Questing for Trig

Leanne Hankins

TI-Nspire FastTrack
July 22-27 Purple Group

This lesson is geared towards students in Algebra 1 and Geometry as an introduction to the 3 basic trig ratios (sine θ, cosine θ, tangent θ)

Plan about 50 to 70 minutes to complete the lesson.

Your students should have basic understanding of how to:

Math: Calculate decimal values of ratios
Identify parts of right triangles
Solve for the missing piece of the Pythagorean Theorem

TI-Nspire: Create & use formulas in "List &Spreadsheets"
Perform manual data captures.
Load "Geo_TrigBasics_Hankins.tns" from "My Documents"
Save a document as "Geo_date_FirstName"

Students will need a TI-Nspire handheld & scratch paper to complete the activity

Lesson Notes:

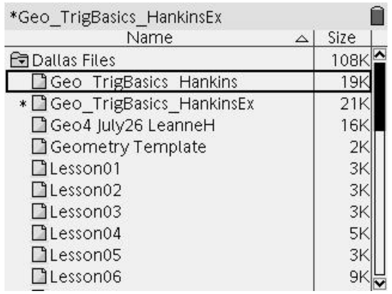
This activity is student driven. The students need to have the activity on their TI-Nspire and paper for computations and comparisons

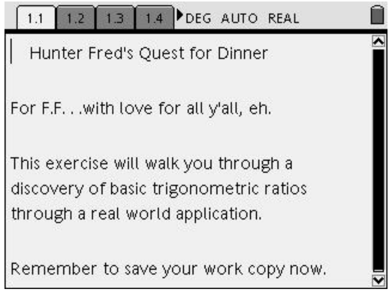
Teachers may want to offer an expansion of the lesson to introduce and explore solving problems with trigonometric ratios including angle of elevation and depression.

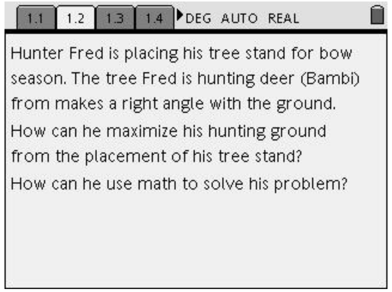
Review Pythagorean Theorem as a part of the lesson introduction. Read through pages 1.1 & 1.2 with your students and discuss elements of the drawing on page 1.3 befre releasing the students to work individually (i.e. - if you shoot a deer, the arrow will not hit the deer at the ground).

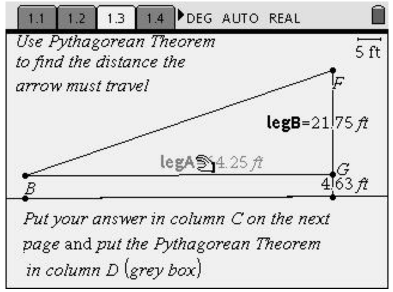
Remind students that ctrl needs to be used to collect data in this activity.

