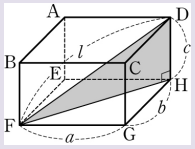
◇「콘텐츠산업 진흥법 시행령」제33조에 의한 표시
1) 제작연월일 : 2016-10-25
2) 제작자 : 교육지대㈜
3) 이 콘텐츠는 「콘텐츠산업 진흥법」에 따라 최초 제작일부터 5년간 보호됩니다.

◇「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

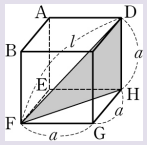
1. 직육면체의 대각선의 길이

세 모서리의 길이가 각각 a, b, c인 직육면체의 대각선의 길이를 l이라 하면 ⇨ $l=\sqrt{a^2+b^2+c^2}$



2. 정육면체의 대각선의 길이

한 모서리의 길이가 a인 정육면체의 대각선의 길이를 l이라 하면 ⇨ $l=\sqrt{3}a$

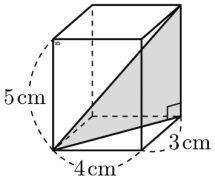


참고
◉ 직육면체의 대각선은 4개이고, 그 길이가 모두 같다.

직육면체의 대각선의 길이

◪ 다음 직육면체의 대각선의 길이를 구하여라.

1.



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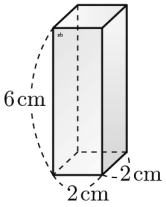

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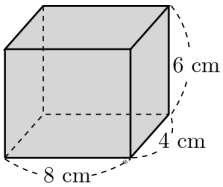

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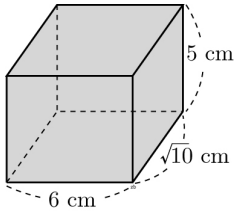

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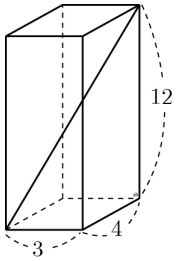

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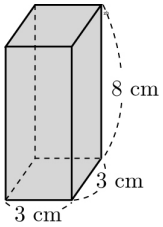

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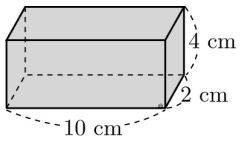
7.



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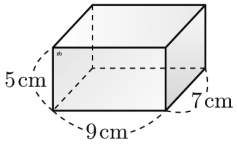

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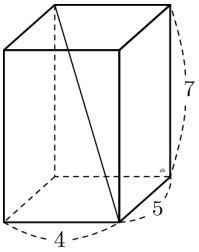

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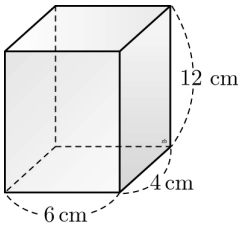

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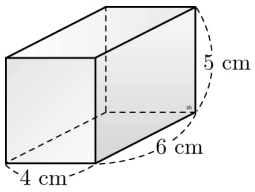

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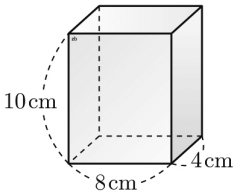
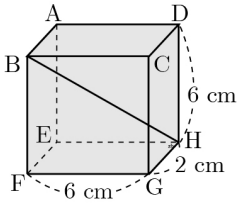


◪ 다음 그림과 같은 직육면체에서 대각선 BH의 길이를 구하여라.

13.



