G.CO.C.11: Parallelograms 2

1 In the diagram below, parallelogram \(ABCD\) has diagonals \(AC\) and \(BD\) that intersect at point \(E\).

Which expression is not always true?
1) \(\angle DAE \cong \angle BCE\)
2) \(\angle DEC \cong \angle BEA\)
3) \(AC \cong DB\)
4) \(DE \cong EB\)

2 Parallelogram \(ABCD\) with diagonals \(AC\) and \(BD\) intersecting at \(E\) is shown below.

Which statement must be true?
1) \(BE \cong CE\)
2) \(\angle BAE \cong \angle DCE\)
3) \(AB \cong BC\)
4) \(\angle DAE \cong \angle CBE\)

3 Which statement is true about every parallelogram?
1) All four sides are congruent.
2) The interior angles are all congruent.
3) Two pairs of opposite sides are congruent.
4) The diagonals are perpendicular to each other.

4 In parallelogram \(QRST\), diagonal \(QS\) is drawn. Which statement must always be true?
1) \(\triangle QRS\) is an isosceles triangle.
2) \(\triangle STQ\) is an acute triangle.
3) \(\triangle STQ \cong \triangle QRS\)
4) \(QS \cong QT\)

5 Which statement is not always true about a parallelogram?
1) The diagonals are congruent.
2) The opposite sides are congruent.
3) The opposite angles are congruent.
4) The opposite sides are parallel.

6 In the accompanying diagram of parallelogram \(ABCD\), \(m\angle A = (2x + 10)\) and \(m\angle B = 3x\). Find the number of degrees in \(m\angle B\).
7 In the accompanying diagram of parallelogram \(ABCD\), \(m\angle B = 5x\), and \(m\angle C = 2x + 12\). Find the number of degrees in \(\angle D\).

8 In parallelogram \(JKLM\), \(m\angle L\) exceeds \(m\angle M\) by 30 degrees. What is the measure of \(m\angle J\)?
   1) 75°
   2) 105°
   3) 165°
   4) 195°

9 The measures of two consecutive angles of a parallelogram are in the ratio 5:4. What is the measure of an obtuse angle of the parallelogram?
   1) 20°
   2) 80°
   3) 100°
   4) 160°

10 In parallelogram \(RSTU\), \(m\angle R = 5x – 2\) and \(m\angle S = 3x + 10\). Determine and state the value of \(x\).

11 In the diagram below of parallelogram \(ABCD\) with diagonals \(AC\) and \(BD\), \(m\angle 1 = 45\) and \(m\angle DCB = 120\).

What is the measure of \(\angle 2\)?
   1) 15°
   2) 30°
   3) 45°
   4) 60°

12 In the diagram below of parallelogram \(STUV\), \(SV = x + 3\), \(VU = 2x – 1\), and \(TU = 4x – 3\).

What is the length of \(SV\)?
   1) 5
   2) 2
   3) 7
   4) 4
13 In the accompanying diagram of parallelogram $ABCD$, diagonals $AC$ and $BD$ intersect at $E$, $BE = \frac{2}{3}x$, and $ED = x - 10$.

What is the value of $x$?
1) $-30$
2) $30$
3) $-6$
4) $6$

14 In the accompanying diagram of parallelogram $ABCD$, diagonals $AC$ and $DB$ intersect at $E$, $AE = 3x - 4$, and $EC = x + 12$.

What is the value of $x$?
1) $8$
2) $16$
3) $20$
4) $40$

15 As shown in the diagram below, the diagonals of parallelogram $QRST$ intersect at $E$. If $QE = x^2 + 6x$, $SE = x + 14$, and $TE = 6x - 1$, determine $TE$ algebraically.

16 In parallelogram $ABCD$, with diagonal $AC$ drawn, $m\angle BCA = 4x + 2$, $m\angle DAC = 6x - 6$, $m\angle BAC = 5y - 1$, and $m\angle DCA = 7y - 15$. Determine $m\angle B$. 

Name: ________________________
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Answer Section

1 ANS: 3  REF: 061111ge
2 ANS: 2  REF: 011522ge
3 ANS: 3  REF: 011104ge
4 ANS: 3

5 ANS: 1
Only rectangles have congruent diagonals.
REF: 060106a

6 ANS:
102. Adjacent angles in a parallelogram are supplementary.  \[ 2x + 10 + 3x = 180 \]
\[ 5x = 170 \]
\[ x = 34 \]
m\angle B = 3(34) = 102.
REF: 060126a

7 ANS:
120. Adjacent angles in a parallelogram are supplementary.  \[ 2x + 12 + 5x = 180 \]
\[ 7x = 168 \]
\[ x = 24 \]
m\angle B = 5(24) = 120.
Opposite angles in a parallelogram are congruent, so m\angle D = 120.
REF: 060736a

8 ANS: 2
\[ L + L - 30 = 180 \]
\[ 2L = 210 \]
\[ L = 105 \]
REF: 081519ge

9 ANS: 3
Adjacent angles in a parallelogram are supplementary.  \[ \frac{5}{5 + 4} \times 180 = 100. \]
REF: 080618a
10 ANS:
\[5x - 2 + 3x + 10 = 180\]
\[8x + 8 = 180\]
\[8x = 172\]
\[x = 21.5\]

REF: 011631ge

11 ANS: 1
\(\angle DCB\) and \(\angle ADC\) are supplementary adjacent angles of a parallelogram. \(180 - 120 = 60\).
\[\angle 2 = 60 - 45 = 15\]

REF: 080907ge

12 ANS: 1
Opposite sides of a parallelogram are congruent. \(4x - 3 = x + 3\).
\[SV = (2) + 3 = 5\]
\[3x = 6\]
\[x = 2\]

REF: 011013ge

13 ANS: 2
The diagonals of a parallelogram bisect each other.
\[\frac{2}{3}x = x - 10\]
\[x = 30\]

REF: 060626a

14 ANS: 1
The diagonals of a parallelogram bisect each other.
\[3x - 4 = x + 12\]
\[x = 8\]

REF: 080202a

15 ANS:
11. \[x^2 + 6x = x + 14\]
\[6(2) - 1 = 11\]
\[x^2 + 5x - 14 = 0\]
\[(x + 7)(x - 2) = 0\]
\[x = 2\]

REF: 081235ge

16 ANS:
\[6x - 6 = 4x + 2\]
\[m\angle BCA = 4(4) + 2 = 18\]
\[7y - 15 = 5y - 1\]
\[m\angle BAC = 5(7) - 1 = 34\]
\[m\angle B = 180 - (18 + 34) = 128\]
\[2x = 8\]
\[2y = 14\]
\[x = 4\]
\[y = 7\]

REF: 061536ge