

Geometry · Triangle Theorems and Points of Concurrency · Test Answer Key

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

Use this key to score the triangle theorems test out of 20 points. Each solution lists the theorem used and a scoring guide. Award partial credit exactly as described and accept any equivalent correct method.

Geometry Common Core: G-CO.C.10 · G-C.A.3

Question 1: Angle sum with variables (2 points)

- a. $(2x+4)+(3x-1)+(x+15)=180$ gives $6x+18=180$, so $6x=162$ and $x=27$.
- b. The angles are 58° , 80° , and 42° . The largest is 80° .

Scoring: 1 point for a correct equation and $x=27$. 1 point for 80° .

Question 2: Exterior angle equation (2 points)

- a. $7x-4=(3x+8)+(2x+16)$ gives $7x-4=5x+24$, so $2x=28$ and $x=14$.
- b. $7(14)-4=94^\circ$. Check: $50+44=94$.

Scoring: 1 point for using the Exterior Angle Theorem to find $x=14$. 1 point for 94° .

Question 3: Isosceles triangle angles (2 points)

- a. Base angles are congruent: $4x+6=6x-14$ gives $x=10$, and $m\angle B=4(10)+6=46^\circ$.
- b. $m\angle A=180-46-46=88^\circ$.

Scoring: 1 point for $x=10$ and 46° with the isosceles reason. 1 point for 88° .

Question 4: Midsegment theorem (2 points)

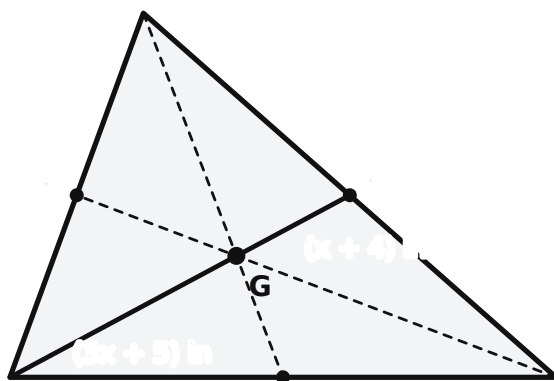
- a. $BC=2\cdot DE$: $5x+4=2(3x-2)$ gives $5x+4=6x-4$, so $x=8$. $DE=3(8)-2=22$ ft and $BC=5(8)+4=44$ ft.
- b. $AD=\frac{1}{2}(36)=18$ and $AE=\frac{1}{2}(40)=20$. Perimeter $=18+20+22=60$ ft.

Scoring: 1 point for $x=8$ with DE and BC . 1 point for the three sides and perimeter 60 ft.

Question 5: Centroid segments (2 points)

- a. $BG=2\cdot GE$: $3x+5=2(x+4)$ gives $3x+5=2x+8$, so $x=3$.

b. $BG = 14$ and $GE = 7$, so $BE = 21$ in.



$BG = 14$ in, $GE = 7$ in.

Scoring: 1 point for the $2 : 1$ equation and $x = 3$. 1 point for $BE = 21$.

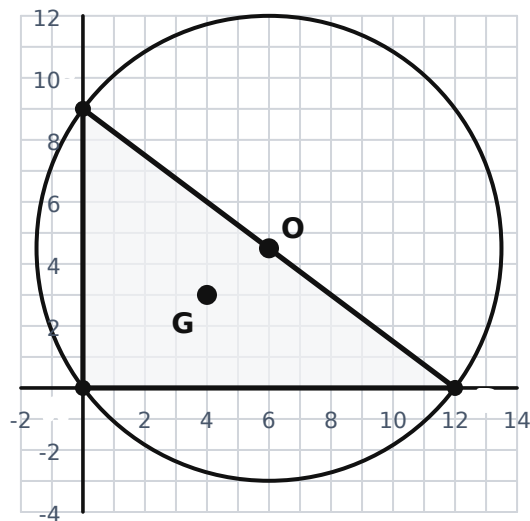
Question 6: Name the center (2 points)

- Incenter** (intersection of the angle bisectors).
- Circumcenter** (intersection of the perpendicular bisectors).

Scoring: 1 point for each correct center. Accept the matching description of the lines as support.

Question 7: Centers on the plane (3 points)

- The triangle is right-angled at A, so the circumcenter is the midpoint of the hypotenuse $\overline{BC}$: $\left(\frac{12+0}{2}, \frac{0+9}{2}\right) = (6, 4.5)$. The hypotenuse is $\sqrt{12^2 + 9^2} = 15$, so the radius is 7.5.
- $\left(\frac{0+12+0}{3}, \frac{0+0+9}{3}\right) = (4, 3)$.

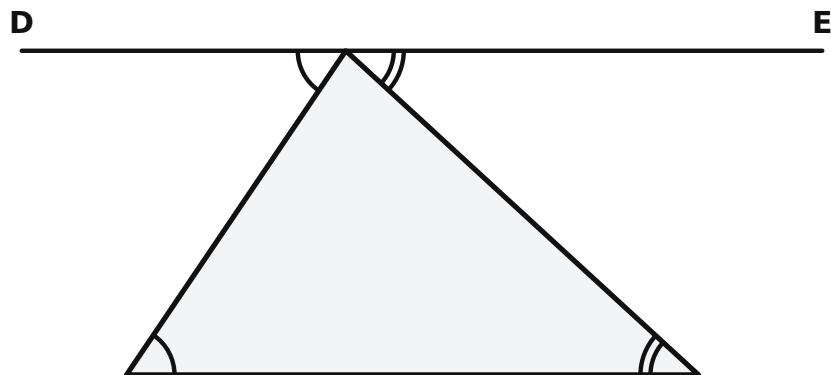


Circumcenter O and centroid G.

Scoring: 1 point for the circumcenter (6,4.5), 1 point for the radius 7.5, 1 point for the centroid (4,3).

Question 8: Prove the angle sum (3 points)

Statements	Reasons
Line DE passes through C and $DE \parallel AB$	Given
$\angle DCA \cong \angle A$ and $\angle ECB \cong \angle B$	Alternate interior angles are congruent
$m\angle DCA + m\angle ACB + m\angle ECB = 180^\circ$	Angles along a straight line add to 180 degrees
$m\angle A + m\angle ACB + m\angle B = 180^\circ$	Substitution



Matching arcs show congruent alternate interior angles.

Scoring: 1 point for the parallel lines with the alternate interior angle reason. 1 point for the straight angle statement. 1 point for the substitution that reaches the conclusion.

Question 9: Incenter angles (2 points)

- a. I lies on the angle bisectors: $m\angle IAB = \frac{64}{2} = 32^\circ$ and $m\angle IBA = \frac{48}{2} = 24^\circ$.
b. $m\angle AIB = 180 - 32 - 24 = 124^\circ$.

Scoring: 1 point for both half angles. 1 point for 124° .

Total
20 points