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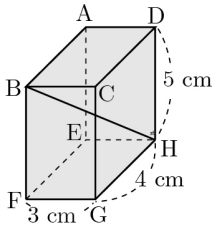

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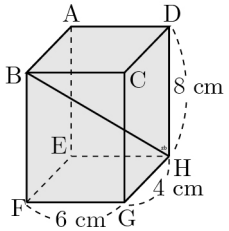

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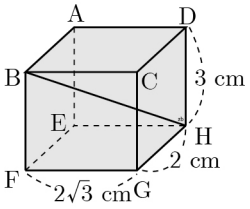

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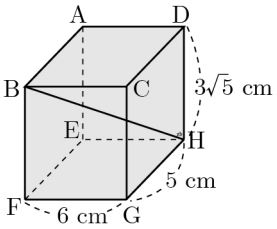

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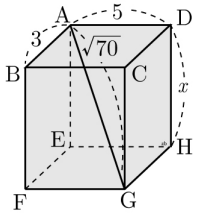
◪ 다음 그림과 같은 직육면체에서 x의 값을 구하여라.

18.



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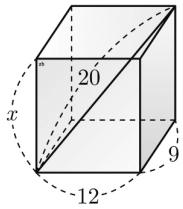

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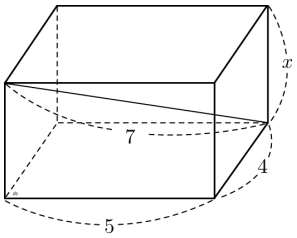

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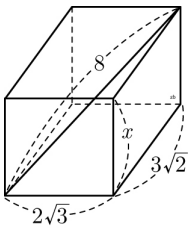

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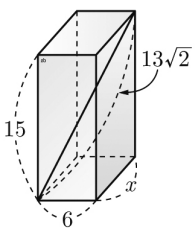

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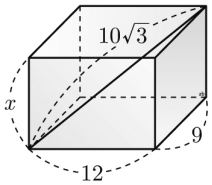

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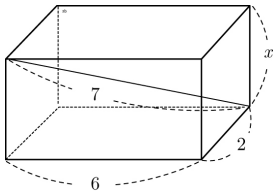

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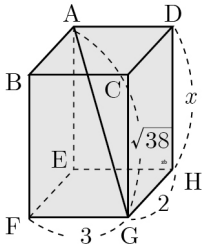

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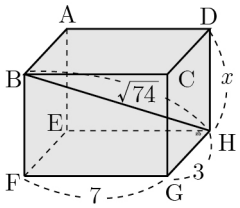

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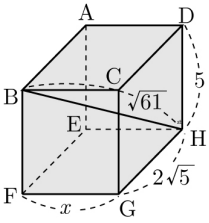

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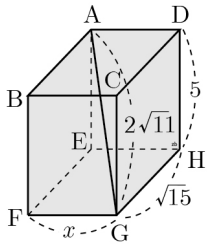

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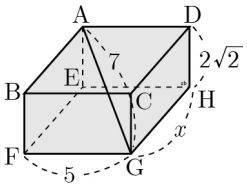

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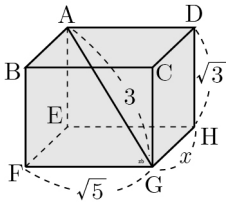

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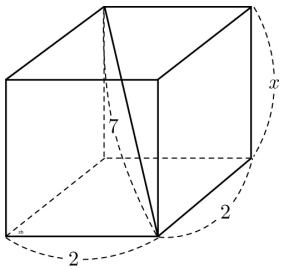

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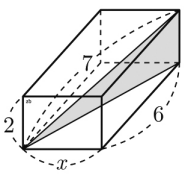

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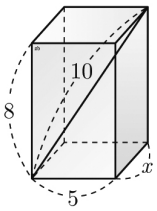

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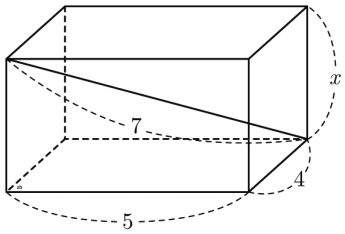

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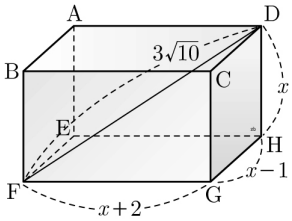

