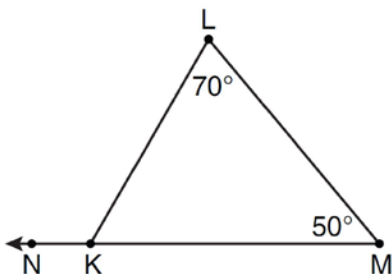


**G.G.32: Exterior Angle Theorem 1: Investigate, justify, and apply theorems about geometric inequalities, using the exterior angle theorem**

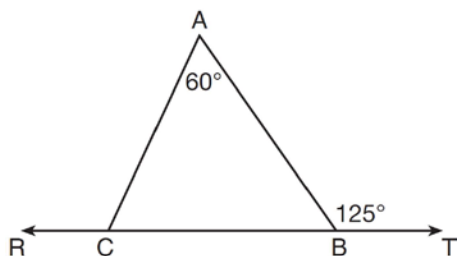
- 1 In the diagram of  $\triangle KLM$  below,  $m\angle L = 70$ ,  $m\angle M = 50$ , and  $\overline{MK}$  is extended through  $N$ .



What is the measure of  $\angle LKN$ ?

- 1)  $60^\circ$
- 2)  $120^\circ$
- 3)  $180^\circ$
- 4)  $300^\circ$

- 2 In the diagram below,  $\overleftrightarrow{RCBT}$  and  $\triangle ABC$  are shown with  $m\angle A = 60$  and  $m\angle ABT = 125$ .



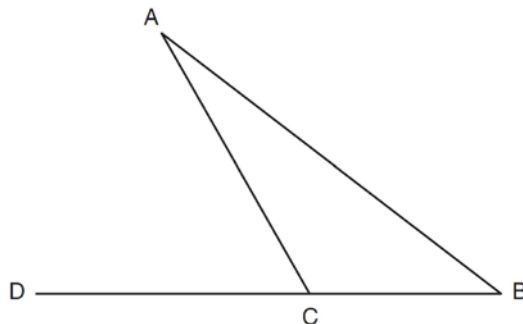
What is  $m\angle ACR$ ?

- 1) 125
- 2) 115
- 3) 65
- 4) 55

- 3 In  $\triangle FGH$ ,  $m\angle F = 42$  and an exterior angle at vertex  $H$  has a measure of 104. What is  $m\angle G$ ?

- 1) 34
- 2) 62
- 3) 76
- 4) 146

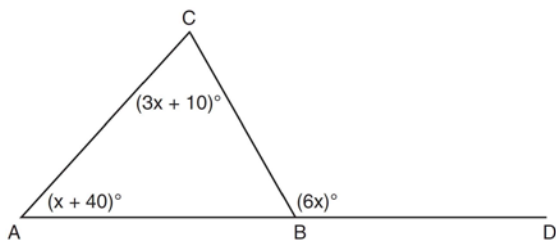
- 4 In the diagram below of  $\triangle ABC$ , side  $\overline{BC}$  is extended to point  $D$ ,  $m\angle A = x$ ,  $m\angle B = 2x + 15$ , and  $m\angle ACD = 5x + 5$ .



What is  $m\angle B$ ?

- 1) 5
- 2) 20
- 3) 25
- 4) 55

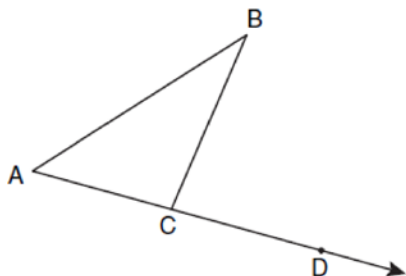
- 5 In the diagram of  $\triangle ABC$  below,  $\overline{AB}$  is extended to point  $D$ .



If  $m\angle CAB = x + 40$ ,  $m\angle ACB = 3x + 10$ ,  
 $m\angle CBD = 6x$ , what is  $m\angle CAB$ ?

