# GR9 ADV EOT2 MATH

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**Grade 9A1**



| | | | |
|---|---|---|---|
| 1 | Statements, Conditionals, and Biconditionals | (1-6) | 717 |

## Examples 1 and 2

**Use the statements to write a compound statement for each conjunction or disjunction. Then find the truth values. Explain your reasoning.**

***p*: $-3 - 2 = -5$**

***q*: Vertical angles are congruent.**

***r*: $2 + 8 > 10$**

**1.** $p$ and $q$

**2.** $p \wedge r$

**3.** $q \vee \sim r$

**4.** $r \vee q$

**5.** $\sim p \wedge \sim q$

**6.** $\sim r \vee \sim p$

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|---|---|---|---|
| 2 | Proving Angle Relationships | (1-10) | 753,754 |

## Practice

Go Online You can complete your homework online.

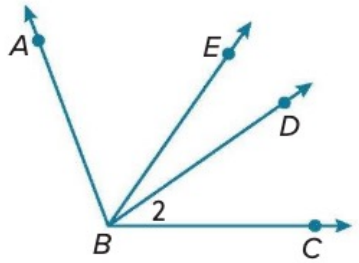
### Example 1

**Find the measure of each angle.**

**1.** Find $m\angle ABC$ if $m\angle ABD = 70°$ and $m\angle DBC = 43°$.

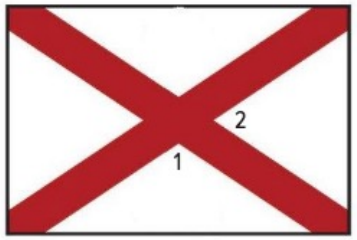
**2.** If $m\angle EBC = 55°$ and $m\angle EBD = 20°$, find $m\angle 2$.

**3.** Find $m\angle ABD$ if $m\angle ABC = 110°$ and $m\angle 2 = 36°$.

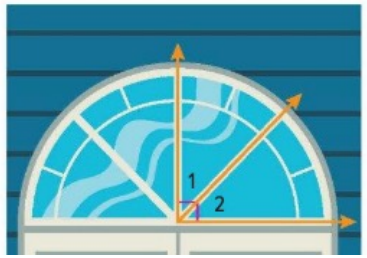



### Example 2

**4.** FLAGS The Alabama state flag is white and has two diagonal red stripes. If the $m\angle 1 = 112°$, what is $m\angle 2$?

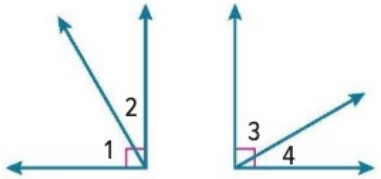



**5.** CONSTRUCTION Aaron has installed a new window above the entrance of an office building. If $m\angle 2 = 44°$, what is $m\angle 1$?

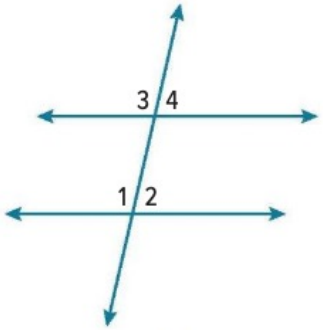



**PROOF** Write a two-column proof.

**6.** Given: $\angle 2 \cong \angle 4$
Prove: $\angle 1 \cong \angle 3$



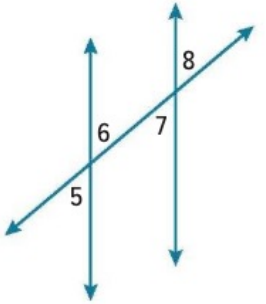

**7.** Given: $\angle 1 \cong \angle 3$
Prove: $\angle 2 \cong \angle 4$




### Example 4

**PROOF** Write a two-column proof.

**8.** Given: $\angle 5 \cong \angle 7$
Prove: $\angle 5 \cong \angle 8$



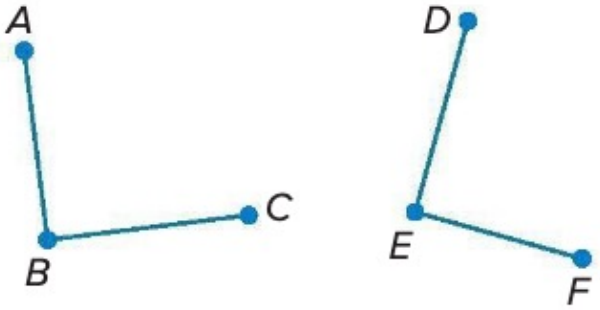

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| 2 | Proving Angle Relationships | (1-10) | 753,754 |

