# Chapter 7 – Geometric Relationships
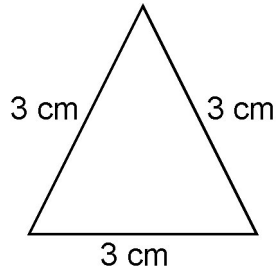
## Practice Worksheets

## MPM1D

## Part 1: Classify Triangles

1. Classify each triangle according to its side lengths.

   **a)**
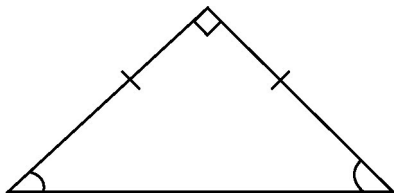
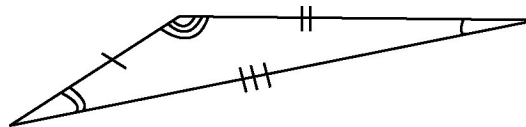   3 cm / 3 cm / 3 cm

   **b)**

   25 m / 25 m / 40 m
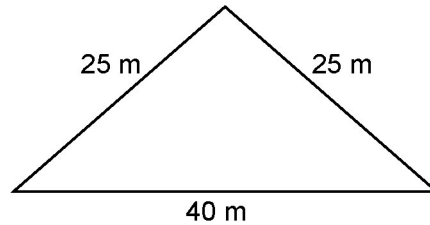
2. Classify each triangle according to its side lengths and angle measures.
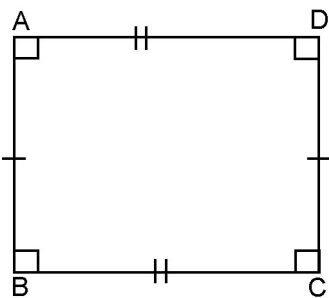
   **a)**

   **b)**

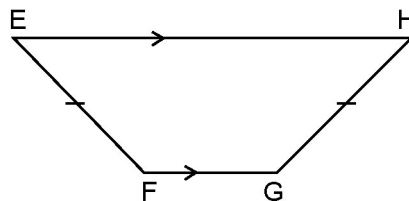## Part 2: Classify Polygons

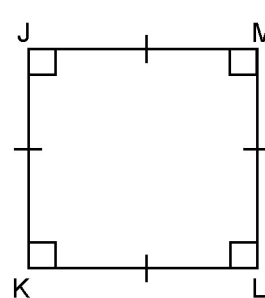3. Is each quadrilateral regular or irregular? Name each quadrilateral.

   **a)** A D B C

   **b)** E H F G

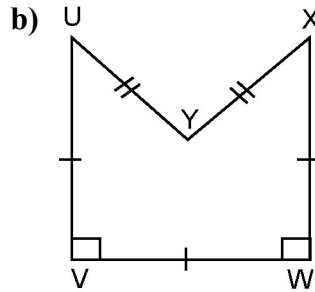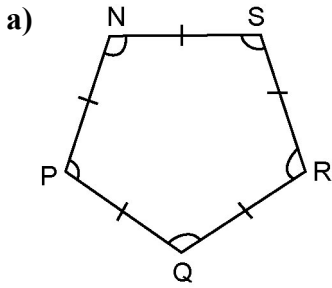   **c)** J M K L

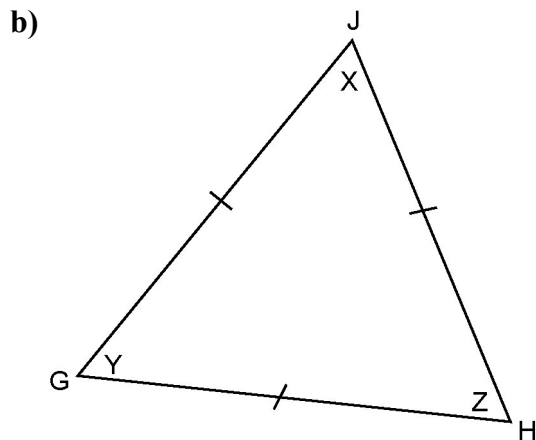**4.** Is each polygon regular or irregular? Classify each polygon according to its number of sides.

a)

N      S

P      R

Q

b) U          X

Y

V      W

c)

C

A

B
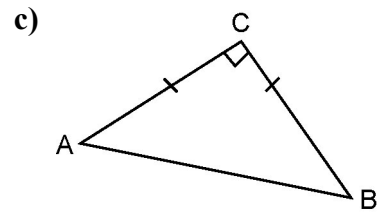
**Part 3: Angle Properties**

**5.** Find the measures of the indicated angles.

a)

F

X

D  47°

52°

E

b)

J

X

G  Y

Z

H
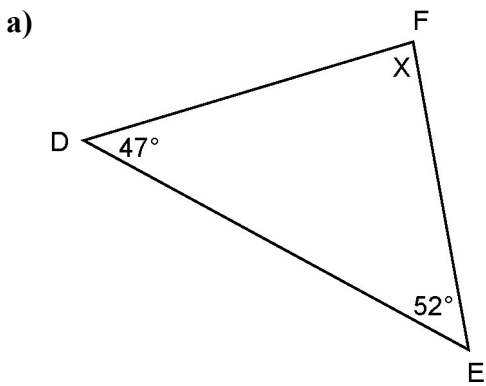
**6.** Find the measures of the indicated angles. Give reasons for your answers.

a)

b
c  a

45°

b)

105°
c  a
b
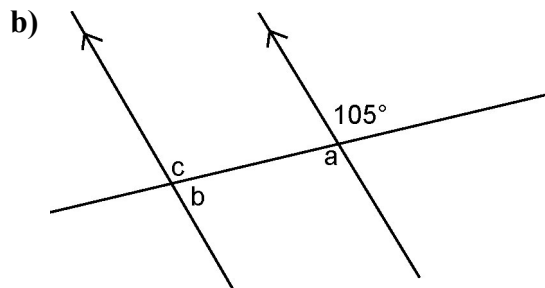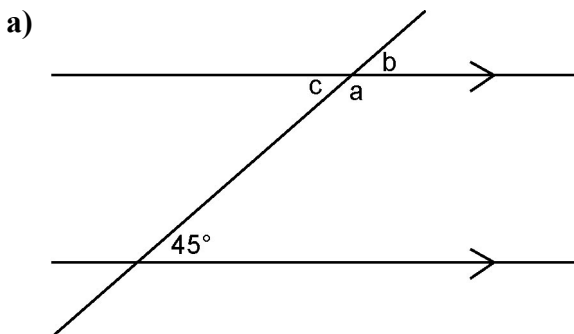
# Answers