◪ **세 모서리의 길이가 각각 다음과 같은 직육면체의 대각선의 길이를 구하여라.**

36. 1cm, 2cm, 4cm

37. 2cm, 4cm, 6cm

38. 3cm, 6cm, $3\sqrt{2}$ cm

39. $3\sqrt{2}$ cm, $4\sqrt{2}$ cm, 5cm

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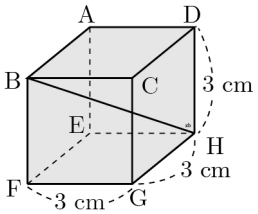
정육면체의 대각선의 길이

◪ 다음 그림과 같은 정육면체에서 대각선 BH의 길이를 구하여라.

40.



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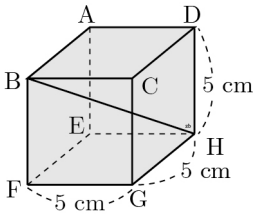

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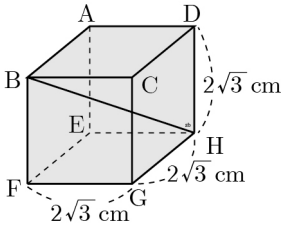

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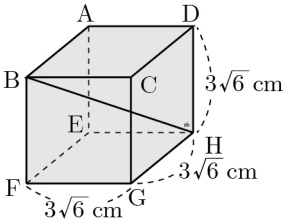

◪ 다음 그림과 같은 정육면체에서 대각선의 길이를 구하여라.

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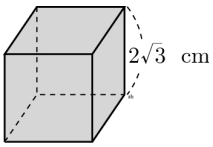

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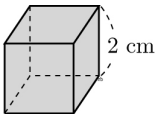

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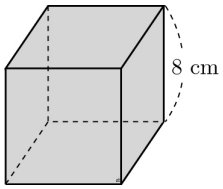

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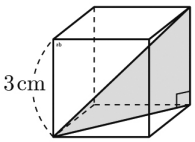

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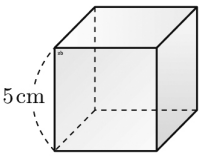

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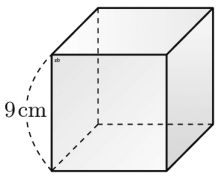

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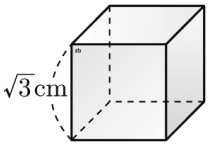
50.



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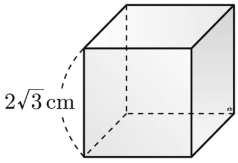
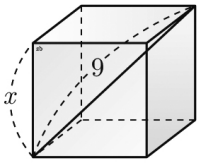


◪ 다음 그림과 같은 정육면체에서 x의 값을 구하여라.

52.



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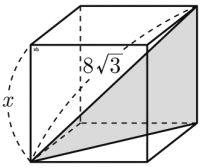

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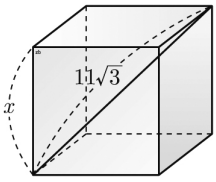

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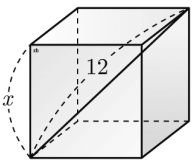

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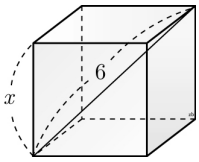

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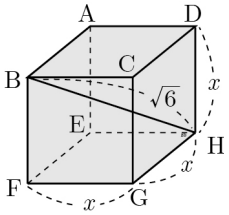

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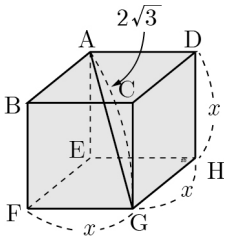

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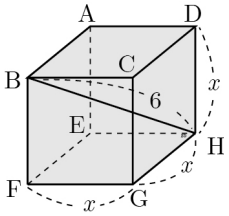

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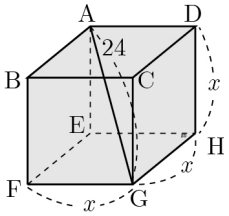