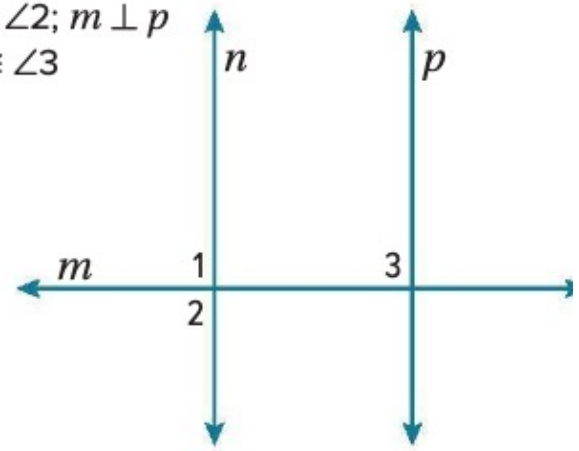
## Example 5

**PROOF** **Write a two-column proof.**

**9.** **Given:** $m\angle ABC = m\angle DEF$
$\angle ABC$ and $\angle DEF$ are supplementary.
**Prove:** $\angle ABC$ and $\angle DEF$ are right angles.




**10.** **Given:** $\angle 1 \cong \angle 2$; $m \perp p$
**Prove:** $\angle 2 \cong \angle 3$

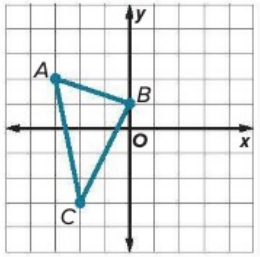


| 3 | Reflections | (1-6) | 801 |
|---|---|---|---|

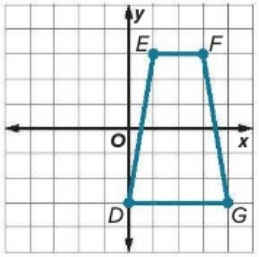
**Examples 1 and 2**

**Graph the image of each figure under the given reflection. Determine the coordinates of the image.**

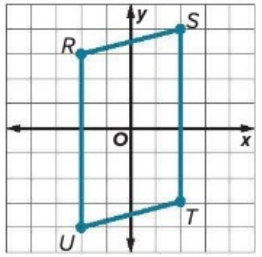
**1.** $\triangle ABC$ in the line $y = x$



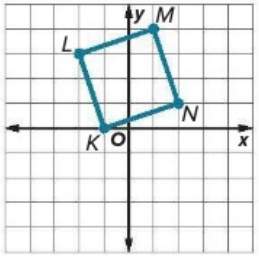

**2.** trapezoid $DEFG$ in the line $x = -1$




**3.** parallelogram $RSTU$ in the line $y = x$




**4.** square $KLMN$ in the line $y = -2$




**5.** Determine the coordinates of $S(-7, 1)$ after a reflection in the line $y = 3$.

**6.** Determine the coordinates of $Q(6, -4)$ after a reflection in the line $x = 2$.

| | | | |
|---|---|---|---|
| 4 | Slope and Equations of Lines | (10-15) | 771 |

## Example 3

**Determine whether each pair of lines is *parallel*, *perpendicular*, or *neither*.**

**10.** $y = 2x + 4, y = 2x - 10$

**11.** $y = -\frac{1}{2}x - 12, y - 3 = 2(x + 2)$

**12.** $y - 4 = 3(x + 5), y + 3 = -\frac{1}{3}(x + 1)$

**13.** $y - 3 = 6(x + 2), y + 3 = -\frac{1}{3}(x - 4)$

**14.** $x = -2, y = 10$

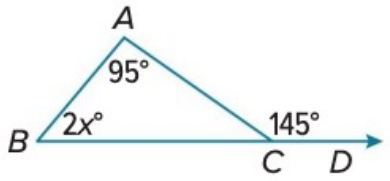
**15.** $y = 5, y = -3$

| 5 | Angles of Triangles | (5-8) | 843 |
|---|---|---|---|

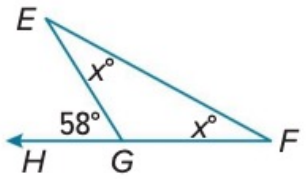
**Example 2**

**Find each measure.**

**5.** $m\angle ABC$



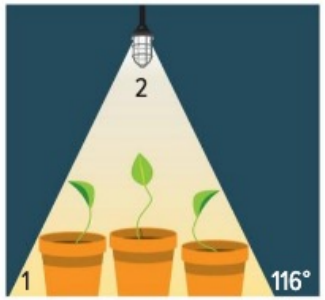

**6.** $m\angle F$




**7.** **TOWERS** A lookout tower sits on a network of struts and posts. Leslie measured three angles on the tower. If $m\angle 1 = (7x - 7)°$, $m\angle 2 = (4x + 2)°$, and $m\angle 3 = (2x + 6)°$, what is $m\angle 1$?




**8.** **GARDENING** A gardener uses a grow light to grow vegetables indoors. If $m\angle 1 = 8x°$ and $m\angle 2 = (7x - 4)°$, what is $m\angle 1$?



