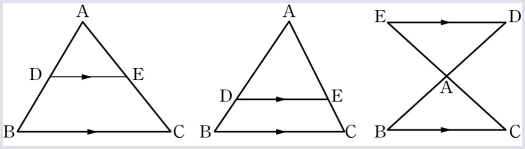
◇「콘텐츠산업 진흥법 시행령」제33조에 의한 표시
1) 제작연월일 : 2016-08-25
2) 제작자 : 교육지대㈜
3) 이 콘텐츠는 「콘텐츠산업 진흥법」에 따라 최초 제작일부터 5년간 보호됩니다.

◇「콘텐츠산업 진흥법」외에도「저작권법」에 의하여 보호되는 콘텐츠의 경우, 그 콘텐츠의 전부 또는 일부를 무단으로 복제하거나 전송하는 것은 콘텐츠산업 진흥법 외에도 저작권법에 의한 법적 책임을 질 수 있습니다.

계산시 참고사항

1. 삼각형에서의 평행선과 선분의 길이의 비



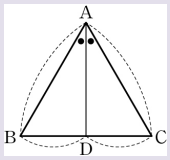
1) $\triangle ABC$에서 점 D, E가 각각 $\overline{AB}$, $\overline{AC}$ 또는 그 연장선 위의 점일 때, $\overline{BC}//\overline{DE}$이면
(1) $\overline{AB}:\overline{AD}=\overline{AC}:\overline{AE}=\overline{BC}:\overline{DE}$ (2) $\overline{AD}:\overline{DB}=\overline{AE}:\overline{EC}$

2) $\triangle ABC$에서 점 D, E가 각각 $\overline{AB}$, $\overline{AC}$ 또는 그 연장선 위의 점일 때,
(1) $\overline{AB}:\overline{AD}=\overline{AC}:\overline{AE}$이면 $\overline{BC}//\overline{DE}$ (2) $\overline{AD}:\overline{DB}=\overline{AE}:\overline{EC}$이면 $\overline{BC}//\overline{DE}$

참고
◉ $\triangle ABC \backsim \triangle ADE$(AA 닮음)이므로
$\overline{AB}:\overline{AD}=\overline{AC}:\overline{AE}=\overline{BC}:\overline{DE}$

2. 삼각형의 내각의 이등분선

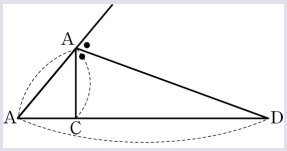
1) 내각의 이등분선
: $\triangle ABC$에서 $\angle A$의 이등분선이 $\overline{BC}$와 만나는 점을 D라 하면
⇨ $\overline{AB}:\overline{AC}=\overline{BD}:\overline{CD}$



2) 내각의 이등분선과 삼각형의 넓이의 비
: $\triangle ABD$와 $\triangle ACD$의 높이가 같으므로 넓이의 비는 밑변의 길이의 비와 같다.
⇨ $\triangle ABD:\triangle ACD=\overline{BD}:\overline{CD}=\overline{AB}:\overline{AC}$

3. 삼각형의 외각의 이등분선

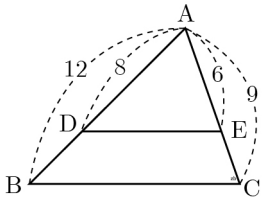
$\triangle ABC$에서 $\angle A$의 외각의 이등분선이 $\overline{BC}$의 연장선과 만나는 점을 D라 하면 ⇨ $\overline{AB}:\overline{AC}=\overline{BD}:\overline{CD}$



삼각형에서의 평행선과 선분의 길이의 비

◪ 다음 그림에서 $\overline{BC}//\overline{DE}$인 것에는 ○표, 아닌 것에는 ×표를 하여라.

1. ( )



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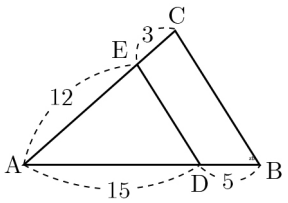

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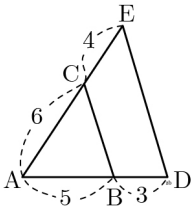

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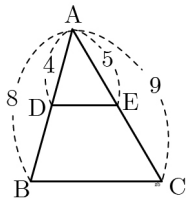
4. ( )



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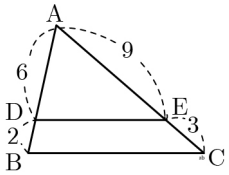

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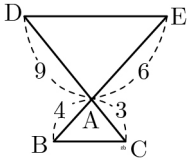

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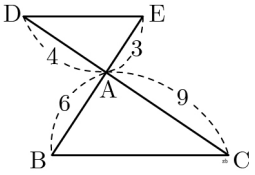

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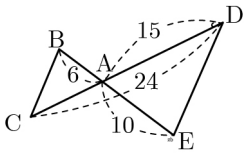

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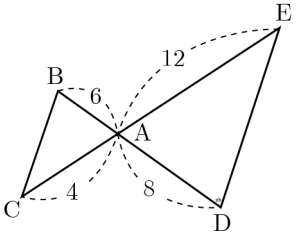

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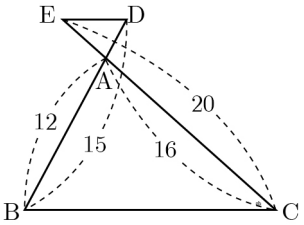

