◇「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. 각뿔의 겉넓이와 부피

1) (겉넓이)=(밑넓이)+(옆넓이)

2) (부피)$=\frac{1}{3}\times$(밑넓이)$\times$(높이)$=\frac{1}{3}\times$(각기둥의 부피)

2. 원뿔의 겉넓이와 부피

밑면의 반지름의 길이가 r, 모선의 길이가 l, 높이가 h인 원뿔에서

1) (겉넓이)=(밑넓이)+(옆넓이)$=\pi r^2+\pi rl$

2) (부피)$=\frac{1}{3}\times$(밑넓이)$\times$(높이)$=\frac{1}{3}\pi r^2h$

3. 뿔대의 겉넓이와 부피

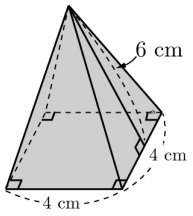
1) (겉넓이)=(작은 밑면의 넓이)+(큰 밑면의 넓이)+(옆넓이)

2) (부피)=(큰 뿔의 부피)−(작은 뿔의 부피)

각뿔의 겉넓이와 부피

◪ 다음 각뿔의 겉넓이를 구하여라.(단, 옆면은 모두 합동이다.)

1.



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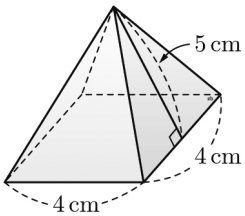

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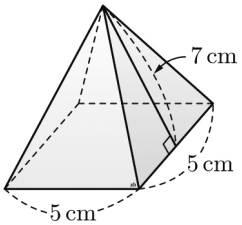

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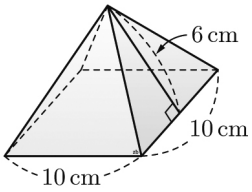

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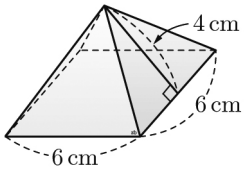

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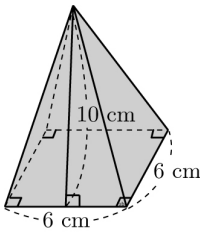
6.



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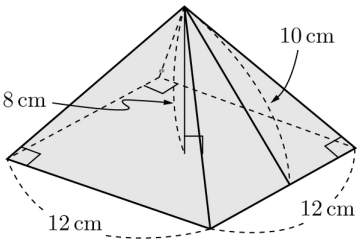

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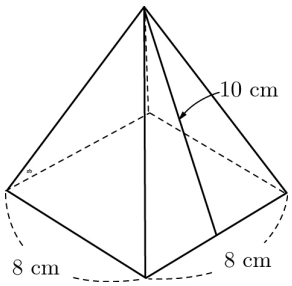

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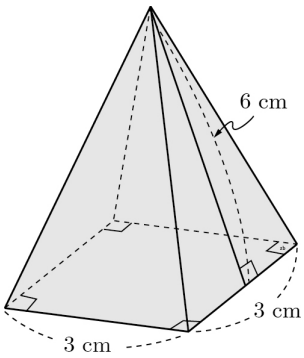
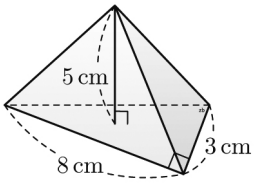


◪ 다음 각뿔의 부피를 구하여라.

10.



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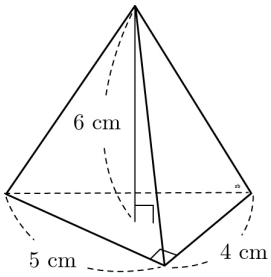

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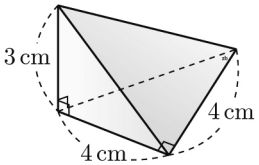

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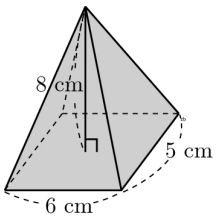

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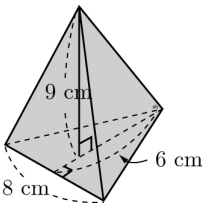

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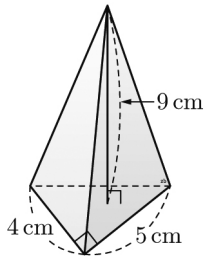
15.



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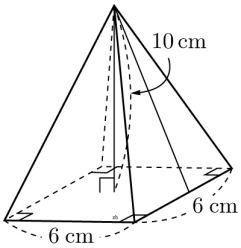

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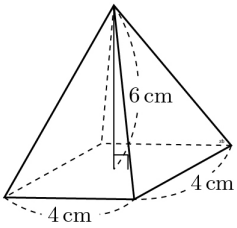

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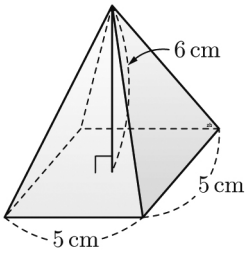

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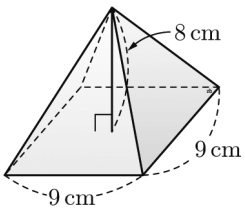
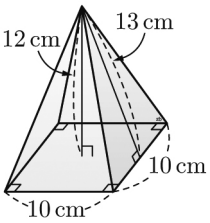


◪ 다음 각뿔의 겉넓이와 부피를 구하여라. (단, 옆면은 모두 합동이다.)

20.



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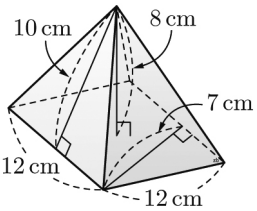
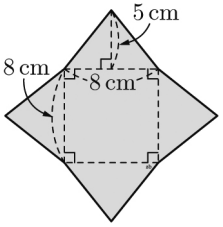
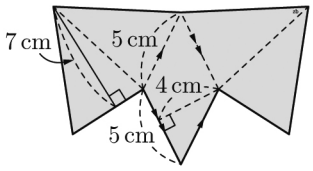


◪ 다음 전개도로 만들어진 각뿔의 겉넓이와 부피를 구하여라. (단, 옆면은 모두 합동이다.)

22. 각뿔의 높이: 3cm



23. 각뿔의 높이: 6cm



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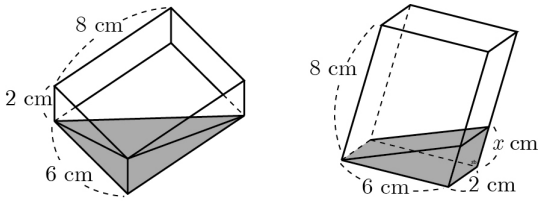
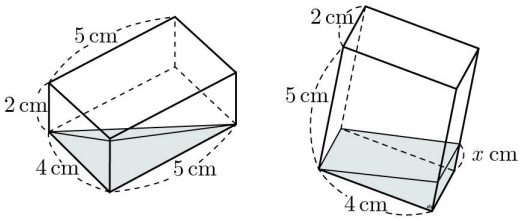
◪ 다음 그림과 같이 두 직육면체 모양의 그릇에 담겨 있는 물의 양이 같을 때, x의 값을 구하여라.