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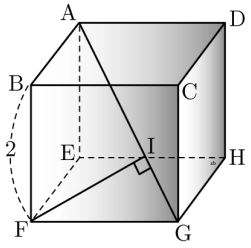
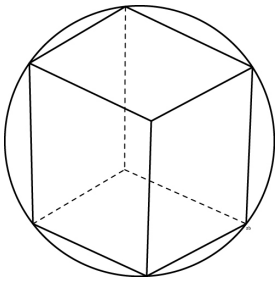
직육면체의 대각선의 길이의 응용

◪ 다음 물음에 답하여라.

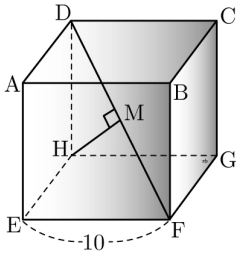
61. 다음 그림과 같이 한 모서리의 길이가 2인 정육면체의 꼭짓점 F에서 대각선 AG에 내린 수선의 발을 I라고 할 때, $\overline{FI}$의 길이를 구하여라.



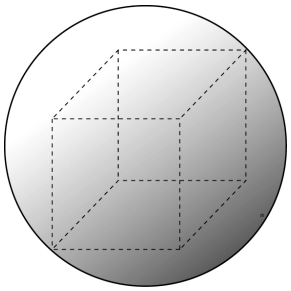
62. 한 모서리의 길이가 8인 정육면체에 외접하는 구의 지름의 길이를 구하여라.



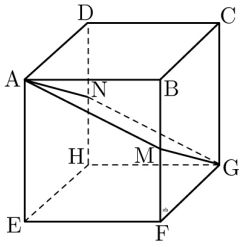
63. 다음 그림과 같이 한 모서리의 길이가 10인 정육면체의 꼭짓점 H에서 $\overline{DF}$에 내린 수선의 발을 M이라 할 때, $\overline{HM}$의 길이를 구하여라.



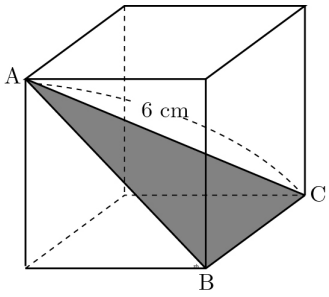
64. 다음 그림과 같이 반지름의 길이가 3인 구에 들어갈 수 있는 가장 큰 정육면체의 부피를 구하여라.



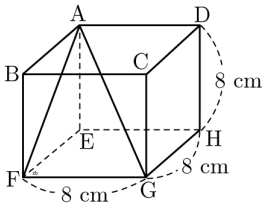
65. 한 변의 길이가 10인 정육면체에서 $\overline{BF}$와 $\overline{DH}$의 중점을 M, N이라 할 때, □AMGN의 넓이를 구하여라.



66. 다음 그림과 같이 대각선 $\overline{AC}$의 길이가 6cm인 정육면체에서 △ABC의 넓이를 구하여라.



67. 다음 정육면체의 한 모서리의 길이가 8cm에서 △AFG의 둘레의 길이를 구하여라.



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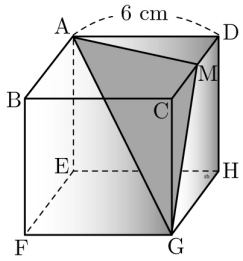
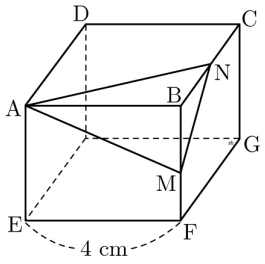
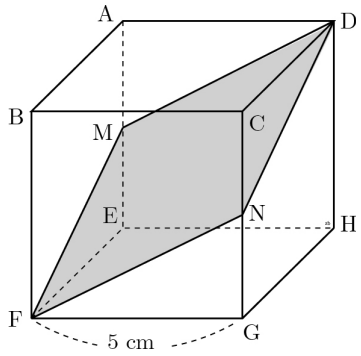
68. 다음 그림과 같이 한 모서리의 길이가 6cm인 정육면체에서 점 M이 $\overline{CD}$의 중점일 때, $\triangle MAG$의 넓이를 구하여라.



