figure 4

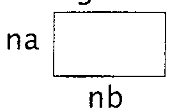


figure 5

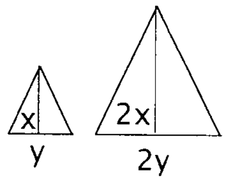
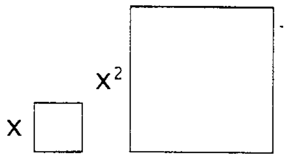
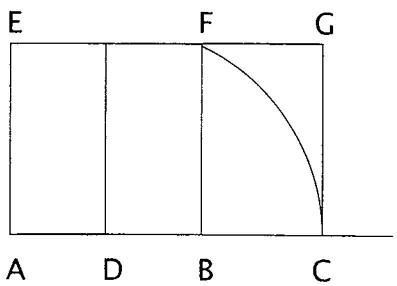


figure 6



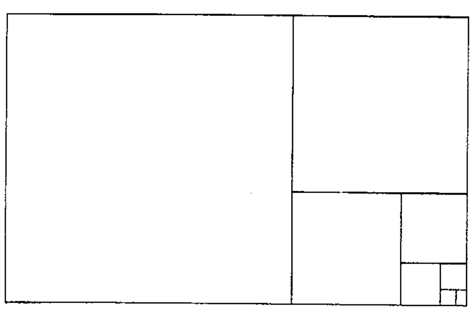
Honors Lesson 10

1-4.



5. your answer should be close to 0.61803.
6. See illustration above. The ratio should be close to what you got in #5.

7-8.



Honors Lesson 11

1.

	green, buttons	green, zipper	red, zipper	blue, buttons
Chris	yes	x	x	x
Douglas	x	yes	x	x
Ashley	x	x	x	yes
Naomi	x	x	yes	x

2.

	planning games	refresh – ments	place for party	birthday guest
Sam	x	x	yes	x
Jason	x	x	x	yes
Shane	yes	x	x	x
Troy	x	yes	x	x

3.

	train	boat	airplane	car
Janelle	yes	x	x	x
Walter	x	x	x	yes
Julie	x	yes	x	x
Jared	x	x	yes	x

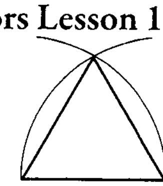
4.

	hot dog	pizza	chicken soup	tossed salad
Molly	yes	x	x	x
Tina	x	x	x	yes
Logan	x	x	yes	x
Sam	x	yes	x	x

5. Answers will vary.

Honors Lesson 12

1.



2. It is necessary sometimes to add lines to the drawing to make it clearer. In figure 1a, dotted lines have been added to show how one end of the figure has been broken up. Since we know that the long measurement is 6.40 in and the space between the dotted lined is .80 in, we can see that the heights of the trapezoids add up to 5.60 in. Since we have been told that the top and bottom are the same, each trapezoid must have a height of 2.80 in.
   Area of each trapezoid:
   $(2.8)\left(\frac{1.27+.80}{2}\right) = (2.8)\left(\frac{2.07}{2}\right) =$
   2.898 in^2
   Since there are four trapezoids in all, we multiply by 4:
   $2.898 \times 4 = 11.592 \text{ in}^2$
   Rectangular center portion:
   $.80 \text{ in} \times 15 \text{ in} = 12 \text{ in}^2$
   Total:
   $12 + 11.592 = 23.592 \text{ in}^2$
3. area = $(a)(b)$ or ab (see figure 2)
4. area = $(2a)(2b)$ or $4ab$ (see figure 3)
5. area = $(na)(nb)$ or n^2ab (see figure 4)
6. area = $n^2ab = (5^2)(4)(5) = (25)(20) =$ 500 ft^2
7. first triangle: $a = \frac{1}{2}xy$
   second triangle: $a = \frac{1}{2}(2x)(2y) = 2xy$
   4 times $\frac{1}{2} = 2$, so new area is four times as great.
8. first square: $(x)(x) = x^2$
   second square: $(x^2)(x^2) = x^4$