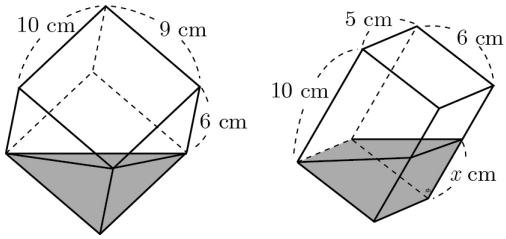
24.



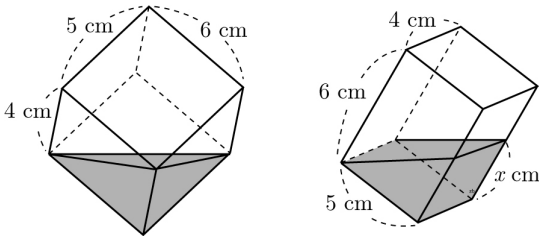
25.



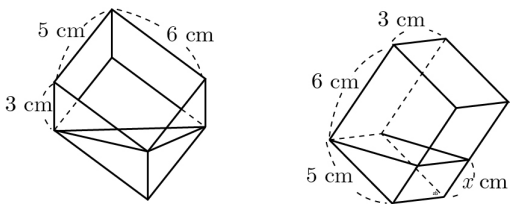
26.



27.

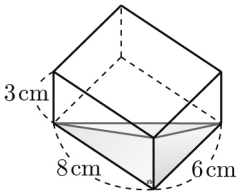


28.



◪ 직육면체 모양의 그릇에 물을 가득 채운 후 그릇을 기울여 물을 버리고 남은 물의 양이 다음 그림과 같다. 남은 물의 부피를 구하여라. (단, 그릇의 두께는 무시한다.)

29.



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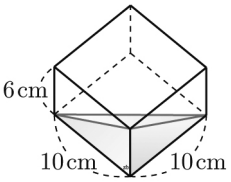
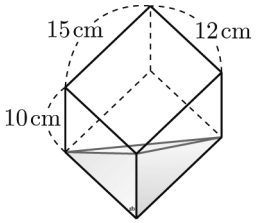
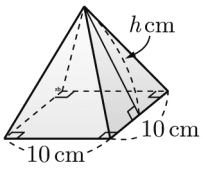


31.

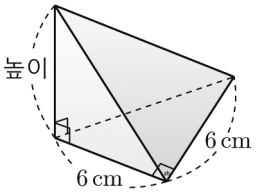


◪ 다음 물음에 답하여라.

32. 다음 정사각뿔의 겉넓이가 340cm^2일 때, h의 값을 구하여라.



33. 다음 삼각뿔의 부피가 36cm^3일 때, 높이를 구하여라.



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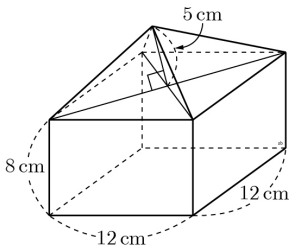
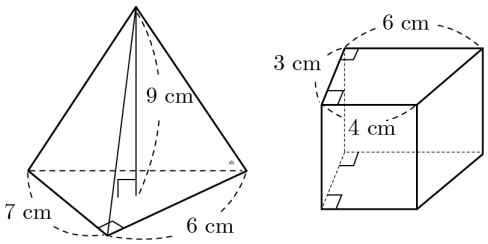
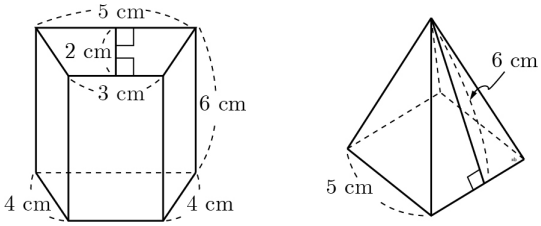
34. 다음 입체도형의 부피를 구하여라.



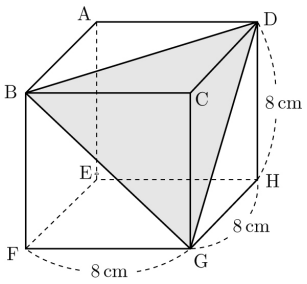
35. 다음 삼각뿔의 부피와 사각기둥의 부피가 같을 때 사각기둥의 높이를 구하여라.



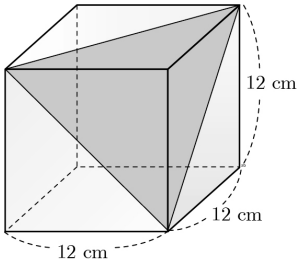
36. 다음 그림의 각기둥과 밑면이 정사각형이고 옆면이 모두 합동인 각뿔에서 두 입체도형의 겉넓이의 합을 구하여라.



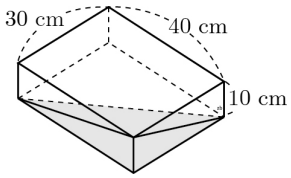
37. 다음 그림과 같이 한 모서리의 길이가 8cm인 정육면체를 세 꼭짓점 B, G, D를 지나는 평면으로 잘랐을 때 생기는 삼각뿔 C－BGD의 부피를 구하여라.



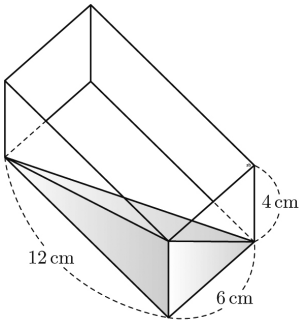
38. 다음 그림과 같이 한 모서리의 길이가 12cm인 정육면체를 세 꼭짓점을 지나는 평면으로 자를 때 생기는 삼각뿔의 부피를 구하여라.



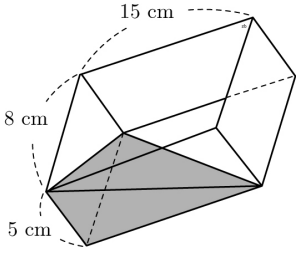
39. 다음 그림과 같은 직육면체 모양의 그릇에 물을 가득 넣은 다음, 그릇을 기울여 물을 흘려 보냈다. 그릇에 남아 있는 물의 양을 구하여라.



40. 다음 그림과 같이 직육면체의 그릇에 물을 부은 다음 그릇을 기울였을 때의 그림이다. 남아 있는 물의 양의 부피를 구하여라.



41. 다음 그림과 같은 직육면체 모양의 그릇에 물이 담겨있다. 얼마를 더 부으면 가득 차겠는지 구하여라.



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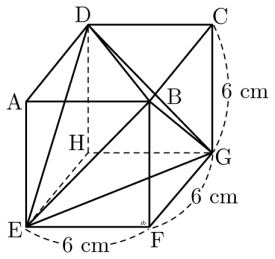
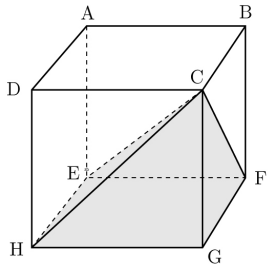
42. 다음 그림과 같이 한 모서리의 길이가 6cm인 정육면체가 있다. 이 정육면체의 네 꼭짓점 D, B, E, G를 꼭짓점으로 하는 사면체의 부피를 구하여라.



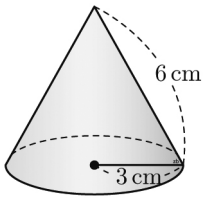
43. 다음 그림과 같은 직육면체 ABCD－EFGH의 부피가 $60cm^3$라면, 직사각형 EFGH를 밑면으로 하고, 점 C를 꼭짓점으로 하는 사각뿔의 부피를 구하여라.