69. 한 모서리의 길이가 4cm인 정육면체에서 $\overline{BF}$의 중점을 M, $\overline{BC}$의 중점을 N이라고 할 때, $\triangle AMN$의 넓이를 구하여라.



70. 한 모서리의 길이가 5cm인 정육면체에서 $\overline{AE}$의 중점을 M, $\overline{CG}$의 중점을 N이라 할 때, $\square MFND$의 넓이를 구하여라.



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정답 및 해설

1) $5\sqrt{2}$ cm
⇨ $\sqrt{4^2+3^2+5^2}=5\sqrt{2}\,(\mathrm{cm})$

2) $2\sqrt{11}$ cm
⇨ $\sqrt{2^2+2^2+6^2}=2\sqrt{11}\,(\mathrm{cm})$

3) $2\sqrt{29}$ cm
⇨ $\sqrt{8^2+4^2+6^2}=2\sqrt{29}\,(\mathrm{cm})$

4) $\sqrt{71}$ cm
⇨ $\sqrt{6^2+(\sqrt{10})^2+5^2}=\sqrt{71}\,(\mathrm{cm})$

5) 13
⇨ 직육면체의 대각선의 길이는
$\sqrt{3^2+4^2+12^2}=13$

6) $\sqrt{82}$ cm
⇨ $\sqrt{3^2+3^2+8^2}=\sqrt{82}\,(\mathrm{cm})$

7) $2\sqrt{30}$ cm
⇨ $\sqrt{10^2+2^2+4^2}=2\sqrt{30}\,(\mathrm{cm})$

8) $\sqrt{155}$ cm
⇨ $\sqrt{9^2+7^2+5^2}=\sqrt{155}\,(\mathrm{cm})$

9) $3\sqrt{10}$
⇨ 직육면체의 대각선의 길이는
$\sqrt{4^2+5^2+7^2}=\sqrt{90}=3\sqrt{10}$

10) 14cm
⇨ $\sqrt{6^2+4^2+12^2}=\sqrt{196}=14(\mathrm{cm})$

11) $\sqrt{77}$ cm

12) $6\sqrt{5}$ cm
⇨ $\sqrt{8^2+4^2+10^2}=6\sqrt{5}\,(\mathrm{cm})$

13) $2\sqrt{19}$ cm
⇨ $\overline{\mathrm{BH}}=\sqrt{6^2+2^2+6^2}=\sqrt{76}=2\sqrt{19}\,(\mathrm{cm}$

14) $5\sqrt{2}$ cm
⇨ $\overline{\mathrm{BH}}=\sqrt{3^2+4^2+5^2}=\sqrt{50}=5\sqrt{2}\,(\mathrm{cm})$

15) $2\sqrt{29}$ cm
⇨ $\overline{\mathrm{BH}}=\sqrt{6^2+4^2+8^2}=\sqrt{116}=2\sqrt{29}\,(\mathrm{cm})$

16) 5cm
⇨ $\overline{\mathrm{BH}}=\sqrt{(2\sqrt{3})^2+2^2+3^2}=\sqrt{25}=5(\mathrm{cm})$

17) $\sqrt{106}$ cm
⇨ $\overline{\mathrm{BH}}=\sqrt{6^2+5^2+(3\sqrt{5})^2}=\sqrt{106}\,(\mathrm{cm})$

18) 6
⇨ $\sqrt{3^2+5^2+x^2}=\sqrt{70}$ 이므로 $34+x^2=70$
$x^2=36 \quad \therefore\ x=6$