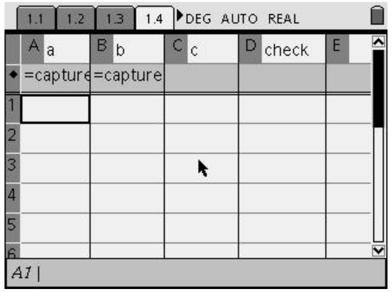
Student Slides

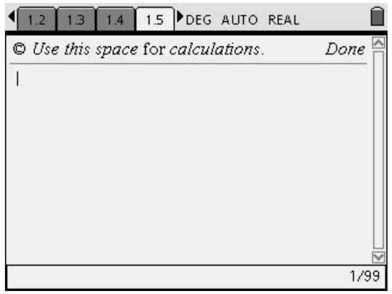


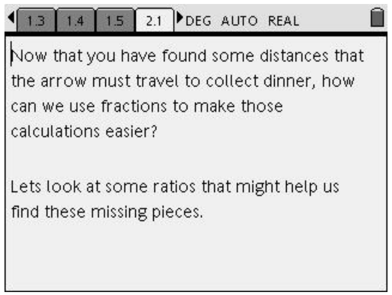


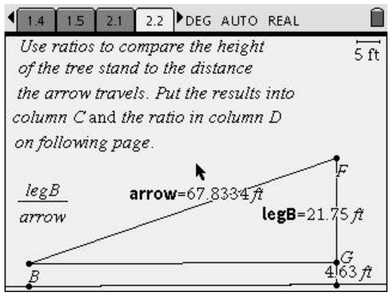


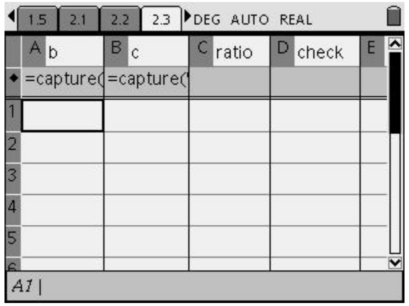


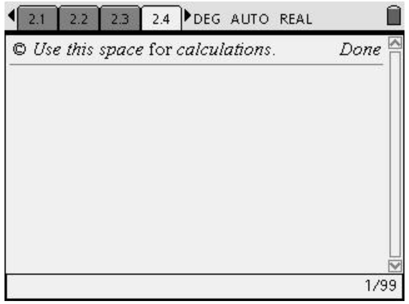


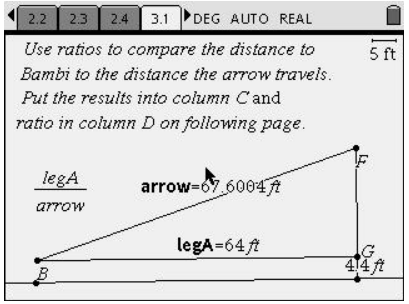


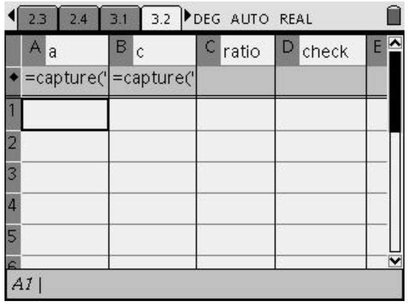


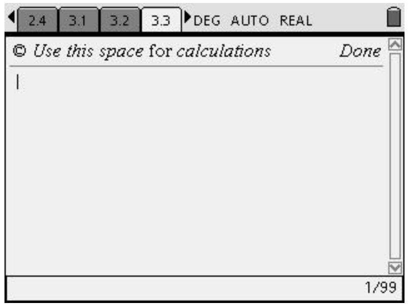


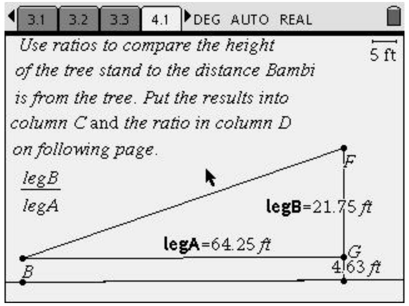

1.5 2.1 2.2 2.3 DEG AUTO REAL
A b
B c
C ratio
D check
E
=capture(
=capture('
1
2
3
4
5
A1 |

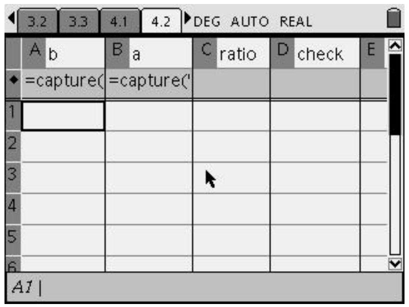

2.1 2.2 2.3 2.4 DEG AUTO REAL
© Use this space for calculations.
Done
1/99

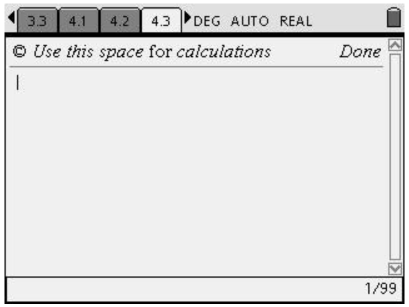

2.2 2.3 2.4 3.1 DEG AUTO REAL
Use ratios to compare the distance to
Bambi to the distance the arrow travels.
Put the results into column C and
ratio in column D on following page.
5 ft
legA
arrow
arrow=67.6004 ft
legA=64 ft
F
G
B
4.4 ft