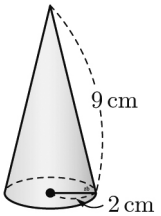
원뿔의 겉넓이와 부피

◪ 다음 원뿔의 겉넓이를 구하여라.

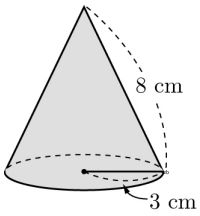
44.



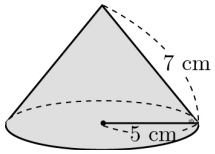
45.



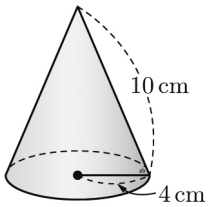
46.



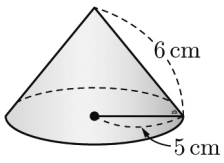
47.



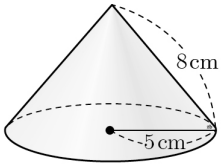
48.



49.



50.



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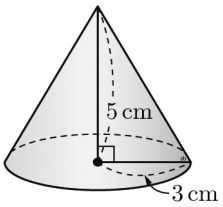
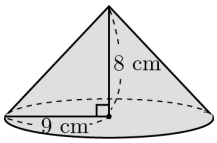
◪ 다음 원뿔의 부피를 구하여라.

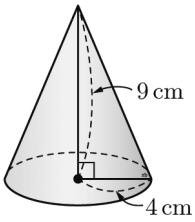
51.



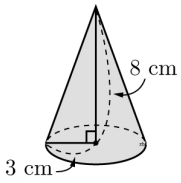
52.



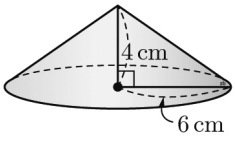
53.



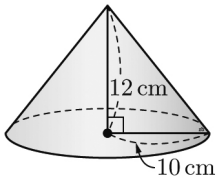
54.



55.

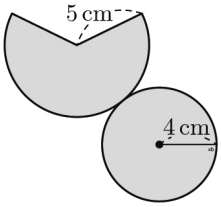


56.

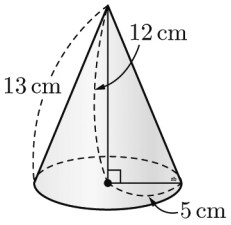


◪ 다음 원뿔의 겉넓이와 부피를 구하여라.

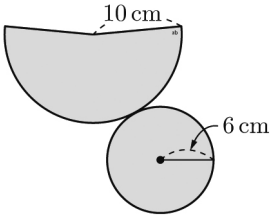
57. **원뿔의 높이 :** $3cm$



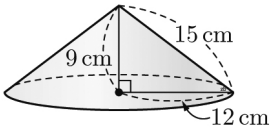
58.



59. **원뿔의 높이 :** $8cm$

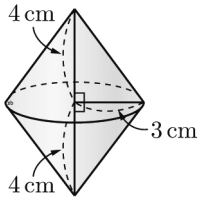


60.



◪ 다음 입체도형의 부피를 구하여라.

61.



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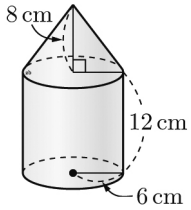
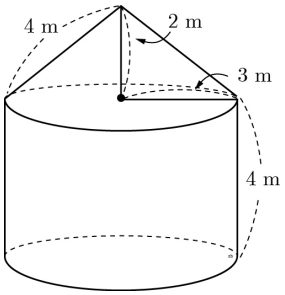
62.

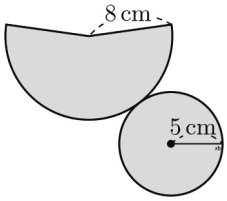


63.

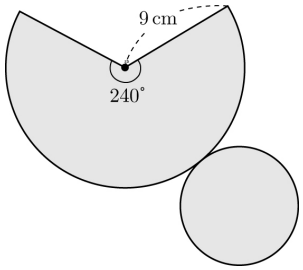


◪ 다음 전개도로 만들 수 있는 입체도형의 겉넓이를 구하여라.

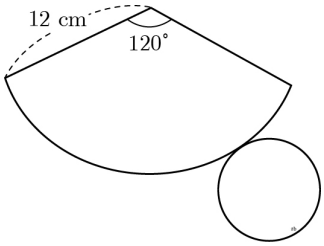
64.



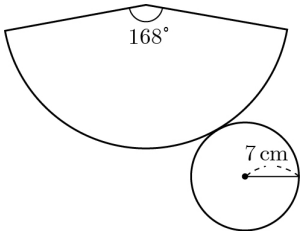
65.



66.

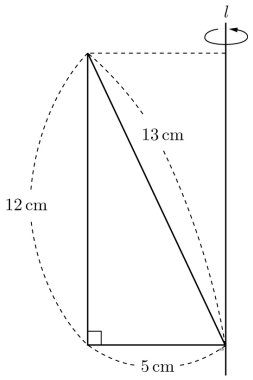


67.

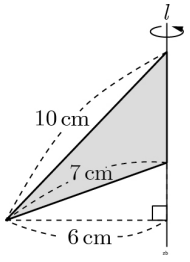


◪ 다음 그림과 같은 평면도형을 l을 축으로 하여 1회전시켰을 때 생기는 입체도형의 겉넓이를 구하여라.

68.



69.



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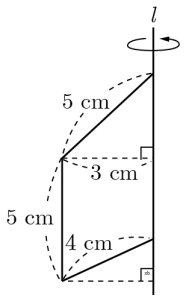
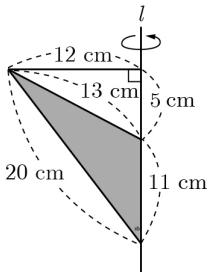
70.



71.



◪ 다음을 구하여라.

72. 겉넓이가 $14\pi\text{cm}^2$이고 밑면의 반지름이 2cm인 원뿔에서 옆면의 모선의 길이

73. 겉넓이가 $65\pi\text{cm}^2$이고 밑면의 반지름이 5cm인 원뿔에서 옆면의 모선의 길이

74. 밑면의 반지름의 길이가 4cm인 원뿔의 겉넓이가 $44\pi\text{cm}^2$일 때, 이 원뿔의 모선의 길이

75. 부피가 $15\pi\text{cm}^3$이고 밑면의 반지름이 3cm인 원뿔에서 높이

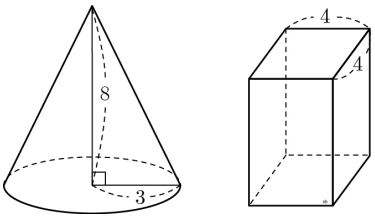
76. 부피가 $48\pi\text{cm}^3$이고 높이가 9cm인 원뿔에서 밑면의 반지름의 길이

77. 부피가 $96\pi\text{cm}^3$이고, 밑면의 반지름의 길이가 6cm인 원뿔에서 높이

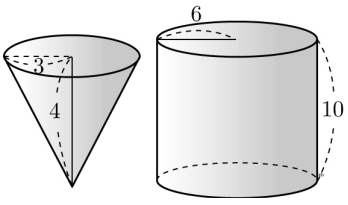
78. 부피가 $\frac{250}{3}\pi\text{cm}^3$이고, 높이가 10cm인 원뿔에서 밑면의 반지름의 길이

◪ 다음 물음에 답하여라.

