G.CO.C.11: Parallelograms 2
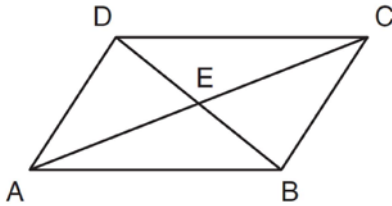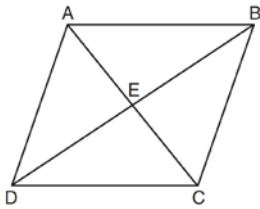
1 In the diagram below, parallelogram $ABCD$ has diagonals $\overline{AC}$ and $\overline{BD}$ that intersect at point E.

Which expression is *not* always true?
1) $\angle DAE \cong \angle BCE$
2) $\angle DEC \cong \angle BEA$
3) $\overline{AC} \cong \overline{DB}$
4) $\overline{DE} \cong \overline{EB}$

2 Parallelogram $ABCD$ with diagonals $\overline{AC}$ and $\overline{BD}$ intersecting at E is shown below.

Which statement must be true?
1) $\overline{BE} \cong \overline{CE}$
2) $\angle BAE \cong \angle DCE$
3) $\overline{AB} \cong \overline{BC}$
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 $\overline{QS}$ is drawn. Which statement must always be true?
1) $\triangle QRS$ is an isosceles triangle.
2) $\triangle STQ$ is an acute triangle.
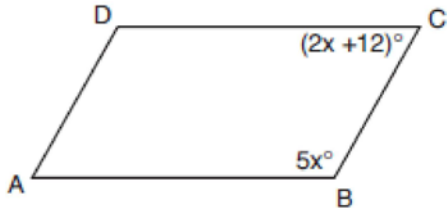3) $\triangle STQ \cong \triangle QRS$
4) $\overline{QS} \cong \overline{QT}$

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$\angle B$.
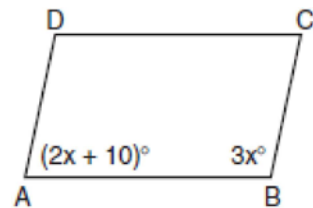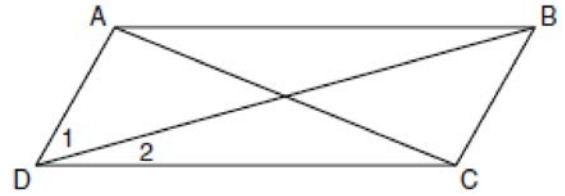
7   In the accompanying diagram of parallelogram
     ABCD, m∠*B* = 5*x*, and m∠*C* = 2*x* + 12. Find the
     number of degrees in ∠*D*.

11   In the diagram below of parallelogram *ABCD* with
     diagonals $\overline{AC}$ and $\overline{BD}$, m∠1 = 45 and
     m∠*DCB* = 120.

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

8   In parallelogram *JKLM*, m∠*L* exceeds m∠*M* by 30
     degrees. What is the measure of m∠*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?
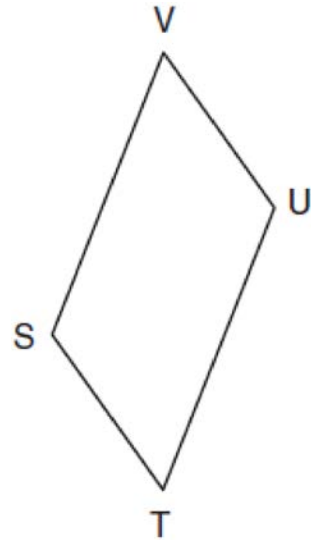1)   20°
2)   80°
3)   100°
4)   160°

12   In the diagram below of parallelogram *STUV*,
     SV = *x* + 3, *VU* = 2*x* − 1, and *TU* = 4*x* − 3.

10   In parallelogram *RSTU*, m∠*R* = 5*x* − 2 and
     m∠*S* = 3*x* + 10. Determine and state the value of *x*.

What is the length of $\overline{SV}$?
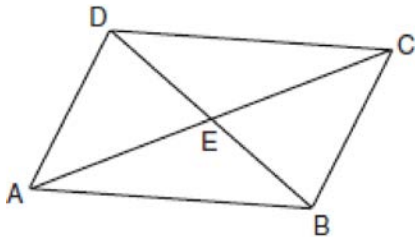1)   5
2)   2
3)   7
4)   4

2

13 In the accompanying diagram of parallelogram
ABCD, diagonals $\overline{AC}$ and $\overline{BD}$ intersect at E,
$BE = \dfrac{2}{3}x$, and $ED = x - 10$.
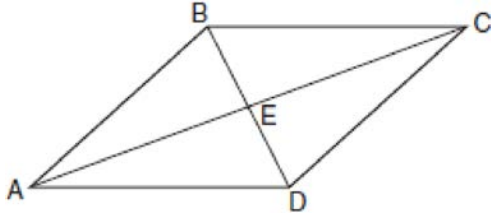
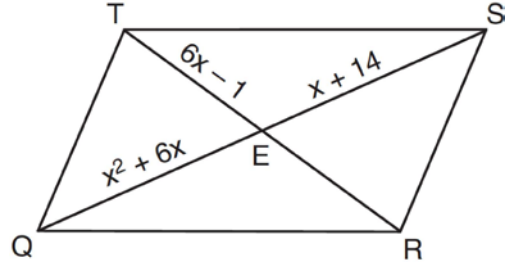What is the value of x?
1) −30
2) 30
3) −6
4) 6

14 In the accompanying diagram of parallelogram
ABCD, diagonals $\overline{AC}$ and $\overline{DB}$ 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 $\overline{AC}$ drawn,
m∠BCA = 4x + 2, m∠DAC = 6x − 6,
m∠BAC = 5y − 1, and m∠DCA = 7y − 15.
Determine m∠B.

3

G.CO.C.11: Parallelograms 2
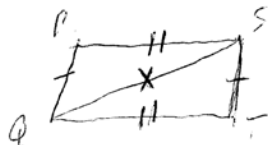## Answer Section

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

 REF: 081402ge
5 ANS: 1
Only rectangles have congruent diagonals.

 REF: 060106a
6 ANS:

102. Adjacent angles in a parallelogram are supplementary. $\begin{array}{c} 2x+10+3x=180 \\ x=34 \end{array}$. $m\angle B = 3(34) = 102$.

 REF: 060126a
7 ANS:

120. Adjacent angles in a parallelogram are supplementary. $\begin{array}{c} 2x+12+5x=180 \\ x=24 \end{array}$. $m\angle B = 5(24) = 120$.

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. $\dfrac{5}{5+4} \times 180 = 100$.

 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. $\dfrac{2}{3}x = x - 10$.

$$x = 30$$

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:

$6x - 6 = 4x + 2$ $m\angle BCA = 4(4) + 2 = 18$ $7y - 15 = 5y - 1$ $m\angle BAC = 5(7) - 1 = 34$ $m\angle B = 180 - (18 + 34) = 128$

$$2x = 8 \qquad\qquad\qquad 2y = 14$$

$$x = 4 \qquad\qquad\qquad y = 7$$

REF: 061536ge