19) $5\sqrt{7}$
⇨ $\sqrt{12^2+9^2+x^2}=20$
$x^2+225=400,\ x^2=175 \quad \therefore x=5\sqrt{7}\,(x>0)$

20) $2\sqrt{2}$
⇨ $7^2=5^2+4^2+x^2,\ x^2=49-41=8,$
$\therefore\ x=\sqrt{8}=2\sqrt{2}\ \ (x>0)$

21) $\sqrt{34}$
⇨ 직육면체의 대각선의 길이가 8이 되므로
$8^2=(2\sqrt{3})^2+(3\sqrt{2})^2+x^2,$
$64=12+18+x^2,\ x^2=34 \quad \therefore\ x=\sqrt{34}\ \ (x>0)$

22) $\sqrt{77}$
⇨ $\sqrt{6^2+x^2+15^2}=13\sqrt{2}$
$x^2+261=338,\ \ x^2=77 \quad \therefore x=\sqrt{77}\,(x>0)$

23) $5\sqrt{3}$
⇨ $\sqrt{12^2+9^2+x^2}=10\sqrt{3}$
$x^2+225=300,\ x^2=75 \quad \therefore\ x=5\sqrt{3}\,(x>0)$

24) 3
⇨ 직육면체의 대각선의 길이는 $\sqrt{6^2+2^2+x^2}=7$이므로
$x^2+40=49,\ x^2=9 \quad \therefore\ x=3$

25) 5
⇨ $\sqrt{3^2+2^2+x^2}=\sqrt{38}$ 이므로
$13+x^2=38, x^2=25 \quad \therefore x=5(\because x>0)$

26) 4
⇨ $\sqrt{7^2+3^2+x^2}=\sqrt{74}$ 이므로
$58+x^2=74, x^2=16 \quad \therefore x=4(\because x>0)$

27) 4
⇨ $\sqrt{x^2+(2\sqrt{5})^2+5^2}=\sqrt{61}$ 이므로
$x^2+45=61, x^2=16 \quad \therefore x=4(\because x>0)$

28) 2
⇨ $\sqrt{x^2+(\sqrt{15})^2+5^2}=2\sqrt{11}$ 이므로
$x^2+40=44, x^2=4 \quad \therefore x=2(\because x>0)$

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29) 4
⇨ $\sqrt{5^2+x^2+(2\sqrt{2})^2}=7$이므로
$x^2+33=49, x^2=16 \quad \therefore x=4(\because x>0)$

30) 1
⇨ $\sqrt{(\sqrt{5})^2+x^2+(\sqrt{3})^2}=3$이므로
$x^2+8=9, x^2=1 \quad \therefore x=1(\because x>0)$

31) $\sqrt{41}$
⇨ 대각선의 길이가 7이므로
$\sqrt{2^2+2^2+x^2}=\sqrt{49}$
$x^2=41 \quad \therefore x=\sqrt{41}$

32) 3
⇨ $\sqrt{x^2+6^2+2^2}=7$이므로
$x^2+40=49,\ x^2=9 \quad \therefore\ x=3\ (x>0)$

33) $\sqrt{11}$
⇨ $\sqrt{5^2+x^2+8^2}=10$이므로
$x^2+89=100,\ x^2=11 \quad \therefore x=\sqrt{11}(x>0)$

34) $2\sqrt{2}$

35) 5

36) $\sqrt{21}\,\mathrm{cm}$
⇨ $\sqrt{1^2+2^2+4^2}=\sqrt{21}\,(\mathrm{cm})$

37) $2\sqrt{14}\,\mathrm{cm}$
⇨ 세 모서리의 길이가 각각 2cm, 4cm, 6cm인 직육면체의 대각선의 길이는
$\sqrt{2^2+4^2+6^2}=\sqrt{4+16+36}=\sqrt{56}=2\sqrt{14}$ 가 된다.