79. 다음 그림의 두 입체도형의 부피가 같을 때, 직육면체의 높이를 구하여라.



80. 다음 그림과 같은 원뿔 모양의 그릇에 물을 가득 담아 원기둥 모양의 물통에 물을 부어 가득 채우려면 물을 몇 번 옮겨 부어야 하는지 구하여라.



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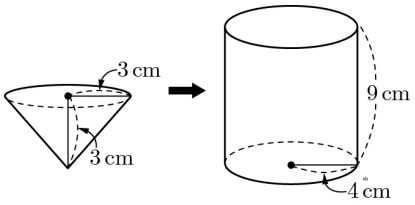
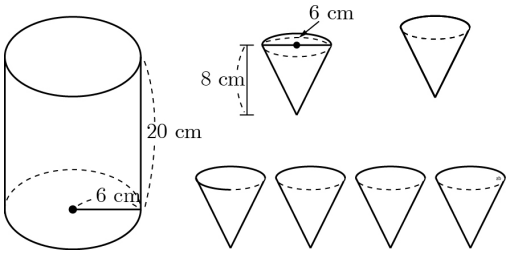
81. 다음 그림과 같은 원뿔 모양의 그릇에 모래를 가득 채운 다음, 여러 번 부어 원기둥 모양의 그릇에 모래를 가득 채우려고 할 때, 부어야 되는 횟수를 구하여라.



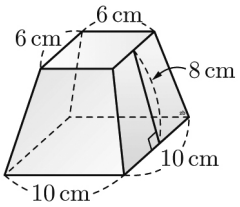
82. 반지름이 6cm, 높이가 20cm인 원기둥모양의 물병에 물이 가득 차 있다. 이 물을 밑면의 지름이 6cm이고 높이가 8cm인 원뿔모양의 같은 크기의 컵에 가득 담아 6명의 학생에게 따라 주었다. 물병에 남아 있는 물의 높이를 구하여라.



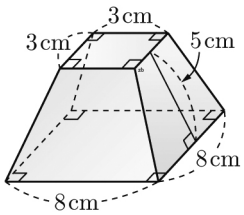
뿔대의 겉넓이와 부피

◪ 다음 입체도형의 겉넓이를 구하여라.

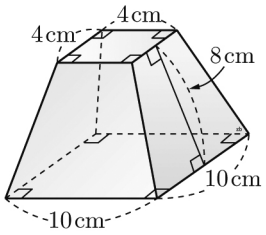
83.



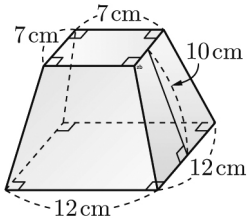
84.



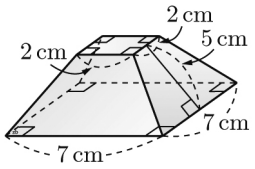
85.



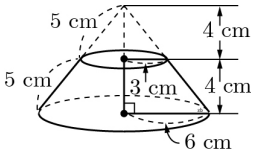
86.



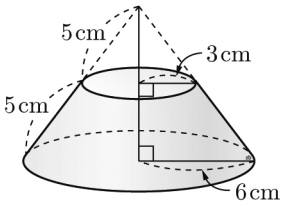
87.



88.



89.



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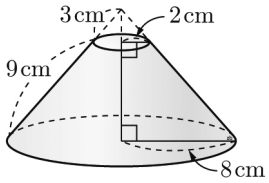
90.



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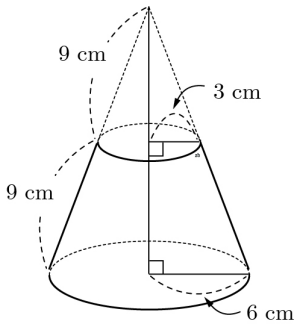

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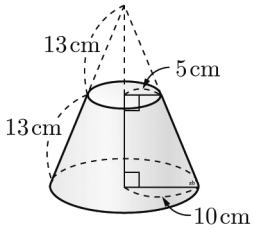

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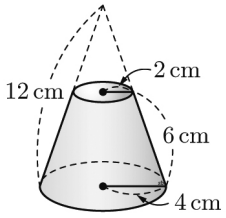
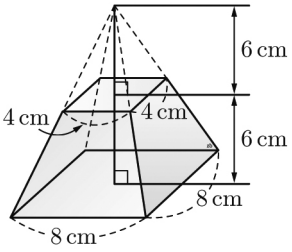


◪ 다음 입체도형의 부피를 구하여라.

94.



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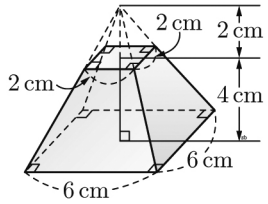

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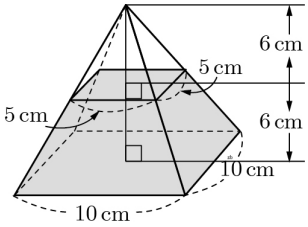

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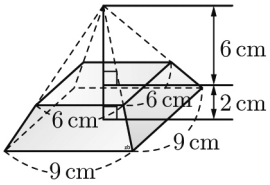

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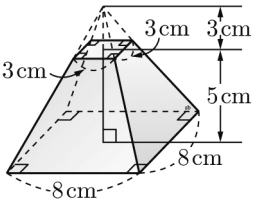

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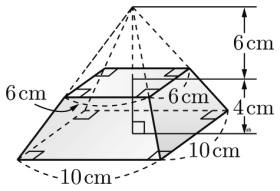
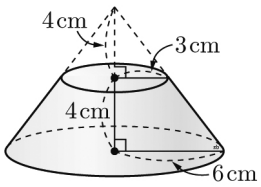
99.



100.



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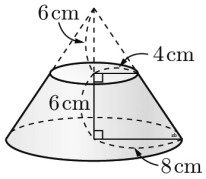

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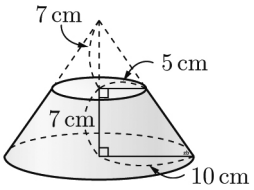

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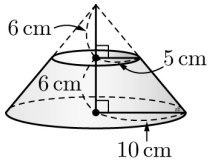
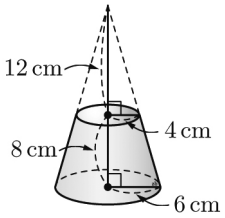
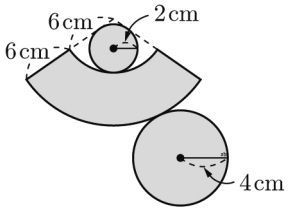


104.



◪ 다음 그림과 같은 전개도로 만든 원뿔대의 겉넓이를 구하여라.

105.



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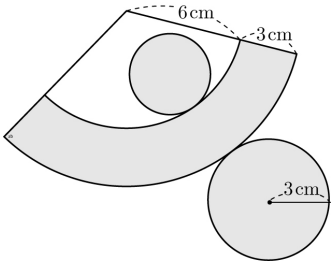
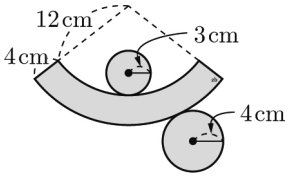
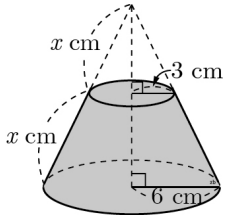


107.