1. **a)** equilateral triangle
   **b)** isosceles triangle
2. **a)** right isosceles triangle
   **b)** obtuse scalene triangle
3. **a)** irregular; rectangle
   **b)** irregular; trapezoid
   **c)** regular; square
4. **a)** regular; pentagon
   **b)** irregular; hexagon
   **c)** irregular; triangle
5. **a)** $x = 81°$       **b)** $x = y = z = 60°$
6. **a)** $a = 135°$; $b = 45°$; $c = 45°$
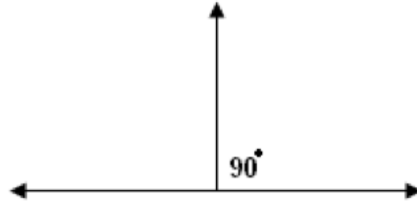   **b)** $a = 105°$; $b = 75°$; $c = 105°$

**1.** Find the missing angles in the following supplementary angles

**a)**

135°

**b)**

90°

**c)**

151°

**d)**

129°

**e)**

80°

**f)**

167°

**g)**

40°   35°

**h)**

72°   58°
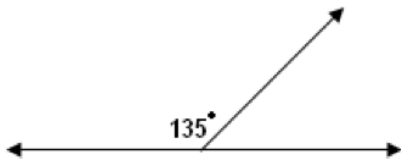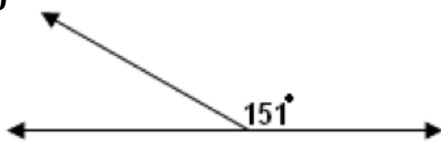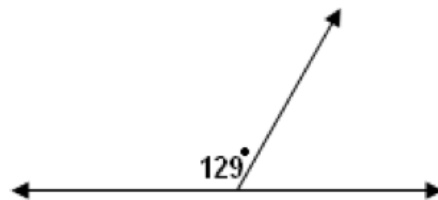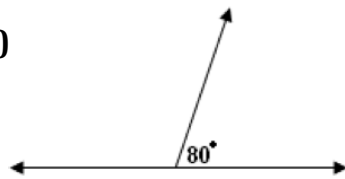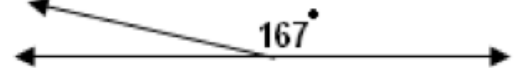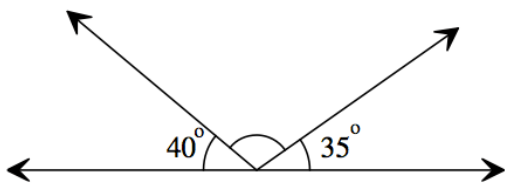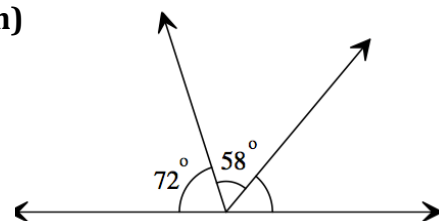
**2.** Find the value of $x$, $y$, and $z$.

**a)**

80°   x   y   z

**b)**

x   62°   y   z
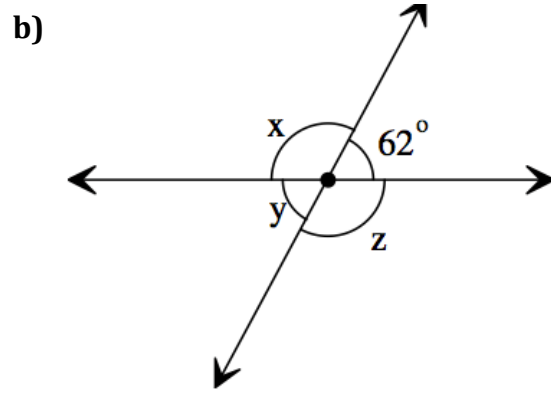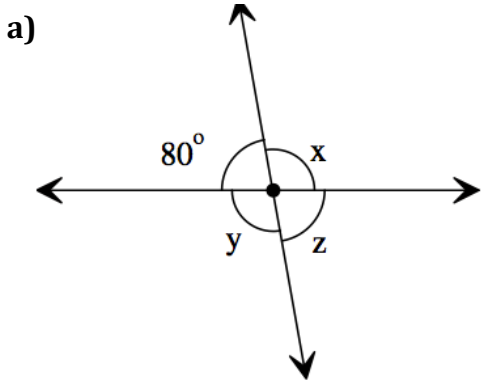
**3.** Find the missing angles

**a)**

110° 70°   ? ?

**b)**

? 95°   85° ?

**c)**

112° 68°   ? ?

**d)**

130° 50°   ? ?

**e)**

110°   70°   ?   ?

