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 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

θ

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 in this activity.



needs to be used to collect data

Student Slides

f

Name	△ Size
🖻 Dallas Files	108K
Geo TrigBasics Hankins	19K
* 🗋 Geo_TrigBasics_HankinsEx	21K
🗋 Geo4 July26 LeanneH	16K
🗋 Geometry Template	2K
Lesson01	3K
Lesson02	3K
Lesson03	3K
Lesson04	5K
Lesson05	3K
Lesson06	9K

1.1 1.2 1.3 1.4 DEG AUTO REAL

Hunter Fred is placing his tree stand for bow season. The tree Fred is hunting deer (Bambi) from makes a right angle with the ground. How can he maximize his hunting ground from the placement of his tree stand? How can he use math to solve his problem?



legASS4.25 ft

G 4.63 ft

Done

4.63 ft



▲ 1.3 1.4 1.5 2.1 DEG AUTO REAL

A1 |

Now that you have found some distances that the arrow must travel to collect dinner, how can we use fractions to make those calculations easier?

Lets look at some ratios that might help us find these missing pieces.



Ab	Вс	C ratio	D check	E	© Use this space for calculations.
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		1]	~	



 $\frac{legA}{arrow} = \frac{1}{6004ft}$

	Aa	Bc	C ratio	D check	1
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◀ 3.1	3.2	3.3 4.	1 DEG A	UTO REA	AL.	ĺ
Use	ratios	to comp	are the h	eight		5 ft
of th	e tree	stand to	the distar	ice Bam	bi	
is fro	om the	tree. Pu	t the resu.	lts into		
colun	nn C'ai	nd <i>the r</i> i	atio in col	lumn D		
on fo	llowin	g page.				ç
legi	3		*		Í	
legr	4			legB	=21.7	5 <i>f</i> t
-			legA=64.:	25 <i>f</i> t		G
В					4](53 ft
10000						

	Ab	Ba	C ratio	D check	E
٠	=capture	(=capture(
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angle.

A1 |

A length

=capture('le=capture('an

Click on Bambi's point (B) to see how

changing the distance from the tree will affect the angle between the arrow's

arrow=651821

legA=62.5 ft

path and the ground.

angleB=19.1902°

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

Î

5 ft

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.

	A degrees	B sinb	C cosb	D tanb
٠	=capture('ar	=sin(a[])	=cos(a[])	=tan(a[])
1				
2				
3				
4				
5			-	
6				

Question	
Which fraction set fit: ratio?	s each trigonomtric
Answer	*
sin θ =	
$\cos \theta =$	

5 ft

legB=21.75 ft

439 ft

6

1.1 1.2 1.3 1.4 DEG AUTO REAL	1: File 1: New Document (Ctrl+N) 2: Edit 2: My Documents
Hunter Fred's Quest for Dinner	3: Back (Ctrl+3: Save (Ctrl+S)
	4: Forward (Ctrl+4: Save As
For F.Fwith love for all y'all, eh.	5: Page Sorter (Ctri 5: Send
i i i i i i i i i i i i i i i i i i i	7: Select App (Ctrl+K)
This exercise will walk you through a	8: Delete Pageou through a
discovery of basic trigonometric ratios	discovery of basic trigonometric ratios
through a real world application.	through a real world application.
Remember to save your work copy now.	Remember to save your work copy now.
1.1 1.2 1.3 1.4 DEG AUTO REAL	1.1 1.2 1.3 1.4 DEG AUTO REAL
Hunter Fred's Quest for Dinner	Hunter Fred is placing his tree stand for how
Save As	season. The tree Fred is hunting deer (Bambi)
For F.F. Save In: Disold	from makes a right angle with the ground.
Save III. BIOCK4	How can he maximize his hunting ground
This es	from the placement of his tree stand?
discov OK Cancel	How can he use math to solve his problem?
throug	
Remember to save your work copy now.	
1.1 1.2 1.3 1.4 DEG AUTO REAL	1.1 1.2 1.3 1.4 DEG AUTO REAL
Use Pythagorean Theorem 5 ft	Aa Bb Cc Dcheck E 🗳
to find the distance the	=capture =capture
arrow must travel	1 64.2505 21.7544
legB=21 75 ft	2 53 7500 21 7544
57A=48.01 <i>ft</i>	3 35 7509 21 7544
B 537 ft	4 20 5015 21 7544
Put your answer in column C on the next	5 13 5335 31 7544
page and put the Pythagorean Theorem	6
in column D (grey box)	A1 =64.25048637948
1.2 1.3 1.4 1.5 ▶ DEG AUTO REAL 1	1.2 1.3 1.4 1.5 ▶ DEG AUTO REAL 1
© Use this space for calculations. Done \square	Aa Bb Cc Dcheck E 🦉
(64.2505) ² +(21.7544) ² 4601.3807	=capture =capture
<u>√4601.38066961</u> 67.8335	1 64.2505 21.7544 67.8335
(53.75)2+(21.7544)2 3362.3164	2 53.7500 21.7544 57.9855
	3 35.7509 21.7544
V3202.31041930 57.9655	4 20.5015 21.7544
	5 12.5225 21.7544
► /00	B Michaek
5/99	DICICCK