◪ 다음 물음에 답하여라.

108. 다음 원뿔대의 겉넓이는 $90\pi\text{cm}^2$이다. x의 값을 구하여라.



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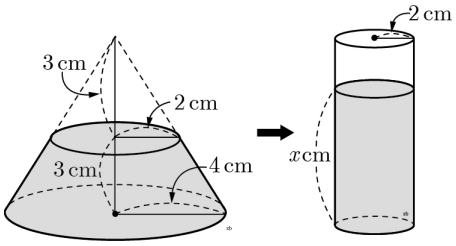
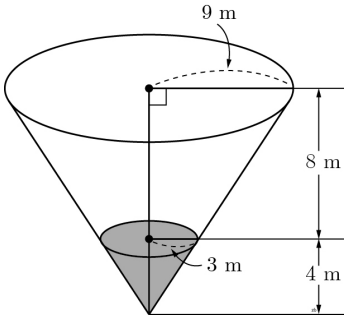
109 다음 그림과 같이 원뿔대 모양의 그릇에 물을 가득 채워서 원기둥 모양의 그릇에 옮겼을 때 x의 값을 구하여라.



110 원뿔 모양의 수조에 일정한 속력으로 물을 넣고 있다. 물을 넣기 시작한 지 4분이 되는 순간의 물의 깊이가 $4\mathrm{m}$이었다면 수조에 물을 가득 채우려면 몇 분 동안 더 물을 넣어야 하는지 구하여라.



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정답 및 해설

1) 64cm^2

⇨ $4\times4+\left(\frac{1}{2}\times4\times6\right)\times4=64(\text{cm}^2)$

2) 56cm^2

⇨ $(\text{겉넓이})=4\times4+\left(\frac{1}{2}\times4\times5\right)\times4=56(\text{cm}^2)$

3) 95cm^2

⇨ $(\text{겉넓이})=5\times5+\left(\frac{1}{2}\times5\times7\right)\times4=95(\text{cm}^2)$

4) 220cm^2

⇨ $(\text{겉넓이})=10\times10+\left(\frac{1}{2}\times10\times6\right)\times4=220(\text{cm}^2)$

5) 84cm^2

⇨ $(\text{겉넓이})=6\times6+\left(\frac{1}{2}\times6\times4\right)\times4=84(\text{cm}^2)$

6) 156cm^2

⇨ $6\times6+\left(\frac{1}{2}\times6\times10\right)\times4=156(\text{cm}^2)$

7) 384cm^2

8) 224cm^2

9) $45cm^2$

10) 20cm^3

⇨ $(\text{부피})=\frac{1}{3}\times\left(\frac{1}{2}\times8\times3\right)\times5=20(\text{cm}^3)$

11) 20cm^3

12) 8cm^3

⇨ $(\text{부피})=\frac{1}{3}\times\frac{1}{2}\times4\times4\times3=8(\text{cm}^3)$

13) 80cm^3

⇨ $\frac{1}{3}\times6\times5\times8=80(\text{cm}^3)$

14) 72cm^3

⇨ $\frac{1}{3}\times\left(\frac{1}{2}\times8\times6\right)\times9=72(\text{cm}^3)$

15) 30cm^3

⇨ $(\text{부피})=\frac{1}{3}\times\left(\frac{1}{2}\times4\times5\right)\times9=30(\text{cm}^3)$

16) 120cm^3

17) 32cm^3

18) $50cm^3$

⇨ $(\text{부피})=\frac{1}{3}\times(5\times5)\times6=50(cm^3)$

19) 216cm^3

⇨ $(\text{부피})=\frac{1}{3}\times(9\times9)\times8=216(\text{cm}^3)$

20) $360\text{cm}^2,\ 400\text{cm}^3$

⇨ $(\text{겉넓이})=10\times10+\frac{1}{2}\times10\times13\times4=360(\text{cm}^2)$

$(\text{부피})=\frac{1}{3}\times10\times10\times12=400(\text{cm}^3)$

21) $324\text{cm}^2,\ 224\text{cm}^3$

⇨ $(\text{겉넓이})=12\times7+\frac{1}{2}\times12\times10\times4=324(\text{cm}^2)$

$(\text{부피})=\frac{1}{3}\times12\times7\times8=224(\text{cm}^3)$

22) $144\text{cm}^2,\ 64\text{cm}^3$

⇨ $(\text{겉넓이})=8\times8+\frac{1}{2}\times8\times5\times4=144(\text{cm}^2)$

$(\text{부피})=\frac{1}{3}\times8\times8\times3=64(\text{cm}^3)$

23) $90\text{cm}^2,\ 40\text{cm}^3$

⇨ $(\text{겉넓이})=5\times4+\frac{1}{2}\times5\times7\times4=90(\text{cm}^2)$

$(\text{부피})=\frac{1}{3}\times5\times4\times6=40(\text{cm}^3)$

24) $\frac{8}{3}\text{cm}$

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

⇨ 물의 부피가 같으므로

$\frac{1}{3}\times(\frac{1}{2}\times4\times5)\times2=(\frac{1}{2}\times4\times x)\times2$

$\frac{20}{3}=4x,\ x=\frac{5}{3}$

26) 6

⇨ 물의 부피가 같으므로

$\frac{1}{3}\times(\frac{1}{2}\times9\times10)\times6=(\frac{1}{2}\times6\times x)\times5$

$90=15x,\ x=6$

27) 2

⇨ 물의 부피가 같으므로

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$\frac{1}{3}\times(\frac{1}{2}\times6\times5\times4)=(\frac{1}{2}\times5\times x)\times4$

$20=10x,\ x=2$

28) 2

⇨ 물의 부피가 같으므로

$\frac{1}{3}\times(\frac{1}{2}\times6\times5)\times3=(\frac{1}{2}\times5\times x)\times3$

$15=\frac{15}{2}x,\ \therefore x=2$

29) 24cm^3

⇨ (남은 물의 부피)$=\frac{1}{3}\times\frac{1}{2}\times6\times8\times3=24(\text{cm}^3)$

30) 100cm^3

⇨ (남은 물의 부피)

$=\frac{1}{3}\times\frac{1}{2}\times10\times10\times6=100(\text{cm}^3)$

31) 300cm^3

⇨ (남은 물의 부피)$=\frac{1}{3}\times\frac{1}{2}\times15\times12\times10=300(\text{cm}^3)$

32) 12

⇨ $10\times10+\frac{1}{2}\times10\times h\times4=340,\ 100+20h=340,$

$20h=240 \quad \therefore\ h=12$

33) 6cm

⇨ $\frac{1}{3}\times\frac{1}{2}\times6\times6\times h=36,\ 6h=36 \quad \therefore\ h=6$

34) 1392cm^3

⇨ $\frac{1}{3}\times12\times12\times5+12\times12\times8$

$=240+1152=1392(\text{cm}^3)$

35) $\frac{21}{5}\text{cm}$

⇨ 사각기둥의 높이를 h라 하면 부피가 서로 같으므로

$\frac{1}{3}\times\frac{1}{2}\times7\times6\times9=\frac{1}{2}\times(6+4)\times3\times h$

