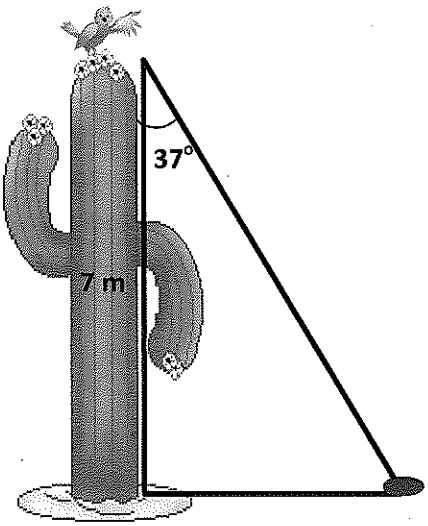


Saguaros and Trigonometry Problems

A white-winged dove is eating a saguaro fruit. As the dove finishes eating, the fruit falls to the ground. The saguaro is 7 meters tall. The dove line of sight from the top of the saguaro is at an angle of 37 degrees down to the fruit. Answer the following questions.

1. Is the distance from the where the fruit fell and the height of the saguaro the same? If not, why?
2. What is the distance between the fallen saguaro fruit and the saguaro?
3. What is the distance of the dove's flight from the top of the saguaro to the fallen fruit?
4. Sketch and label the diagram of the situation including all side and angle measurements.

A cactus wren is seeking shade under a bristle bush. It sees a fruit on top of a saguaro. The saguaro is 10 feet away from the bristle bush. The cactus wren's line of sight from the ground to the top of the saguaro is at an angle of 63 degrees up from horizontal.

1. Carefully sketch and label the diagram of the situation.
2. What is the height of the saguaro?

----------^^^^^^^---------- Sin/Cos/Tan----------^^^^^----------

A bat is resting on top of a 9 meter saguaro. 2 meters from the saguaro is a pushpin cactus. The saguaro is perpendicular to the ground. The top of the saguaro to the ground where the pushpin is planted creates a 45 degree angle.

1. Carefully sketch and label the diagram of the situation.
2. Find the angle from the ground where the pushpin is planted to the top of the saguaro.

Jeffrey is a white winged dove who loves to eat saguaro fruit. One day, he spots a blooming 10 meter saguaro that is 3 meters away from where he's standing on the ground. The saguaro is perpendicular to the ground. The top of the saguaro to the ground where Jeffrey is standing creates a 45 degree angle.

1. Carefully sketch and label a diagram of the situation.
2. What is the angle from the ground where Jeffrey is standing to the top of the blooming saguaro?
3. Explain your reasoning.

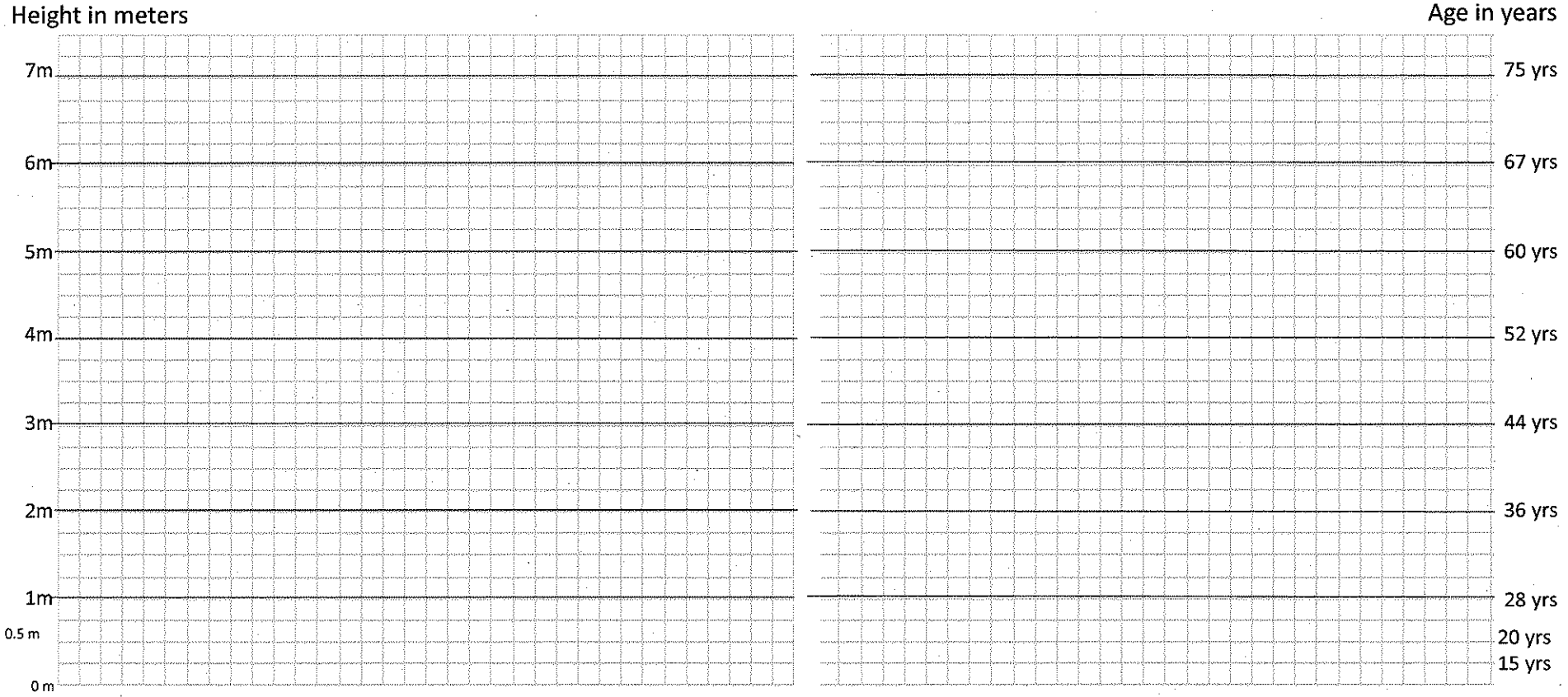
---------^^^^^----------Angles----------^^^^^^^----------

