

# Geometry · Triangle Theorems and Points of Concurrency · Test

Common Core G-CO.C.10, G-C.A.3 · mathovore.fr

Name: \_\_\_\_\_ Date: \_\_\_\_/\_\_\_\_/\_\_\_\_ Score: \_\_\_\_\_

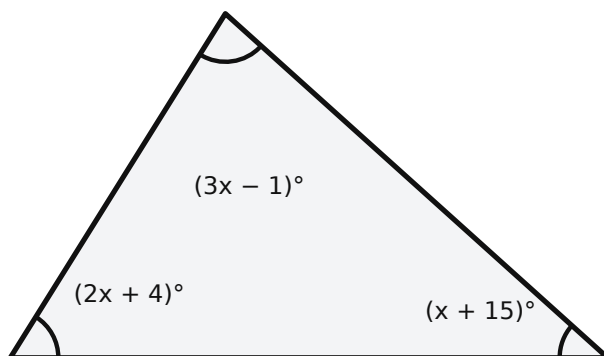
This 45-minute test has 9 questions worth 20 points. Show your work, give a reason for each theorem you use, and label every answer with the right units. A calculator is allowed for arithmetic only.

## Test information

- **Grade:** Geometry
- **Chapter:** Triangle Theorems and Points of Concurrency
- **Common Core:** G-CO.C.10, G-C.A.3
- **Time:** 45 minutes
- **Total:** 20 points (Question 1: 2 pts; Question 2: 2 pts; Question 3: 2 pts; Question 4: 2 pts; Question 5: 2 pts; Question 6: 2 pts; Question 7: 3 pts; Question 8: 3 pts; Question 9: 2 pts)

## Question 1: Angle sum with variables (2 points)

The angles of a triangle measure  $(2x+4)^\circ$ ,  $(3x-1)^\circ$ , and  $(x+15)^\circ$ .



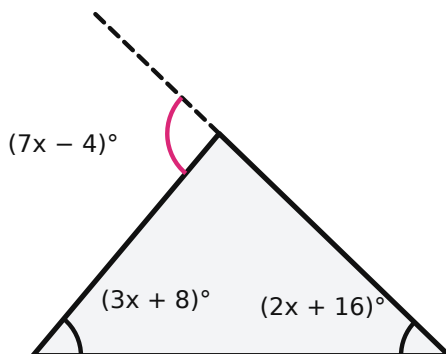
Triangle with algebraic angle measures.

a. Find  $x$ . (1 point)

- b. Find the measure of the largest angle. (1 point)

## Question 2: Exterior angle equation (2 points)

The figure shows a triangle with one side extended. The remote interior angles measure  $(3x+8)^\circ$  and  $(2x+16)^\circ$ , and the exterior angle measures  $(7x-4)^\circ$ .

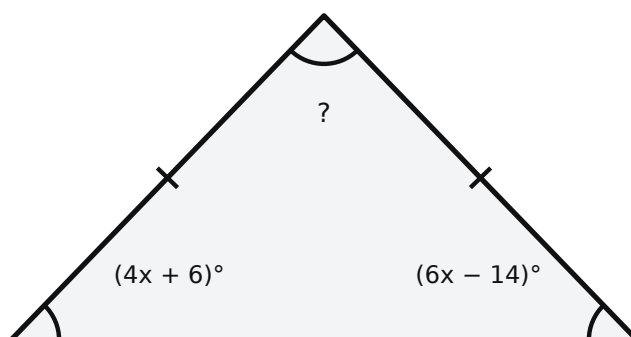


Exterior angle of a triangle.

- Find  $x$ . (1 point)
- Find the measure of the exterior angle. (1 point)

## Question 3: Isosceles triangle angles (2 points)

In  $\triangle ABC$ ,  $\overline{AB} \cong \overline{AC}$ ,  $m\angle B = (4x+6)^\circ$ , and  $m\angle C = (6x-14)^\circ$ .



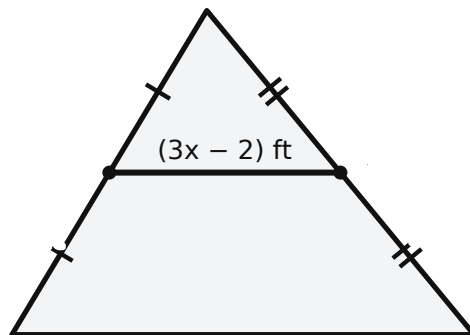
Isosceles triangle ABC.

- Find  $x$  and  $m\angle B$ . (1 point)
- Find  $m\angle A$ . (1 point)

#### Question 4: Midsegment theorem (2 points)

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In  $\triangle ABC$ , D and E are the midpoints of  $\overline{AB}$  and  $\overline{AC}$ .