$63=15h$

$\therefore h=\frac{63}{15}=\frac{21}{5}(\text{cm})$

36) $197cm^2$

37) $\frac{256}{3}\text{cm}^3$

⇨ 밑면이 $\triangle\text{BCD}$이고 높이가 $\overline{\text{CG}}$인 삼각뿔이므로

(삼각뿔의 부피)$=\frac{1}{3}\times\left(\frac{1}{2}\times8\times8\right)\times8=\frac{256}{3}(\text{cm}^3)$

38) 288cm^3

⇨ (삼각뿔의 부피)

$=\frac{1}{3}\times\left(\frac{1}{2}\times12\times12\right)\times12=288(\text{cm}^3)$

39) 2000cm^3

⇨ (물의 양)$=\frac{1}{3}\times\left(\frac{1}{2}\times40\times30\right)\times10=2000(\text{cm}^3)$

40) 48cm^3

41) 500cm^3

42) $72\,\text{cm}^3$

⇨ (정육면체의 부피)$-4\times$(삼각뿔BEFG의 부피)

$=6^3-4\times\frac{1}{3}\times(\frac{1}{2}\times6\times6)\times6$

$=216-144=72(\text{cm}^3)$

43) 20cm^3

⇨ 직육면체의 가로, 세로, 높이가 각각 $a,\ b,\ c$ 이라면 직육면체의 부피는 $abc=60$

사각뿔의 부피는 $\frac{1}{3}\times(a\times b)\times c=\frac{1}{3}\times60=20$

44) $27\pi\text{cm}^2$

⇨ (겉넓이)$=\pi\times3^2+\pi\times3\times6=27\pi(\text{cm}^2)$

45) $22\pi\text{cm}^2$

⇨ (겉넓이)$=\pi\times2^2+\pi\times2\times9=22\pi(\text{cm}^2)$

46) $33\pi\text{cm}^2$

⇨ $\pi\times3^2+\pi\times3\times8=33\pi(\text{cm}^2)$

47) $60\pi\text{cm}^2$

⇨ $\pi\times5^2+\pi\times5\times7=60\pi(\text{cm}^2)$

48) $56\pi\text{cm}^2$

⇨ (겉넓이)$=\pi\times4^2+\pi\times4\times10=56\pi(\text{cm}^2)$

49) $55\pi\text{cm}^2$

⇨ (겉넓이)$=\pi\times5^2+\pi\times5\times6=55\pi(\text{cm}^2)$

50) $65\pi\text{cm}^2$

⇨ (원뿔의 겉넓이)

$=\frac{1}{2}\times8\times(2\pi\times5)+\pi\times5^2=40\pi+25\pi=65\pi(\text{cm}^2)$

51) $15\pi\text{cm}^3$

⇨ (부피)$=\frac{1}{3}\times(\pi\times3^2)\times5=15\pi(\text{cm}^3)$

52) $216\pi\text{cm}^3$

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⇨ $\frac{1}{3}\times\pi\times9^2\times8=216\pi(\mathrm{cm}^3)$

53) $48\pi\mathrm{cm}^3$

⇨ (부피)$=\frac{1}{3}\times(\pi\times4^2)\times9=48\pi(\mathrm{cm}^3)$

54) $24\pi\mathrm{cm}^3$

⇨ $\frac{1}{3}\times\pi\times3^2\times8=24\pi(\mathrm{cm}^3)$

55) $48\pi\mathrm{cm}^3$

⇨ (부피)$=\frac{1}{3}\times(\pi\times6^2)\times4=48\pi(\mathrm{cm}^3)$

56) $400\pi\mathrm{cm}^3$

⇨ (부피)$=\frac{1}{3}\times(\pi\times10^2)\times12=400\pi(\mathrm{cm}^3)$

57) $36\pi\mathrm{cm}^2,\ 16\pi\mathrm{cm}^3$

⇨ (겉넓이)$=\pi\times4^2+\pi\times4\times5=36\pi(\mathrm{cm}^2)$

(부피)$=\frac{1}{3}\times\pi\times4^2\times3=16\pi(\mathrm{cm}^3)$

58) $90\pi\mathrm{cm}^2,\ 100\pi\mathrm{cm}^3$

⇨ (겉넓이)$=\pi\times5^2+\pi\times5\times13=90\pi(\mathrm{cm}^2)$

(부피)$=\frac{1}{3}\times\pi\times5^2\times12=100\pi(\mathrm{cm}^3)$

59) $96\pi\mathrm{cm}^2,\ 96\pi\mathrm{cm}^3$

⇨ (겉넓이)$=\pi\times6^2+\pi\times6\times10=96\pi(\mathrm{cm}^2)$

(부피)$=\frac{1}{3}\times\pi\times6^2\times8=96\pi(\mathrm{cm}^3)$

60) $324\pi\mathrm{cm}^2,\ 432\pi\mathrm{cm}^3$

⇨ (겉넓이)$=\pi\times12^2+\pi\times12\times15=324\pi(\mathrm{cm}^2)$

(부피)$=\frac{1}{3}\times\pi\times12^2\times9=432\pi(\mathrm{cm}^3)$

61) $24\pi\mathrm{cm}^3$

⇨ (부피)$=\frac{1}{3}\times\pi\times3^2\times4\times2=24\pi(\mathrm{cm}^3)$

62) $528\pi\mathrm{cm}^3$

⇨ (입체도형의 부피)

$=\frac{1}{3}\times\pi\times6^2\times8+\pi\times6^2\times12$

$=96\pi+432\pi=528\pi(\mathrm{cm}^3)$

63) $42\pi\mathrm{m}^3$

⇨ $\frac{1}{3}\times\pi\times3^2\times2+\pi\times3^2\times4=42\pi(\mathrm{m}^3)$

64) $65\pi\mathrm{cm}^2$

⇨ (겉넓이)$=\pi\times5^2+\pi\times5\times8=65\pi(\mathrm{cm}^2)$

65) $90\pi\mathrm{cm}^2$

⇨ 밑면의 반지름을 r이라고 하면 옆면 부채꼴의 호의 길이와 밑면의 둘레의 길이가 같으므로

$\frac{240}{360}\times2\pi\times9=2\pi r\ \rightarrow\ r=6$

∴ (원뿔의 겉넓이)

$=\frac{240}{360}\times\pi\times9^2+\pi\times6^2=54\pi+36\pi=90\pi(\mathrm{cm}^2)$

66) $64\pi\mathrm{cm}^2$

⇨ 밑면의 반지름을 r 이라 하면

부채꼴의 호의 길이와 밑면의 둘레의 길이가 같아서

$\frac{120}{360}\times2\pi\times12=2\pi r\qquad\therefore\ r=4(\mathrm{cm})$

∴ (겉넓이)$=\frac{120}{360}\times\pi\times12^2+\pi\times4^2=64\pi(\mathrm{cm}^2)$

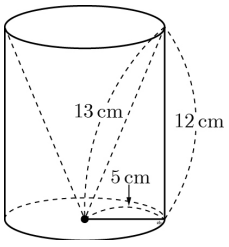
67) $154\pi\mathrm{cm}^2$

⇨ 부채꼴의 반지름을 l이라고 하면 부채꼴의 호의 길이와 밑면의 둘레의 길이가 같으므로

$\frac{168}{360}\times2\pi l=2\pi\times7\qquad\therefore\ l=7\times\frac{360}{168}=15$

∴ (원뿔의 겉넓이)$=\frac{1}{2}\times15\times14\pi+\pi\times7^2=154\pi(\mathrm{cm}^2)$

68) $210\pi\mathrm{cm}^2$

⇨ 

(회전체의 겉넓이)

$=\frac{1}{2}\times13\times2\pi\times5+2\pi\times5\times12+\pi\times5^2$

$=65\pi+120\pi+25\pi=210\pi(\mathrm{cm}^2)$

69) $102\pi\,\mathrm{cm}^2$

⇨ (회전체의 겉넓이)

=(반지름이 $10\,\mathrm{cm}$이고 호의 길이가 $2\pi\times6=12\pi(\mathrm{cm})$인 부채꼴의 넓이)+(반지름이 $7\,\mathrm{cm}$이고 호의 길이가 $2\pi\times6=12\pi(\mathrm{cm})$인 부채꼴의 넓이)

$=\left(\frac{1}{2}\times10\times12\pi\right)+\left(\frac{1}{2}\times7\times12\pi\right)$

$=60\pi+42\pi=102\pi(\mathrm{cm}^2)$

70) $57\pi\mathrm{cm}^2$

⇨ 1회전 시켰을 때의 입체도형은 다음 그림과 같다.