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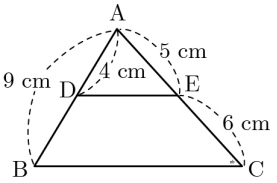

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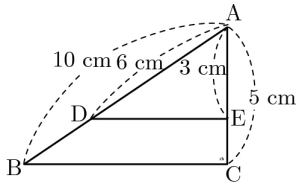

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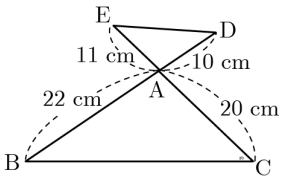

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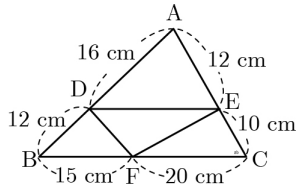

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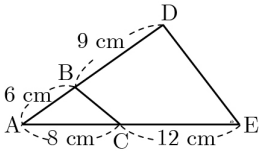

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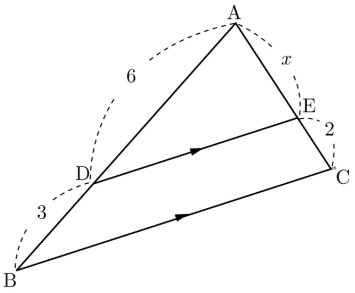
◪ 다음 그림에서 $\overline{BC}//\overline{DE}$일 때, x의 값을 구하여라.

16.



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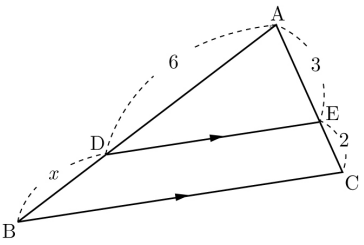

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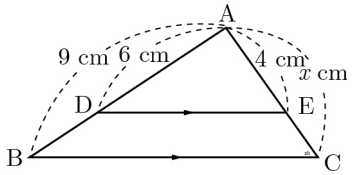

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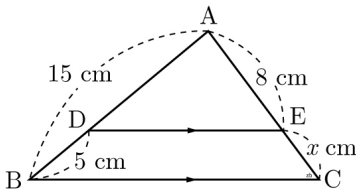

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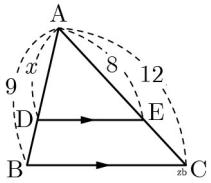

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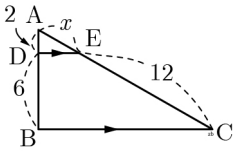

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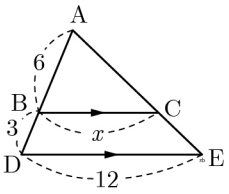

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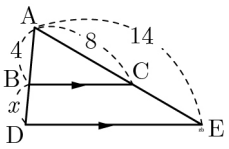

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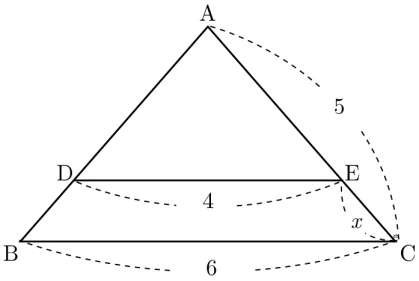

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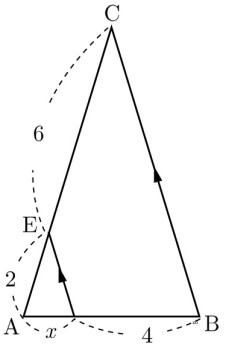

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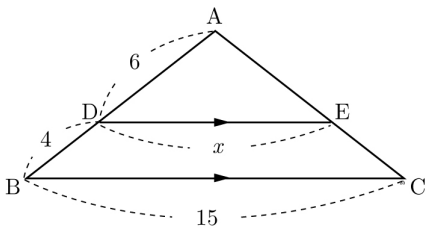

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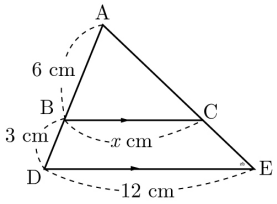

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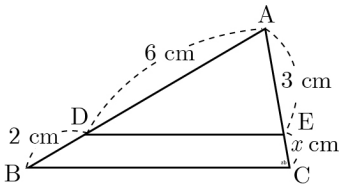

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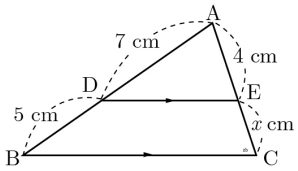

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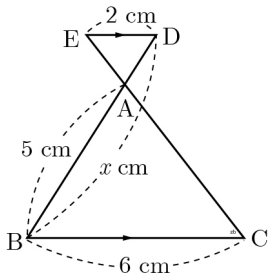

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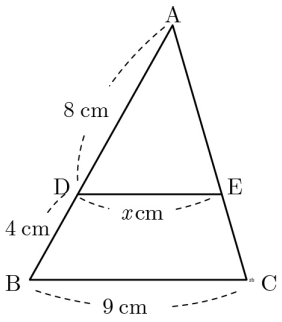

