2.3 - Geometric Diagrams

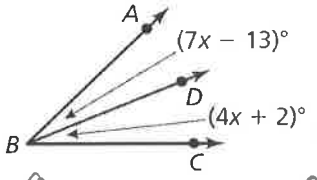
BELLWORK

Find the angle measure.

1. $\angle 1$ is a supplement of $\angle 2$ and $m\angle 1 = 32°$. Find $m\angle 2$.

2. $\angle 5$ is a complement of $\angle 6$ and $m\angle 5 = 59°$. Find $m\angle 6$.

3 $\overline{BD}$ **bisects** $\angle ABC$. **Find** $m\angle ABD$ **and** $m\angle CBD$.



① $m\angle 1 + m\angle 2 = 180$
$32 + m\angle 2 = 180$
$m\angle 2 = 148°$

② $m\angle 5 + m\angle 6 = 90$
$59 + m\angle 6 = 90$
$m\angle 6 = 31°$

③ $7x - 13 = 4x + 2$
$3x = 15$
$x = 5$

Warm Up

Essential Question

In a diagram, what can be assumed and what needs to be labeled?

How can algebraic properties help you solve an equation?

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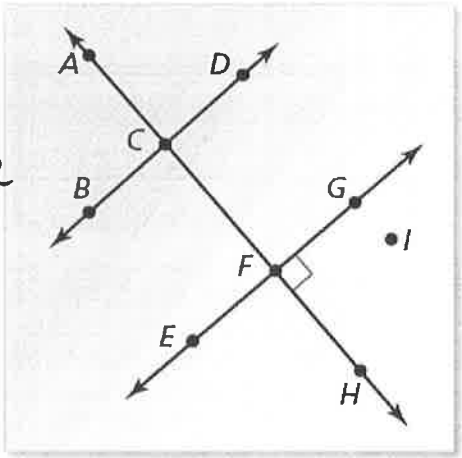
Use the diagram to determine which of the following statements you can assume to be true. Explain your reasoning.



a. All the points shown are coplanar. True

b. Points *D*, *G*, and *I* are collinear. False

c. Points *A*, *C*, and *H* are collinear. True

d. $\overleftrightarrow{EG}$ and $\overleftrightarrow{AH}$ are perpendicular. True

e. $\angle BCA$ and $\angle ACD$ are a linear pair. True

Exploration 2a-e

f. $\overleftrightarrow{AF}$ and $\overleftrightarrow{BD}$ are perpendicular. False

g. $\overleftrightarrow{EG}$ and $\overleftrightarrow{BD}$ are parallel. False

h. $\overleftrightarrow{AF}$ and $\overleftrightarrow{BD}$ are coplanar. True

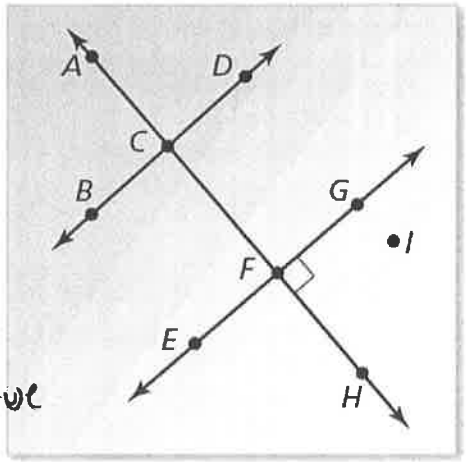
i. $\overleftrightarrow{EG}$ and $\overleftrightarrow{BD}$ do not intersect. False

j. $\overleftrightarrow{AF}$ and $\overleftrightarrow{BD}$ intersect. True

k. $\overleftrightarrow{EG}$ and $\overleftrightarrow{BD}$ are perpendicular. False

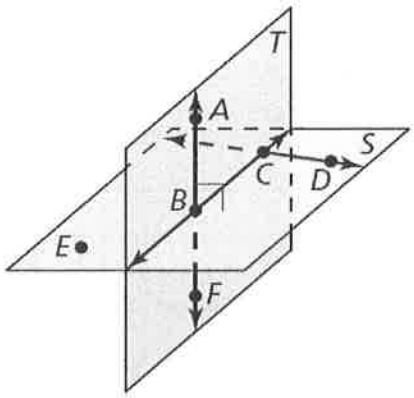
l. $\angle ACD$ and $\angle BCF$ are vertical angles. True

m. $\overleftrightarrow{AC}$ and $\overleftrightarrow{FH}$ are the same line. True



Exploration 2f-m

Which of the following statements *cannot* be assumed from the diagram?



