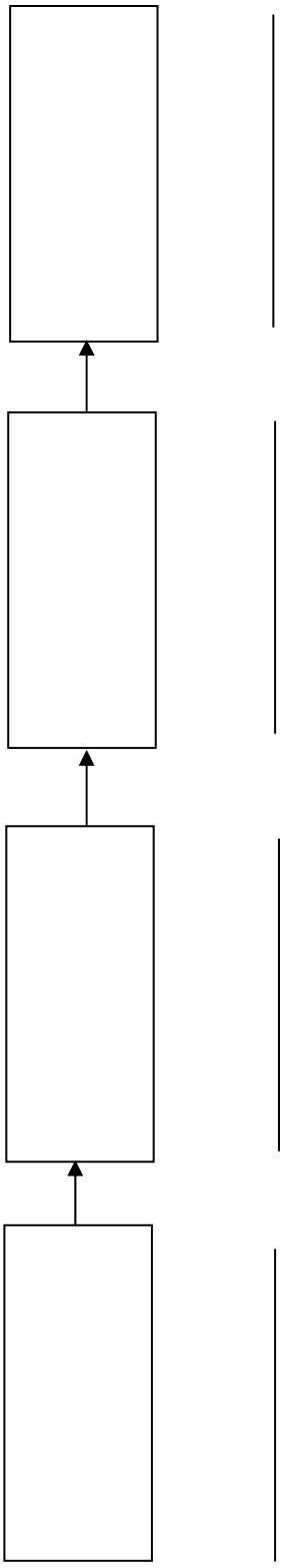
$\overline{PR}$ and $\overline{QS}$ bisect each other at T	Given
$\overline{PT} \cong \overline{TR}$	Vertical angles are congruent
$\overline{QT} \cong \overline{TS}$	Definition of bisector
$\angle PTQ \cong \angle RTS$	Side-Angle-Side Congruence
$\Delta PQT \cong \Delta RST$	Definition of bisector

Introduction to Flow Chart Proofs (Continued)