figure 1a

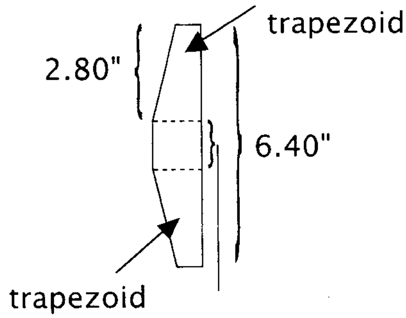
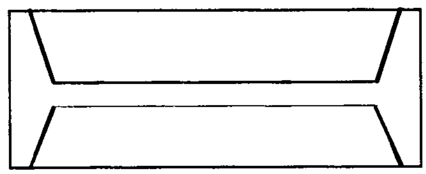


figure 1b (shows a different way of finding the area)



Area of large rectangle $15 \times 6.4 = 96 \text{ in}^2$

One trapezoid	long base $15-(2 \times .8) = 13.4 \text{ in}^2$ short base $15-(2 \times 1.27) =$ 12.46 in^2 height $(6.4 - .8) \div$ $2 = 2.8 \text{ in}^2$ Area of one trapezoid $= 36.204 \text{ in}^2$
Both trapezoids	$2 \times 36.204 =$ 72.408 in^2
Area of figure	$96 - 72.408 =$ 23.592 in^2

figure 2

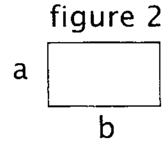
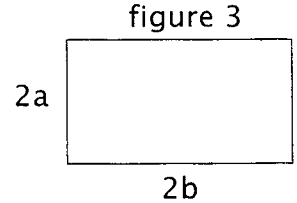