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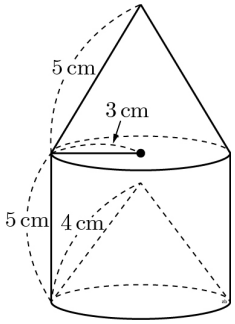


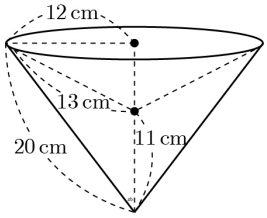
(입체도형의 겉넓이)

$=\frac{1}{2}\times 5\times 2\pi\times 3+2\pi\times 3\times 5+\frac{1}{2}\times 4\times 2\pi\times 3$

$=15\pi+30\pi+12\pi=57\pi(\mathrm{cm}^2)$

71) $396\pi\mathrm{cm}^2$

⇨



(회전체의 겉넓이)

$=\frac{1}{2}\times 20\times 2\pi\times 12+\frac{1}{2}\times 13\times 2\pi\times 12$

$=240\pi+156\pi=396\pi(\mathrm{cm}^2)$

72) 5cm

⇨ $\pi\times 2^2+\pi\times 2l=14\pi,\ 4\pi+2\pi l=14\pi$

$2\pi l=10\pi \quad \therefore\ l=5$

73) 8cm

⇨ $\pi\times 5^2+\pi\times 5\times l=65\pi,\ 25\pi+5\pi l=65\pi$

$5\pi l=40\pi \quad \therefore\ l=8$

74) 7cm

⇨ 원뿔의 모선의 길이를 l이라고 하면

$44\pi=(\pi\times 4^2)+\left(\frac{1}{2}\times l\times 2\pi\times 4\right)$

$44\pi=16\pi+4l\pi$

$28\pi=4l\pi$

$\therefore\ l=7(\mathrm{cm})$

75) 5cm

⇨ $\frac{1}{3}\times\pi\times 3^2\times h=15\pi,\ 3h=15 \quad \therefore\ h=5$

76) 4cm

⇨ $\frac{1}{3}\times\pi\times r^2\times 9=48\pi,\ r^2=16 \quad \therefore\ r=4$

77) 8cm

⇨ $\frac{1}{3}\times\pi\times 6^2\times h=96\pi,\ 12h=96 \quad \therefore\ h=8$

78) 5cm

⇨ $\frac{1}{3}\times\pi\times r^2\times 10=\frac{250}{3}\pi,\ r^2=25 \quad \therefore\ r=5$

79) $\frac{3}{2}\pi$

⇨ 직육면체의 높이를 h 라 하면

$\frac{1}{3}\times\pi\times 3^2\times 8=4^2\times h$

$24\pi=16h$

$\therefore\ h=\frac{24\pi}{16}=\frac{3}{2}\pi$

80) 30번

⇨ (원뿔의 부피)$=\frac{1}{3}\times\pi\times 3^2\times 4=12\pi$

(원기둥의 부피)$=\pi\times 6^2\times 10=360\pi$

물을 부어 가득채우려면 $360\pi\div 12\pi=30$(번) 옮겨 부어야 한다.

81) 16번

⇨ 원뿔의 부피: $\frac{1}{3}\times\pi\times 3^2\times 3=9\pi(\mathrm{cm}^3)$

원기둥의 부피: $\pi\times 4^2\times 9=144\pi(\mathrm{cm}^3)$

따라서 부어야 되는 횟수는 $144\pi\div 9\pi=16$(번)이다.

82) 16cm

83) $392\mathrm{cm}^2$

⇨ (윗면의 넓이)$=6\times 6=36(\mathrm{cm}^2)$

(아랫면의 넓이)$=10\times 10=100(\mathrm{cm}^2)$

(옆면의 넓이)$=\left\{\frac{1}{2}\times(6+10)\times 8\right\}\times 4=256(\mathrm{cm}^2)$

$\therefore$ (겉넓이)$=36+100+256=392(\mathrm{cm}^2)$

84) $183\mathrm{cm}^2$

⇨ (겉넓이)

$=3\times 3+8\times 8+\frac{1}{2}\times(3+8)\times 5\times 4$

$=9+64+110=183(\mathrm{cm}^2)$

85) $340\mathrm{cm}^2$

⇨ (겉넓이)

$=4\times 4+10\times 10+\frac{1}{2}\times(4+10)\times 8\times 4$

$=16+100+224=340(\mathrm{cm}^2)$

86) $573\mathrm{cm}^2$

⇨ (겉넓이)

$=7\times 7+12\times 12+\frac{1}{2}\times(7+12)\times 10\times 4$

$=49+144+380=573(\mathrm{cm}^2)$

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87) 143cm^2

⇨ (겉넓이)

$=2\times2+7\times7+\frac{1}{2}\times(2+7)\times5\times4$

$=4+49+90=143(\text{cm}^2)$

88) $90\pi\text{cm}^2$

⇨ (원뿔대의 겉넓이)

$=\pi\times3^2+\left(\frac{1}{2}\times10\times12\pi-\frac{1}{2}\times5\times6\pi\right)+\pi\times6^2$

$=9\pi+(60\pi-15\pi)+36\pi=90\pi(\text{cm}^2)$

89) $90\pi\text{cm}^2$

⇨ (겉넓이)

$=\pi\times3^2+\pi\times6^2+\left(\frac{1}{2}\times10\times2\pi\times6-\frac{1}{2}\times5\times2\pi\times3\right)$

$=9\pi+36\pi+(60\pi-15\pi)=90\pi(\text{cm}^2)$

90) $158\pi\text{cm}^2$

⇨ (겉넓이)

$=\pi\times2^2+\pi\times8^2+\left(\frac{1}{2}\times12\times2\pi\times8-\frac{1}{2}\times3\times2\pi\times2\right)$

$=4\pi+64\pi+(96\pi-6\pi)=158\pi(\text{cm}^2)$

91) $126\pi\,\text{cm}^2$

⇨ (원뿔대의 겉넓이)

$=\pi\times3^2+\pi\times6^2+\left(\frac{1}{2}\times18\times12\pi-\frac{1}{2}\times9\times6\pi\right)$

$=9\pi+36\pi+(108\pi-27\pi)=126\pi(\text{cm}^2)$

92) $320\pi\text{cm}^2$

⇨ (겉넓이)