Points A, B, and F are collinear. Can

Points E, B, and D are collinear. Cannot

$\overleftrightarrow{AB} \perp$ plane S Can

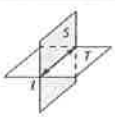
$\overleftrightarrow{CD} \perp$ plane T Cannot

$\overleftrightarrow{AF}$ intersects $\overleftrightarrow{BC}$ at point B. Can

Example 4

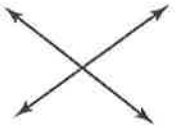
Postulates

Point, Line, and Plane Postulates

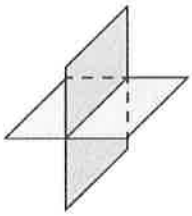
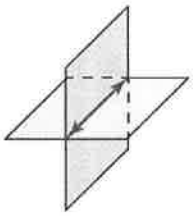
Postulate	Example	
2.1 Two Point Postulate Through any two points, there exists exactly one line. **2.2 Line-Point Postulate** A line contains at least two points.		Through points A and B, there is exactly one line ℓ. Line ℓ contains at least two points.
2.3 Line Intersection Postulate If two lines intersect, then their intersection is exactly one point.		The intersection of line m and line n is point C.
2.4 Three Point Postulate Through any three noncollinear points, there exists exactly one plane. **2.5 Plane-Point Postulate** A plane contains at least three noncollinear points.		Through points D, E, and F, there is exactly one plane, plane R. Plane R contains at least three noncollinear points.
2.6 Plane-Line Postulate If two points lie in a plane, then the line containing them lies in the plane.		Points D and E lie in plane R, so $\overleftrightarrow{DE}$ lies in plane R.
2.7 Plane Intersection Postulate If two planes intersect, then their intersection is a line.		The intersection of plane S and plane T is line ℓ.

Postulate

State the postulate illustrated by the diagram.

a. If  then 

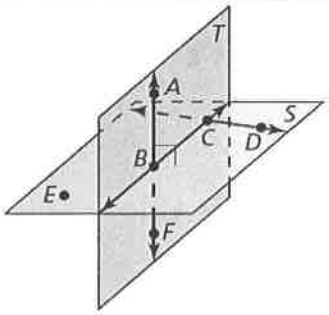
Line Intersection Postulate

b. If  then 

Plane Intersection Postulate

Example 1

Continued



5. Can you assume that plane *S* intersects plane *T* at $\overleftrightarrow{BC}$?

Yes

6. Explain how you know that $\overleftrightarrow{AB} \perp \overleftrightarrow{BC}$.

$\overleftrightarrow{AB}$ ⊥ Plane S

$\overleftrightarrow{BC}$ is on Plane S and intersects $\overleftrightarrow{AB}$ at point B

Monitoring Progress 3-4

2.4 Algebraic Proof

Core Concept

Algebraic Properties of Equality

Let a, b, and c be real numbers.

Addition Property of Equality	If $a = b$, then $a + c = b + c$.
Subtraction Property of Equality	If $a = b$, then $a - c = b - c$.
Multiplication Property of Equality	If $a = b$, then $a \cdot c = b \cdot c$, $c \neq 0$.
Division Property of Equality	If $a = b$, then $\frac{a}{c} = \frac{b}{c}$, $c \neq 0$.
Substitution Property of Equality	If $a = b$, then a can be substituted for b (or b for a) in any equation or expression.

Core Concept

Distributive Property

Let a, b, and c be real numbers.

Sum $a(b + c) = ab + ac$ **Difference** $a(b - c) = ab - ac$

Core Concept

Core Concept

Reflexive, Symmetric, and Transitive Properties of Equality

	Real Numbers	Segment Lengths	Angle Measures
Reflexive Property	$a = a$	$AB = AB$	$m\angle A = m\angle A$
Symmetric Property	If $a = b$, then $b = a$.	If $AB = CD$, then $CD = AB$.	If $m\angle A = m\angle B$, then $m\angle B = m\angle A$.
Transitive Property	If $a = b$ and $b = c$, then $a = c$.	If $AB = CD$ and $CD = EF$, then $AB = EF$.	If $m\angle A = m\angle B$ and $m\angle B = m\angle C$, then $m\angle A = m\angle C$.