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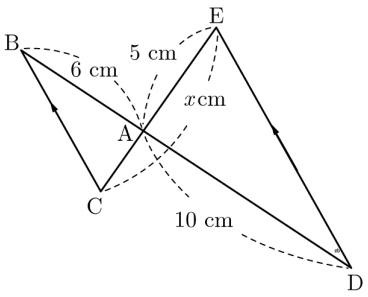

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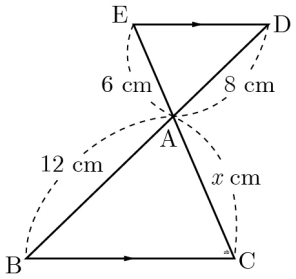

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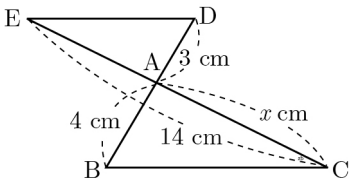

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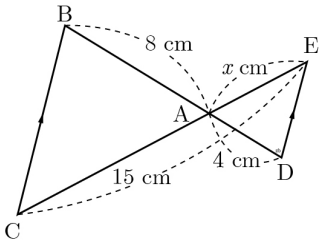

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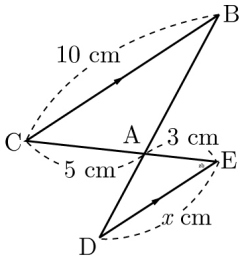

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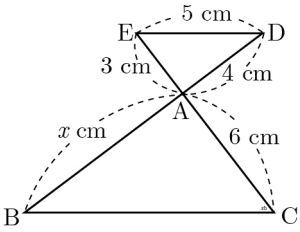

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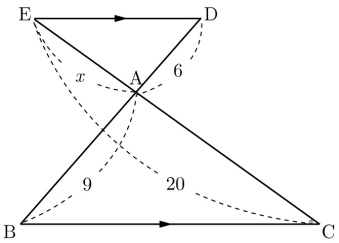

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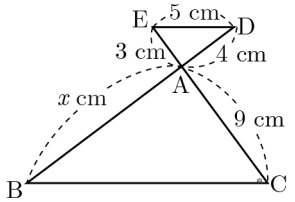

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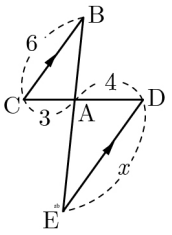
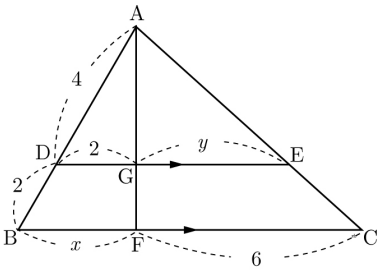


◪ 다음 그림에서 $\overline{BC}//\overline{DE}$일 때, $x+y$의 값을 구하여라.

41.



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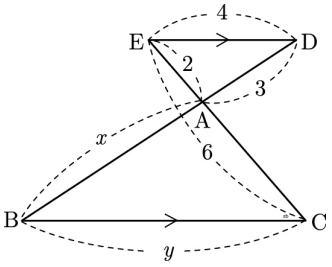
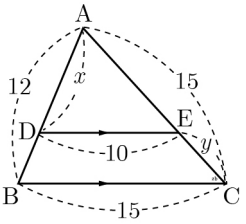


43.



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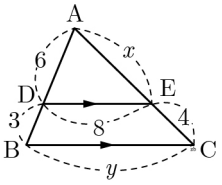
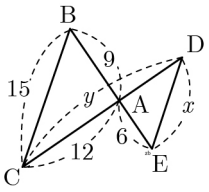
44.



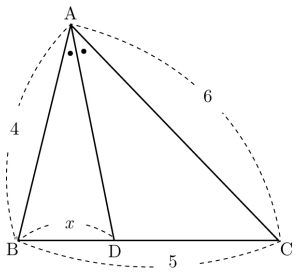
45.



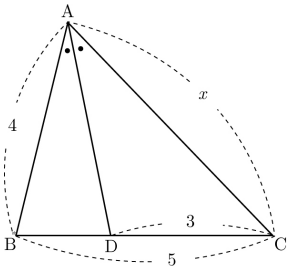
삼각형의 내각의 이등분선

◪ **다음 그림의 $\triangle ABC$에서 $\overline{AD}$가 $\angle A$의 이등분선일 때, x의 값을 구하여라.**

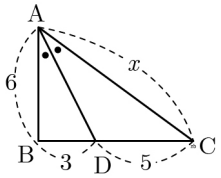
46.



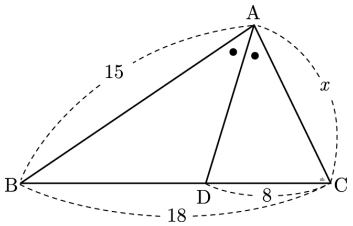
47.



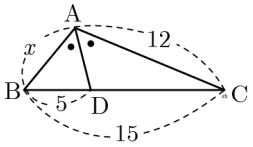
48.



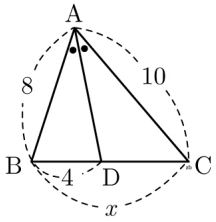
49.



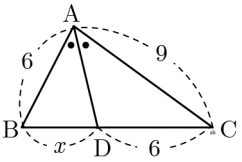
50.