- 1) 13
- 2) 25
- 3) 53
- 4) 65

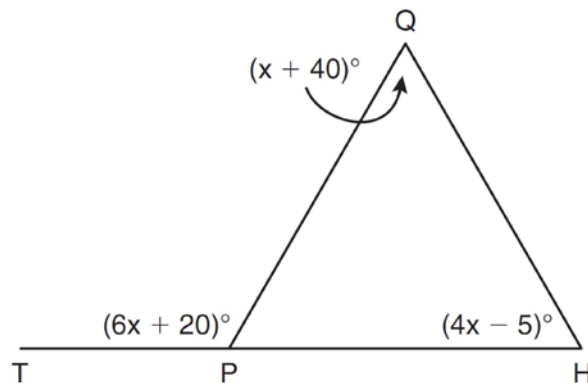
- 6 In the diagram below,  $\triangle ABC$  is shown with  $\overline{AC}$  extended through point  $D$ .



If  $m\angle BCD = 6x + 2$ ,  $m\angle BAC = 3x + 15$ , and  
 $m\angle ABC = 2x - 1$ , what is the value of  $x$ ?

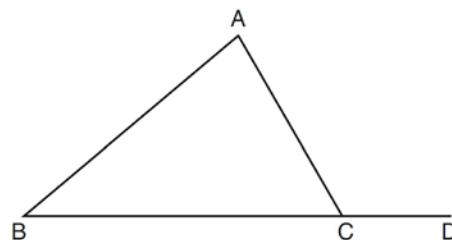
- 1) 12
- 2)  $14\frac{10}{11}$
- 3) 16
- 4)  $18\frac{1}{9}$

- 7 In the diagram below of  $\triangle HQP$ , side  $\overline{HP}$  is extended through  $P$  to  $T$ ,  $m\angle QPT = 6x + 20$ ,  $m\angle HQP = x + 40$ , and  $m\angle PHQ = 4x - 5$ . Find  $m\angle QPT$ .



(Not drawn to scale)

- 8 In the diagram below of  $\triangle ABC$ ,  $\overline{BC}$  is extended to  $D$ .

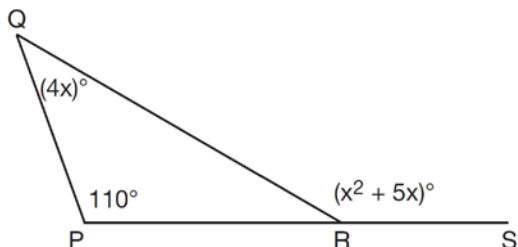


(Not drawn to scale)

If  $m\angle A = x^2 - 6x$ ,  $m\angle B = 2x - 3$ , and  
 $m\angle ACD = 9x + 27$ , what is the value of  $x$ ?

- 1) 10
- 2) 2
- 3) 3
- 4) 15

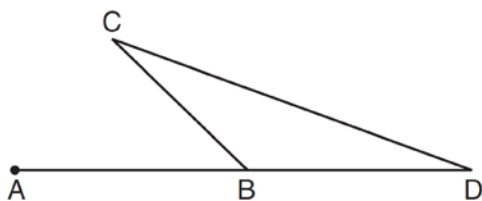
- 9 In the diagram of  $\triangle PQR$  shown below,  $\overline{PR}$  is extended to  $S$ ,  $m\angle P = 110$ ,  $m\angle Q = 4x$ , and  $m\angle QRS = x^2 + 5x$ .



What is  $m\angle Q$ ?

- 1) 44
- 2) 40
- 3) 11
- 4) 10

- 10 In the diagram below of  $\triangle BCD$ , side  $\overline{DB}$  is extended to point  $A$ .



Which statement must be true?