figure 3



9. $2+1.5+3+2+3.5+1=13$ units^2

$32 - 13 = 19$ units^2

10. See illustration.

$10 \times 5 = 50$ units^2

$\frac{1}{2}(5\times2) = 5$ units^2

$1 \times 5 = 5$ units^2

$\frac{1}{2}(1\times5) = 2.5$ units^2

$\frac{1}{2}(4\times1) = 2$ units^2

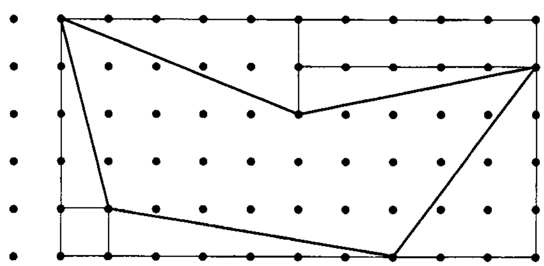
$1 \times 1 = 1$ unit^2

$\frac{1}{2}(6\times1) = 3$ units^2

$\frac{1}{2}(3\times4) = 6$ units^2

$5+5+2.5+2+1+3+6 = 24.5$ units^2

$50 - 24.5 = 25.5$ units^2



11. See illustration.

$4 \times 8 = 32$ units^2

$\frac{1}{2}(1\times1) = .5$ units^2

$\frac{1}{2}(3\times1) = 1.5$ units^2

$1\times1=1$ unit^2

$\frac{1}{2}(1\times2) = 1$ unit^2

$\frac{1}{2}(1\times2) = 1$ unit^2

$1 \times 1 = 1$ unit^2

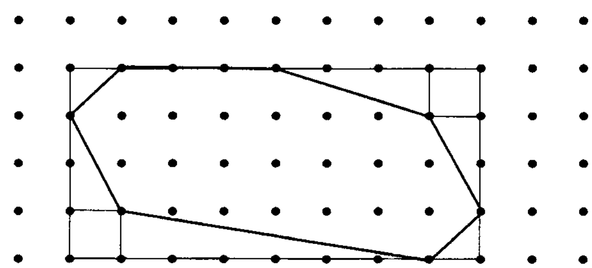
$\frac{1}{2}(5\times1) = 2.5$ units^2

$\frac{1}{2}(2\times1) = 1$ unit^2

$.5 + 1.5 + 1 + 1 + 1 + 1 + 2.5 + 1$

$= 9.5$ units^2

$32 - 9.5 = 22.5$ units^2



Honors Lesson 14

1. $\frac{1}{2}(3\times4) = \frac{1}{2}(12) = 6$ units^2

2. $A = \sqrt{s(s-a)(s-b)(s-c)}$

$A = \sqrt{6(6-3)(6-4)(6-5)}$

$A = \sqrt{6(3)(2)(1)}$

$A = \sqrt{36}$

$A = 6$ units^2

yes

3. $A = \sqrt{16(16-7)(16-10)(16-15)}$
$A = \sqrt{16(9)(6)(1)}$
$A = \sqrt{864}$
$A = 29.39 \text{ units}^2$

4. $A = \sqrt{52(52-36)(52-28)(52-40)}$
$A = \sqrt{52(16)(24)(12)}$
$A = \sqrt{239{,}616}$
$A = 489.51 \text{ units}^2$

5. $V = \pi r^2 h$
$V = 3.14(2)^2(10)$
$V = 3.14(4)(10)$
$V = 125.6 \text{ in}^3$

6. $V = \pi r^2 h$
$V = 3.14(1)^2(10)$
$V = 3.14(1)(10)$
$V = 31.4 \text{ in}^3$
It is $\frac{1}{4}$ the first one

7. $V = \pi r^2 h$
$V = 3.14(2)^2(5)$
$V = 3.14(4)(5)$
$V = 62.8 \text{ in}^3$
It is half the first one.

8. $V = \pi r^2 h$
$V = 3.14(4)^2(10)$
$V = 3.14(16)(10)$
$V = 502.4 \text{ in}^3$
It is four times the first one.

9. $V = \pi r^2 h$
$V = 3.14(2)^2(20)$
$V = 3.14(4)(20)$
$V = 251.2 \text{ cu in}^3$
It is two times the first one

10. When the height is doubled, the volume is doubled. When the height is halved, the volume is halved. When the radius is doubled, the volume increases by a factor of 4. When the radius is halved, the volume decreases by a factor of 4.
The student may use his own words to express this.

11. Answers will vary.

12. Take the formula, and multiply both sides by 2:
$V = \pi r^2 h$
$2V = 2\pi r^2 h$
Now rearrange the factors:
$V = \pi r^2 h$
$2V = \pi r^2 2h$
Take the formula, and multiply both sides by 4:
$V = \pi r^2 h$
$4V = 4\pi r^2 h$
Rewrite the 4 on the right side as 2^2:
$4V = 2^2 \pi r^2 h$
Rearrange the factors:
$4V = \pi 2^2 r^2 h$
$4V = \pi (2r)^2 h$
There is more than one way to set this up. As long as you show the same results as by experimentation, the answer is correct.