**f)**

76°   ?   ? 104°
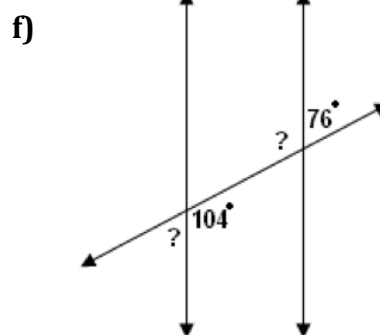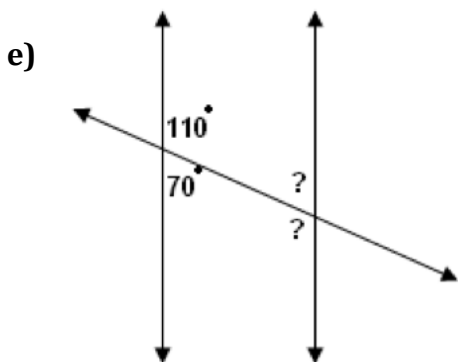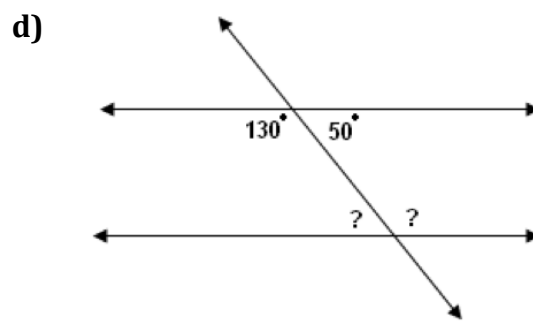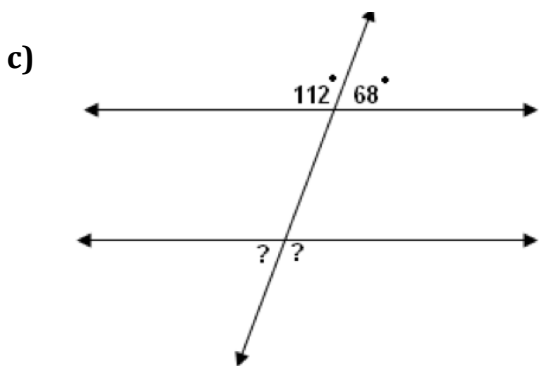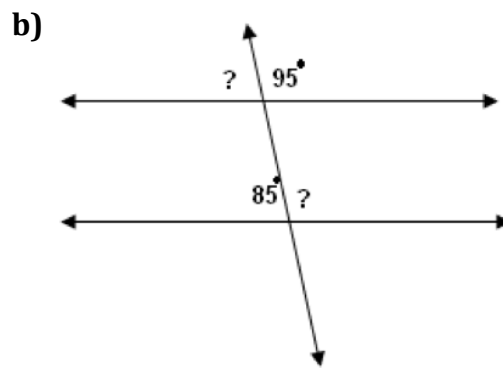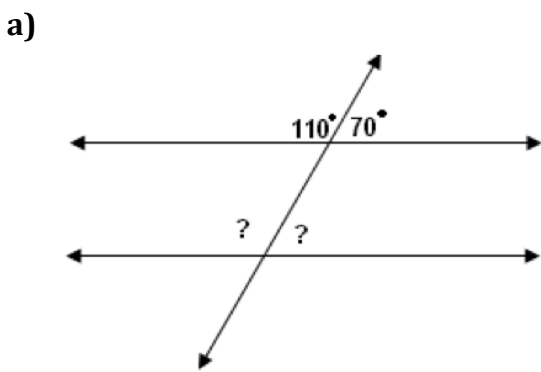
**4.** Write all of the angles from the given angle for each of the following:

**a)**

75°

**b)**

143°

**c)**

94°

**d)**

26°

**e)**

115°

**f)**

90°
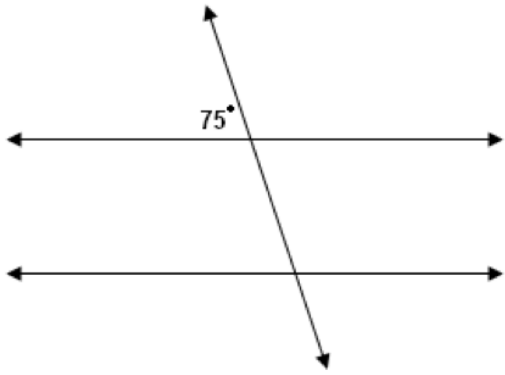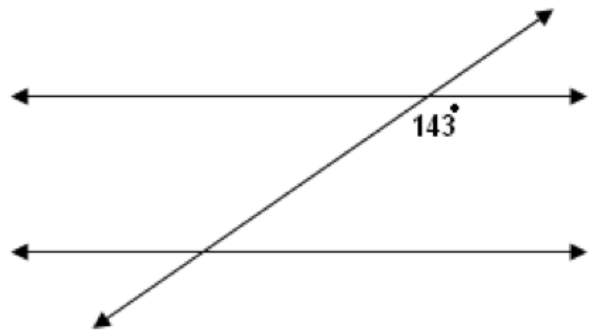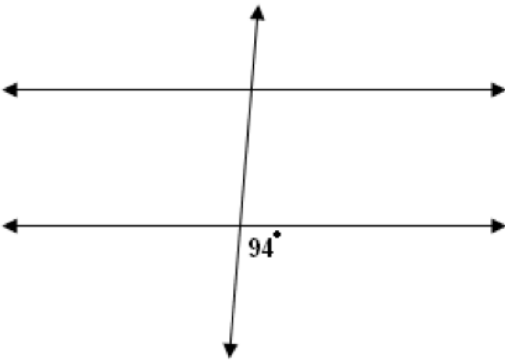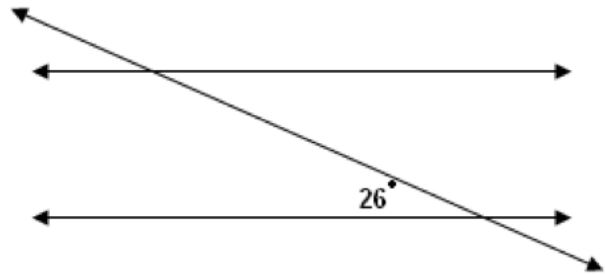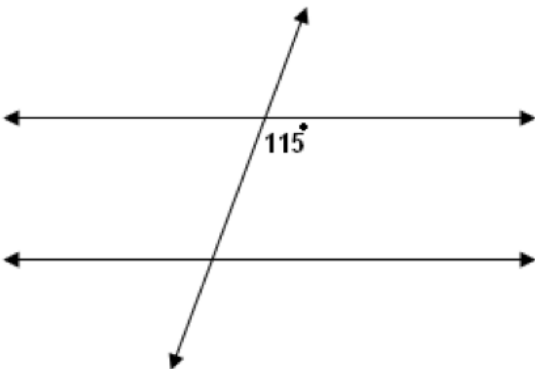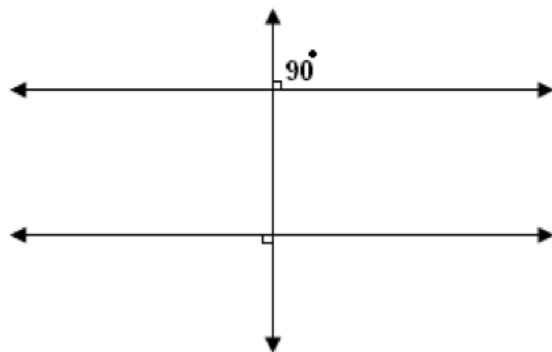
## Answers