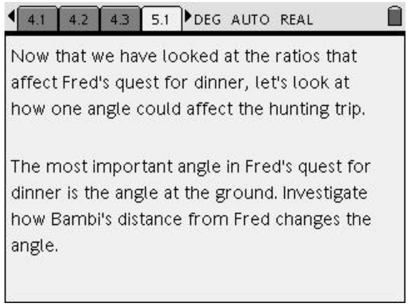

2.3 2.4 3.1 3.2 DEG AUTO REAL
A a
B c
C ratio
D check
E
=capture('
=capture('
1
2
3
4
5
A1 |

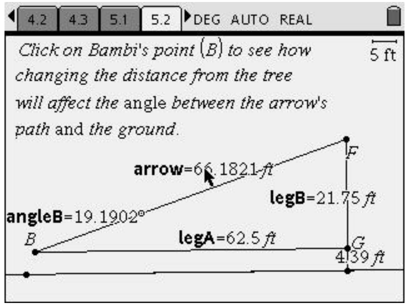

2.4 3.1 3.2 3.3 DEG AUTO REAL
© Use this space for calculations
Done
1/99

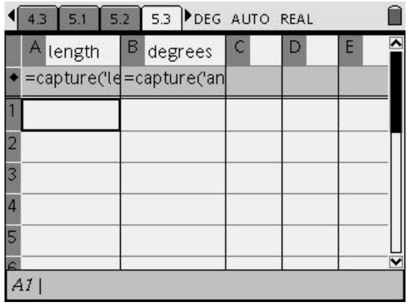

3.1 3.2 3.3 4.1 DEG AUTO REAL
Use ratios to compare the height
of the tree stand to the distance Bambi
is from the tree. Put the results into
column C and the ratio in column D
on following page.
5 ft
legB
legA
legB=21.75 ft
legA=64.25 ft
F
G
B
4.63 ft

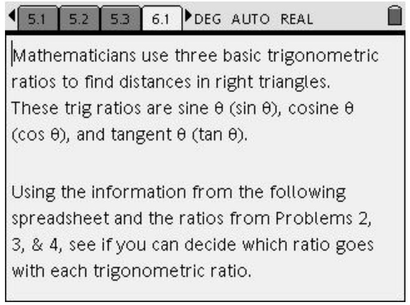

3.2 3.3 4.1 4.2 DEG AUTO REAL
A b
B a
C ratio
D check
E
=capture(
=capture('
1
2
3
4
5
A1 |

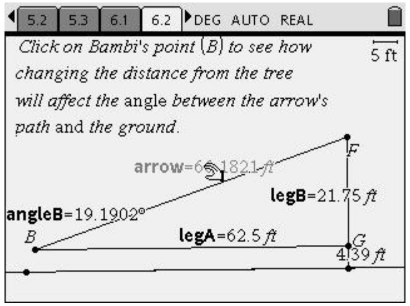

3.3 4.1 4.2 4.3 DEG AUTO REAL
© Use this space for calculations
Done
1/99

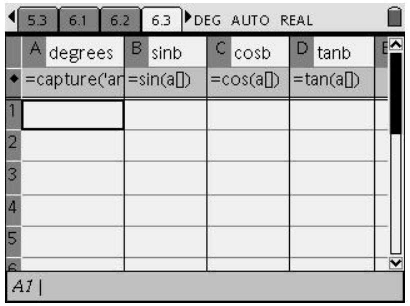

4.1 4.2 4.3 5.1 DEG AUTO REAL
Now that we have looked at the ratios that affect Fred's quest for dinner, let's look at how one angle could affect the hunting trip.
The most important angle in Fred's quest for dinner is the angle at the ground. Investigate how Bambi's distance from Fred changes the angle.

