Basic Geometry Vocabulary – A definition uses known words to describe a new word. In geometry, some words, such as *point, line,* and *plane* are undefined terms. Although these words are not formally defined, it is important to have general agreement about what each word means.

A **point** has no dimension. It is usually represented by a small dot.

A **line** extends in one dimension. It is usually represented by a straight line with two arrowheads to indicate that the line extends without end in two directions. For our purposes, lines are always straight lines.

A **plane** extends in two dimensions. It is usually represented by a shape that looks like a tabletop or wall. You must imagine that the plane extends without end, even though the drawing of a plane appears to have edges.

Point A   Line l or $\overleftrightarrow{AB}$ Plane M or plane ABC

A few concepts in geometry must also be commonly understood without being defined. One such concept is the idea that a point *lies on* a line or a plane.

Collinear points are points that lie on the same line.

Coplanar points are points that lie on the same plane.

What is a line segment?

What is a ray?

In geometry, rules that are accepted without proof are called **postulates** or **axioms.** Rules that are proved to be true are called *theorems*.
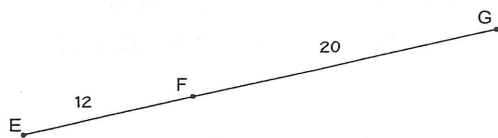
Segment congruence Postulate: If two segment have the same length, then they are congruent.

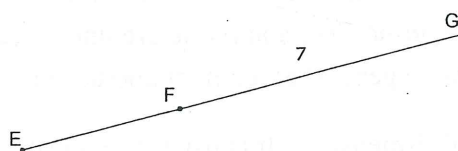**SEGMENT ADDITION POSTULATE:** If point Y lies between points X and Z, then _____.

Examples:

1. EG = _____

2. If EG = 11, find EF.

E •————12————• F ————20————• G

E •————• F ————7————• G

3. If HJ = 10x – 13, find x.

4. If HJ = 26, find x.

H •————$3X + 5$————• I ————$2X - 3$————• J
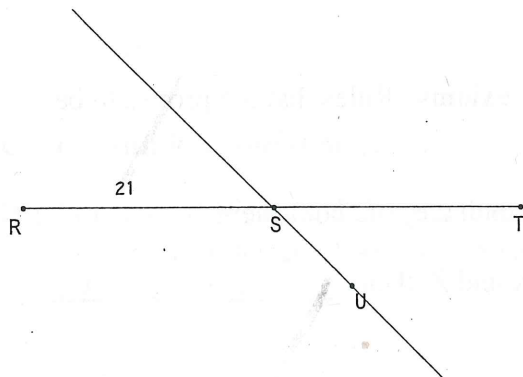
H •————$\cancel{X^2+3X}$ **2x**————• I ————$X + 5$————• J

SEGMENT BISECTOR:
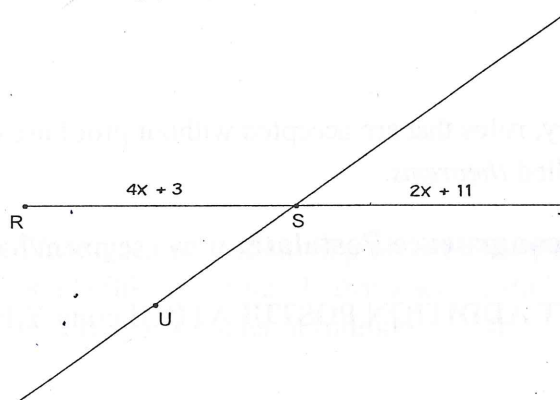
A segment bisector is a _____ that divides a

_____ into _____. It may or may not be

_____.

Examples:

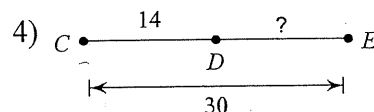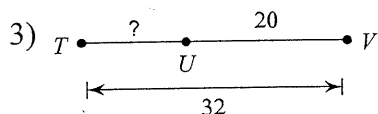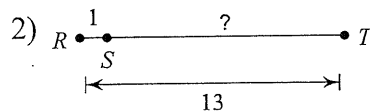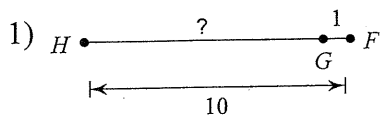1. If $\overrightarrow{SU}$ is a segment bisector of $\overline{RT}$, find RT.
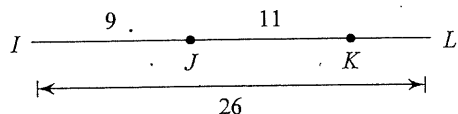
R •————21————• S ————————• T
(line through S to U)

2. If $\overrightarrow{SU}$ is a segment bisector of $\overline{RT}$, find RS and RT.

R •————$4X + 3$————• S ————$2X + 11$————• T
(line through S to U)

Name_____

The Segment Addition Postulate

Date_____ Period_____

Find the length indicated.

