OBJECTS AND IMAGES
Teaching Guidelines

Subject: Mathematics

Topics: Algebra--Expressions and Equations

Grades: 6 - 12

Knowledge and Skills:

- Can evaluate expressions by substituting values for variables

- Can simplify expressions using correct order of operations

- Can do basic operations on both sides of an equation in such a way as to preserve the equality

Answers

1.

lens	D_o (inches)	D_i (inches)	f
#1	25	3	**2.68**
#2	30	3.5	**3.13**
#3	100	2.75	**2.68**
#4	50	3.25	**3.05**

2.

lens	D_o (inches)	D_i (inches)	f
#5	**30**	2.25	2.09
#6	40	**2.75**	2.57
#7	10	**3.25**	2.45
#8	**60**	2.00	1.94
#9	**100**	2.00	1.96
#10	10	**4.29**	3.00
#10	25	**3.41**	3.00
#10	50	**3.19**	3.00
#10	100	**3.09**	3.00
#10	200	**3.05**	3.00
#10	500	**3.02**	3.00
#10	1000	**3.01**	3.00
#10	2000	**3.00**	3.00

As D_o gets large, D_i gets closer and closer to the value of f. (You may wish to discuss the fact that the focal length of a lens is defined to be the distance to the image when the object is infinitely far away.)

Objects and Images

The focal length of a lens *(f)* is related to the distance from the lens to the object *(D$_o$)* and the distance from the lens to the image that is created *(D$_i$)* by this equation:

$$f = \frac{D_o D_i}{D_0 + D_i}$$

1. Determine the focal length of each lens:

lens	D$_o$ (inches)	D$_i$ (inches)	f
#1	25	3	
#2	30	3.5	
#3	100	2.75	
#4	50	3.25	

2. Find the missing value in each case:

lens	D$_o$ (inches)	D$_i$ (inches)	f
#5	?	2.25	2.09
#6	40	?	2.57
#7	10	?	2.45
#8	?	2	1.94
#9	?	2	1.96
#10	10	?	3.00
#10	25	?	3.00
#10	50	?	3.00
#10	100	?	3.00
#10	200	?	3.00
#10	500	?	3.00
#10	1000	?	3.00
#10	2000	?	3.00

For lens #10, what happens to the value of D_i as D_o gets very large? (Compare D_i to the value of *f*.)