1) a) 45  b) 90  c) 29  d) 51  e) 100  f) 13  g) 105   h) 50

2) a) x=100, y=100, z=80   b) x=118, y=62, z=118

3) a)



b)



c)



d)



e)



f)



4) a)



b)



c)



d)



e)



f)
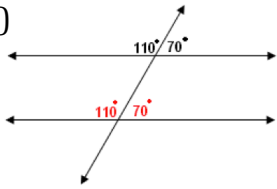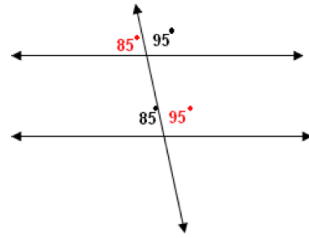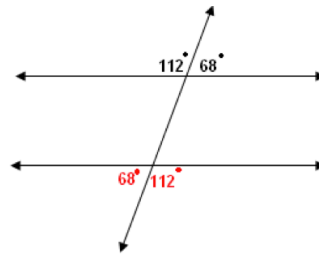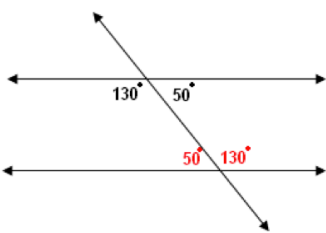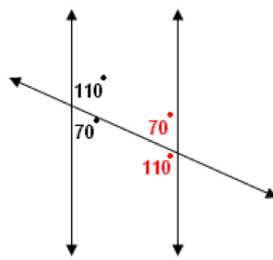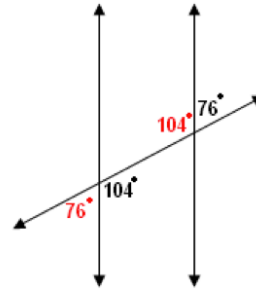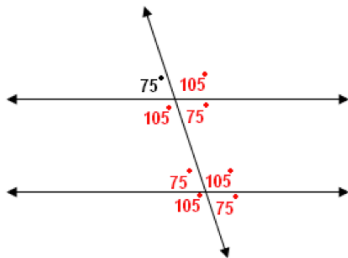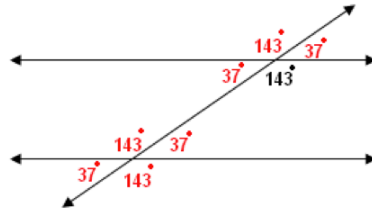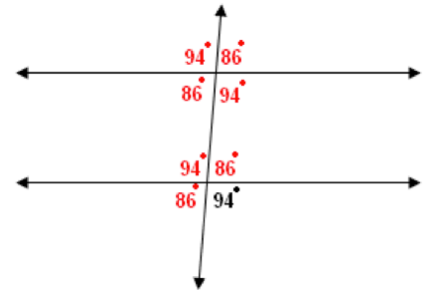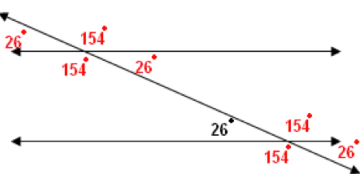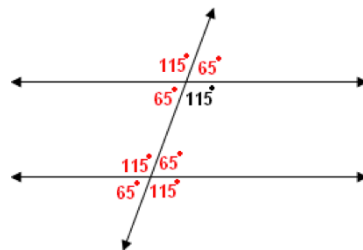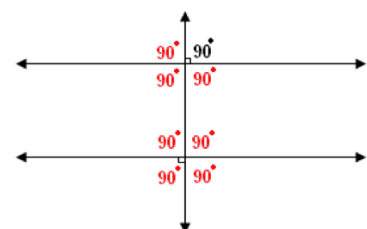
**1.** For each problem, determine the value of each unknown and give a reason for your answer.

a)

71°

x

b)

132°

y  x

c)

48°

f  g

e

h

k

a

c

d

b

80°

d)

56°

x

127°

e)

95°

48°

x

f)

115°

y

x

126°

g)

30°

x

z

y

w

h)