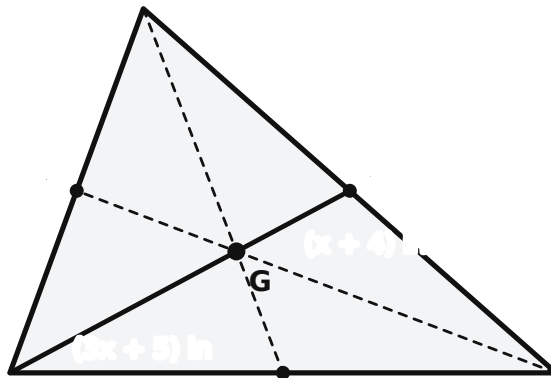
DE joins the midpoints of AB and AC.

- Find  $x$ ,  $DE$ , and  $BC$ . (1 point)
- Find the perimeter of  $\triangle ADE$ . (1 point)

#### Question 5: Centroid segments (2 points)

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G is the centroid of  $\triangle ABC$ , and  $\overline{BE}$  is a median with  $BG = (3x + 5)$  in and  $GE = (x + 4)$  in.



G is the centroid and BE is a median.

- Find  $x$ . (1 point)
- Find  $BE$ . (1 point)

#### Question 6: Name the center (2 points)

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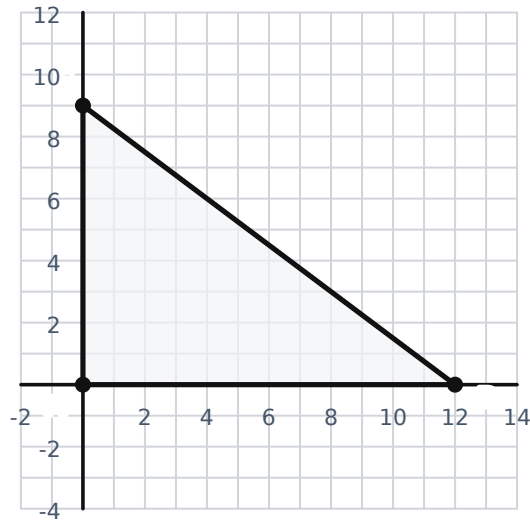
For each description, name the center of the triangle.

- The center of the largest circle that fits inside the triangle and touches all three sides. (1 point)
- The center of the circle that passes through all three vertices. (1 point)

### Question 7: Centers on the plane (3 points)

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Triangle ABC has vertices  $A(0,0)$ ,  $B(12,0)$ , and  $C(0,9)$ .



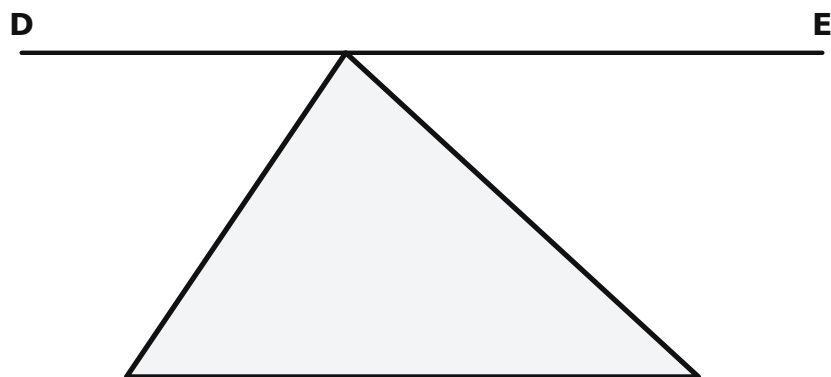
Right triangle ABC.

- Find the circumcenter and the radius of the circumscribed circle. (2 points)
- Find the centroid. (1 point)

### Question 8: Prove the angle sum (3 points)

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Given:  $\triangle ABC$ . Line  $DE$  passes through C and is parallel to  $\overline{AB}$ , with D on the left of C and E on the right. Prove  $m\angle A + m\angle B + m\angle C = 180^\circ$ . Write a two-column proof.

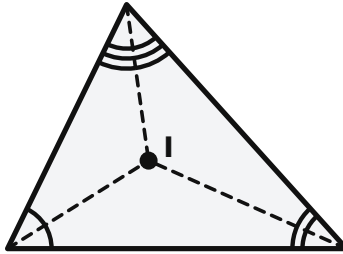


Line DE is drawn through C parallel to AB.

### Question 9: Incenter angles (2 points)

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I is the incenter of  $\triangle ABC$ ,  $m\angle A = 64^\circ$ , and  $m\angle B = 48^\circ$ .



I is the incenter.

- a. Find  $m\angle IAB$  and  $m\angle IBA$ . (1 point)
- b. Find  $m\angle AIB$ . (1 point)