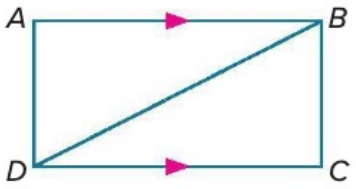
| 6 | Proving Triangles Congruent – ASA, AAS | (1-6) | 867 |
|---|---|---|---|

**PROOF** **Write the specified type of proof.**

**1.** two-column proof

**Given:** $\overline{AB} \parallel \overline{CD}$, $\angle CBD \cong \angle ADB$

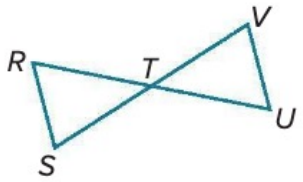
**Prove:** $\triangle ABD \cong \triangle CDB$




**2.** two-column proof

**Given:** $\angle S \cong \angle V$, and $T$ is the midpoint of $\overline{SV}$.

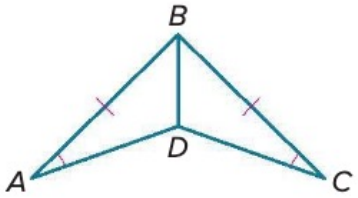
**Prove:** $\triangle RTS \cong \triangle UTV$




**3.** flow proof

**Given:** $\overline{AB} \cong \overline{CB}$, $\angle A \cong \angle C$, and $\overline{DB}$ bisects $\angle ABC$.

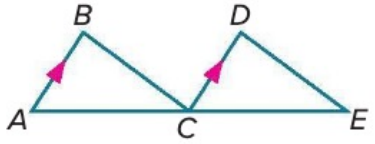
**Prove:** $\overline{AD} \cong \overline{CD}$




**4.** paragraph proof

**Given:** $\overline{CD}$ bisects $\overline{AE}$, $\overline{AB} \parallel \overline{CD}$, and $\angle E \cong \angle BCA$.

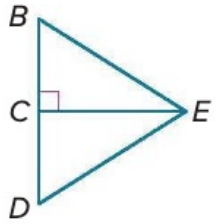
**Prove:** $\triangle ABC \cong \triangle CDE$




**5.** paragraph proof

**Given:** $\overline{CE}$ bisects $\angle BED$; $\angle BCE$ and $\angle ECD$ are right angles.

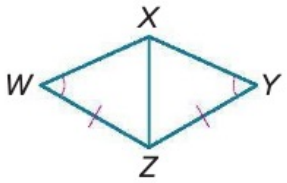
**Prove:** $\triangle ECB \cong \triangle ECD$




**6.** paragraph proof

**Given:** $\angle W \cong \angle Y$, $\overline{WZ} \cong \overline{YZ}$, and $\overline{XZ}$ bisects $\angle WZY$.

**Prove:** $\triangle XWZ \cong \triangle XYZ$



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| 7 | Conjectures and Counterexamples. | (1-8) | 707 |

**Write a conjecture that describes the pattern in each sequence. Then use your conjecture to find the next term in the sequence.**

**1.** 4, 8, 12, 16, 20

**2.** 2, 22, 222, 2222

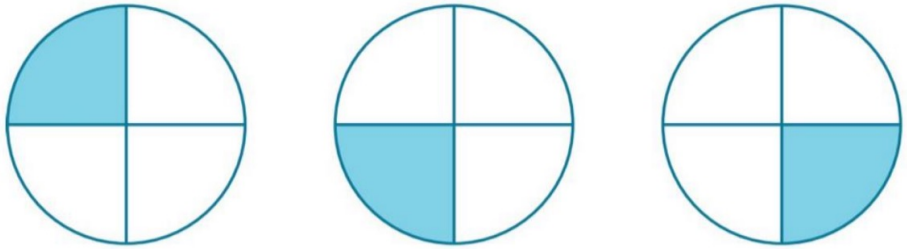
**3.** $1, \frac{1}{2}, \frac{1}{4}, \frac{1}{8}$

**4.** $6, \frac{11}{2}, 5, \frac{9}{2}, 4$

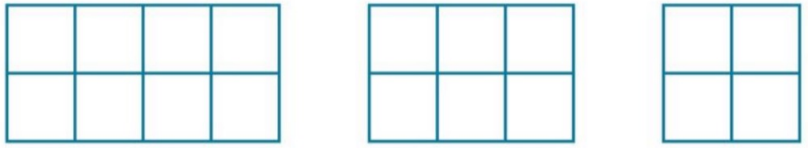
**5.** Arrival times: 3:00 P.M., 12:30 P.M., 10:00 A.M., . . .