y

x+2

x+20     2x-10
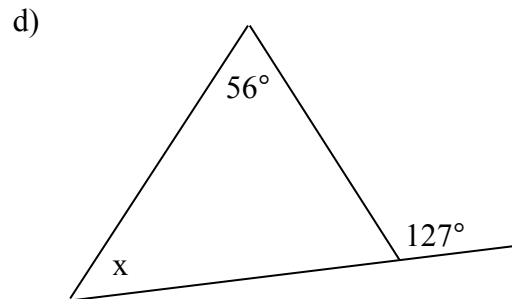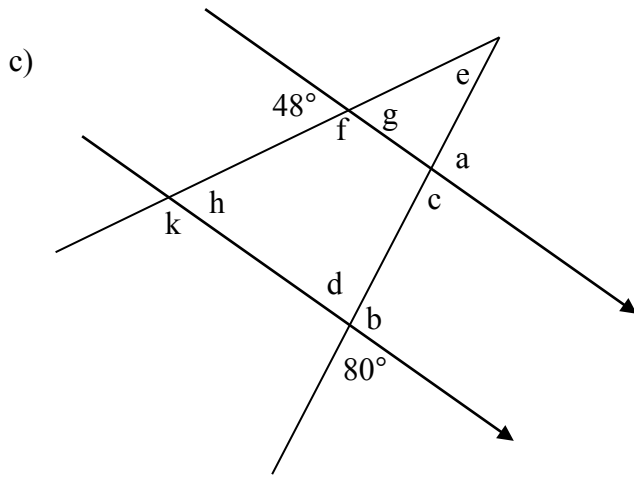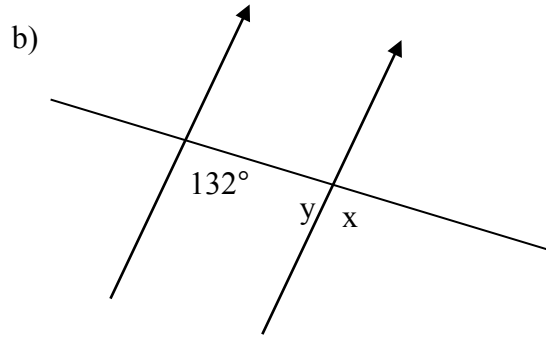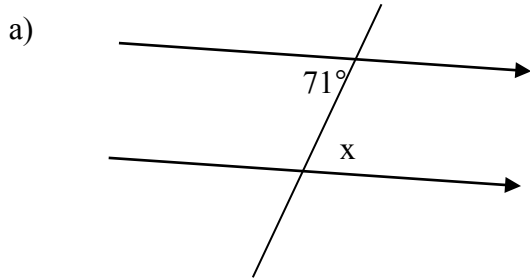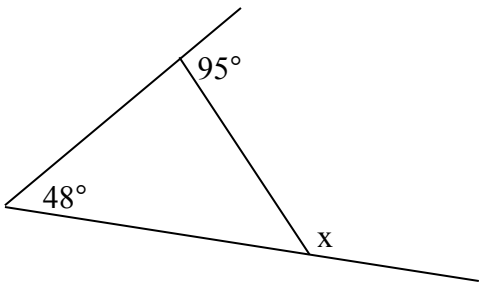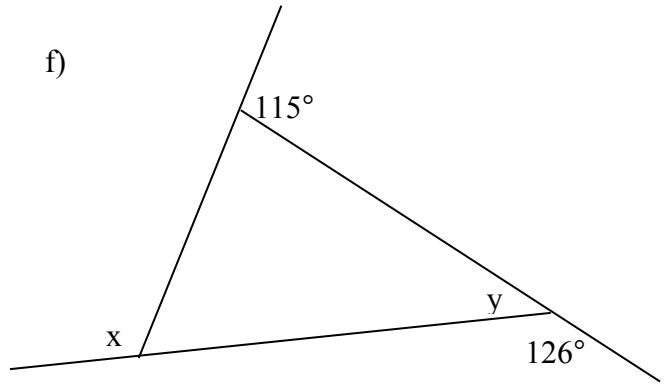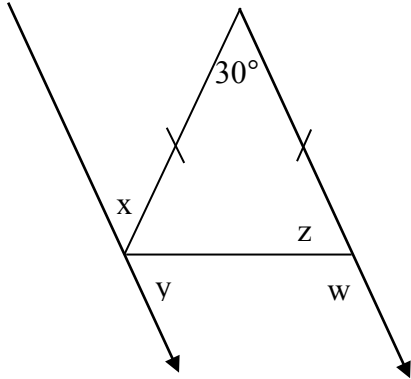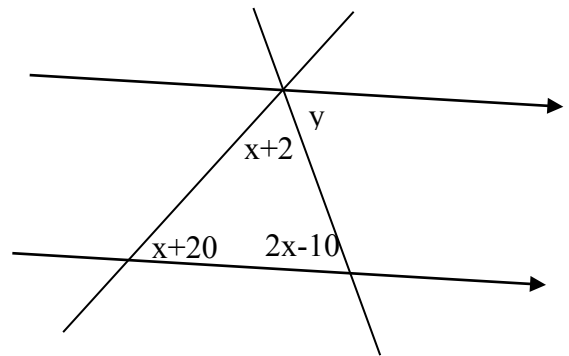
ANSWERS

**1) a)** $x = 71°$

**b)** $x = 132°, y = 48°$

**c)** $a = 100°, b = 100°, c = 80°, d = 80°, e = 52°, f = 132°, g = 48°, h = 48°, k = 132°$

**d)** $x = 71°$

**e)** $x = 133°$

**f)** $x = 119°, y = 54°$

**g)** $w = 105°, x = 30°, y = 75°, z = 75°$

**h)** $x = 42, y = 74°$

**1.** Find the measure of each exterior angle.

**a)**



**b)**



**c)**



**d)**
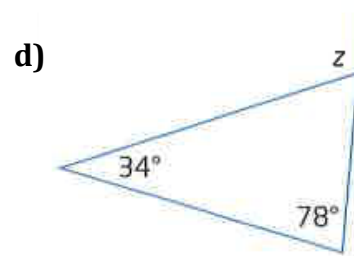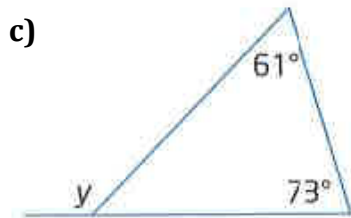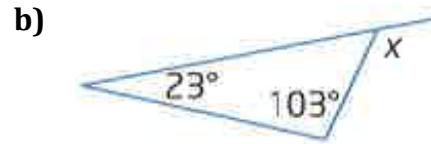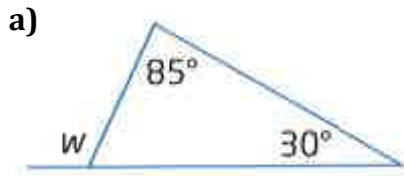


**2.** Find the measure of each unknown exterior angle.

**a)**



**b)**



**c)**
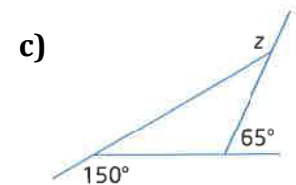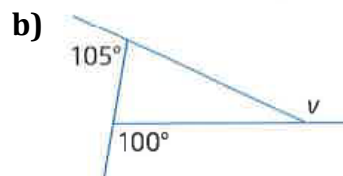


**3.** If the measures of two of the exterior angles of a triangle are 70° and 120°, the measure of the third exterior angle is...