51.



52.



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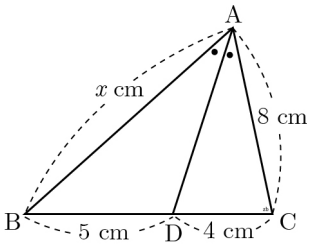
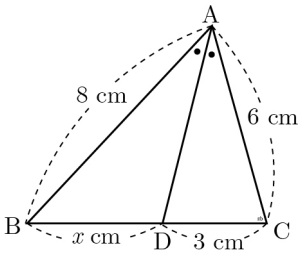
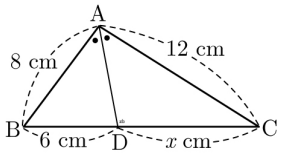
53.



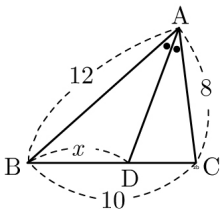
54.



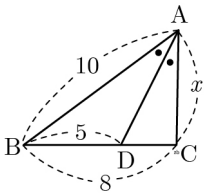
55.



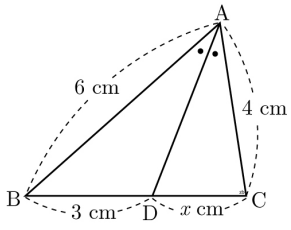
56.



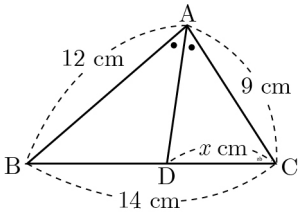
57.



58.

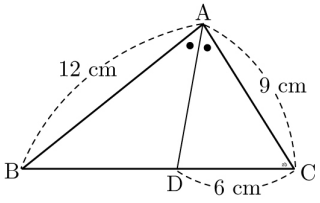


59.

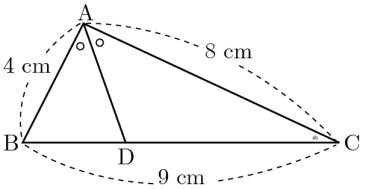


◪ **다음 그림의 △ABC에서 ∠A의 이등분선이 $\overline{BC}$와 만나는 점을 D라 할 때, $\overline{BD}$의 길이를 구하여라.**

60.



61.



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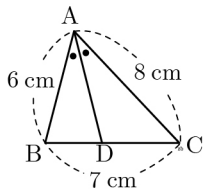
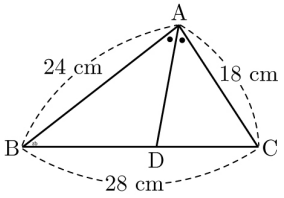
62.

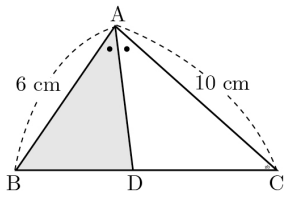


63.

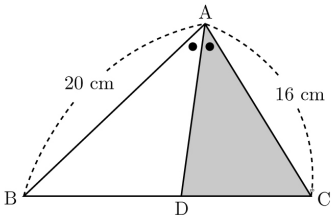


◪ **다음 그림의 $\triangle ABC$에서 $\overline{AD}$가 $\angle A$의 이등분선일 때, 색칠한 부분의 넓이를 구하여라.**

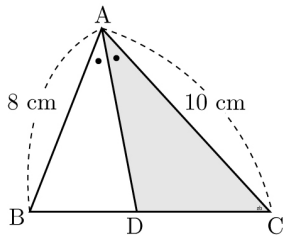
64. $\triangle ABC = 56cm^2$



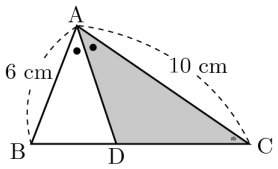
65. $\triangle ABC = 108cm^2$



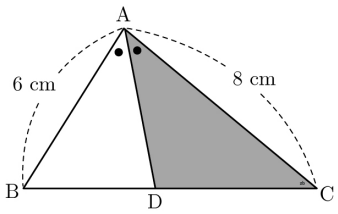
66. $\triangle ABD = 16cm^2$



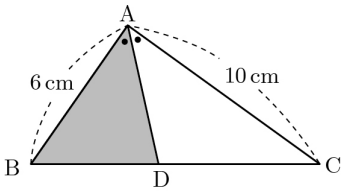
67. $\triangle ABC = 32cm^2$



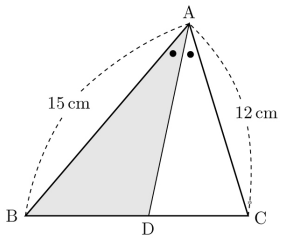
68. $\triangle ABC = 70cm^2$



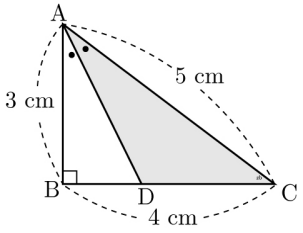
69. $\triangle ABC = 24cm^2$



70. $\triangle ACD = 36cm^2$



71.



