

Measuring Angles ANSWER KEY

Use your protractor to extend the lines and measure each angle.

(1)



This angle is 139 degrees.

(6)



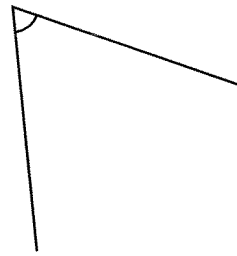
This angle is 106 degrees.

(2)



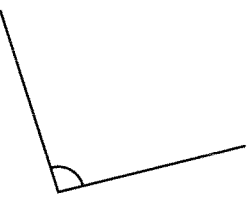
This angle is 21 degrees.

(7)



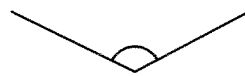
This angle is 65 degrees.

(3)



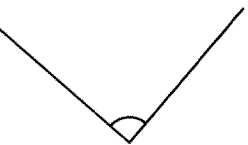
This angle is 94 degrees.

(8)



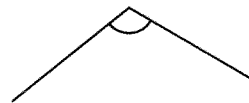
This angle is 126 degrees.

(4)



This angle is 89 degrees.

(9)



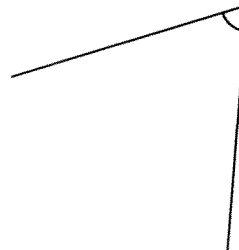
This angle is 111 degrees.

(5)



This angle is 83 degrees.

(10)

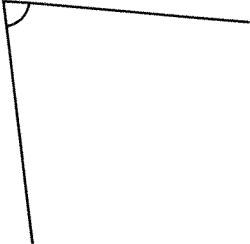



This angle is 69 degrees.

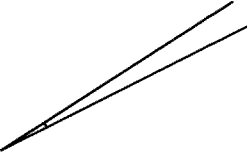
Measuring Angles

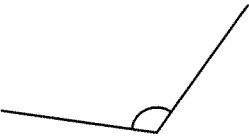
ANSWER KEY


Use your protractor to extend the lines and measure each angle.

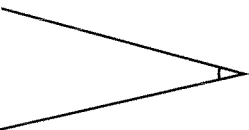
(1)  This angle is 78 degrees.

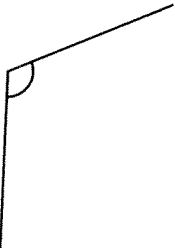
(6)  This angle is 114 degrees.

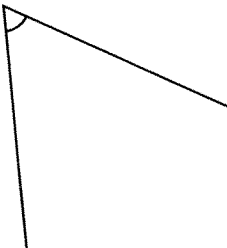
(2)  This angle is 6 degrees.

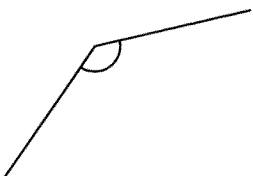
(7)  This angle is 117 degrees.


(3)  This angle is 113 degrees.

(8)  This angle is 28 degrees.

(4)  This angle is 114 degrees.

(9)  This angle is 60 degrees.

(5)  This angle is 137 degrees.

(10)  This angle is 132 degrees.

Name and Label Connected Angles (page 22)

- Point E
- \vec{ES}
- $\angle 1$, $\angle RES$, $\angle SER$
- $\angle 2$, $\angle SET$, $\angle TES$
- $\angle RET$, $\angle TER$
- Point U
- \vec{UN}
- $\angle 1$, $\angle MUN$, $\angle NUM$, $\angle 2$, $\angle NUR$, $\angle RUN$, $\angle MUR$, $\angle RUM$

Classify Angles (page 23)

- obtuse; $\angle I$, $\angle GIV$, $\angle VIG$
- right; $\angle D$, $\angle ADF$, $\angle FDA$
- acute; $\angle O$, $\angle XOT$, $\angle TOX$
- obtuse; $\angle N$, $\angle WNF$, $\angle FNF$
- acute; $\angle B$, $\angle ABC$, $\angle CBA$
- straight; $\angle K$, $\angle JKL$, $\angle LKJ$

Identify Congruent Angles (page 24)

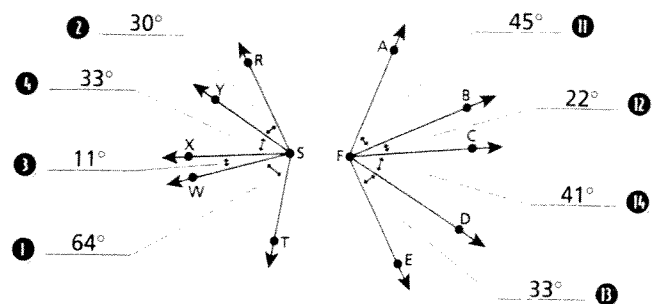
Note: For all angles and lines, letters can be written in reverse order.