1) $H \bullet$ —— ? —— $\bullet$ 1 $\bullet F$
    G
    |←———— 10 ————→|

2) $R \bullet$ 1 $\bullet$ —— ? —— $\bullet T$
    S
    |←———— 13 ————→|

3) $T \bullet$ — ? — $\bullet$ —— 20 —— $\bullet V$
    U
    |←———— 32 ————→|

4) $C \bullet$ —— 14 —— $\bullet$ — ? — $\bullet E$
    D
    |←———— 30 ————→|

5) Find KL

   I —— 9 — $\bullet$ —— 11 —— $\bullet$ —— L
           J K
   |←———————— 26 ————————→|

6) Find HJ

   G —— 2 — $\bullet$ —— 12 —— $\bullet$ —— J
           H I
   |←—— 7 ——→|

7) Find EC

   E —— $\bullet$ —— 16 —— $\bullet$ —— B
        D C
   |←———————— 49 ————————→|
        |←———— 30 ————→|

8) Find IK

   I —— $\bullet$ — 12 — $\bullet$ —— L
        J K
   |←———————— 49 ————————→|
        |←———— 31 ————→|
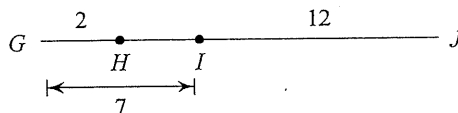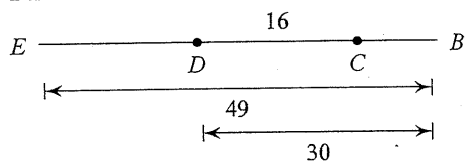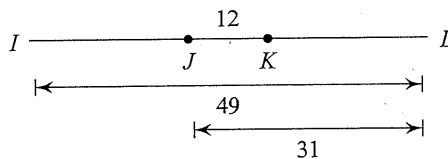
Points A, B, and C are collinear. Point B is between A and C. Find the length indicated.
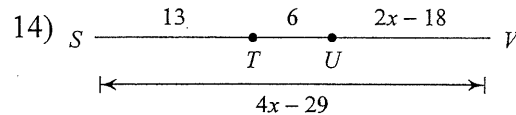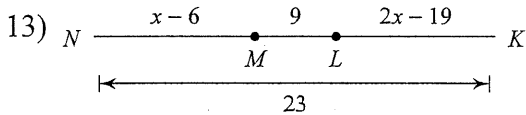
9) Find AC if $AB = 16$ and $BC = 12$.

10) Find AC if $AB = 13$ and $BC = 9$.

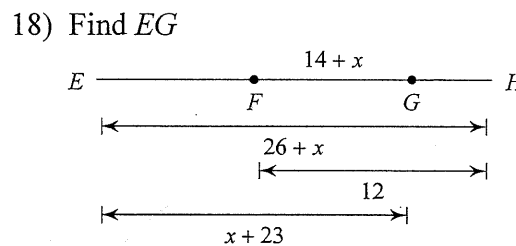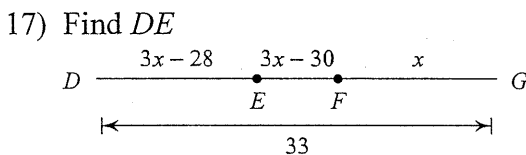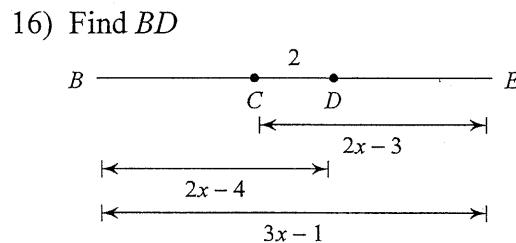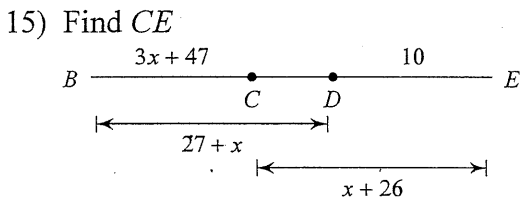**Points A, B, and C are collinear. Point B is between A and C. Solve for x.**

11) $AC = 3x + 3$, $AB = -1 + 2x$, and $BC = 11$.
 Find x.