Honors Lesson 15

1. $3 \times 3 \times 3 = 27$ ft
2. $12 \times 12 \times 12 = 1{,}728 \text{ in}^3$
3. $8 \times 4 \times 2 = 64 \text{ in}^3$
   $64 \times .3 = 19.2$ lb
4. $64 \text{ in}^3 \div 1{,}728 = .037 \text{ ft}^3$
   $.037 \times 1200 = 44.4$ lbs
   You could probably lift it, but it would be much heavier than expected.
5. First find what the volume would be if it were solid:
   $V = \pi r^2 h$
   $V = 3.14(.5)^2(12)$
   $V = 9.42 \text{ in}^3$
   Now find the volume inside the pipe:
   $V = \pi r^2 h$
   $V = 3.14(.25)^2(12)$
   $V = 2.355 \text{ in}^3$
   Then find the difference:
   $9.42 - 2.355 = 7.065 \text{ in}^3$
6. $7.065 \text{x} .26 = 1.8369$ lb
7. $V = \frac{4}{3}\pi r^3$
   $V = \frac{4}{3}(3.14)(.25)^3$
   $V = .07 \text{ in}^3$ (rounded)
   $.07 \times .3 \approx .02$ pounds for one bearing
   $25 \div .02 = 1{,}250$ bearings
   Because we rounded some numbers, the actual number of bearings in the box may be slightly different. Keep in mind that the starting weight was rounded to a whole number. Our answer is close enough to be helpful in a real life situation, where someone wants to know approximately how many bearings are available without counting.
8. The side view is a trapezoid, and the volume of the water is the area of the trapezoid times the width of the pool:
   $A = \frac{3+10}{2}(40)$
   $A = 6.5(40)$
   $A = 260 \text{ ft}^2$
   $V = 260(20)$
   $V = 5{,}200 \text{ ft}^3$
9. Volume of the sphere:
   $V = \frac{4}{3}(3.14)(1)^3 \text{ units}^3$
   $V = 4.19$
   Volume of the cube:
   $V = 2 \times 2 \times 2 = 8 \text{ units}^3$
   $8 - 4.19 = 3.81 \text{ units}^3$

10. Volume of the cylinder:
$V=3.14\ (1)^2(2)$
$V = 6.28$ units^3
Volume of the sphere from #9:
4.19 units^3
$6.28 - 4.19 = 2.09$ units^3

Note: You may use the fractional value of π if it seems more convenient.

Honors Lesson 16

1. $(r)\pi r = \pi r^2$
2. $A = LW + LW + LH + LH + WH + WH$
$= 2LW + 2LH + 2WH$
$= 2(LW + LH + WH)$
3. $2(s^2 + s^2 + s^2) = 2(3s^2) = 6s^2$
4. $V = 3(11)(3) = 99$ ft^3
$SA = 2(3x11) + 2(3x3) + 2(11x3)$
$= 2(33) + 2(9) + 2(33)$
$= 66 + 18 + 66$
$= 150$ ft^2
5. 150 ft^2 ÷ 6 faces = 25 ft^2 per face
$\sqrt{25} = 5$ ft
The new bin is 5 x 5 x 5.
6. The cube-shaped one holds more.
125 - 99 = 26 ft^3 difference.

Honors Lesson 17

1. $V = \pi r^2 h$
$V = 3.14(2)^2(4)$
$V = 50.24$ ft^3
2. $V = \frac{4}{3}\pi r^3$
$V = \frac{4}{3}(3.14)(2)^3$
$V = 33.49$ ft^3(rounded)
3. $V = 3.14(3)^2(6)$
$V = 169.56$ units^3
4. $V = \frac{4}{3}(3.14)(3)^3$
$V = 113.04$ units^3 (rounded)
5. $V = 3.14(1)^2(2)$
$V = 6.28$ units^3
6. $V = \frac{4}{3}(3.14)(1)^3$
$V = 4.19$ units^3 (rounded)
7. $\frac{33.49}{50.24} \approx .67$ $\quad \frac{113.04}{169.56} \approx .67$
$\frac{4.19}{6.28} \approx .67$
8. $\frac{2}{3}$
9. $A = 2\pi r^2 + 2\pi rh$
$A = 2(3.14)(3)^2 + 2(3.14)(3)(6)$
$A = 56.52 + 113.04 = 169.56$ units^2
10. $A = 4(3.14)(3)^2$
$A = 113.04$ units^2
11. $\frac{113.04}{169.56} \approx \frac{2}{3}$
12. The surface area and volume of a sphere appear to be $\frac{2}{3}$ of the surface area and volume of a cylinder with the same dimensions. (Archimedes proved that this is the case.)

Honors Lesson 18

1. 4,003 mi
2. 90°; a tangent to a circle is perpendicular to the diameter