- $\angle IFJ$, $\angle JFK$, $\angle GFK$
- $\angle GFK$, $\angle IFK$, $\angle IFG$, $\angle JFH$
- $\angle HFI$
- $\angle IFJ \cong \angle JFK$
- \vec{JG}
- $\angle TSR$, $\angle RSU$, $\angle TSU$, or $\angle USV$
- $\angle TSV$
- $\angle RSV$
- $\angle RSU \cong \angle USV$
- \vec{SU} (can only be written in this order)

Add and Subtract to Find Angle Measures (page 25)

- 23°
- 45°
- 87°
- 135°
- 180°
- $m\angle DAB - m\angle MAB = 87 - 23 = 64^\circ$
- $m\angle KAB - m\angle GAB = 180 - 135 = 45^\circ$
- $m\angle KAB - m\angle DAB = 180 - 87 = 93^\circ$
- $m\angle GAB - m\angle LAB = 135 - 45 = 90^\circ$
- $m\angle GAB - m\angle MAB = 135 - 23 = 112^\circ$
- $m\angle KAB - m\angle LAB = 180 - 45 = 135^\circ$
- $\angle GAB \cong \angle LAK$, $\angle LAB \cong \angle KAG$

Calculate Angle Measures (page 26)



- 63°
- 138°
- 75°
- 44°
- 108°
- 74°
- 67°
- 63°
- 108°
- 96°
- 141°
- 74°

Complementary and Perpendicular Angles (page 27)

- 55° , 35° , adjacent
- 30° , 60° , nonadjacent
- 65° , 25° , nonadjacent
- 42° , 48° , adjacent
- 72° , 18° , adjacent
- 38° , 52° , adjacent

Supplementary and Linear Angles (page 28)

- 25° , 155° , linear
- 45° , 135°
- 73° , 107°
- 150° , 30°
- 55° , 125° , linear
- 153° , 27° , linear

Find Values of Angles (page 29)

- 148° ; Both total 180°
- 78° ; Both total 180°
- 82° ; Both adjacent angles total 180°
- 49° ; Both total 90°
- 137° ; Both total 180°
- 87° ; Both adjacent angles total 180°
- 123° ; Both adjacent angles total 180°
- 69° ; Both total 180°

Parallel Lines (page 38)

1. Possible answers: \overrightarrow{PJ} and \overrightarrow{MR} , \overrightarrow{PJ} and \overrightarrow{FX} ,
 \overrightarrow{PJ} and \overrightarrow{QD} , \overrightarrow{FX} and \overrightarrow{MR} , or \overrightarrow{QD} and \overrightarrow{MR}
2. \overrightarrow{QD} and \overrightarrow{FX}
3. \overrightarrow{PJ} and \overrightarrow{MR}
4. Possible answers: \overrightarrow{TO} and \overrightarrow{RD} , \overrightarrow{TO} and \overrightarrow{CA} ,
 \overrightarrow{CA} and \overrightarrow{RD} , \overrightarrow{CA} and \overrightarrow{PS} , \overrightarrow{PS} and \overrightarrow{TO}
5. \overrightarrow{SP} and \overrightarrow{RD}
6. \overrightarrow{TO} and \overrightarrow{CA}

Transversals and Corresponding Angles (page 39)

1. \overrightarrow{AB}
2. \overrightarrow{CD} and \overrightarrow{FE}
3. $\angle 2$ and $\angle 6$, $\angle 4$ and $\angle 8$, $\angle 1$ and $\angle 5$, $\angle 3$ and $\angle 7$
4. \overrightarrow{RS}
5. \overrightarrow{LM} and \overrightarrow{FG}
6. $\angle 1$ and $\angle 5$, $\angle 4$ and $\angle 8$, $\angle 2$ and $\angle 6$, $\angle 3$ and $\angle 7$

Interior Angles (page 40)

1. \overrightarrow{RS}
2. \overrightarrow{XY} , \overrightarrow{MO}
3. $\angle 3$ and $\angle 5$, $\angle 4$ and $\angle 6$
4. $\angle 3$ and $\angle 6$, $\angle 5$ and $\angle 4$
5. \overrightarrow{LS}
6. \overrightarrow{AB} , \overrightarrow{MN}
7. $\angle 4$ and $\angle 5$, $\angle 3$ and $\angle 6$
8. $\angle 4$ and $\angle 6$, $\angle 3$ and $\angle 5$