12) $AC = 22$, $BC = x + 14$, and $AB = x + 10$.
 Find x.

Solve for x.

13)

N $\underset{\underset{\displaystyle 23}{\longleftarrow\!\!\!-\!\!\!\longrightarrow}}{\overset{x-6 \qquad 9 \qquad 2x-19}{\rule{5cm}{0.4pt}}}$ K

(N —— x−6 —— M —— 9 —— L —— 2x−19 —— K, with 23 spanning N to L)

14)

S $\overset{13 \qquad 6 \qquad 2x-18}{\rule{5cm}{0.4pt}}$ V

(S —— 13 —— T —— 6 —— U —— 2x−18 —— V, with 4x − 29 spanning S to U)

Find the length indicated.

15) Find CE

B —— $3x+47$ —— C —— D —— 10 —— E
$27 + x$ (spans B to D)
$x + 26$ (spans C to E)

16) Find BD

B —— C —— 2 —— D —— E
$2x - 3$ (spans D to E)
$2x - 4$ (spans B to D)
$3x - 1$ (spans B to E)

17) Find DE

D —— $3x-28$ —— E —— $3x-30$ —— F —— x —— G
33 (spans D to G)

18) Find EG

E —— $14 + x$ —— F —— G —— H
$26 + x$ (spans E to G)
12 (spans F to G)
$x + 23$ (spans E to G)

Critical thinking questions:

19) Points A, B, C, D, and E are collinear and in
 that order. Find AC if $AE = x + 50$ and
 $CE = x + 32$.

20) Write a segment addition problem using three
 points (like question 11) that asks the student
 to solve for x but has a solution $x = 20$.

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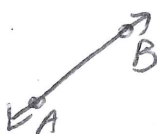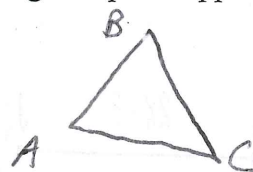
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A **plane** extends in two dimensions. It is usually represented by a shape that looks like a tabletop or wall. You must imagine that the plane extends without end, even though the drawing of a plane appears to have edges.
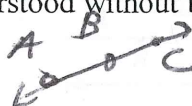
Point A   Line *l* or $\overleftrightarrow{AB}$ Plane M or plane ABC

A few concepts in geometry must also be commonly understood without being defined. One such concept is the idea that a point *lies on* a line or a plane.

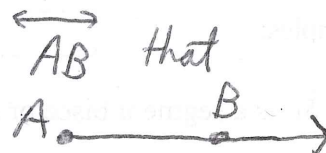**Collinear points** are points that lie on the same line.

Coplanar points are points that lie on the same plane.

What is a line segment?   a line consisting of the endpoints and all the points between the endpoints

What is a ray?   consists of an initial point and all points $\overleftrightarrow{AB}$ that lie on the same side of A as point B

In geometry, rules that are accepted without proof are called **postulates** or **axioms**. Rules that are proved to be true are called *theorems*.
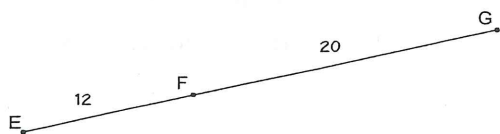
Segment congruence Postulate: If two segment have the same length, then they are congruent. (equal)

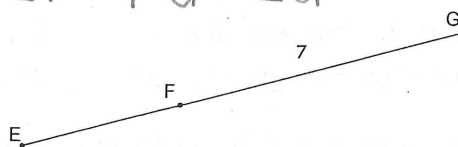**SEGMENT ADDITION POSTULATE**: If point Y lies between points X and Z, then $XY + YZ = XZ$

Examples:

1. EG = __EF + FG__

20

F

12

E

2. If EG = 11, find EF.

EF + FG = EG

G

7

F

E

3. If HJ = 10x – 13, find x. H

H $3X + 5$ I $2X - 3$ J

4. If HJ = 26, find x.

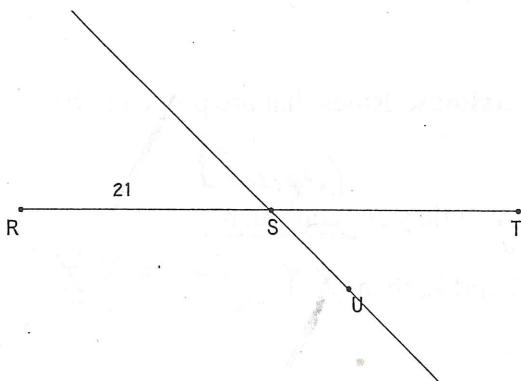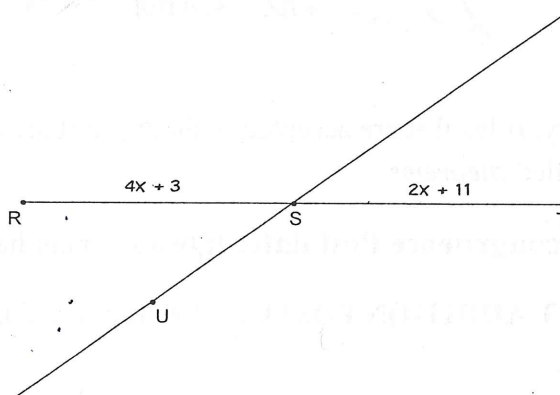H $X^2 + 3X$ I $X + 5$ J

SEGMENT BISECTOR:

A segment bisector is a __segment, ray, line, or plane__ that divides a __line__ __segment__ into __two equal parts__. It may or may not be __perpendicular__.

Examples:

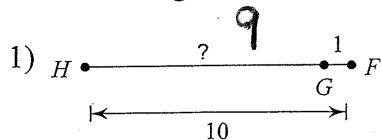1. If $\overrightarrow{SU}$ is a segment bisector of $\overline{RT}$, find RT.

21

R   S   T

U

2. If $\overrightarrow{SU}$ is a segment bisector of $\overline{RT}$, find RS and RT.
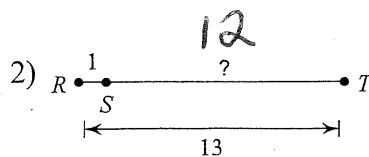

$4X + 3$ $2X + 11$

R   S   T

U

Name_____

The Segment Addition Postulate

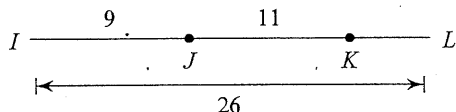Date_____ Period_____

Find the length indicated.

1)
$$9$$

H •————?————•——•F
         G 1

|←———— 10 ————→|

$$\boxed{HG = 9}$$

2)
$$12$$

R •—•————?————————•T
   S 1

|←———— 13 ————→|

$$\boxed{ST = 12}$$

3)
$$12$$

T •——?——•————20————•V
      U

|←———— 32 ————→|

$$\boxed{TU = 12}$$

4)
$$16$$

C •————14————•——?——•E
          D

|←———— 30 ————→|

$$\boxed{DE = 16}$$

5) Find KL

I ——9——•——11——•————L
       J   K

|←———— 26 ————→|

$$IL = IJ + JK + x$$
$$26 = 9 + 11 + x \quad \boxed{KL = 6}$$
$$6 = x$$

6) Find HJ

G ——2——•—5—•————12————J
       H   I

|←— 7 —→|

$$HI = 5$$
$$\boxed{HJ = 17}$$

7) Find EC

$$19 \qquad 16 \qquad 14$$

E ————•————•——B
      D   C

|←———— 49 ————→|
      |←—— 30 ——→|

$$\boxed{EC = 35}$$

8) Find IK

$$18 \qquad 12 \qquad 19$$

I ————•—•————L
      J K

|←———— 49 ————→|
      |←—— 31 ——→|
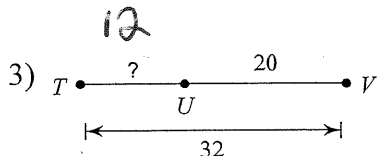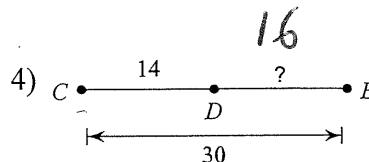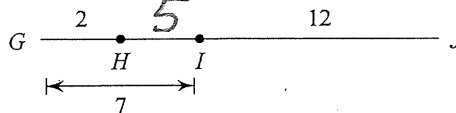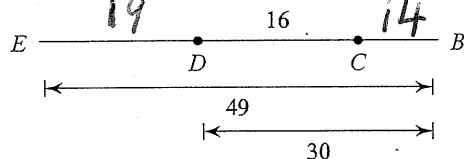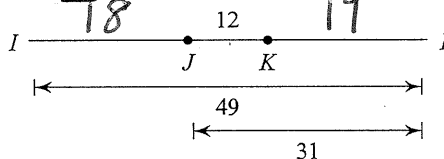
$$\boxed{IK = 30}$$

Points A, B, and C are collinear. Point B is between A and C. Find the length indicated.

