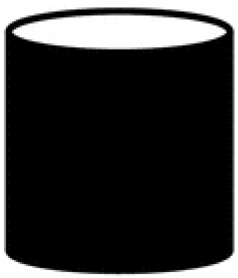
Answer Sheet Name________Teacher Notes

Making Hay While the Sun Shines
&
Not Losing It in the Rain

(The Geometry of the Big Round Bale)



height

base

1. If the diameter of the bale is 6 ft. and the height is 5 ft., determine the volume of the bale. (**include units**)
   141.372 ft^2

2. The net wrap goes around the lateral surface of the bale. Therefore we are going to consider the deterioration of the lateral surface only. Find the usable volume if the outer 6 in. all the way around the bale spoils due to weather. (**include units**)
   98.175 ft^2

3. Determine how much hay is lost from spoilage. (**include units**) 43.197 ft^2

4. Determine what percent of the hay spoiled. 30.6%

5. Were you surprised at the percent that spoiled? I was

6. Does changing the radius or the height affect the volume of the cylinder the most? radius

7. Discuss what you think the reason might be for your answer to #6.
   Since the radius is squared to find the volume, it will affect the volume more that the height.. Also changing the radius affects it all the way around, but the height just comes of one end.

8. Adjust the radius to 2.5 ft. Does the percent loss agree with your answer to #4? ___________
   If not, recalculate #1 – 4.

9. Cut the radius in half, from 3 ft. to 1.5 ft. What percent was lost? 75%

10. Approximately what is the radius of the bale when there is a 50% loss? ~ 2.1 ft

11. For what other reasons might the farmer want to compute the volume of the hay bale or be concerned with the percent of loss in the smaller bale?
    He may be purchasing hay or paying someone to bale it, and he should know that a 5 ft bale has 30% less hay than a 6 ft bale. He also must consider if he has the equipment to handle the larger bale that can weigh almost a ton.

Extension Questions: Collecting Data in a Spreadsheet and Displaying it in a Graph

12. Does the volume increase at a constant rate with respect to the radius? No

13. Explain your answer to #12 with respect to the graph on page 1.4.

    If it increases at a constant rate the graph would be a straight line. This graph is in the shape of a parabola, and it increases faster as the radius increases.

14. What type of function might we use to model the data on page 1.4? Quadratic Function

15. Does the percent of volume lost decrease at a constant rate with respect to the radius? No

16. Explain your answer to #14 with respect to the graph on page 1.5.

    Again if it increases at a constant rate the graph would be a straight line. This graph is in the shape of an inverted parabola, and the percent loss changes faster at larger radii.

17. What type of function might we use to model the data on page 1.5? Quadratic Function

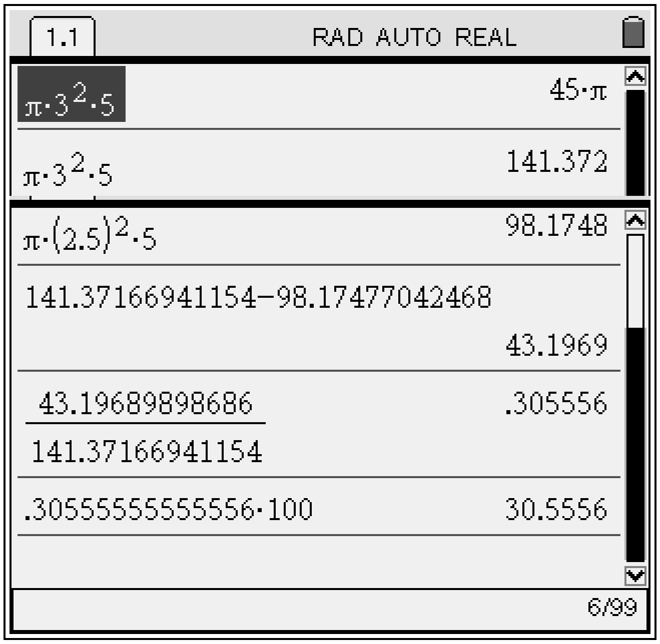
18. What exact function did you find to model the data on page 1.4? $f(x) = 5 \cdot \pi \cdot x^2$

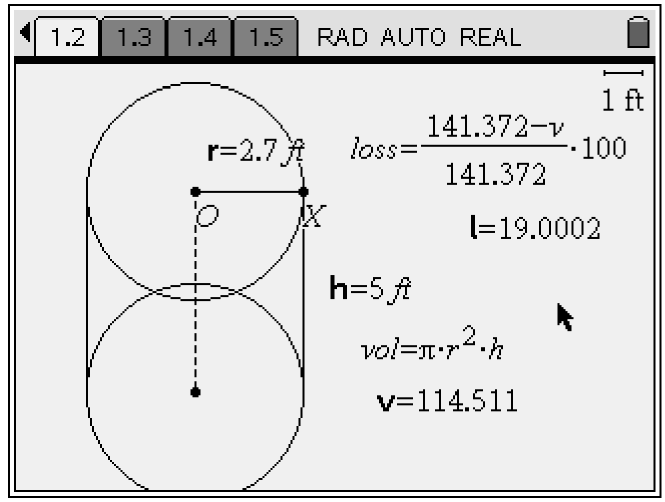
19. What exact function did you find to model the data on page 1.5? $f(x) = \dfrac{141.372 - 5\pi x^2}{141.372} \cdot 100$