**6.** Percent humidity: 100%, 93%, 86%, . . .

**7.**



**8.**



### Examples 2 and 3

**Identify the transversal connecting each pair of angles. Then classify the relationship between each pair of angles as *alternate interior*, *alternate exterior*, *corresponding*, or *consecutive interior* angles.**

**8.** ∠4 and ∠5

**9.** ∠5 and ∠15

**10.** ∠12 and ∠14

**11.** ∠7 and ∠15

**12.** ∠2 and ∠12

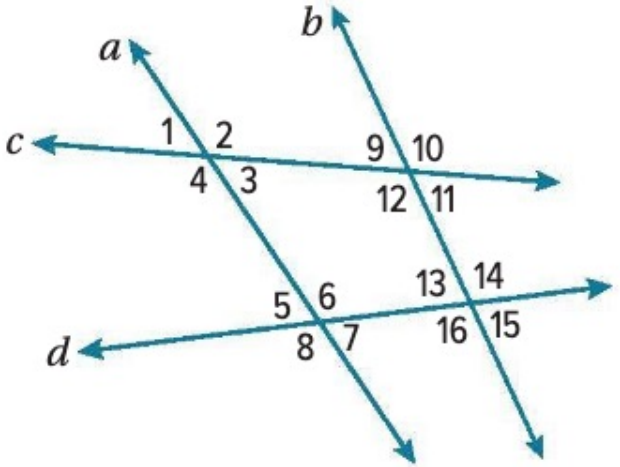
**13.** ∠3 and ∠6

**14.** ∠1 and ∠9

**15.** ∠3 and ∠9

**16.** ∠10 and ∠16

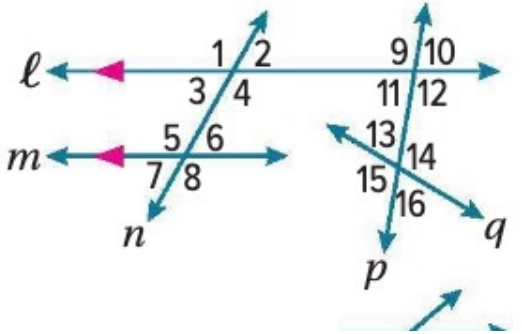
**17.** ∠5 and ∠13




**For Exercises 18 and 19, use the figure.**

**18.** What type of angles are ∠3 and ∠10?

**19.** State the transversal that connects ∠11 and ∠13.



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| 9 | Slope and Equations of Lines | (22-27) | 772 |

### Example 5

**Write an equation in slope-intercept form for each line described.**

**22.** passes through $(-7, -4)$, perpendicular to $y = \frac{1}{2}x + 9$

**23.** passes through $(-1, -10)$, parallel to $y = 7$

**24.** passes through $(6, 2)$, parallel to $y = -\frac{2}{3}x + 1$

**25.** passes through $(-2, 2)$, perpendicular to $y = -5x - 8$

### Mixed Exercises

**Find the value of *x* or *y* that satisfies the given conditions. Then graph the line.**

**26.** The line containing $(4, -2)$ and $(x, -6)$ is perpendicular to the line containing $(-2, -9)$ and $(3, -4)$.

**27.** The line containing $(-4, 9)$ and $(4, 3)$ is parallel to the line containing $(-8, 1)$ and $(4, y)$.

| 10 | Perpendiculars and Distance | (9-20) | 790 |
|---|---|---|---|

**Find the distance between each pair of parallel lines with the given equations.**

**9.** $y = 7$
$y = -1$

**10.** $x = -6$
$x = 5$

**11.** $y = 3x$
$y = 3x + 10$

**12.** $y = -5x$
$y = -5x + 26$

**13.** $y = x + 9$
$y = x + 3$

**14.** $y = -2x + 5$
$y = -2x - 5$

**15.** $y = \frac{1}{4}x + 2$
$4y - x = -60$

**16.** $3x + y = 3$
$y + 17 = -3x$

**17.** $y = -\frac{5}{4}x + 3.5$
$4y + 10.6 = -5x$

## Mixed Exercises

**Find the distance from the line to the given point.**

**18.** $y = -3$; $(5, 2)$

**19.** $y = \frac{1}{6}x + 6$; $(-6, 5)$

**20.** $x = 4$; $(-2, 5)$

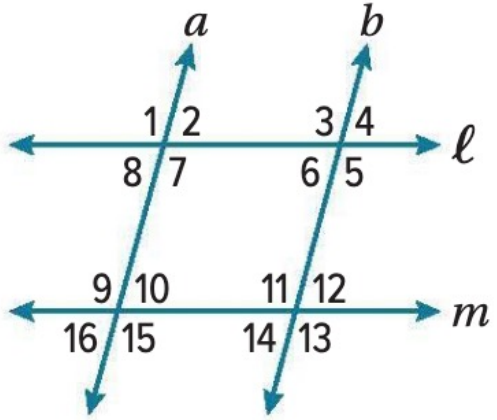
| 11 | Proving Lines Parallel | (1-6) | 779 |
|---|---|---|---|