Norris is a cicada that loves to eat and rest on a barrel cactus. He is resting at the top of a 7 meter tall saguaro. There is a barrel cactus 5 meters away.

1. What is the distance Norris must fly in order to get to the barrel cactus?
2. Explain your reasoning.

-------^^^^^----------Pythagorean Theorem----------^^^^^--------

Name_____ # Saguaro Cactus Data Sheet



Draw a picture of your saguaro to scale!

Use the scale in meters on the left side

How tall is it? ____How many arms? ____bird holes? ____

How old ? _____ How old will it be in 50 years? _____

How tall will be in 50 years? _____

What year was it "born"? _____

Draw a picture of your saguaro to scale!

Use the scale in meters on the left side

How tall is it? ____How many arms? ____bird holes? ____

How old ? _____ How old will it be in 50 years? _____

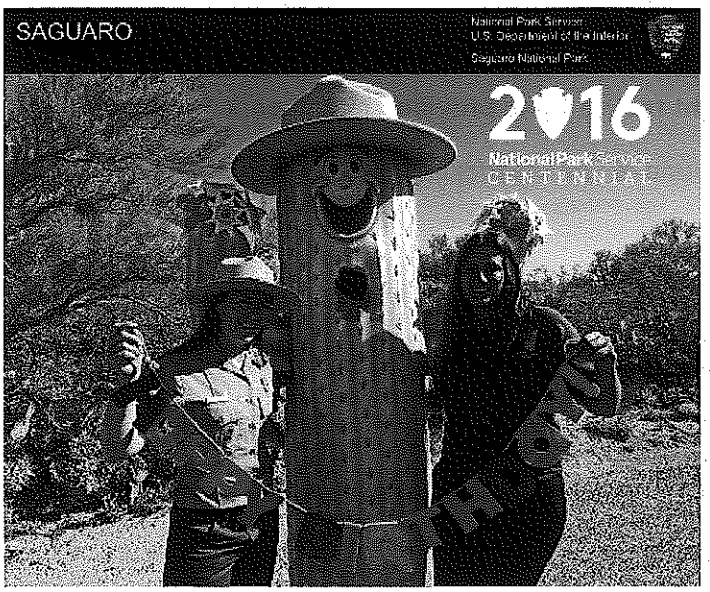
How tall will be in 50 years? _____

What year was it "born"? _____

Average Age at a Given Height for a Saguaro in the Rincon Mountain District, Saguaro NP