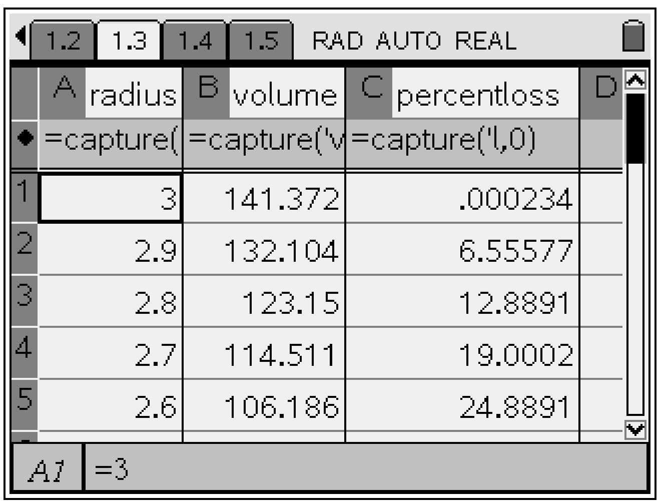
20. Explain the transformations you see in the graph on page 1.5 in relation to your function.
    i.e. Explain the y-intercept & vertical stretches or flips in relation to the graph & data.

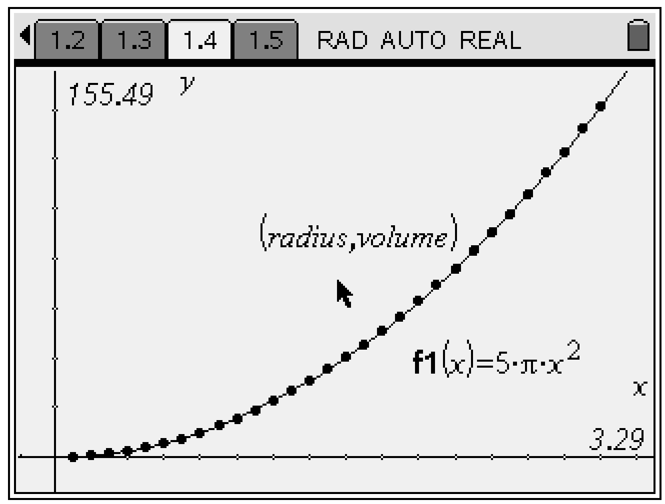
$$f(x) = \frac{141.372 - 5 \cdot \pi \cdot x^2}{141.372} \cdot 100 = \left(1 - \frac{5 \cdot \pi \cdot x^2}{141.372}\right) \cdot 100 = -\left(\frac{500\pi}{141.372}\right) \cdot x^2 + 100$$

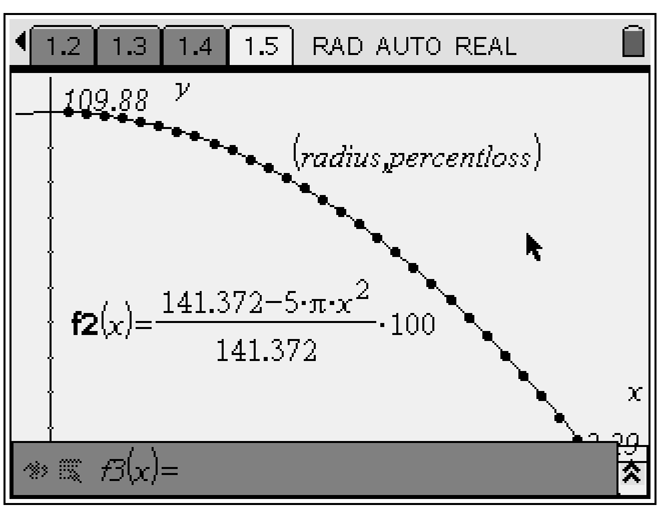
The negative sign indicates there will be a vertical flip. The vertical stretch is 500π/141.372.
The +100 indicates there will be a vertical translation of up 100.


1.1
RAD AUTO REAL
π·3²·5
45·π
π·3²·5
141.372
π·(2.5)²·5
98.1748
141.37166941154−98.17477042468
43.1969
43.19689898686 / 141.37166941154
.305556
.30555555555556·100
30.5556
6/99


1.2 1.3 1.4 1.5
RAD AUTO REAL
1 ft
r=2.7 ft
loss=(141.372−v)/141.372·100
O
X
l=19.0002
h=5 ft
vol=π·r²·h
v=114.511


1.2 1.3 1.4 1.5
RAD AUTO REAL
A radius
B volume
C percentloss
D
=capture(
=capture('v
=capture('l,0)
1 3 141.372 .000234
2 2.9 132.104 6.55577
3 2.8 123.15 12.8891
4 2.7 114.511 19.0002
5 2.6 106.186 24.8891
A1 =3


1.2 1.3 1.4 1.5
RAD AUTO REAL
155.49
y
(radius,volume)
f1(x)=5·π·x²
x
3.29


1.2 1.3 1.4 1.5
RAD AUTO REAL
109.88
y
(radius,percentloss)
f2(x)=(141.372−5·π·x²)/141.372·100
x
f3(x)=