## Example 1

**Use the given information to determine which lines, if any, are parallel. State the postulate or theorem that justifies your answer.**

**1.** $\angle 3 \cong \angle 7$

**2.** $\angle 9 \cong \angle 11$



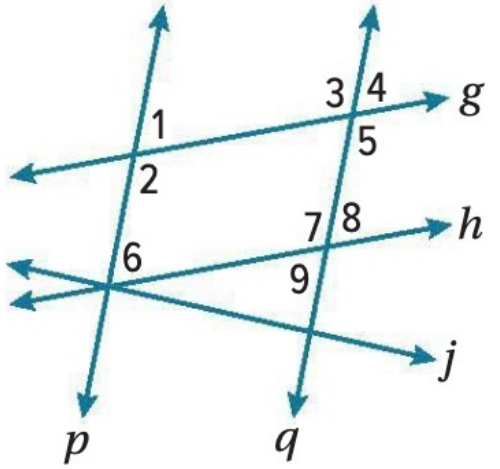

**3.** $\angle 2 \cong \angle 16$

**4.** $m\angle 5 + m\angle 12 = 180°$

**Given the following information, determine which lines, if any, are parallel. State the theorem that justifies your answer.**

**5.** $\angle 1 \cong \angle 6$

**6.** $m\angle 7 + m\angle 6 = 180°$



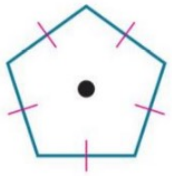
| 12 | Symmetry | EX 3 | 828 |
|---|---|---|---|

## **Example 3** Determine Order and Magnitude of Symmetry

**Part A State the order and magnitude of symmetry.**

**Determine whether each figure has rotational symmetry. If so, locate the center of symmetry and state the order and magnitude of symmetry.**

**a.**



rotational symmetry: yes

order = 5

magnitude = 72°

**b.**

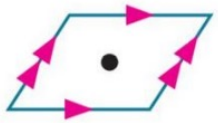


rotational symmetry: no

order = none

magnitude = none

**c.**



rotational symmetry: yes

order = 2

magnitude = 180°

**Part B Identify point symmetry.**

**Which figure(s) in Part A has point symmetry? Justify your reasoning.**

**The parallelogram has point symmetry because it can be rotated 180° about its center so that it maps onto itself.**

| 13 | Translations | (8-14) | 806 |
|---|---|---|---|

**Name the image of each point after the given translation vector.**

**8.** $F(-3, 1)$; $\langle 5, -1 \rangle$

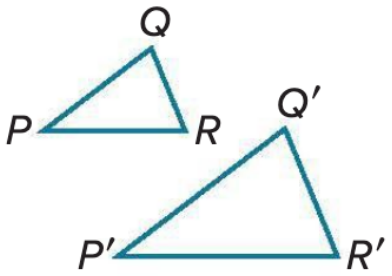
**9.** $Q(4, -2)$; $\langle -2, -5 \rangle$

**10.** $P(9, 1.5)$; $\langle 3, -0.5 \rangle$

**11.** The image of $A(-3, -5)$ under a translation is $A'(6, -1)$. Find the image of $B(3, -2)$ under the same translation.

**12.** **CONSTRUCT ARGUMENTS** Explain why $\triangle A'B'C'$ with vertices $A'(-1, -2)$, $B'(0, 0)$, and $C'(-6, 0)$ is not a translation image of $\triangle ABC$ with vertices $A(1, 2)$, $B(0, 0)$, and $C(6, 0)$.