38) $3\sqrt{7}\,\mathrm{cm}$
⇨ $\sqrt{3^2+6^2+(3\sqrt{2})^2}=3\sqrt{7}\,(\mathrm{cm})$

39) $5\sqrt{3}\,\mathrm{cm}$
⇨ $\sqrt{(3\sqrt{2})^2+(4\sqrt{2})^2+5^2}=5\sqrt{3}\,(\mathrm{cm})$

40) $3\sqrt{3}\,\mathrm{cm}$
⇨ $\overline{\mathrm{BH}}=\sqrt{3}\times3=3\sqrt{3}\,(\mathrm{cm})$

41) $5\sqrt{3}\,\mathrm{cm}$
⇨ $\overline{\mathrm{BH}}=\sqrt{3}\times5=5\sqrt{3}\,(\mathrm{cm})$

42) 6cm
⇨ $\overline{\mathrm{BH}}=\sqrt{3}\times2\sqrt{3}=6(\mathrm{cm})$

43) $9\sqrt{2}\,\mathrm{cm}$
⇨ $\overline{\mathrm{BH}}=\sqrt{3}\times3\sqrt{6}=9\sqrt{2}\,(\mathrm{cm})$

44) 6cm
⇨ $\sqrt{3}\times2\sqrt{3}=6\,(\mathrm{cm})$

45) $2\sqrt{3}\,\mathrm{cm}$
⇨ $\sqrt{3}\times2=2\sqrt{3}\,(\mathrm{cm})$

46) $8\sqrt{3}\,\mathrm{cm}$
⇨ $\sqrt{3}\times8=8\sqrt{3}\,(\mathrm{cm})$

47) $3\sqrt{3}\,\mathrm{cm}$
⇨ $\sqrt{3}\times3=3\sqrt{3}\,(\mathrm{cm})$

48) $5\sqrt{3}\,\mathrm{cm}$
⇨ $\sqrt{3}\times5=5\sqrt{3}\,(\mathrm{cm})$

49) $9\sqrt{3}\,\mathrm{cm}$
⇨ $\sqrt{3}\times9=9\sqrt{3}\,(\mathrm{cm})$

50) 3cm

51) 6cm
⇨ $\sqrt{3}\times2\sqrt{3}=6\,(\mathrm{cm})$

52) $3\sqrt{3}$
⇨ $\sqrt{3}\times x=9 \quad \therefore\ x=3\sqrt{3}$

53) 8
⇨ $\sqrt{3}\times x=8\sqrt{3} \quad \therefore\ x=8$

54) 11
⇨ $\sqrt{3}\times x=11\sqrt{3} \quad \therefore\ x=11$

55) $4\sqrt{3}$
⇨ $\sqrt{3}\times x=12 \quad \therefore\ x=4\sqrt{3}$

56) $2\sqrt{3}$
⇨ $\sqrt{3}\times x=6 \quad \therefore\ x=2\sqrt{3}$

57) $\sqrt{2}$
⇨ $\sqrt{3}x=\sqrt{6} \quad \therefore x=\sqrt{2}$

58) 2
⇨ $\sqrt{3}x=2\sqrt{3} \quad \therefore x=2$

59) $2\sqrt{3}$
⇨ $\sqrt{3}x=6 \quad \therefore x=2\sqrt{3}$

60) $8\sqrt{3}$
⇨ $\sqrt{3}x=24 \quad \therefore x=8\sqrt{3}$

61) $\frac{2\sqrt{6}}{3}$
⇨ $\overline{\mathrm{AG}}=\sqrt{2^2+2^2+2^2}=2\sqrt{3}$, $\overline{\mathrm{AF}}=2\sqrt{2}$

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△AFG에서 $2\times 2\sqrt{2}=2\sqrt{3}\times \overline{FI}$

$\therefore \overline{FI}=\dfrac{2\sqrt{2}}{\sqrt{3}}=\dfrac{2\sqrt{6}}{3}$

62) $8\sqrt{3}$

⇨ 한 모서리의 길이가 8인 정육면체의 대각선의 길이가 $8\sqrt{3}$이므로 정육면체에 외접하는 구의 지름의 길이는 $8\sqrt{3}$이다.