Transversals and Exterior Angles (page 41)

1. \overrightarrow{KM}
2. \overrightarrow{EH} , \overrightarrow{NP}
3. $\angle 1$ and $\angle 7$, $\angle 2$ and $\angle 8$
4. $\angle 1$ and $\angle 8$, $\angle 2$, and $\angle 7$
5. \overrightarrow{QK}
6. \overrightarrow{CD} , \overrightarrow{PT}
7. $\angle 1$ and $\angle 8$, $\angle 2$ and $\angle 7$
8. $\angle 1$ and $\angle 7$, $\angle 2$ and $\angle 8$

Identify Transversal Angles (page 42)

1. $\angle PNM$ and $\angle RQT$, $\angle PNO$ and $\angle SQT$
2. $\angle MNT$ and $\angle PQR$, $\angle PQS$ and $\angle ONT$
3. $\angle MNT$ and $\angle PQS$, $\angle ONT$ and $\angle PQR$
4. $\angle PNM$ and $\angle SQT$, $\angle PNO$ and $\angle RQT$
5. Possible answers: $\angle ABD$ and $\angle FGD$, $\angle DBC$ and $\angle DGH$,
 $\angle ABE$ and $\angle FGE$, $\angle EBC$ and $\angle EGH$
6. $\angle ABD$ and $\angle EGH$, $\angle DBC$ and $\angle FGE$
7. $\angle ABE$ and $\angle DGH$, $\angle FGD$ and $\angle CBE$
8. $\angle ABD$ and $\angle FGE$, $\angle DBC$ and $\angle EGH$
9. true
10. false
11. false
12. true

Congruent Transversal Angle Measures (page 43)

- | | |
|-----------------|-----------------|
| 1. 80° | 2. 80° |
| 3. 100° | 4. 100° |
| 5. 80° | 6. 100° |
| 7. 46° | 8. 134° |
| 9. 46° | 10. 46° |
| 11. 134° | 12. 134° |

Supplementary Transversal Angle Measures (page 44)

- | | |
|-----------------|-----------------|
| 1. 107° | 2. 73° |
| 3. 107° | 4. 75° |
| 5. 105° | 6. 75° |
| 7. 70° | 8. 110° |
| 9. 70° | 10. 56° |
| 11. 124° | 12. 124° |

More Transversal Angles (page 45)

- | | |
|-----------------|-----------------|
| 1. 121° | 2. 121° |
| 3. 59° | 4. 77° |
| 5. 103° | 6. 77° |
| 7. 66° | 8. 114° |
| 9. 114° | 10. 66° |
| 11. 114° | 12. 114° |
| 13. 66° | |

Midpoint Bisectors (page 46)

- $-4 + 6$
midpoint coordinate = 1
- $-3 + 10$
midpoint coordinate = 3.5
- $-6 + 3$
midpoint coordinate = -1.5
- $3 + 9$
midpoint coordinate = 6
- $-11 + 1$
midpoint coordinate = -5
- $-9 + 3$
midpoint coordinate = -3
- $-2 + 8$
midpoint coordinate = 3
- $-3 + 13$
midpoint coordinate = 5
- $-1 + 11$
midpoint coordinate = 5

Angle Bisectors (page 47)

- \overrightarrow{JM}
- $m\angle KJM = m\angle MJL$
- $60^\circ, 30^\circ$
- \overrightarrow{PN}
- $m\angle MPN = m\angle NPO$
- $24^\circ, 24^\circ$
- \overrightarrow{SP}
- $56^\circ, 28^\circ$
- $m\angle TVW = m\angle WVX$
- $16^\circ, 32^\circ$

Algebra and Intersecting Lines (page 48)

- $4x + 9x + 11 = 180^\circ$
 $x = 13$
 128°
 52°
- $x + 5 + 6x = 180^\circ$
 $x = 25$
 30°
 150°
- $x = 25$
 90°
 90°
- $x = 16$
 148°
 32°

Algebra and Transversals (page 49)

- $11x + 2 + 7x - 2 = 180^\circ$
 $x = 10$
 68°
 112°
 112°
 112°
- $6x + 12 + 5x + 3 = 180^\circ$
 $8x - 5 + 4x + 5 = 180^\circ$
 $x = 15$
 102°
 78°
 115°
 65°
- $11x + 4x = 180^\circ$
 $x = 12$
 132°
 48°
 90°
 90°
- $4x + 10 + 3x - 5 = 180^\circ$
 $x = 25$
 110°
 70°
 70°
 110°