**13.** Determine whether $\triangle P'Q'R'$ is a translation image of $\triangle PQR$. Explain.



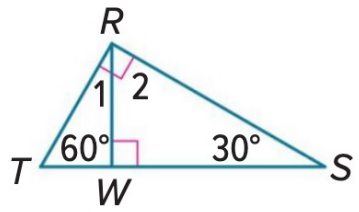

**14.** Determine the translation vector that moves every point of a preimage 4 units left and 6 units up.

| 14 | Angles of Triangles | (1-6) | 843 |
|---|---|---|---|

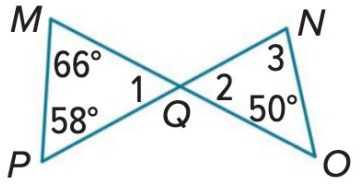
### Example 1

**Find the measure of each numbered angle.**

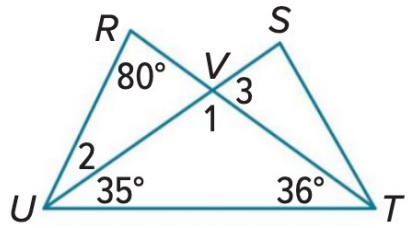
**1.**




**2.**




**3.**



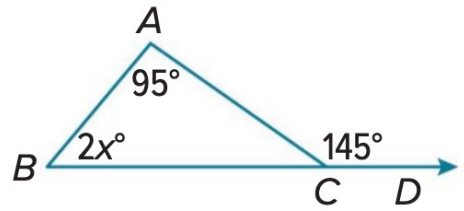

**4.**



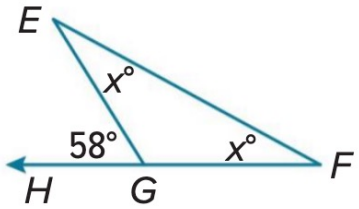

### Example 2

**Find each measure.**

**5.** $m\angle ABC$




**6.** $m\angle F$



| 15 | Symmetry | (1-7) | 829 |
|---|---|---|---|

**Example 1**

**Determine whether each figure has a line of symmetry. If so, draw the lines of symmetry and state how many lines of symmetry it has.**

**1.**



**2.**



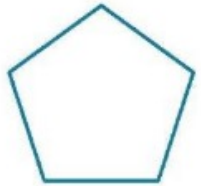
**3.**



**4.**



**5.**



**6.**



**Example 2**

**7.** **CARS** Steve found the hubcaps shown below at his local junkyard. Determine whether each hubcap has rotational symmetry. Explain.

**a.**



**b.**



**c.**

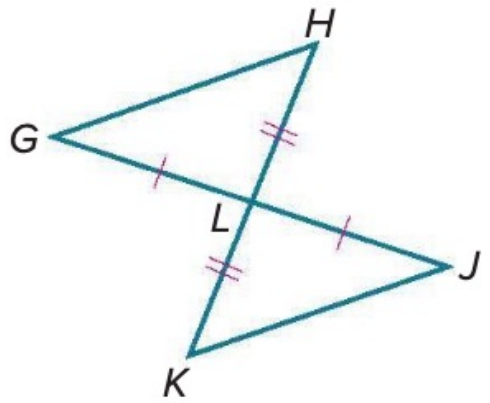


# Writing Questions

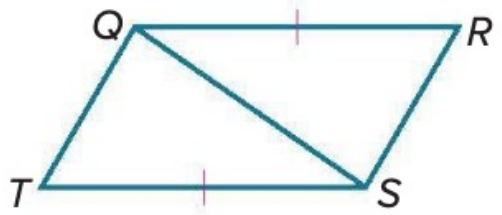
| | | | |
|---|---|---|---|
| 16 | Proving Triangles Congruent – SSS, SAS | (17-20) | 861 |

**Explain whether there is enough information given in each figure to prove that the triangles are congruent using SSS or SAS.**

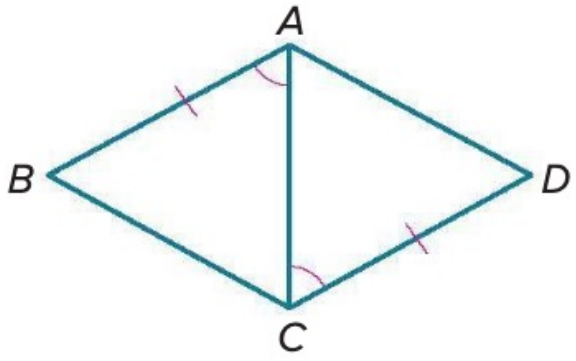
**17.**



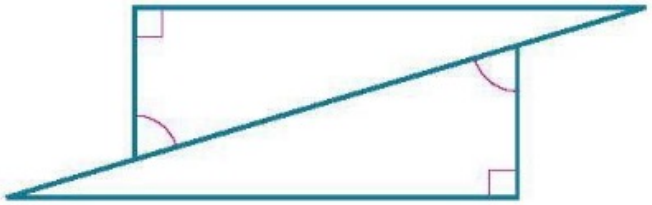

**18.**




**19.**



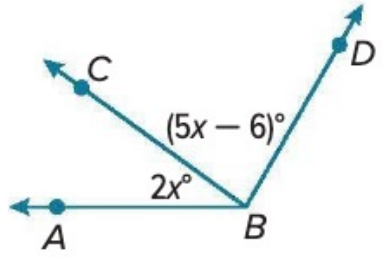

**20.**



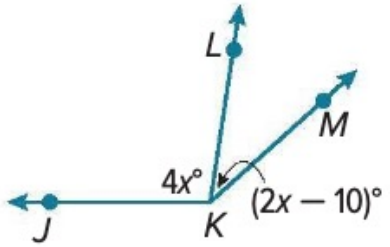
| 17 | Proving Angle Relationships | (11-15) | 754 |
|---|---|---|---|