63) $\dfrac{10\sqrt{6}}{3}$

64) $24\sqrt{3}$

⇨ 정육면체의 한 변의 길이를 a라고 하면

정육면체의 대각선의 길이와 구의 지름의 크기가 같아져서

$\sqrt{3}a=6,\ a=\dfrac{6}{\sqrt{3}}=2\sqrt{3}$

정육면체의 부피$=a^3=(2\sqrt{3})^3=8\times 3\sqrt{3}=24\sqrt{3}$이 된다.

65) $50\sqrt{6}$

⇨ □AMGN은 $\overline{AM}=\overline{MG}=\overline{GN}=\overline{NA}=\sqrt{10^2+5^2}=5\sqrt{5}$인 마름모이다.

$\overline{AG}=\sqrt{10^2+10^2+10^2}=10\sqrt{3}$이고, $\overline{MN}=10\sqrt{2}$이므로

□AMGN의 넓이는 $\dfrac{1}{2}\times 10\sqrt{3}\times 10\sqrt{2}=50\sqrt{6}$이다.

66) $6\sqrt{2}\,\mathrm{cm}^2$

⇨ 정육면체의 한 모서리의 길이를 a라 하면 대각선의 길이는 $\sqrt{3}a=6$이므로 $a=2\sqrt{3}$

△ABC에서 $\overline{BC}=2\sqrt{3}$, $\overline{AB}=\sqrt{(2\sqrt{3})^2+(2\sqrt{3})^2}=2\sqrt{6}$

$\therefore \triangle ABC=\dfrac{1}{2}\times 2\sqrt{3}\times 2\sqrt{6}=6\sqrt{2}$

67) $8(1+\sqrt{2}+\sqrt{3})\mathrm{cm}$

⇨ △ABF에서 $\overline{AF}=\sqrt{8^2+8^2}=8\sqrt{2}$

정육면체의 대각선 $\overline{AG}=\sqrt{8^2+8^2+8^2}=8\sqrt{3}$

따라서 △AFG의 둘레의 길이는

$8+8\sqrt{2}+8\sqrt{3}=8(1+\sqrt{2}+\sqrt{3})$이다.

68) $9\sqrt{6}\,\mathrm{cm}^2$

⇨ △ADM에서 $\overline{AM}=\sqrt{6^2+3^2}=3\sqrt{5}$

△CGM에서 $\overline{MG}=\sqrt{6^2+3^2}=3\sqrt{5}$

정육면체의 대각선의 길이 $\overline{AG}=\sqrt{6^2+6^2+6^2}=6\sqrt{3}$

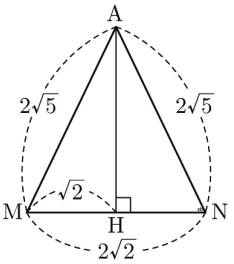
△MAG는 $\overline{AM}=\overline{MG}=3\sqrt{5}$인 이등변삼각형이므로

점 M에서 $\overline{AG}$에 내린 수선의 발을 P라 하면

△AMP에서 $\overline{MP}=\sqrt{(3\sqrt{5})^2-(3\sqrt{3})^2}=3\sqrt{2}$

$\therefore \triangle MAG=\dfrac{1}{2}\times 6\sqrt{3}\times 3\sqrt{2}=9\sqrt{6}$

69) $6\mathrm{cm}^2$



⇨

$\overline{AH}=\sqrt{(2\sqrt{5})^2-(\sqrt{2})^2}=\sqrt{18}=3\sqrt{2}$

$\therefore \triangle AMN=\dfrac{1}{2}\times 2\sqrt{2}\times 3\sqrt{2}=6$

70) $\dfrac{25\sqrt{6}}{2}\,\mathrm{cm}^2$

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교육지대(주) 서울특별시 강남구 논현동 학동로 130 한주빌딩 7층 대표전화 : 1544-5633 FAX : 02-521-0331