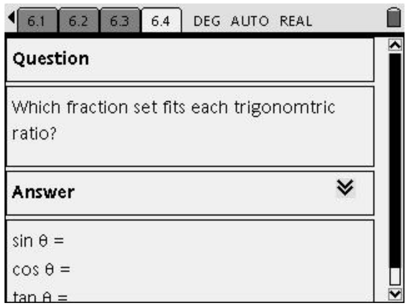

4.2 4.3 5.1 5.2 DEG AUTO REAL
Click on Bambi's point (B) to see how changing the distance from the tree will affect the angle between the arrow's path and the ground.
5 ft
arrow=66.1821 ft
legB=21.75 ft
angleB=19.1902°
legA=62.5 ft
4.39 ft
B
F
G


4.3 5.1 5.2 5.3 DEG AUTO REAL
A length
B degrees
C
D
E
=capture('le
=capture('an
A1 |

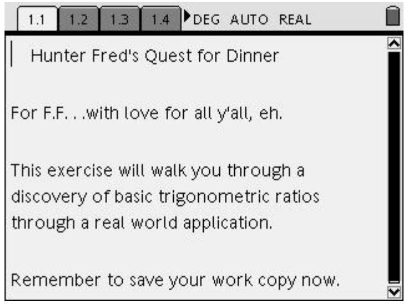

5.1 5.2 5.3 6.1 DEG AUTO REAL
Mathematicians use three basic trigonometric ratios to find distances in right triangles. These trig ratios are sine θ (sin θ), cosine θ (cos θ), and tangent θ (tan θ).
Using the information from the following spreadsheet and the ratios from Problems 2, 3, & 4, see if you can decide which ratio goes with each trigonometric ratio.

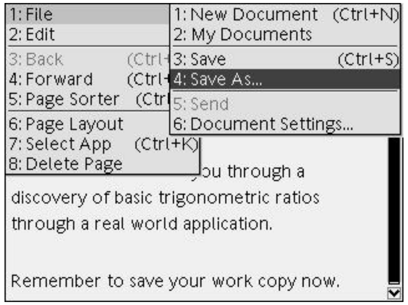

5.2 5.3 6.1 6.2 DEG AUTO REAL
Click on Bambi's point (B) to see how changing the distance from the tree will affect the angle between the arrow's path and the ground.
5 ft
arrow=66.1821 ft
legB=21.75 ft
angleB=19.1902°
legA=62.5 ft
4.39 ft
B
F
G

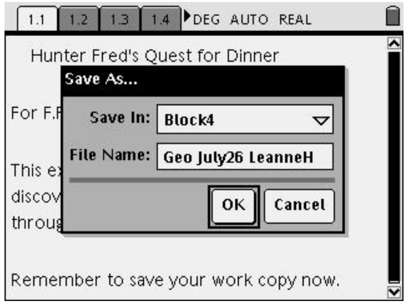

5.3 6.1 6.2 6.3 DEG AUTO REAL
A degrees
B sinb
C cosb
D tanb
=capture('an
=sin(a[])
=cos(a[])
=tan(a[])
A1 |

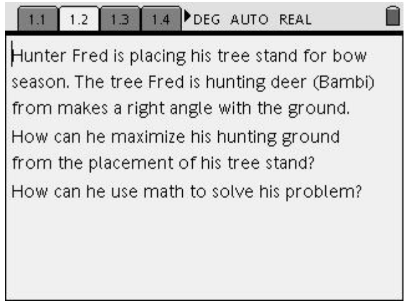

6.1 6.2 6.3 6.4 DEG AUTO REAL
Question
Which fraction set fits each trigonomtric ratio?
Answer
sin θ =
cos θ =
tan θ =