## Mixed Exercises

**11.** Find $m\angle ABC$ and $m\angle CBD$ if $m\angle ABD = 120°$.

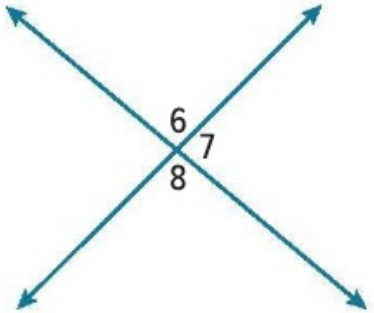



**12.** Find $m\angle JKL$ and $m\angle LKM$ if $m\angle JKM = 140°$.

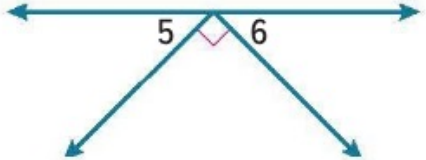



**Find the measure of each numbered angle and name the theorems that you used to justify your work.**

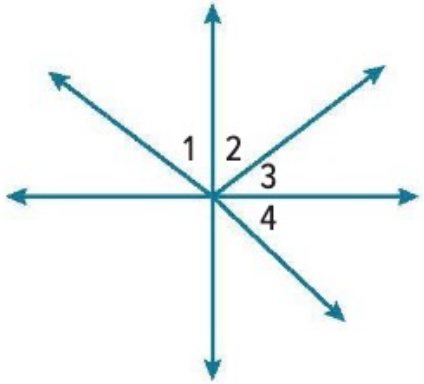
**13.** $m\angle 6 = (2x - 21)°$
$m\angle 7 = (3x - 34)°$




**14.** $m\angle 5 = m\angle 6$




**15.** $\angle 2$ and $\angle 3$ are complementary.
$\angle 1 \cong \angle 4$ and $m\angle 2 = 28°$.



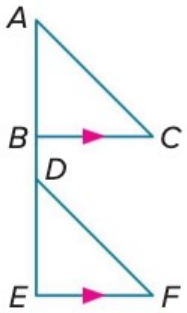
| 18 | Proving Triangles Congruent – ASA, AAS | (10-15) | 868,869 |
|---|---|---|---|

**PROOF** **Write the specified type of proof.**

**10.** two-column proof

**Given:** $\overline{BC} \parallel \overline{EF}$, $\overline{AB} \cong \overline{DE}$, $\angle C \cong \angle F$

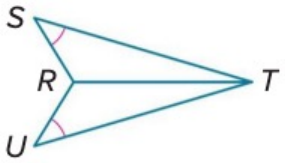
**Prove:** $\triangle ABC \cong \triangle DEF$




**11.** flow proof

**Given:** $\angle S \cong \angle U$, and $\overline{TR}$ bisects $\angle STU$.

**Prove:** $\triangle SRT \cong \triangle URT$



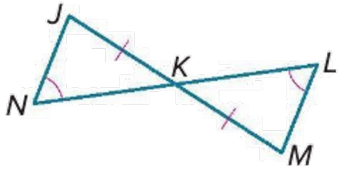

**Example 3**

**Write the specified type of proof.**

**12.** flow proof

**Given:** $\overline{JK} \cong \overline{MK}$, $\angle N \cong \angle L$

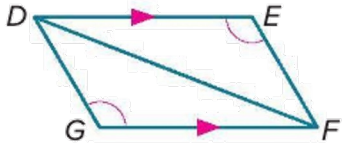
**Prove:** $\triangle JKN \cong \triangle MKL$




**13.** paragraph proof

**Given:** $\overline{DE} \parallel \overline{FG}$, $\angle E \cong \angle G$

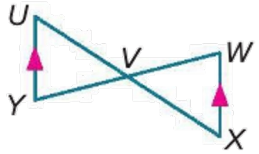
**Prove:** $\triangle DFG \cong \triangle FDE$




**14.** two-column proof

**Given:** $V$ is the midpoint of $\overline{YW}$; $\overline{UY} \parallel \overline{XW}$,

**Prove:** $\triangle UVY \cong \triangle XVW$

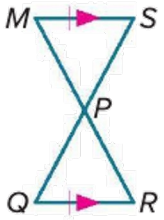



**15.** two-column proof

**Given:** $\overline{MS} \cong \overline{RQ}$,

$\overline{MS} \parallel \overline{RQ}$,

**Prove:** $\triangle MSP \cong \triangle RQP$



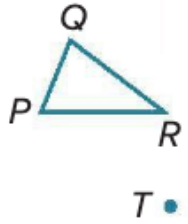
| | | | |
|---|---|---|---|
| 19 | Rotations | (6-12) | 809, 810 |

## Mixed Exercises

**6.** Point $Q$ with coordinates $(4, -7)$ is rotated 270° clockwise about $(5, 1)$. What are the coordinates of its image?