Age (yrs)	Height (meters)	Age	Height	Age	Height	Age	Height
1	0.0035	45	3.101	89	8.4002	133	11.851
2	0.0051	46	3.2353	90	8.4968	134	11.9142
3	0.0073	47	3.37	91	8.5925	135	11.9769
4	0.0104	48	3.5051	92	8.6871	136	12.039
5	0.0149	49	3.6404	93	8.7807	137	12.1006
6	0.021	50	3.7757	94	8.8733	138	12.1617
7	0.0292	51	3.911	95	8.965	139	12.2223
8	0.0398	52	4.0461	96	9.0556	140	12.2824
9	0.0533	53	4.1808	97	9.1454	141	12.3421
10	0.07	54	4.3152	98	9.2342	142	12.4012
11	0.0903	55	4.449	99	9.322	143	12.4599
12	0.1142	56	4.5822	100	9.409	144	12.5181
13	0.1421	57	4.7148	101	9.4951	145	12.5759
14	0.174	58	4.8466	102	9.5803	146	12.6332
15	0.2102	59	4.9776	103	9.6646	147	12.69
16	0.2506	60	5.1077	104	9.7481	148	12.7465
17	0.2955	61	5.2369	105	9.8307	149	12.8025
18	0.3447	62	5.3651	106	9.9125	150	12.858
19	0.3983	63	5.4923	107	9.9935	151	12.9132
20	0.4565	64	5.6185	108	10.0737	152	12.9679
21	0.519	65	5.7436	109	10.1531	153	13.0222
22	0.5861	66	5.8676	110	10.2317	154	13.0762
23	0.6575	67	5.9905	111	10.3096	155	13.1297
24	0.7333	68	6.1123	112	10.3867	156	13.1828
25	0.8135	69	6.2328	113	10.4631	157	13.2356
26	0.8978	70	6.3523	114	10.5387	158	13.2879
27	0.9863	71	6.4705	115	10.6136	159	13.3399
28	1.0788	72	6.5876	116	10.6878	160	13.3915
29	1.1752	73	6.7035	117	10.7613	161	13.4428
30	1.2753	74	6.8182	118	10.8342	162	13.4936
31	1.379	75	6.9317	119	10.9063	163	13.5442
32	1.4862	76	7.0441	120	10.9778	164	13.5943
33	1.5966	77	7.1552	121	11.0486	165	13.6441
34	1.71	78	7.2652	122	11.1188	166	13.6936
35	1.8263	79	7.374	123	11.1884	167	13.7427
36	1.9452	80	7.4817	124	11.2573	168	13.7915
37	2.0666	81	7.5882	125	11.3256	169	13.84
38	2.1903	82	7.6936	126	11.3933	170	13.8881
39	2.3159	83	7.7978	127	11.4604	171	13.936
40	2.4434	84	7.9009	128	11.5269	172	13.9835
41	2.5725	85	8.003	129	11.5929	173	14.0306
42	2.703	86	8.1039	130	11.6582		
43	2.8347	87	8.2037	131	11.7231		
44	2.9674	88	8.3025	132	11.7873		

How much water can Sunny the Saguaro drink?



Rumors have it that Sunny the Saguaro is a one tall cactus! But who knows what his actual height might be? Desert animals speculate that he might be between 6 to 40 feet tall! However, the park rangers are more curious as to how much water Sunny can drink. Let's find out!

Essential Question/Objective

How big is Sunny the Saguaro? How does his age over the years compare to his height? The objective of this lesson is to help students learn about the relationship between the height of saguaros and their age while utilizing their geometric equations to calculate the volume of Sunny the Saguaro.

Background

The saguaro has been called monarch of the Sonoran Desert, supreme symbol of the American Southwest, and a plant with personality. It is renowned for the variety of odd, all-too-human shapes it assumes- shapes that inspire wild and fanciful imaginings. Since 1933 this extra ordinary giant cactus has been protected within Saguaro National Park.

Sunny the Saguaro has been the Park's official mascot since 2016. You can find him at different park events such as Find Your Park or you can see him hanging out with Jr. Rangers during one of the Jr. Ranger programs held every summer.

More About Sunny

As far as Sunny can remember he was 3 inches tall when he was 10 years old, 3 feet tall when he was 25 years old, and 16 feet tall when he was 60 years old! Now, sunny is 20 feet tall and still growing!

Can you guess how old Sunny the Saguaro is based on his height? Using his height, can you guess how big Sunny the Saguaro is and how much water he can drink?

Materials

Worksheet and Height to Age Table provided by the park

Saguaro Pamphlet found at the Visitors Center

Procedure

#1: Talk to students about Saguaro National Park.

#2: Show a variety of saguaros with different height and ask what could be the age of each.

#3: Ask how big students think Sunny is as well as his age.

#4: Ask what shape does Sunny resembles—hint: it's a cylinder!

#5: Discuss how to calculate the volume of a cylinder and provide the formula needed for doing so.

#6: Provide students with a measurement of the circumference of the saguaro.

#7: Have students calculate the answer. How much water can Sunny the Saguaro drink?

Vocabulary and Formulas

Volume, Circumference, Radius, Cylinder, Saguaro

Extension

Find out how much water a saguaro cactus can store in itself more accurately by using multiple circumference**

Measure the circumference of multiple saguaros using a measuring tape prior to the activity.

Additional Resources

Table of height to age of saguaros

Related Lessons or Education Materials

This lesson was originally created by Wyoming Agriculture in the Classroom and inspired by Devils Tower Math- Volume of a Cylinder by Devils Tower National Monument.