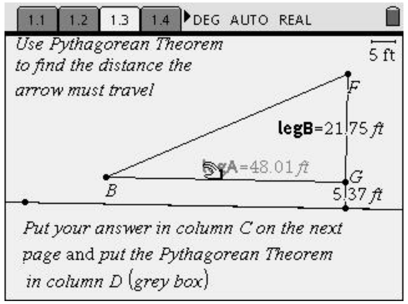
Sample Answer Screen Shots

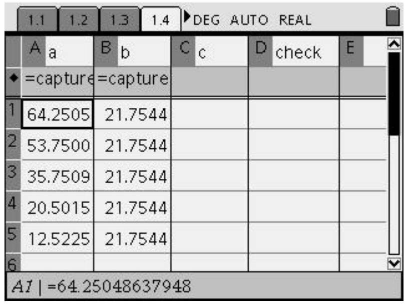


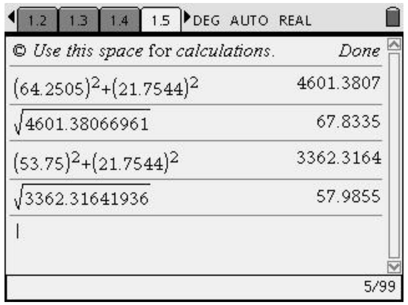


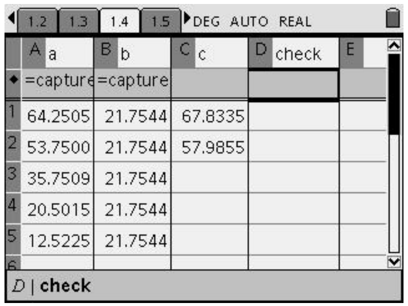


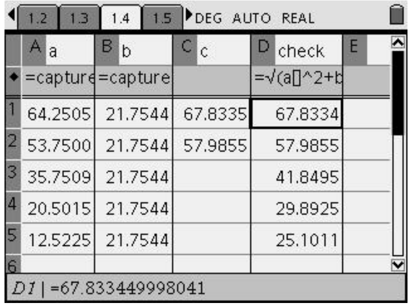








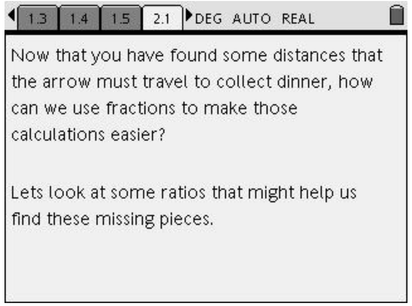


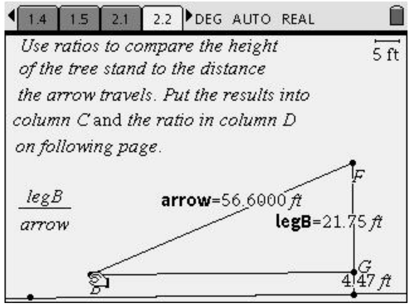


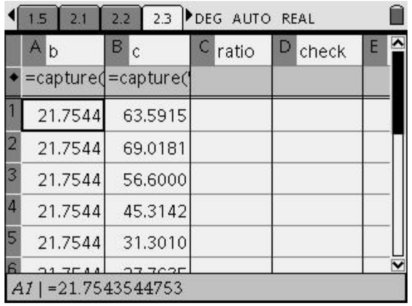
1.2 | 1.3 | 1.4 | 1.5 DEG AUTO REAL

	A a	B b	C c	D check	E
◆	=capture	=capture		=√(a[]^2+b	
1	64.2505	21.7544	67.8335	67.8334	
2	53.7500	21.7544	57.9855	57.9855	
3	35.7509	21.7544		41.8495	
4	20.5015	21.7544		29.8925	
5	12.5225	21.7544		25.1011	
6					