$=\pi\times5^2+\pi\times10^2+\left(\frac{1}{2}\times26\times2\pi\times10-\frac{1}{2}\times13\times2\pi\times5\right)$

$=25\pi+100\pi+(260\pi-65\pi)=320\pi(\text{cm}^2)$

93) $56\pi\text{cm}^2$

⇨ (윗면의 넓이)$=\pi\times2^2=4\pi(\text{cm}^2)$

(아랫면의 넓이)$=\pi\times4^2=16\pi(\text{cm}^2)$

(옆면의 넓이)$=\pi\times4\times12-\pi\times2\times6=36\pi(\text{cm}^2)$

$\therefore$ (겉넓이)$=4\pi+16\pi+36\pi=56\pi(\text{cm}^2)$

94) 224cm^3

⇨ (부피)$=\frac{1}{3}\times(8\times8)\times12-\frac{1}{3}\times(4\times4)\times6$

$=256-32=224(\text{cm}^3)$

95) $\frac{208}{3}\text{cm}^3$

⇨ (부피)$=\frac{1}{3}\times6\times6\times6-\frac{1}{3}\times2\times2\times2=\frac{208}{3}(\text{cm}^3)$

96) 350cm^3

⇨ (입체도형의 부피)

$=\frac{1}{3}\times10\times10\times12-\frac{1}{3}\times5\times5\times6$

$=400-50=350(\text{cm}^3)$

97) 144cm^3

⇨ (부피)$=\frac{1}{3}\times(9\times9)\times8-\frac{1}{3}\times(6\times6)\times6$

$=216-72=144(\text{cm}^3)$

98) $\frac{485}{3}\text{cm}^3$

⇨ (각뿔대의 부피)

=(큰 각뿔의 부피)−(작은 각뿔의 부피)

$=\frac{1}{3}\times8^3-\frac{1}{3}\times3^3=\frac{485}{3}\,(\text{cm}^3)$

99) $\frac{784}{3}\text{cm}^3$

⇨ (부피)$=\frac{1}{3}\times10\times10\times10-\frac{1}{3}\times6\times6\times6=\frac{784}{3}(\text{cm}^3)$

100) $84\pi\text{cm}^3$

⇨ (원뿔대의 부피)

=(큰 원뿔의 부피)−(작은 원뿔의 부피)

$=\frac{1}{3}\pi\times6^2\times8-\frac{1}{3}\pi\times3^2\times4=96\pi-12\pi=84\pi\,(\text{cm}^3)$

101) $224\pi\text{cm}^3$

⇨ (부피)

$=\frac{1}{3}\pi\times8^2\times12-\frac{1}{3}\pi\times4^2\times6=256\pi-32\pi=224\pi(\text{cm}^3)$

102) $\frac{1225}{3}\pi\text{cm}^3$

⇨ (부피)

$=\frac{1}{3}\times\pi\times10^2\times14-\frac{1}{3}\times\pi\times5^2\times7=\frac{1225}{3}\pi(\text{cm}^3)$

103) $350\pi\text{cm}^3$

⇨ (부피)$=\frac{1}{3}\times(\pi\times10^2)\times12-\frac{1}{3}\times(\pi\times5^2)\times6$

$=400\pi-50\pi=350\pi(\text{cm}^3)$

104) $176\pi\text{cm}^3$

⇨ (부피)$=\frac{1}{3}\times(\pi\times6^2)\times20-\frac{1}{3}\times(\pi\times4^2)\times12$

$=240\pi-64\pi=176\pi(\text{cm}^3)$

105) $56\pi\text{cm}^2$

⇨ (밑넓이)$=\pi\times2^2+\pi\times4^2=4\pi+16\pi=20\pi(\text{cm}^2)$

(옆넓이)=(반지름이 12 cm인 부채꼴의 넓이)

−(반지름이 6 cm인 부채꼴의 넓이)

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$= \frac{1}{2} \times 12 \times (2\pi \times 4) - \frac{1}{2} \times 6 \times (2\pi \times 2)$

$= 48\pi - 12\pi = 36\pi\,(\mathrm{cm}^2)$

$\therefore$ (겉넓이) $= 20\pi + 36\pi = 56\pi\,(\mathrm{cm}^2)$

106) $28\pi \mathrm{cm}^2$

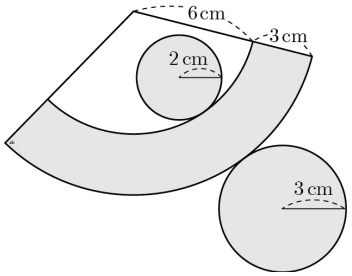
⇨ 반지름이 $3\,\mathrm{cm}$인 원의 호의 길이와 반지름이 $9\,\mathrm{cm}$인 부채꼴의 호의 길이가 같으므로 부채꼴의 중심각을 x라 하면

$\frac{x}{360^\circ} \times 2\pi \times 9 = 2\pi \times 3$, $\frac{x}{360^\circ} \times 18\pi = 6\pi$

$\therefore\ x = 120^\circ$

이때 원뿔대의 윗면이 되는 작은 원의 반지름을 r이라 하면

$\frac{120}{360} \times 2\pi \times 6 = 2\pi r$ $\therefore\ r = 2(\mathrm{cm})$



(원뿔대의 겉넓이)

$= \pi \times 2^2 + \pi \times 3^2 + \left(\frac{1}{2} \times 9 \times 6\pi - \frac{1}{2} \times 6 \times 4\pi\right)$

$= 4\pi + 9\pi + 27\pi - 12\pi = 28\pi(\mathrm{cm}^2)$

107) $53\pi \mathrm{cm}^2$

⇨ (겉넓이)

$= \pi \times 3^2 + \pi \times 4^2 + \left(\frac{1}{2} \times 16 \times 2\pi \times 4 - \frac{1}{2} \times 12 \times 2\pi \times 3\right)$

$= 9\pi + 16\pi + (64\pi - 36\pi) = 53\pi(\mathrm{cm}^2)$

108) 5

⇨ 원뿔대의 겉넓이가 $90\pi\,\mathrm{cm}^2$이므로

$\pi \times 3^2 + \pi \times 6^2 + \left(\frac{1}{2} \times 2x \times 2\pi \times 6 - \frac{1}{2} \times x \times 2\pi \times 3\right) = 90\pi$

$9\pi + 36\pi + (12x\pi - 3x\pi) = 90\pi$

$45\pi + 9x\pi = 90\pi$

$9x\pi = 45\pi$

$\therefore x = 5$

109) 7

⇨ 원뿔대의 부피와 원기둥에 채워진 물의 부피가 같으므로

$\left(\frac{1}{3} \times \pi \times 4^2 \times 6\right) - \left(\frac{1}{3} \times \pi \times 2^2 \times 3\right) = \pi \times 2^2 \times x$

$32\pi - 4\pi = 4\pi x,\ 28 = 4x$ $\therefore\ x = 7$

110) [정답] 104분

⇨ 4분 동안 채워진 물의 부피는

$\frac{1}{3} \times \pi \times 3^2 \times 4 = 12\pi$

따라서 1 분에 $12\pi \div 4 = 3\pi$ 씩 채워진다.

이때 남은 부분의 부피는

$\frac{1}{3} \times \pi \times 9^2 \times 12 - \frac{1}{3} \times \pi \times 3^2 \times 4$

$= 324\pi - 12\pi$

$= 312\pi$

더 물을 넣어야 하는 시간은 $312\pi \div 3\pi = 104$ 분

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