9) Find AC if AB = 16 and BC = 12.

$$16 \qquad 12$$

A ————•————• C
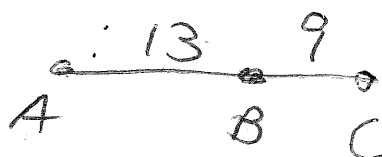   B
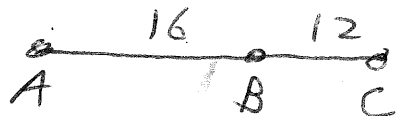
$$AC = 28$$

10) Find AC if AB = 13 and BC = 9.

$$13 \qquad 9$$

A ————•——• C
      B

$$AC = 22$$

Points A, B, and C are collinear. Point B is between A and C. Solve for x.
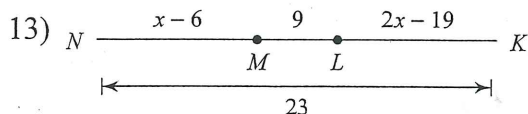
11) $AC = 3x + 3$, $AB = -1 + 2x$, and $BC = 11$.
Find x.

$AC = AB + BC$

$3x + 3 = -1 + 2x + 11$

$x = 7$ $\boxed{x = 7}$
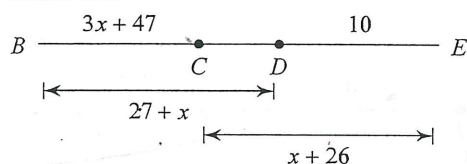
$\boxed{x = 7}$

Solve for x.

12) $AC = 22$, $BC = x + 14$, and $AB = x + 10$.
Find x.

$22 = x + 10 + x + 14$

$22 = 2x + 24$

$-2 = 2x$ $\boxed{x = -1}$
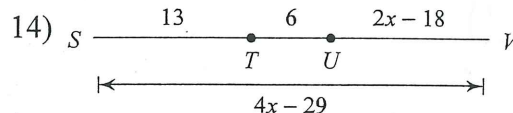
13) N $\overline{\quad\underset{}{\overset{x-6}{\quad}}\quad\underset{M}{\bullet}\quad\overset{9}{\quad}\quad\underset{L}{\bullet}\quad\overset{2x-19}{\quad}}$ K

23

$23 = x - 6 + 9 + 2x - 19$

$\boxed{X = 13}$

14) S $\overline{\quad\overset{13}{\quad}\quad\underset{T}{\bullet}\quad\overset{6}{\quad}\quad\underset{U}{\bullet}\quad\overset{2x-18}{\quad}}$ V

$4x - 29$

$4x - 29 = 13 + 6 + 2x - 18$

$4x - 29 = 1 + 2x$
$-2x \qquad\qquad -2x$
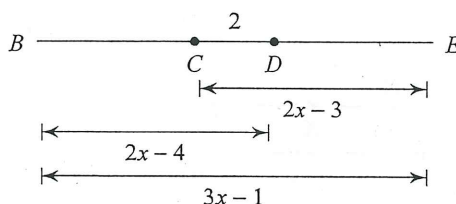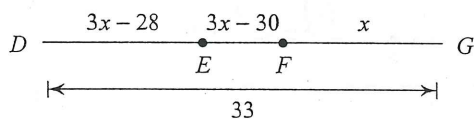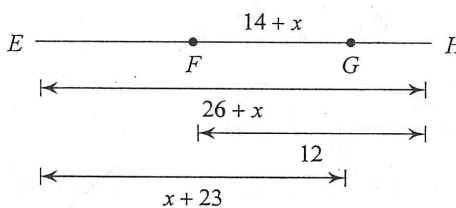
$2x = 30$ $\boxed{X = 15}$

Find the length indicated.