D1 | =67.833449998041



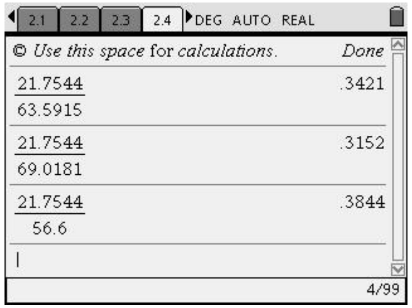


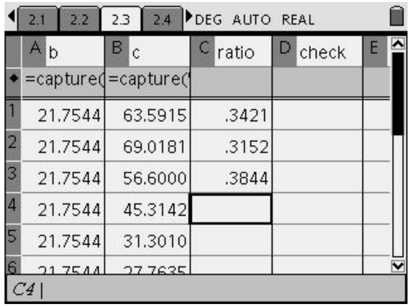


1.5 | 2.1 | 2.2 | 2.3 DEG AUTO REAL

	A b	B c	C ratio	D check	E
◆	=capture(	=capture(			
1	21.7544	63.5915			
2	21.7544	69.0181			
3	21.7544	56.6000			
4	21.7544	45.3142			
5	21.7544	31.3010			

A1 | =21.7543544753

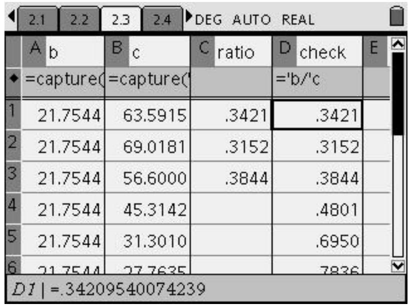




2.1 | 2.2 | 2.3 | 2.4 DEG AUTO REAL

	A b	B c	C ratio	D check	E
◆	=capture(	=capture(			
1	21.7544	63.5915	.3421		
2	21.7544	69.0181	.3152		
3	21.7544	56.6000	.3844		
4	21.7544	45.3142			
5	21.7544	31.3010			

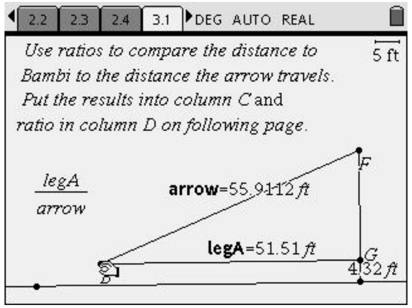
C4 |

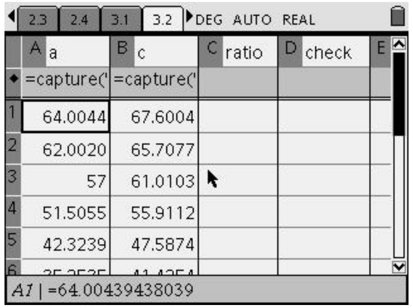


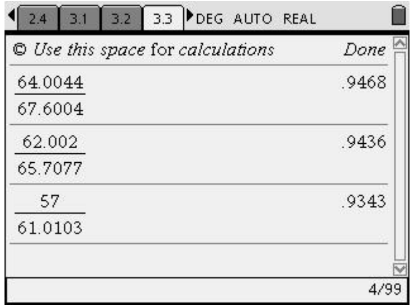
2.1 | 2.2 | 2.3 | 2.4 DEG AUTO REAL

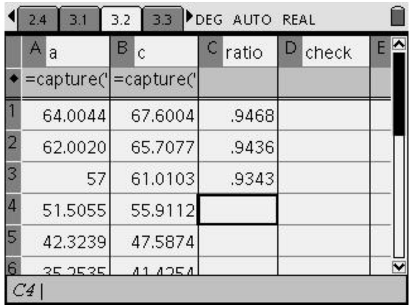
	A b	B c	C ratio	D check	E
◆	=capture(	=capture(		='b/'c	
1	21.7544	63.5915	.3421	.3421	
2	21.7544	69.0181	.3152	.3152	
3	21.7544	56.6000	.3844	.3844	
4	21.7544	45.3142		.4801	
5	21.7544	31.3010		.6950	