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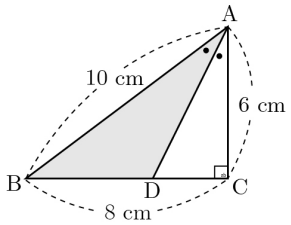
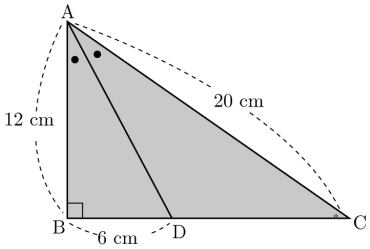
72.



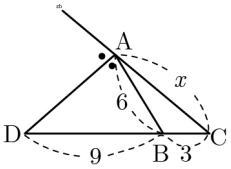
73.



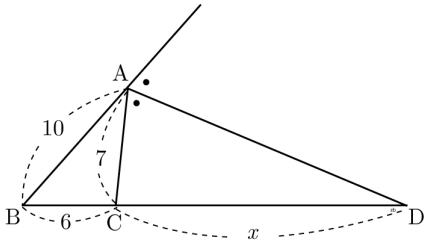
삼각형의 외각의 이등분선

◪ 다음 그림의 $\triangle ABC$에서 $\overline{AD}$가 $\angle A$의 외각의 이등분선일 때, x의 값을 구하여라.

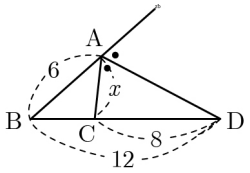
74.



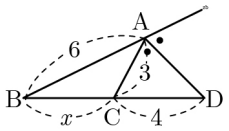
75.



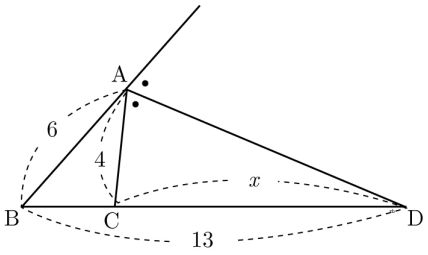
76.



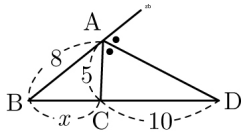
77.



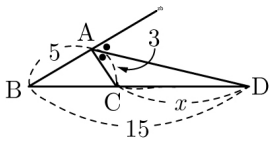
78.



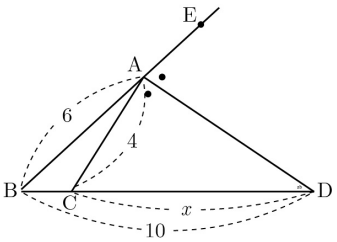
79.



80.



81.



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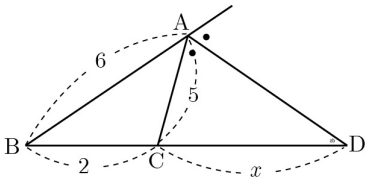
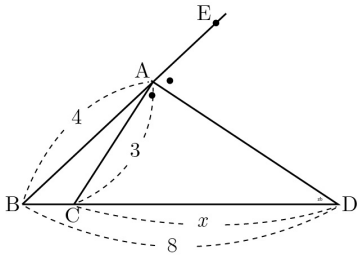
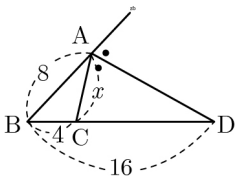
82.



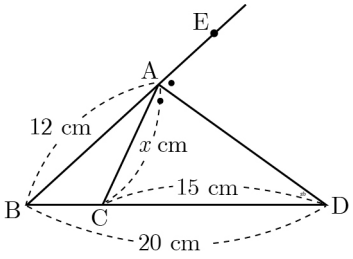
83.



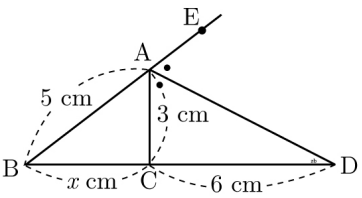
84.



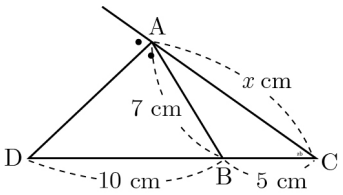
85.



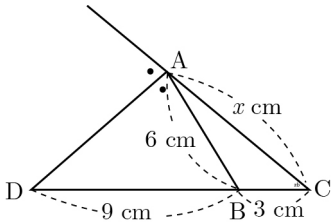
86.



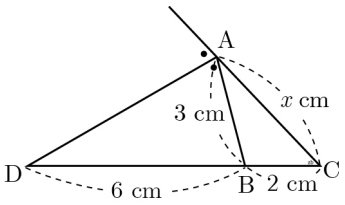
87.



88.

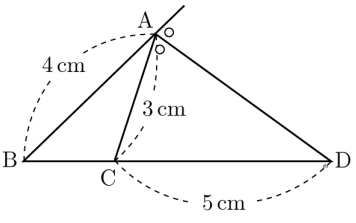


89.



◪ **다음 그림의 △ABC에서 $\overline{AD}$가 ∠A의 외각의 이등분선일 때, $\overline{BC}$의 길이를 구하여라.**

90.