**7.** Parallelogram $JKLM$ has vertices $J(2, 1)$, $K(7, 1)$, $L(6, -3)$, and $M(1, -3)$. What are the coordinates of the image of $K$ if the parallelogram is rotated 270° counterclockwise about $(-2, -1)$?

**8.** USE TOOLS Use a protractor and ruler to draw a rotation of $\triangle PQR$ 210° about $T$.




**9.** The line segment $XY$ with endpoints $X(3, 1)$ and $Y(2, -2)$ is rotated 90° counterclockwise about $(-6, 4)$. What are the endpoints of $\overline{X'Y'}$?

**10.** HIKING A damaged compass points northwest instead of north. If you travel west by the compass, what is your angle of rotation to true north?



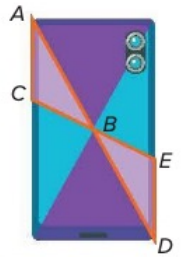

**11.** A circular dial with the digits 0 through 9 evenly spaced around its edge is rotated clockwise 36°. How many times would you have to perform this rotation to bring the dial back to its original position?

**12.** Under a rotation about the origin, the point $A(5, -1)$ is mapped to the point $A'(1, 5)$. What is the image of the point $B(-4, 6)$ under this rotation? Explain.

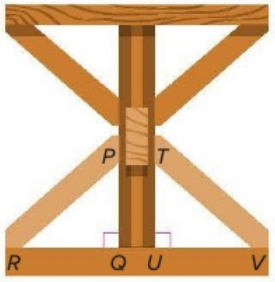
| 20 | Congruent Triangles | (12-16) | 852 |
|---|---|---|---|

### Example 3

**12.** **DESIGN** Camila is designing a new image for her cell phone case. If $m\angle ABC = 35°$, $m\angle BAC = 29°$, and $\angle ACB \cong \angle DEB$, what is $m\angle DEB$?



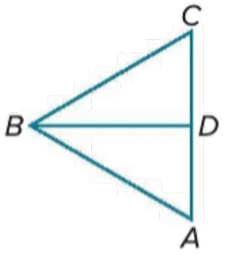

**13.** **CARPENTRY** Mr. Lewis is building a rustic dining table. Instead of having four legs, the table has a set of supports at each end. If $\angle PRQ \cong \angle TVU$ and $m\angle RPQ = 49°$, what is $m\angle TVU$?



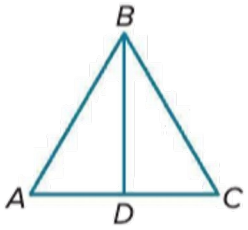

### Example 4

**PROOF** **For 14–16, write a two-column proof.**

**14.** **Given:** $\overline{AB} \cong \overline{CB}$, $\overline{AD} \cong \overline{CD}$, $\angle BAD \cong \angle BCD$, $\overline{BD}$ bisects $\angle ABC$.
**Prove:** $\triangle ABD \cong \triangle CBD$




**15.** **Given:** $\overline{AB} \cong \overline{CB}$, $\overline{AD} \cong \overline{CD}$, $\angle ABD \cong \angle CBD$, $\angle ADB \cong \angle CDB$
**Prove:** $\triangle ABD \cong \triangle CBD$

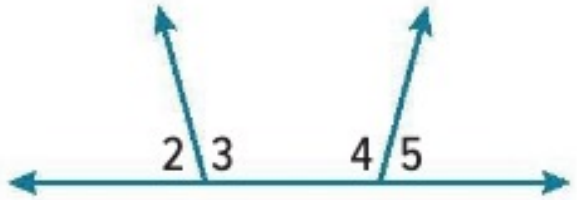



**16.** **Given:** $\angle A \cong \angle C$, $\angle D \cong \angle B$, $\overline{AD} \cong \overline{CB}$, $\overline{AE} \cong \overline{CE}$, $\overline{AC}$ bisects $\overline{BD}$.
**Prove:** $\triangle AED \cong \triangle CEB$

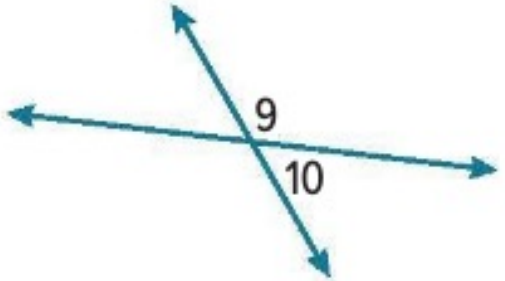


| 21 | Proving Angle Relationships | (16-18) | 754 |
|---|---|---|---|

**16.** $\angle 2$ and $\angle 4$ and $\angle 4$ and $\angle 5$ are supplementary. $m\angle 4 = 105°$.




**17.** $m\angle 9 = (3x + 12)°$
$m\angle 10 = (x - 24)°$




**18.** $m\angle 3 = (2x + 23)°$
$m\angle 4 = (5x - 112)°$