Triangles (page 50)

- | | |
|----------------|-----------------|
| 1. acute | 2. triangle |
| 3. altitude | 4. obtuse |
| 5. scalene | 6. hypotenuse |
| 7. equiangular | 8. legs |
| 9. right | 10. base |
| 11. isosceles | 12. equilateral |

Classify Triangles by Sides (page 51)

- | | |
|----------------|--------------|
| 1. isosceles | 2. scalene |
| 3. isosceles | 4. scalene |
| 5. scalene | 6. scalene |
| 7. equilateral | 8. isosceles |
| 9. equilateral | |

Classify Triangles by Angles (page 52)

- | | |
|----------------|-----------|
| 1. right | 2. right |
| 3. acute | 4. right |
| 5. acute | 6. obtuse |
| 7. equiangular | 8. obtuse |
| 9. equiangular | |

What Triangle Is It? (page 53)

- | | |
|----------------------------|--------------------|
| 1. right scalene | 2. obtuse scalene |
| 3. equiangular equilateral | 4. acute scalene |
| 5. right scalene | 6. right scalene |
| 7. obtuse scalene | 8. acute isosceles |
| 9. right scalene | |

Find Missing Triangle Measures (page 54)

- | | |
|-------------------------|-------------------------|
| 1. $40^\circ, 70^\circ$ | 2. $58^\circ, 90^\circ$ |
| 3. 74° | 4. $30^\circ, 90^\circ$ |
| 5. 65° | 6. $48^\circ, 66^\circ$ |
| 7. $60^\circ, 60^\circ$ | 8. $68^\circ, 44^\circ$ |
| 9. 55° | |

Determine Triangle Measures (page 55)

- | | |
|-------------------------------|-------------------------------|
| 1. 90° and 40° | 2. 45° |
| 3. 60° and 60° | 4. 54° |
| 5. 90° and 30° | 6. 110° |
| 7. 108° | 8. 36° |
| 9. 90° and 55° | 10. 90° and 32° |
| 11. 60° and 60° | 12. 100° |

Segments in Triangles (page 56)

- | | |
|-----------------------------------|-----------------------------------|
| 1. \overline{JC} | 2. \overline{AC} |
| 3. $\overline{JC}, \overline{AC}$ | 4. $\overline{AJ}, \overline{AC}$ |
| 5. \overline{PN} | 6. \overline{MN} |
| 7. $\overline{PM}, \overline{PN}$ | 8. $\overline{NP}, \overline{NM}$ |
| 9. $\angle T$ | 10. $\angle B$ |
| 11. $\angle T$ | 12. $\angle X$ |

Segments in Isosceles Triangles (page 57)

- $\angle Z, \angle Y$
- $\overline{XZ}, \overline{XY}$
- $m\angle Y = 50^\circ$
- $m\overline{XZ} = 6 \text{ cm}$
- $\angle P, \angle Q$
- $\overline{NP}, \overline{NQ}$
- $m\angle P = 76^\circ$
- $m\overline{NP} = 11 \text{ cm}$

The Medians of a Triangle (page 58)

- $\overline{SX}, \overline{NT}, \overline{BP}$
- Point F
- a side
- no
- yes
- $\overline{JM}, \overline{CT}, \overline{AX}$
- Point B
- a median
- yes
- yes

The Perpendicular Bisectors of a Triangle (page 59)

- $\overline{AQ}, \overline{PQ}, \overline{SQ}$
- Point Q
- a side
- yes
- $\overline{HK}, \overline{FH}, \overline{HQ}$
- Point H
- yes
- yes, because an angle is bisected and creates two equal parts

The Angle Bisectors of a Triangle (page 60)

- $\overline{BO}, \overline{TN}, \overline{XM}$
- Point P
- $m\angle BTN = 34^\circ, m\angle NTX = 34^\circ$
- $m\angle BXM = 16^\circ, m\angle MXT = 16^\circ$
- $\overline{JE}, \overline{CF}, \overline{AH}$
- Point G
- $m\angle ACF = 17.5^\circ, m\angle FCJ = 17.5^\circ$
- $m\angle JCF = 27.5^\circ, m\angle FCA = 27.5^\circ$

The Altitude of a Triangle (page 61)