A) 10°        B) 70°        C) 170°        D) 190°

**4.** Find the measure of each exterior angle labeled $x$ for each isosceles triangle.

**a)**



**b)**



**c)**



**5.** Find the measure of each unknown angle.

**a)**



**b)**

**c)**

**d)**
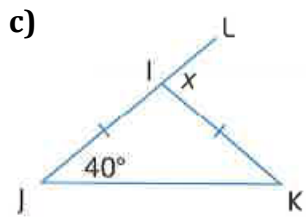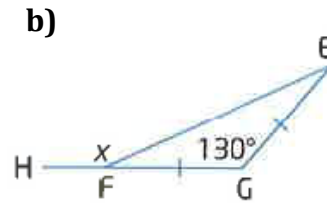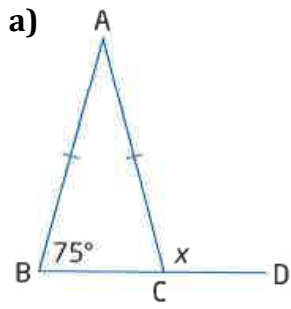
**e)**
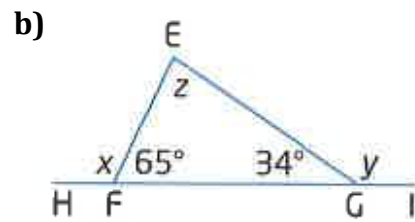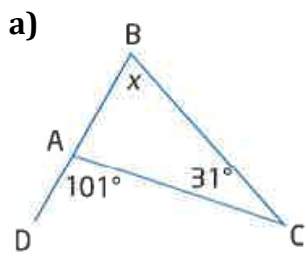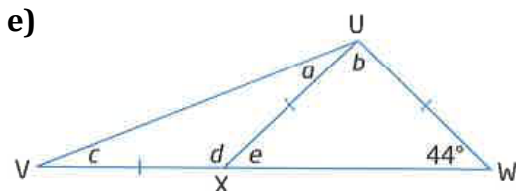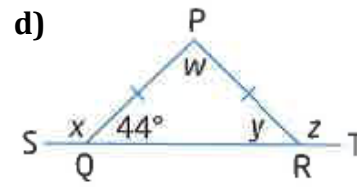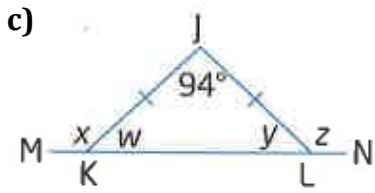
**6.** A contractor is building a wheelchair ramp. To be safe for all users, the ramp should rise at an angle of about 5°.
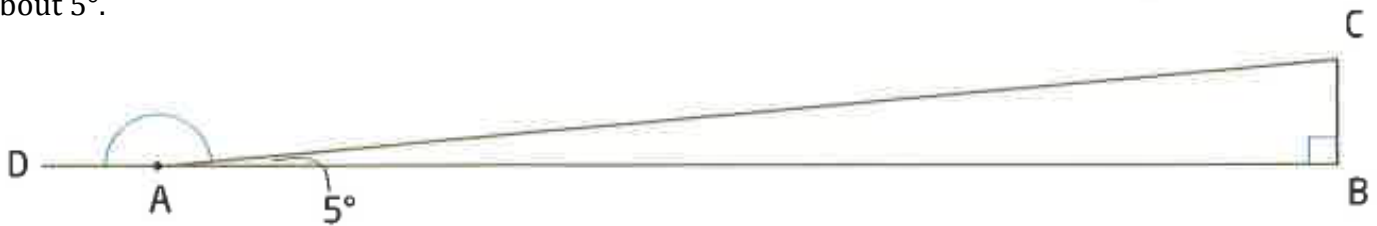
**a)** To check the slope of the ramp, the contractor measures ∠DAC at the foot of the ramp. What measure should this angle have?

**b)** Find the measure of the interior and exterior angle at the top of the ramp.

**7.** Find the measure of each unknown angle.
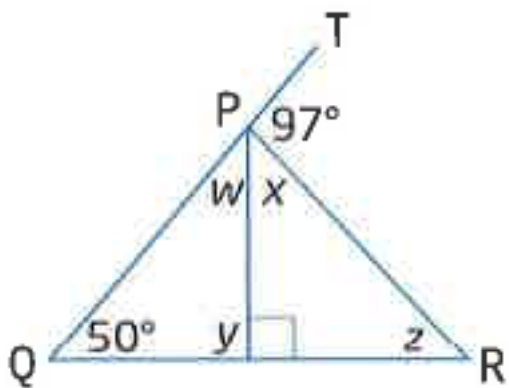
## Answers

1. a) 115°  b) 126°  c) 134°  d) 112°
2. a) 40°  b) 155°   c) 145°
3. C
4. a) 105°  b) 155°  c) 80°
5. a) 70°  b) $x = 115°, y = 146°, z = 81°$   c) $w = 43°, x = 137°, y = 43°, z = 137°$
   d) $w = 92°, x = 136°, y = 44°, z = 136°$   e) $a = 22°, b = 92°, c = 22°, d = 136°, e = 44°$
6. a) 175°  b) interior = 85°; exterior = 95°
7. $w = 40°, x = 43°, y = 90°, z = 47°$