15) Find CE

B $\overline{\quad\overset{3x+47}{\quad}\quad\underset{C}{\bullet}\quad\underset{D}{\bullet}\quad\overset{10}{\quad}}$ E

$27 + x$

$x + 26$

16) Find BD

B $\overline{\quad\quad\underset{C}{\bullet}\quad\overset{2}{\quad}\quad\underset{D}{\bullet}\quad\quad}$ E

$2x - 3$

$2x - 4$

$3x - 1$

17) Find DE

D $\overline{\quad\overset{3x-28}{\quad}\quad\underset{E}{\bullet}\quad\overset{3x-30}{\quad}\quad\underset{F}{\bullet}\quad\overset{x}{\quad}}$ G

33

18) Find EG

E $\overline{\quad\quad\underset{F}{\bullet}\quad\overset{14+x}{\quad}\quad\underset{G}{\bullet}\quad\quad}$ H

$26 + x$

12

$x + 23$

Critical thinking questions:

19) Points A, B, C, D, and E are collinear and in that order. Find AC if $AE = x + 50$ and $CE = x + 32$.

20) Write a segment addition problem using three points (like question 11) that asks the student to solve for x but has a solution $x = 20$.

Points A, B, and C are collinear. Point B is between A and C. Solve for x.

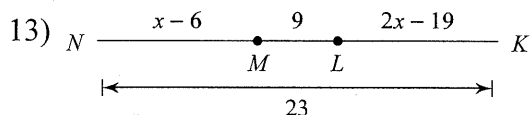11) $AC = 3x + 3$, $AB = -1 + 2x$, and $BC = 11$.
Find x.

7

12) $AC = 22$, $BC = x + 14$, and $AB = x + 10$.
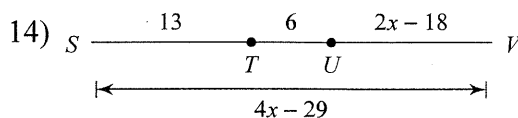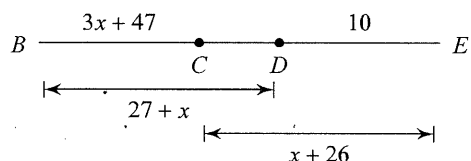Find x.

−1

Solve for x.

13)

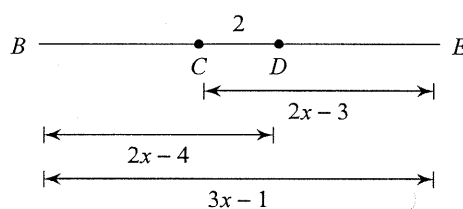$$N \xrightarrow[\hspace{3.5cm}23\hspace{3.5cm}]{\overset{x-6\quad\quad 9\quad\quad 2x-19}{\bullet\quad\bullet}} K$$

$M \quad L$

13

14)

$$S \xrightarrow[\hspace{3.5cm}4x-29\hspace{3.5cm}]{\overset{13\quad\quad 6\quad\quad 2x-18}{\bullet\quad\bullet}} V$$

$T \quad U$

15

Find the length indicated.

15) Find CE

$$B \xrightarrow{\overset{3x+47\quad\quad\quad\quad 10}{\bullet\quad\bullet}} E$$

$C \quad D$

$27 + x$

$x + 26$

14

16) Find BD

$$B \xrightarrow{\overset{2}{\bullet\quad\bullet}} E$$

$C \quad D$

$2x - 3$

$2x - 4$

$3x - 1$

12

17) Find DE

$$D \xrightarrow{\overset{3x-28\quad 3x-30\quad\quad x}{\bullet\quad\bullet}} G$$

$E \quad F$

33

11

18) Find EG

$$E \xrightarrow{\overset{14+x}{\bullet\quad\bullet}} H$$

$F \quad G$

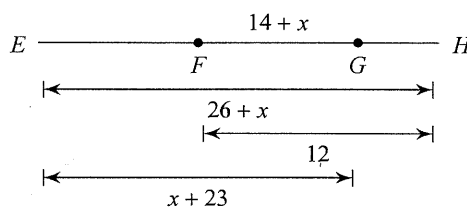$26 + x$

12

$x + 23$
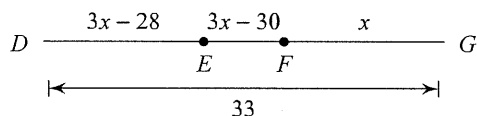
18

Critical thinking questions:

19) Points A, B, C, D, and E are collinear and in
that order. Find AC if $AE = x + 50$ and
$CE = x + 32$.

$AC = AE - CE = 18$

20) Write a segment addition problem using three
points (like question 11) that asks the student
to solve for x but has a solution $x = 20$.

Many possibilities: $AB = x$, $BC = 20$, $AC = 40$