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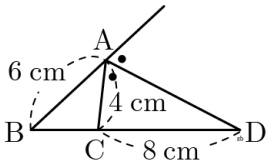
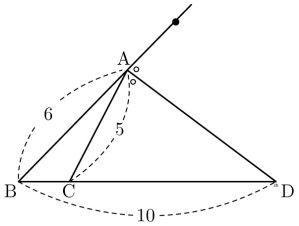
91.

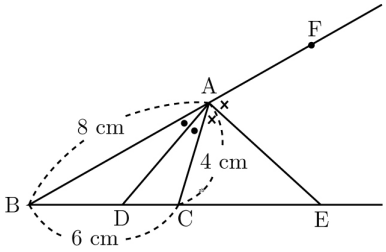


92.



삼각형의 내각, 외각의 이등분선의 혼합

◪ 그림에서 $\angle BAD = \angle CAD$, $\angle CAE = \angle FAE$일 때, 다음을 구하여라.



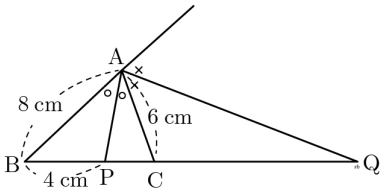
93. $\overline{CD}$의 길이를 구하여라.

94. $\overline{CE}$의 길이를 구하여라.

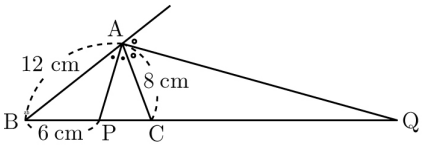
95. $\overline{DE}$의 길이를 구하여라.

◪ 다음 물음에 답하여라.

96. $\overline{AP}$는 $\angle BAC$의 이등분선이고, 점 Q는 $\angle BAC$의 외각의 이등분선과 $\overline{BC}$의 연장선의 교점일 때, $\overline{CQ}$의 길이를 구하여라.



97. 다음 그림에서 $\overline{AP}$는 $\angle BAC$의 이등분선이고, 점 Q는 $\angle BAC$의 외각의 이등분선과 $\overline{BC}$의 연장선의 교점일 때, $\overline{PQ}$의 길이를 구하여라.



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정답 및 해설

1) ○
⇨ $12:8=9:6$이므로 $\overline{BC}//\overline{DE}$

2) ×
⇨ $15:5\neq12:3$이므로 $\overline{BC}$와 $\overline{DE}$는 평행하지 않다.

3) X

4) X

5) O

6) X

7) X

8) O

9) ×
⇨ $6:8\neq4:12$이므로 $\overline{BC}$와 $\overline{DE}$는 평행하지 않다.

10) ○
⇨ $12:(15-12)=16:(20-16)$이므로 $\overline{BC}//\overline{DE}$

11) ×

12) ○
⇨ $\overline{AD}:\overline{AB}=\overline{AE}:\overline{AC}=3:5$이므로 $\overline{BC}//\overline{DE}$이다.

13) ×

14) ×

15) ○
⇨ $\overline{AB}:\overline{BD}=\overline{AC}:\overline{CE}=2:3$이므로 $\overline{BC}//\overline{DE}$이다.

16) 4
⇨ $6:3=x:2$ ∴ $x=4$

17) 4
⇨ $3:2=6:x$ ∴ $x=4$

18) 6
⇨ $\overline{AB}:\overline{AD}=\overline{AC}:\overline{AE}$에서 $9:6=x:4$이므로
$6x=36$ ∴$x=6$

19) 4
⇨ $\overline{AD}:\overline{DB}=\overline{AE}:\overline{EC}$에서 $(15-5):5=8:x$이므로
$10x=40$ ∴$x=4$

20) 6
⇨ $9:12=x:8$ ∴ $x=6$

21) 4
⇨ $2:6=x:12$ ∴ $x=4$

22) 8
⇨ $6:(6+3)=x:12$ ∴ $x=8$

23) 3
⇨ $4:(4+x)=8:14$ ∴ $x=3$

24) $\frac{5}{3}$
⇨ $\overline{AE}:\overline{AC}=\overline{DE}:\overline{BC}$
$(5-x):5=4:6$ ∴ $x=\frac{5}{3}$

25) $\frac{4}{3}$
⇨ $x:4=2:6$ ∴ $x=\frac{4}{3}$

26) 9
⇨ $\overline{AD}:\overline{AB}=\overline{DE}:\overline{BC}$
$6:10=x:15$ ∴ $x=9$

27) 8
⇨ $\overline{AB}:\overline{AD}=\overline{BC}:\overline{DE}$에서 $6:(6+3)=x:12$이므로
$9x=72$ ∴$x=8$

28) 1
⇨ $6:2=3:x$이어야 하므로
$6x=6$ ∴$x=1$

29) $\frac{20}{7}$
⇨ $\overline{AD}:\overline{DB}=\overline{AE}:\overline{EC}$에서 $7:5=4:x$이므로
$7x=20$ ∴$x=\frac{20}{7}$

30) $\frac{20}{3}$
⇨ $\overline{AB}:\overline{AD}=\overline{BC}:\overline{DE}$에서 $5:(x-5)=6:2$이므로
$6(x-5)=10,\ 6x=40$ ∴$x=\frac{20}{3}$

31) 6

32) 8

33) 9
⇨ $\overline{AB}:\overline{AD}=\overline{AC}:\overline{AE}$에서 $12:8=x:6$이므로
$8x=72$ ∴$x=9$