- 1)  $m\angle C > m\angle D$
- 2)  $m\angle ABC < m\angle D$
- 3)  $m\angle ABC > m\angle C$
- 4)  $m\angle ABC > m\angle C + m\angle D$

- 11 Side  $\overline{PQ}$  of  $\triangle PQR$  is extended through  $Q$  to point  $T$ . Which statement is *not* always true?
- 1)  $m\angle RQT > m\angle R$
  - 2)  $m\angle RQT > m\angle P$
  - 3)  $m\angle RQT = m\angle P + m\angle R$
  - 4)  $m\angle RQT > m\angle PQR$
- 12 In  $\triangle ABC$ , an exterior angle at  $C$  measures  $50^\circ$ . If  $m\angle A > 30$ , which inequality must be true?
- 1)  $m\angle B < 20$
  - 2)  $m\angle B > 20$
  - 3)  $m\angle BCA < 130$
  - 4)  $m\angle BCA > 130$
- 13 In all isosceles triangles, the exterior angle of a base angle must always be
- 1) a right angle
  - 2) an acute angle
  - 3) an obtuse angle
  - 4) equal to the vertex angle

**G.G.32: Exterior Angle Theorem 1: Investigate, justify, and apply theorems about geometric inequalities, using the exterior angle theorem**

**Answer Section**

1 ANS: 2 REF: 061107ge

2 ANS: 2  
 $m\angle ABC = 55$ , so  $m\angle ACR = 60 + 55 = 115$

REF: 011414ge

3 ANS: 2 REF: 011206ge

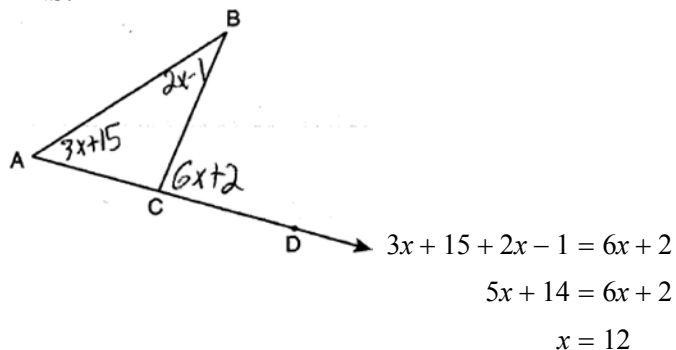
4 ANS: 3  
 $x + 2x + 15 = 5x + 15$   $2(5) + 15 = 25$   
 $3x + 15 = 5x + 5$   
 $10 = 2x$   
 $5 = x$

REF: 011127ge

5 ANS: 4  
 $6x = x + 40 + 3x + 10$ .  $m\angle CAB = 25 + 40 = 65$   
 $6x = 4x + 50$   
 $2x = 50$   
 $x = 25$

REF: 081310ge

6 ANS: 1



REF: 011021ge

7 ANS:  
 110.  $6x + 20 = x + 40 + 4x - 5$   
 $6x + 20 = 5x + 35$   
 $x = 15$   
 $6((15) + 20 = 110$

REF: 081031ge

8 ANS: 4

$$x^2 - 6x + 2x - 3 = 9x + 27$$

$$x^2 - 4x - 3 = 9x + 27$$

$$x^2 - 13x - 30 = 0$$

$$(x - 15)(x + 2) = 0$$

$$x = 15, -2$$

REF: 061225ge

9 ANS: 2

$$x^2 + 5x = 4x + 110 \quad m\angle Q = 4(10) = 40$$

$$x^2 + x - 110 = 0$$

$$(x + 11)(x - 10) = 0$$

$$10 = x$$

REF: 061425ge

10 ANS: 3 REF: 081111ge

11 ANS: 4

(4) is not true if  $\angle PQR$  is obtuse.

REF: 060924ge

12 ANS: 1

$$m\angle A + m\angle B = 50$$

$$30.1 + m\angle B = 50$$

$$m\angle B = 19.9$$

REF: 081424ge

13 ANS: 3 REF: 061508ge