Core Concept

Given: $3x + 2 = 23 - 4x$.

Prove: $x = 3$

Statement	Reason
$3x + 2 = 23 - 4x$	Given
$+4x \quad +4x$	Addition POE
$7x + 2 = 23$	Simplify
$-2 \quad -2$	Subtraction POE
$\frac{7x}{7} = \frac{21}{7}$	Simplify
	DIVISION POE
$x = 3$	Simplify

Given: $-5(7w + 8) = 30$

Prove: $w = -2$

Statement	Reason
$-5(7w + 8) = 30$	Given
$-35w - 40 = 30$	Distributive Prop.
$+40 \quad +40$	Addition POE
$\frac{-35w}{-35} = \frac{70}{-35}$	Simplify
	DIVISION POE
$w = -2$	Simplify

Example 1

1. Given: $6x - 11 = -35$

Prove: $x = -4$

Statement	Reason
$6x - 11 = -35$	Given
$+11 \quad +11$	Addition POE
$\frac{6x}{6} = \frac{-24}{6}$	Simplify
	DIVISION POE
$x = -4$	Simplify

2. Given: $-2p - 9 = 10p - 17$

Prove: $p = 2/3$

Statement	Reason
$-2p - 9 = 10p - 17$	Given
$+2p \quad +2p$	Addition POE
$-9 = 12p - 17$	Simplify
$+17 \quad +17$	Addition POE
$\frac{8}{12} = \frac{12p}{12}$	Simplify
	DIVISION POE
$\frac{2}{3} = p$	Simplify
$p = \frac{2}{3}$	Symmetric POE

Monitoring Progress 1-3

You get a raise at your part-time job. To write your raise as a percent, use the formula $p(r + 1) = n$, where p is your previous wage, r is the percent increase (as a decimal), and n is your new wage. Solve the formula for r. Write a justification for each step.

Statement	Reason
$p(r+1) = n$	Given
$\frac{p}{p} \quad \frac{n}{p}$	Division POE
$r + 1 = \frac{n}{p}$	Simplify
$-1 \quad -1$	Subtraction POE
$r = \frac{n}{p} - 1$	Simplify

Example 3

Solve the equation. Justify each step.

5. Given: $4 = -10b + 6(2 - b)$

Prove: ~~$b = -1/2$~~ $b = \frac{1}{2}$

Statement	Reason
$4 = -10b + 6(2-b)$	Given
$4 = -10b + 12 - 6b$	Distributive Property
$4 = -16b + 12$	Simplify
$-12 \quad -12$	Subtraction POE
$-8 = -16b$	Simplify
$\frac{-8}{-16} \quad \frac{-16b}{-16}$	Division POE
$\frac{1}{2} = b$	Simplify
$b = \frac{1}{2}$	symmetric POE

6. Solve the formula $A = \frac{1}{2}bh$ for b. Justify each step.

Statement	Reason
$A = \frac{1}{2}bh$	Given
$\cdot 2 \quad \cdot 2$	multiplication POE
$2A = bh$	Simplify
$\frac{2A}{h} = \frac{bh}{h}$	division POE
$\frac{2A}{h} = b$	Simplify

Monitoring Progress 4-6

Name the property of equality that the statement illustrates.

7. If $m\angle 6 = m\angle 7$, then $m\angle 7 = m\angle 6$. Symmetric POE

8. $34° = 34°$ Reflexive POE

9. $m\angle 1 = m\angle 2$ and $m\angle 2 = m\angle 5$. So, $m\angle 1 = m\angle 5$. Transitive POE

10. If $JK = KL$ and $KL = 16$, then $JK = 16$. Transitive POE

11. $PQ = ST$, so $ST = PQ$. Symmetric POE

12. $ZY = ZY$ Reflexive POE

Monitoring Progress 7-9

Exit Ticket: State the Property of Equality each statement illustrates.

a. If $AB = CD$, then $AB + FE = CD + FE$.

Addition POE

b. If $m\angle 2 = m\angle 4$ and $m\angle 4 = m\angle 6$, then $m\angle 2 = m\angle 6$.

Transitive POE

c. If $XY = AB$, then $AB = XY$.

Symmetric POE

Closure

Homework

2.3 - pg. 87 # 3,4, 9-23

2.4 pg. 96 #2-12 evens, 23-40, 44, 45

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