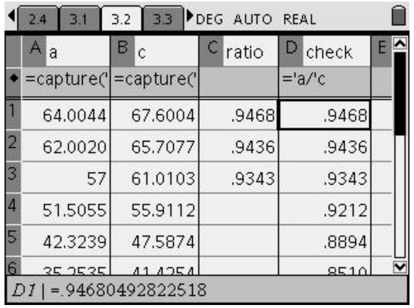
D1 | =.34209540074239

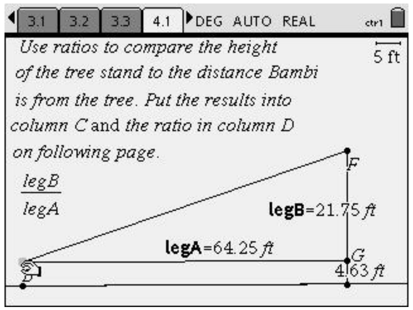


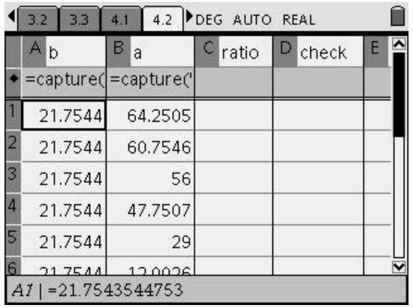

2.3 2.4 3.1 3.2 DEG AUTO REAL
A a | B c | C ratio | D check | E
=capture(' =capture('
1 64.0044 67.6004
2 62.0020 65.7077
3 57 61.0103
4 51.5055 55.9112
5 42.3239 47.5874
A1 | =64.00439438039

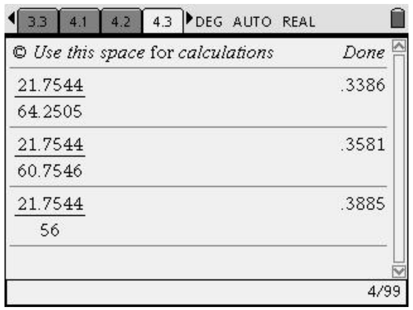

2.4 3.1 3.2 3.3 DEG AUTO REAL
© Use this space for calculations Done
64.0044 / 67.6004 .9468
62.002 / 65.7077 .9436
57 / 61.0103 .9343
4/99

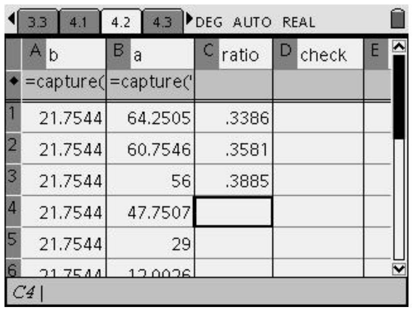

2.4 3.1 3.2 3.3 DEG AUTO REAL
A a | B c | C ratio | D check | E
=capture(' =capture('
1 64.0044 67.6004 .9468
2 62.0020 65.7077 .9436
3 57 61.0103 .9343
4 51.5055 55.9112
5 42.3239 47.5874
C4 |


2.4 3.1 3.2 3.3 DEG AUTO REAL
A a | B c | C ratio | D check | E
=capture(' =capture(' ='a/'c
1 64.0044 67.6004 .9468 .9468
2 62.0020 65.7077 .9436 .9436
3 57 61.0103 .9343 .9343
4 51.5055 55.9112 .9212
5 42.3239 47.5874 .8894
D1 | =.94680492822518


3.1 3.2 3.3 4.1 DEG AUTO REAL
Use ratios to compare the height of the tree stand to the distance Bambi is from the tree. Put the results into column C and the ratio in column D on following page.
5 ft
legB / legA
F
legB=21.75 ft
legA=64.25 ft
G
4.63 ft