- $\overline{BM}, \overline{LT}, \overline{KX}$
- Point N
- \overline{LT}
- $\overline{MX}, \overline{MT}, \text{ or } \overline{TX}$
- $\overline{AS}, \overline{RX}, \overline{CT}$
- Point X
- \overline{AS}
- \overline{RX}

Determine Concurrent Lines (page 62)

- | | |
|---------------------------|---------------------------|
| 1. median | 2. angle bisector |
| 3. perpendicular bisector | 4. perpendicular bisector |
| 5. altitude | 6. median |
| 7. altitude | 8. angle bisector |
| 9. median | |

Quadrilaterals (page 63)

- | | |
|-------------------|--------------------|
| 1. diagonals | 2. parallelogram |
| 3. rhombus | 4. square |
| 5. quadrilateral | 6. opposite angles |
| 7. trapezoid | 8. rectangle |
| 9. opposite sides | 10. leg |
| 11. trapezium | 12. kite |
| 13. base | |

Name Quadrilaterals (page 64)

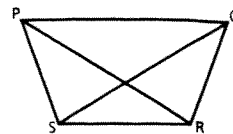
- quadrilateral, parallelogram
- quadrilateral, parallelogram, rectangle, square
- quadrilateral, parallelogram, rectangle
- quadrilateral, trapezoid
- quadrilateral, trapezium
- quadrilateral, parallelogram, rhombus
- quadrilateral
- quadrilateral, parallelogram, rectangle
- quadrilateral, trapezium, kite

Use Markings to Show Quadrilaterals (page 65)

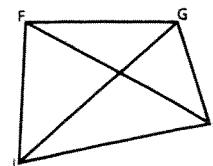
- opposite sides are congruent
opposite sides are parallel
all sides are perpendicular
rectangle
- one pair of opposite sides is parallel
no sides or angles are congruent
trapezoid
- all angles are perpendicular
opposite sides are parallel
all four sides are congruent
square
- opposite sides are parallel
all sides are congruent
rhombus

Diagonals on Quadrilaterals (page 66)

- \overline{PR} and \overline{QS}
- \overline{PS} and \overline{QR} ; \overline{PQ} and \overline{SR}
- $\angle QRS$ and $\angle SPQ$; $\angle PQR$ and $\angle RSP$



- \overline{GI} and \overline{FH}
- \overline{FI} and \overline{GH} ; \overline{FG} and \overline{HI}
- $\angle IFG$ and $\angle GHI$; $\angle FIH$ and $\angle HGF$

**Parallelograms (page 67)**

- $\overline{BC} \cong \overline{ED}$; $\overline{BE} \cong \overline{CD}$
- $\angle C \cong \angle E$; $\angle B \cong \angle D$
- $m\angle E$ and $m\angle D = 180^\circ$; $m\angle C$ and $m\angle B = 180^\circ$;
 $m\angle E$ and $m\angle B = 180^\circ$; $m\angle C$ and $m\angle D = 180^\circ$
- $\overline{BF} \cong \overline{FD}$; $\overline{CF} \cong \overline{FE}$
- $\overline{JK} \cong \overline{ML}$; $\overline{JM} \cong \overline{KL}$
- $\angle J \cong \angle L$; $\angle K \cong \angle M$
- $m\angle J$ and $m\angle K = 180^\circ$; $m\angle M$ and $m\angle L = 180^\circ$;
 $m\angle J$ and $m\angle M = 180^\circ$; $m\angle K$ and $m\angle L = 180^\circ$
- $\overline{JN} \cong \overline{NL}$; $\overline{MN} \cong \overline{NK}$

Rectangles (page 68)

- $\overline{RS} \cong \overline{TU}$; $\overline{RT} \cong \overline{SU}$
- $\angle R \cong \angle S \cong \angle U \cong \angle T$
- $\overline{RV} \cong \overline{VU}$
 $\overline{SV} \cong \overline{VT}$
- $m\angle R = 90^\circ$; $m\angle S = 90^\circ$; $m\angle T = 90^\circ$; $m\angle U = 90^\circ$
- $\overline{FI} \cong \overline{GH}$; $\overline{HI} \cong \overline{FG}$
- $m\angle F$ and $m\angle G = 180^\circ$; $m\angle G$ and $m\angle H = 180^\circ$;
 $m\angle H$ and $m\angle I = 180^\circ$; $m\angle I$ and $m\angle F = 180^\circ$
- $\overline{FK} \cong \overline{KH}$
 $\overline{GK} \cong \overline{KI}$
- $m\angle I = 90^\circ$; $m\angle F = 90^\circ$; $m\angle G = 90^\circ$; $m\angle H = 90^\circ$