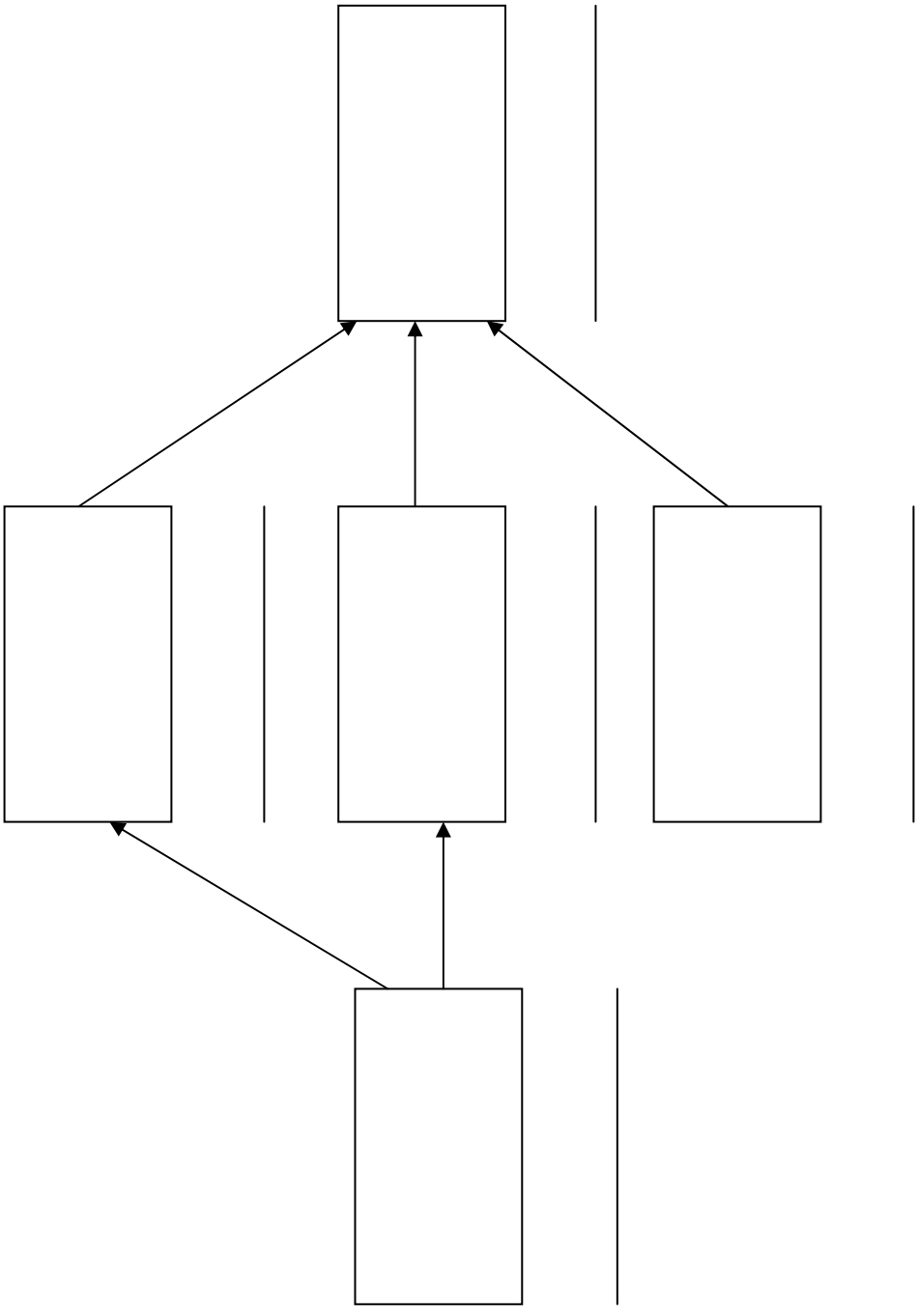
Flowchart for problem 5



Flowchart for problem 6



Introduction to Flow Chart Proofs (Continued)



Flowchart for problem 7

Answers:

1. c. $\boxed{3x-15 = 150} \rightarrow \boxed{3x = 165} \rightarrow \boxed{x = 55}$

Given Equation	Addition Property of Equality	Division Property of Equality

d.-e. The first box is the 'if' statement and the last box is the 'then' statement.

2. a. Given → Multiplication Property of Equality → Division Property of Equality

b.-c. The first box is the 'if' statement and the last box is the 'then' statement.

3. $\boxed{3x+28= 58} \rightarrow \boxed{3x = 30} \rightarrow \boxed{x = 10}$

Given Equation	Subtraction Property of Equality	Division Property of Equality

4. $\boxed{5x-12=x-32} \rightarrow \boxed{4x-12=-32} \rightarrow \boxed{4x=-20} \rightarrow \boxed{x =-5}$

Given Equation	Subtraction Property of Equality	Addition Property of Equality	Division Property of Equality

5. a. Given: $\angle 1$ and $\angle 2$ are supplementary
$\angle 2 \cong \angle 3$
Prove: $\angle 1 + \angle 3 = 180^{o}$

b.

1 and 2 are supplementary	m 1 + m 2 = 180	2 3	m 2 = m 3	m 1 + m 3 = 180
Given	Definition of supplementary angles	Given	Definition of congruent angles	Substitution property of equality

c.-d. The first box is the 'if' statement and the last box is the 'then' statement.

6. a. Given: $m\angle 1 = m\angle 2$
Prove: $m\angle AEC = m\angle BED$

b.

m 1 = m 2	m 1 + m 3 = m 2 + m 3	m AEC = m 1 + m 3 m BED = m 2 + m 3	m AEC = m BED
Given	Addition property of equality	Angle addition postulate	Substitution property of equality

7. a. Given: $\overline{PR}$ and $\overline{QS}$ bisect each other at T

Prove: $\Delta PQT \cong \Delta RST$

$\overline{PT} \cong \overline{TR}$
Definition of bisector

$\overline{PR}$ and $\overline{QS}$ bisect each other at T	$\overline{QT} \cong \overline{TS}$	$\Delta PQT \cong \Delta RST$
Given	Definition of bisector	Side-Angle-Side Congruence

$\angle PTQ \cong \angle RTS$
Vertical angles are congruent

8. a. Given: $\overline{PR}$ and $\overline{QS}$ bisect each other at T

Prove: $\angle P \cong \angle R$

c. Reasons:

	Definition of Bisector	
Given	Definition of Bisector	Side-angle-side Triangle Congruency
	Definition of Vertical Angles	

9. b. Given: A and B are complementary

B and C are complimentary

Prove: A C

c.

A and B are complementary
Given

B and C are complimentary
Given

A + B = 90º
Definition of Complementary Angles

B + C = 90º
Definition of Complementary Angles

A + B = B + C
Transitive Property of Equality

B ≅ B
Reflexive Property of Congruence

A ≅ C
Subtraction Property