3.2 3.3 4.1 4.2 DEG AUTO REAL
A b | B a | C ratio | D check | E
=capture(=capture('
1 21.7544 64.2505
2 21.7544 60.7546
3 21.7544 56
4 21.7544 47.7507
5 21.7544 29
A1 | =21.7543544753


3.3 4.1 4.2 4.3 DEG AUTO REAL
© Use this space for calculations Done
21.7544 / 64.2505 .3386
21.7544 / 60.7546 .3581
21.7544 / 56 .3885
4/99


3.3 4.1 4.2 4.3 DEG AUTO REAL
A b | B a | C ratio | D check | E
=capture(=capture('
1 21.7544 64.2505 .3386
2 21.7544 60.7546 .3581
3 21.7544 56 .3885
4 21.7544 47.7507
5 21.7544 29
C4 |

3.3 | 4.1 | 4.2 | 4.3 DEG AUTO REAL

	A b	B a	C ratio	D check	E
◆	=capture(	=capture('		='b/'a	
1	21.7544	64.2505	.3386	.3386	
2	21.7544	60.7546	.3581	.3581	
3	21.7544	56	.3885	.3885	
4	21.7544	47.7507		.4556	
5	21.7544	29		.7502	
6	21.7544	12.0026		1.8125	

D1 | =.33858661157541

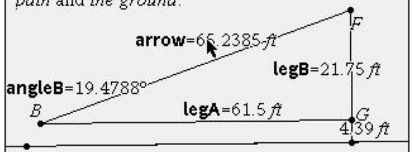
4.1 | 4.2 | 4.3 | 5.1 DEG AUTO REAL

Now that we have looked at the ratios that affect Fred's quest for dinner, let's look at how one angle could affect the hunting trip.

The most important angle in Fred's quest for dinner is the angle at the ground. Investigate how Bambi's distance from Fred changes the angle.

4.2 | 4.3 | 5.1 | 5.2 DEG AUTO REAL

Click on Bambi's point (*B*) *to see how changing the distance from the tree will affect the* angle *between the arrow's* path and *the ground.*



4.3 | 5.1 | 5.2 | 5.3 DEG AUTO REAL

	A length	B degrees	C	D	E
◆	=capture('le	=capture('an			
1	59.0048	20.2383			
2	56.2550	21.1420			
3	50.2599	23.4047			
4	37.5008	30.1182			
5	29	36.8754			

A1 |

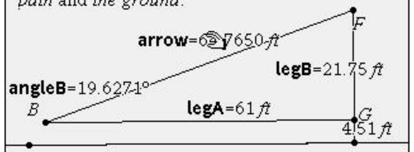
5.1 | 5.2 | 5.3 | 6.1 DEG AUTO REAL

Mathematicians use three basic trigonometric ratios to find distances in right triangles. These trig ratios are sine θ (sin θ), cosine θ (cos θ), and tangent θ (tan θ).

Using the information from the following spreadsheet and the ratios from Problems 2, 3, & 4, see if you can decide which ratio goes with each trigonometric ratio.

5.2 | 5.3 | 6.1 | 6.2 DEG AUTO REAL

Click on Bambi's point (*B*) *to see how changing the distance from the tree will affect the* angle *between the arrow's* path and *the ground.*



5.3 | 6.1 | 6.2 | 6.3 DEG AUTO REAL

	A degrees	B sinb	C cosb	D tanb	E
◆	=capture('an	=sin(a[])	=cos(a[])	=tan(a[])	
1	19.1902	.3287	.9444	.3480	
2	20.2357	.3459	.9383	.3686	
3	21.2249	.3620	.9322	.3884	
4	23.2990	.3955	.9185	.4306	
5	30.4485	.5068	.8621	.5878	

A1 |

6.1 | 6.2 | 6.3 | 6.4 DEG AUTO REAL

Question

Which fraction set fits each trigonomtric ratio?

Answer

sin θ = legB/arrow
cos θ = legA/arrow
tan θ =legB/legA