Sample Answer Screen Shots

•	1.2 1.3	1.4 1.5	DEG AL	ITO REAL	Î
	Aa	Bb	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					×
L	01 =67.8	33449998	3041		

© Use this space for calculations.	Done
21.7544	.3421
03.5915	3152
69.0181	.0102
21.7544	.3844

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	A b	PC	ratio	C check	-
•	=capture(=capture(='b/'c	
	21.7544	63.5915	.3421	.3421	
)	21.7544	69.0181	.3152	.3152	
2	21.7544	56.6000	.3844	.3844	
ŀ	21.7544	45.3142		.4801	
2	21.7544	31.3010		.6950	
1	21.7544	27 7635		7836	

1.3 1.4 1.5 2.1 DEG AUTO REA

Now that you have found some distances that the arrow must travel to collect dinner, how can we use fractions to make those calculations easier?

Lets look at some ratios that might help us find these missing pieces.

	Ab	Вс	C ratio	D check	E
٠	=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			
6	21.7544	27.7025			

	Ab	Bc	C ratio	D check	E
٠	=capture(=capture(
1	21.7544	63.5915	.3421		T
2	21.7544	69.0181	.3152		
3	21.7544	56.6000	.3844		
4	21.7544	45.3142			
5	21.7544	31.3010			
6	21.7544	77 7625			



•	2.3 2.4	3.1 3.2	DEG AUTO	REAL	Î
	Aa	Bc	C ratio	D check	E 合
+	=capture('	=capture('			
1	64.0044	67.6004			
2	62.0020	65.7077			
3	57	61.0103	k		
4	51.5055	55.9112			
5	42.3239	47.5874			
6	25 2525	41 4054			V

D Use this space for calculations	Done
64.0044	.9468
67.6004	
62.002	.9436
65.7077	
57	.9343
61.0103	

	Aa	Вс	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			
6	35 3535	41 4254			

	Aa	Bc	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	
1	51.5055	55.9112		.9212	
5	42.3239	47.5874		.8894	
ŝ	35 3535	41 4254		8510	

◀ 3.1	3.2	3.3	4.1	DEG	AUTO	REAL	ctr1
Use : of the	ratios e tree	to coi stand	mpa to ti	re the he dist	heigh ance 1	t Bambi	5 ft
is fro	om the	tree.	Put .	the res	ults in	ito D	
on fo.	llowir	ig pag	е.	10 11 0	oiumi		F
legE legA	<u>3</u> 4					egB=2	21.75 <i>f</i> t
	_		le	gA =6	4.25 <i>f</i> t	(<u> </u>	G
- F1							4163 ft

	Ab	Ba	C ratio	D check	E
٠	=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			
6	21.7544	12,0026			V

© Use this space for calculations	Done
<u>21.7544</u> 64 2505	.3386
21.7544 (0.854)	.3581
60.7546 21.7544	.3885
56	

	Ab	Ba	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			
6	21.7544	12,0026			

•	3.3 4.1	4.2 4.3	DEG AUTO	REAL	ĺ	1
	Ab	Ba	C ratio	D check	E	^
٠	=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	ş.	
5	21.7544	29		.7502		
6 [01 7544	12.0026 866115754	:1	1,8125	1	2



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.

	A degrees	B sinb	C cosb	D tanb	E
	=capture('ar	=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	
6	44 25 20	0001	7150	0777	

4.1 4.2 4.3 5.1 DEG AUTO REAL

Î

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.

	Ale	ength	В	deg	rees	С	D	E	
٠	=cap	oture('	le=	captu	re('an				
1	ç	59.004	8	20	.2383				
2		6.255	0	21	.1420				
3	5	50.259	9	23	.4047				
4	3	37.500	8	30	.1182				
5		2	9	36	.8754				
6		-			7010				



Whic	h fraci	tion set	fits each	n trigonon	ntric
atio	?			-	
Ansv	ver				♦
sin 0	= legE	3/arrow			
sin 0 cos 6	= legE = leg	3/arrow A/arrov	n N		