34) 8

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⇨ $(14-x):x=3:4$이어야 하므로
$3x=4(14-x)$, $7x=56$ $\therefore x=8$

35) 5
⇨ $\overline{AD}:\overline{DB}=\overline{AE}:\overline{EC}$에서 $4:(4+8)=x:15$이므로
$12x=60$ $\therefore x=5$

36) 6
⇨ $\overline{AC}:\overline{AE}=\overline{BC}:\overline{DE}$에서 $5:3=10:x$이므로
$5x=30$ $\therefore x=6$

37) 8
⇨ $x:4=6:3$이어야 하므로
$3x=24$ $\therefore x=8$

38) 8
⇨ $\overline{DA}:\overline{BA}=\overline{EA}:\overline{CA}$
$6:9=x:(20-x)$ $\therefore\ x=8$

39) 12
⇨ $x:4=9:3$이어야 하므로
$3x=36$ $\therefore x=12$

40) 8
⇨ $3:4=6:x$ $\therefore\ x=8$

41) 7
⇨ $\overline{AD}:\overline{AB}=\overline{DG}:\overline{BF}$
$4:6=2:x$ $\therefore\ x=3$
$\overline{AD}:\overline{AB}=\overline{GE}:\overline{FC}$
$4:6=y:6$ $\therefore\ y=4$
$\therefore\ x+y=7$

42) $x=6$, $y=8$

43) 13
⇨ $\overline{AB}:\overline{AD}=\overline{BC}:\overline{DE}$에서 $12:x=15:10$이므로
$15x=120$ $\therefore x=8$
$\overline{AB}:\overline{BD}=\overline{AC}:\overline{CE}$에서 $12:(12-8)=15:y$이므로
$12y=60$ $\therefore y=5$
$\therefore x+y=8+5=13$

44) 20
⇨ $6:3=x:4$ $\therefore\ x=8$
$6:(6+3)=8:y$ $\therefore\ y=12$
$\therefore\ x+y=20$

45) 30
⇨ $9:6=15:x$ $\therefore\ x=10$
$9:6=12:(y-12)$ $\therefore\ y=20$
$\therefore\ x+y=30$

46) 2
⇨ $\overline{AB}:\overline{AC}=\overline{BD}:\overline{DC}$
$4:6=x:(5-x)$ $\therefore\ x=2$

47) 6
⇨ $\overline{AB}:\overline{AC}=\overline{BD}:\overline{DC}$
$4:x=2:3$ $\therefore\ x=6$

48) 10
⇨ $6:x=3:5$ $\therefore\ x=10$

49) 12
⇨ 내각의 이등분선의 성질에 의해
$\overline{AB}:\overline{AC}=\overline{BD}:\overline{DC}$
$15:\overline{AC}=10:8$ $\therefore\ \overline{AC}=12$

50) 6
⇨ $x:12=5:(15-5)$ $\therefore\ x=6$

51) 9
⇨ $8:10=4:(x-4)$ $\therefore\ x=9$

52) 4
⇨ $6:9=x:6$ $\therefore\ x=4$

53) 10
⇨ $x:8=5:4$에서 $4x=40$ $\therefore x=10$

54) 4
⇨ $8:6=x:3$에서 $6x=24$ $\therefore x=4$

55) 9cm
⇨ 각의 이등분선의 성질에 의해
$\overline{AB}:\overline{AC}=\overline{BD}:\overline{CD}$
$8:12=6:x$
$\therefore\ x=9cm$

56) 6
⇨ $12:8=x:(10-x)$ $\therefore\ x=6$

57) 6
⇨ $10:x=5:(8-5)$ $\therefore\ x=6$

58) 2
⇨ $6:4=3:x$에서 $6x=12$ $\therefore x=2$

59) 6
⇨ $12:9=(14-x):x$에서 $12x=9(14-x)$
$21x=126$ $\therefore x=6$

60) 8cm
⇨ $\overline{AB}:\overline{AC}=\overline{BD}:\overline{DC}=4:3$이다.
따라서 $\overline{BD}:6=4:3$, $\overline{BD}=8$cm이다.

61) 3cm

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⇨ $\overline{AB}:\overline{AC}=\overline{BD}:\overline{DC}=1:2$이다.

따라서 $\overline{BC}=9\text{cm}$일 때, $\overline{BD}=\frac{1}{3}\times 9=3\,(\text{cm})$이다.

62) 3cm

⇨ $\overline{BD}=x\,\text{cm}$라 하면

$6:8=x:(7-x)$ $\therefore\ x=3$

63) 16cm

⇨ 삼각형의 내각을 이등분할 때,

$\overline{AB}:\overline{AC}=\overline{BD}:\overline{DC}=4:3$이 성립한다.

따라서 $\overline{BC}=28\text{cm}$이면 $\overline{BD}=\frac{4}{7}\times 28=16\text{cm}$이다.

64) 21cm^2

⇨ $\overline{BD}:\overline{CD}=\overline{AB}:\overline{AC}=6:10=3:5$이므로

$\triangle ABD=\frac{3}{8}\triangle ABC=\frac{3}{8}\times 56=21(\text{cm}^2)$

65) 48cm^2

⇨ $\overline{AB}:\overline{AC}=\overline{BD}:\overline{DC}$

$20:16=\overline{BD}:\overline{DC}$

$\triangle ABD$와 $\triangle ADC$의 밑변의 길이의 비가 $5:4$이므로

넓이의 비도 $5:4$이다.