**1.** Find the angle measures $w, x, y,$ and $z$.

**a)**



**b)**



**c)**



**d)**
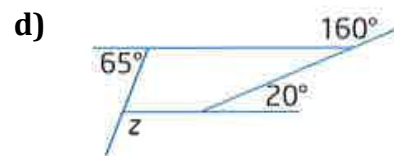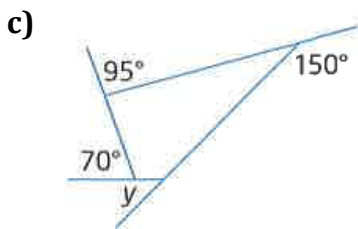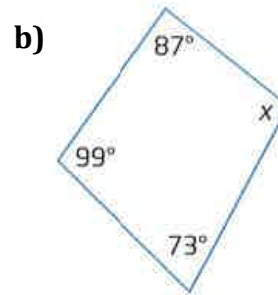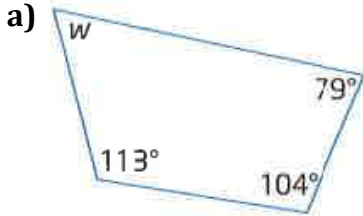


**2.** The measures of three of the interior angles of a quadrilateral are 40°, 90°, and 120°. The measure of the fourth interior angle is:

**A)** 110°           **B)** 130°           **C)** 210°           **D)** 250°

**3.** The measures of exterior angles at three vertices of a quadrilateral are 80°, 100°, and 120°. The measure of an exterior angle at the fourth vertex is:

**A)** 40°           **B)** 60°           **C)** 100°           **D)** 140°

**4.** Each row of this table lists measures of three interior angles in a quadrilateral. Find the measure of the fourth interior angle in each quadrilateral.

| | ∠A | ∠B | ∠C | ∠D |
|---|---|---|---|---|
| **a)** | 100° | 75° | 50° | unknown |
| **b)** | 20° | 35° | unknown | 150° |
| **c)** | 70° | unknown | 70° | 70° |
| **d)** | unknown | 90° | 90° | 90° |

**5.** Find the measure of each unknown angle

**a)**



**b)**



**c)**



**7.** Find the measure of each unknown angle

**a)**



**b)**
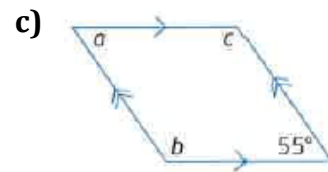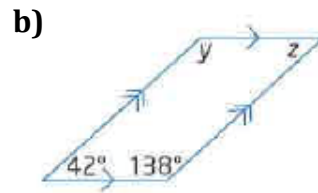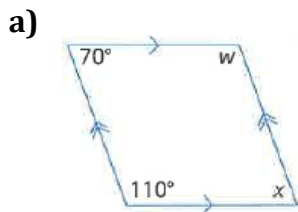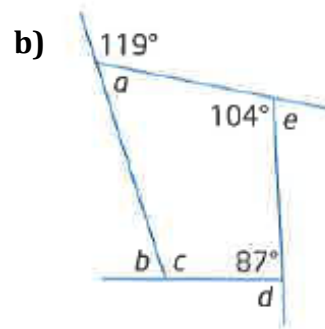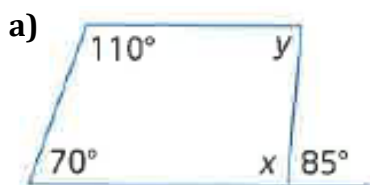
**13.** Find the measure of each unknown angle
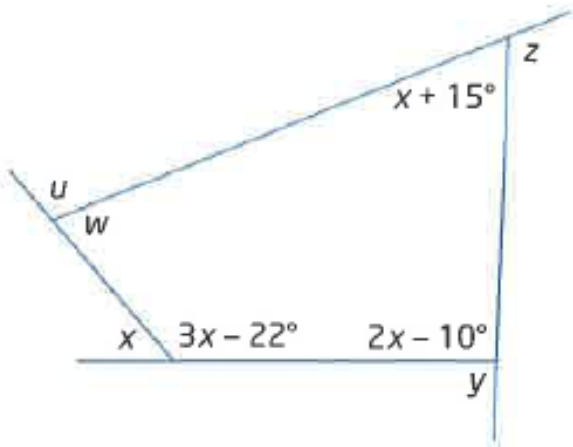


**12.** This diagram shows the structure of a bridge over the river between Ottawa and Gatineau.
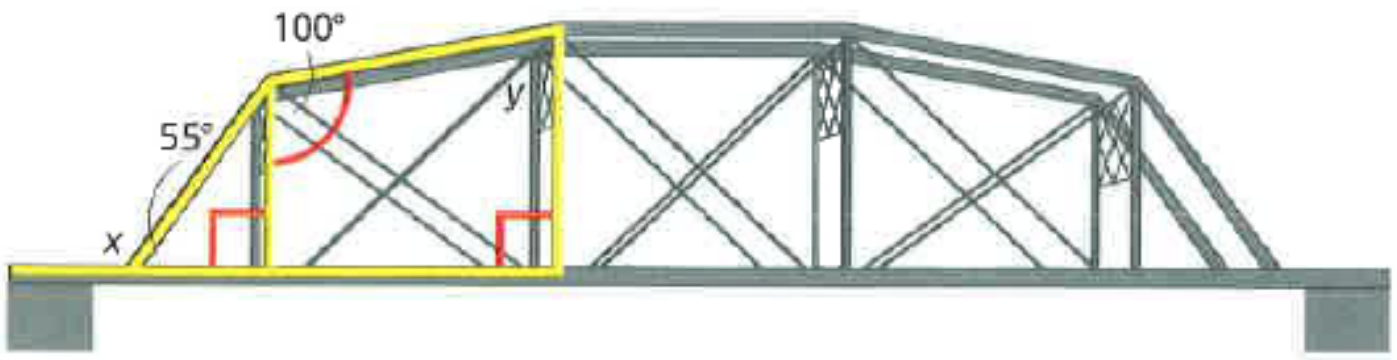


**a)** Calculate the measure of the exterior angle between the road and the foot of the triangle at the left end of the bridge.