$\therefore\ \triangle ADC=108\times\frac{4}{9}=48\,(\text{cm}^2)$

66) 20cm^2

⇨ $\overline{BD}:\overline{CD}=\overline{AB}:\overline{AC}=8:10=4:5$이므로

$\triangle ADC=\frac{5}{4}\triangle ABD=\frac{5}{4}\times 16=20(\text{cm}^2)$

67) 20

68) 40cm^2

⇨ $\overline{AB}:\overline{AC}=\overline{BD}:\overline{CD}$이므로 $\overline{BD}:\overline{CD}=3:4$이다. 이 때,

$\triangle ABC=70\text{cm}^2$이면 $\triangle ADC=\frac{4}{7}\times 70=40\text{cm}^2$이다.

69) 9cm^2

70) 45cm^2

71) $\frac{15}{4}\text{cm}^2$

⇨ $\triangle ABC=\frac{1}{2}\times 4\times 3=6(\text{cm}^2)$

$\overline{BD}:\overline{CD}=\overline{AB}:\overline{AC}=3:5$이므로

$\triangle ABD=\frac{5}{8}\triangle ABC=\frac{5}{8}\times 6=\frac{15}{4}(\text{cm}^2)$

72) 15cm^2

⇨ $\triangle ABC=\frac{1}{2}\times 8\times 6=24(\text{cm}^2)$

$\overline{BD}:\overline{CD}=\overline{AB}:\overline{AC}=10:6=5:3$이므로

$\triangle ABD=\frac{5}{8}\triangle ABC=\frac{5}{8}\times 24=15(\text{cm}^2)$

73) 96cm^2

74) 8

⇨ $x:6=(3+9):9$ $\therefore\ x=8$

75) 14

⇨ $\overline{AB}:\overline{AC}=\overline{BD}:\overline{CD}$

$10:7=(6+x):x$ $\therefore\ x=14$

76) 4

⇨ $6:x=12:8$ $\therefore\ x=4$

77) 4

⇨ $6:3=(x+4):4$ $\therefore\ x=4$

78) $\frac{26}{3}$

⇨ $\overline{AB}:\overline{AC}=\overline{BD}:\overline{CD}$

$6:4=13:x$ $\therefore\ x=\frac{26}{3}$

79) 6

⇨ $8:5=(x+10):10$ $\therefore\ x=6$

80) 9

⇨ $5:3=15:x$ $\therefore\ x=9$

81) $\frac{20}{3}$

82) 10

83) 6

84) 6

⇨ $8:x=16:(16-4)$ $\therefore\ x=6$

85) 9

⇨ $12:x=20:15$이므로 $20x=180$ $\therefore x=9$

86) 4

⇨ $5:3=(x+6):6$이므로 $3(x+6):30$

$3x=12$ $\therefore x=4$

87) $\frac{21}{2}$

⇨ $x:7=(10+5):10$이므로

$10x=105$ $\therefore x=\frac{21}{2}$

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88) 8

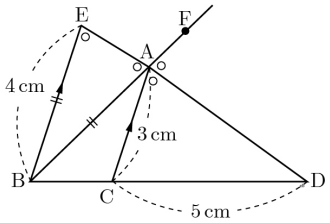
⇨ $x:6=(3+9):9$이므로 $9x=72$ $\therefore x=8$

89) 4

⇨ $x:3=(2+6):6$이므로 $6x=24$ $\therefore x=4$

90) $\frac{5}{3}$cm

⇨ $\overline{AD}$의 연장선과 점 B를 지나 $\overline{AC}$에 평행한 선과의 교점을 E, $\overline{AB}$의 연장선 위의 점을 F라 하자.



이 때, $\angle DAC=\angle DEB$(동위각), $\angle FAD=\angle BAE$(맞꼭지각)이므로 $\overline{AB}=\overline{EB}=4$cm이다.

따라서 $\overline{DC}:\overline{BD}=\overline{AC}:\overline{EB}$이므로

$5:\overline{BD}=3:4$ $\therefore\ \overline{BD}=\frac{20}{3}$cm

따라서 $\overline{BC}=\frac{20}{3}-5=\frac{5}{3}$이다.

91) 4cm

⇨ $\overline{BC}=x$cm라 하면

$6:4=(x+8):8$ $\therefore\ x=4$

92) $\frac{5}{3}$

⇨ $\overline{AB}:\overline{AC}=\overline{BD}:\overline{CD}$가 성립하므로

$6:5=10:\overline{CD}$ $\therefore\ \overline{CD}=\frac{25}{3}$

$\therefore\ \overline{BC}=10-\frac{25}{3}=\frac{5}{3}$

93) 2cm

94) 6cm

95) 8cm

96) 21cm

⇨ 내각의 이등분선의 성질에 의해

$\overline{AB}:\overline{AC}=\overline{BP}:\overline{PC}=8:6=4:3$이므로 $\overline{PC}=3$이다.

외각의 이등분선의 성질에 의해

$\overline{AC}:\overline{AB}=\overline{CQ}:\overline{BQ}$

$6:8=\overline{CQ}:(7+\overline{CQ})$

$8\overline{CQ}=42+6\overline{CQ}$

$2\overline{CQ}=42$ $\therefore\ \overline{CQ}=21$cm

97) 24cm

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