**b)** Calculate the angle at the upper right corner of the quadrilateral on the left side of the bridge.

## Answers

1) a) 64°  b) 101°  c) 45°  d) 115°
2) A
3) B
4) a) 135°  b) 155°  c) 150°  d) 90°
5) a) $w = 110°, x = 70°$  b) $y = 138°, z = 42°$  c) $a = 55°, b = 125°, c = 125°$
7) a) $x = 95°, y = 85°$  b) $a = 61°, b = 72°, c = 108°, d = 93°, e = 76°$
13) $u = 106°, w = 74°, x = 50.5°, y = 89°, z = 114.5°$
12) a) 125°  b) 80°

**1.** Find the sum of the interior angles of a polygon with…

**a)** 10 sides                    **b)** 15 sides                    **c)** 20 sides

**2.** Find the measure of each interior angle of a regular polygon with…

**a)** 7 sides                                        **b)** 12 sides

**3.** How many sides does a polygon have if the sum of its interior angles is…

**a)** 540°                    **b)** 1800°                    **c)** 3060°

**4.** What properties does a regular polygon have?

**5.** Complete the following table

| # of Sides | Interior Angle Sum | Measure of One Interior Angle (regular polygon) | Sum of Exterior Angles | Measure of One Exterior Angle (regular polygon) |
|---|---|---|---|---|
| $n$ | $(n-2)180°$ | $\dfrac{(n-2)180°}{n}$ | $360°$ | $\dfrac{360°}{n}$ |
| 14 | 2160° | ≈154.29° | 360° | ≈25.71° |
| 24 | 3960° | 165° | 360° | 15° |
| 17 | 2700° | ≈158.82° | 360° | ≈21.18° |
| 8 | 1080° | 135° | 360° | 45° |
| 7 | 900° | ≈128.57° | 360° | ≈51.43° |
| 30 | 5040° | 168° | 360° | 12° |
| 11 | 1620° | ≈147.27° | 360° | ≈32.73° |
| 12 | 1800° | 150° | 360° | 30° |
| 6 | 720° | 120° | 360° | 60° |
| 15 | 2340° | 156° | 360° | 24° |
| 36 | 6120° | 170° | 360° | 10° |
| 50 | 8640° | 172.8° | 360° | 7.2° |
| 4 | 360° | 90° | 360° | 90° |
| 72 | 12600° | 175° | 360° | 5° |

**6.** A furniture-maker is designing a hexagonal table.

**a)** At what angle will the adjacent sides of the table meet if its shape is a regular hexagon?

**b)** Do you think the angles between the adjacent sides of the table will all be equal if one pair of opposite sides are twice as long as the other sides.

**7.** Find the measure of each interior angle of…

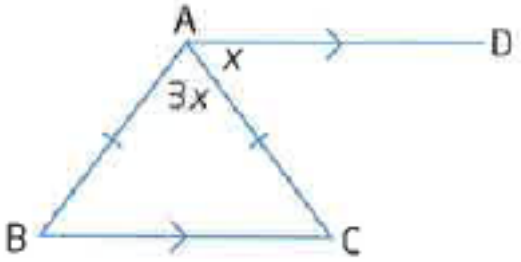**a)** A regular 10-sided polygon

**b)** A regular 16-sided polygon
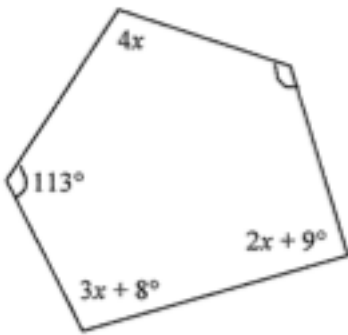
**c)** A regular 20-sided polygon

**d)** A regular polygon with $n$ sides

**8.** Can you determine the number of sides a polygon has from the sum of its exterior angles? Explain your reasoning.
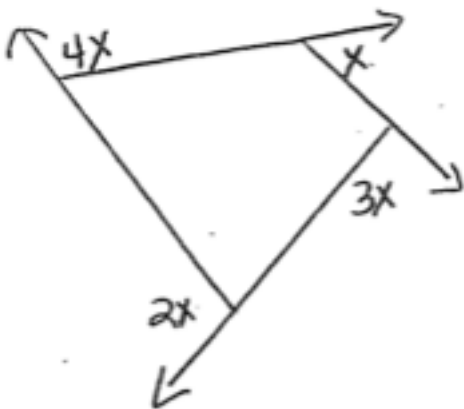
**9.** Determine the measure of angle BCA



**10.** Find the value of $x$



**11.** Find the value of $x$

# Answers

1) a) 1440°  b) 2340°  c) 3240°

2) a) 128.6°  b) 150°

3) a) 5 sides  b) 12 sides  c) 19 sides

4) equal interior angles, equal exterior angles, and equal sides

5)

| # of Sides | Interior Angle Sum | Measure of One Interior Angle (regular polygon) | Sum of Exterior Angles | Measure of One Exterior Angle (regular polygon) |
|---|---|---|---|---|
| $n$ | $180(n-2)$ | $\dfrac{180(n-2)}{n}$ | 360 | $\dfrac{360}{n}$ |
| 14 | 2160 | 154.3 | 360 | 25.7 |
| 24 | 3960 | 165 | 360 | 15 |
| 17 | 2700 | 158.8 | 360 | 21.2 |
| 8 | 1080° | 135 | 360 | 45 |
| 7 | 900° | 128.6 | 360 | 51.4 |
| 30 | 5040° | 168 | 360 | 12 |
| 11 | 1620° | 147.3 | 360 | 32.7 |
| 12 | 1800 | 150° | 360 | 30 |
| 6 | 720 | 120° | 360 | 60 |
| 15 | 2340 | 156° | 360 | 24 |
| 36 | 6120 | 170 | 360 | 10° |
| 50 | 8640 | 172.8 | 360 | 7.2° |
| 4 | 360 | 90 | 360 | 90° |
| 72 | 12600 | 175 | 360 | 5° |

6) a) 120°  b) Answer may vary. The angles don't change.

7) a) 144°  b) 157.5°  c) 162°  d) $\dfrac{180(n-2)}{n}$

8) No; the sum is 360 degrees for all convex polygons.

9) 36°

10) 33

11) 36