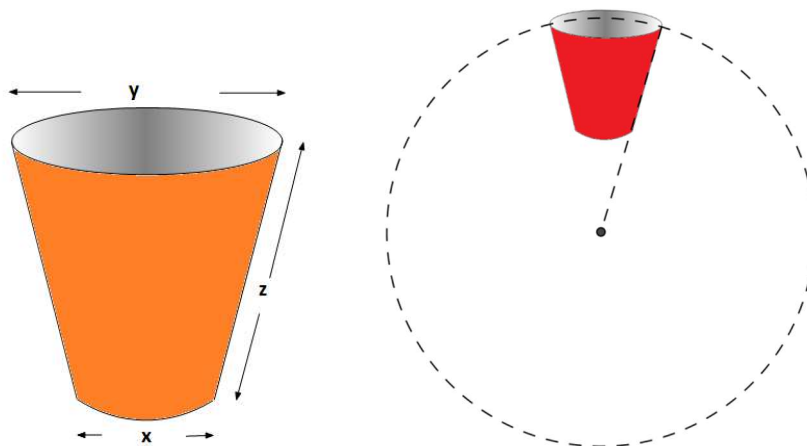


Tööjuhend

Joogitops panakse lauale külili ja lükatakse veerma.

Uurime, kuidas sõltub nii tekkinud ringi raadius topsi mõõtmetest.



Vaata sellist veeretamist videolt

http://map.mathshell.org/lesson_support/rolling_cups/cups_task.htm

Videol nähtud ja veel mõnede täiendavate topside veeretamist kirjeldab alljärgnev tabel

	Mõõtmed			
	y	x	z	raadius
A	$3\frac{1}{2}$	3	$3\frac{3}{4}$	$26\frac{1}{4}$
B	3	2	$3\frac{1}{2}$	$10\frac{1}{2}$
C	$2\frac{1}{2}$	2	$5\frac{3}{4}$	$28\frac{3}{4}$
D	3	3	$4\frac{1}{4}$	lõpmatus!
E	3	2	6	18
F	$3\frac{1}{2}$	2	$3\frac{3}{4}$	$8\frac{3}{4}$
G	$3\frac{3}{4}$	3	$3\frac{3}{4}$	$18\frac{3}{4}$
H	$3\frac{1}{2}$	0	$3\frac{3}{4}$	$3\frac{3}{4}$

Teie ülesandeks on konstrueerida matemaatiline mudel (st.seos $r=f(x,y,z)$), mis võimaldab topsi mõõtmetest lähtudes arvutada tekkiva ringi raadiuse.

Alljärgnevas on kolme õpilase arutluskäigid. Nende poolt kasutatud tähised erinevad meie omadest: N=x; W=y; S=z; R=raadius

Analüüsi toodud arutluskäike ja otsusta nende korrektsuse üle.

N narrow diameter
W wide diameter
S slant height
R roll radius

$R = 1.5 \times S$

Fix N=0 and W=4

S	R
1	1
2	2
3	3
4	4
5	5

Fix N=0 and W=5

S	R
1	1
2	2
3	3
4	4
5	5

When N=0 the cup is a cone + R=S. It doesn't matter what W is.

Fix N=1 and W=3

S	R
1	1.5
2	3
3	4.5
4	6
5	7.5

N=1 and W=4

S	R
1	1.25
2	2.75
3	4
4	5.25
5	6.75

N=1 and W=5

S	R
1	1.25
2	2.5
3	3.75
4	5
5	6.25

N=1 and W=6

S	R
1	1.25
2	2.5
3	3.5
4	4.75
5	6

Some of the values are rounded so it's hard to see patterns.

Fix N=2 and W=2

S	R
1	inf
2	inf
3	inf
4	inf
5	inf

Fix N=2 and W=3

S	R
1	3
2	6
3	9
4	12
5	15

Fix N=2 and W=4

S	R
1	2
2	4
3	6
4	8
5	10

When N=w R is infinite ie you have a cylinder that rolls in a straight line. Formula is something like $R = \frac{?}{W-N}$

Fix N=4 and W=4

S	R
1	inf
2	inf
3	inf
4	inf
5	inf

$R = 1.25 \times S$

$R = \frac{? \times S}{W-N}$

HEATHER

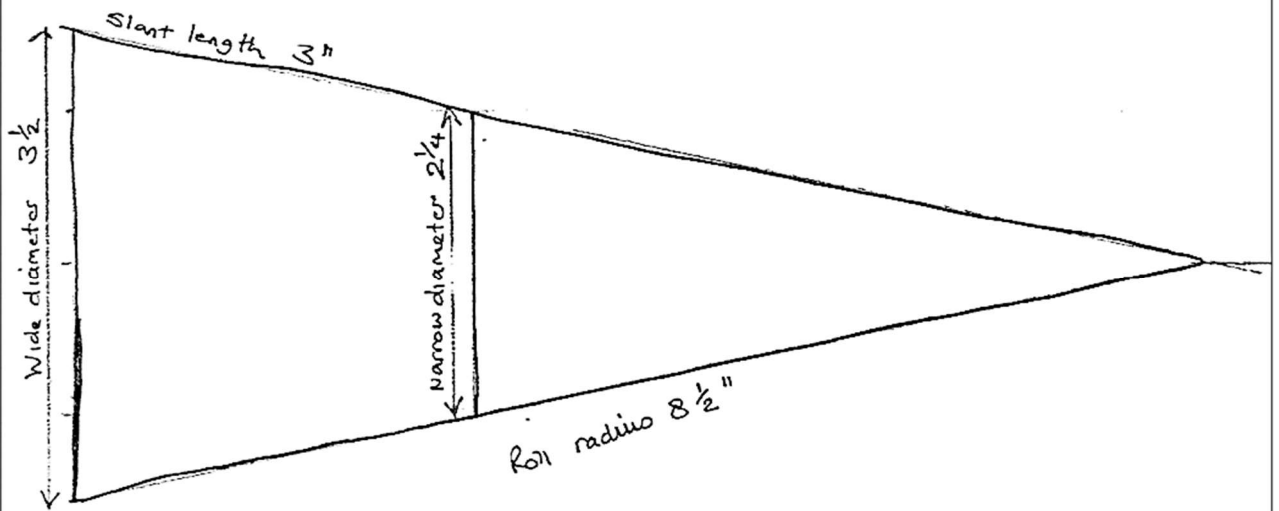
Gerry

3d Extend any cup you get a cone.

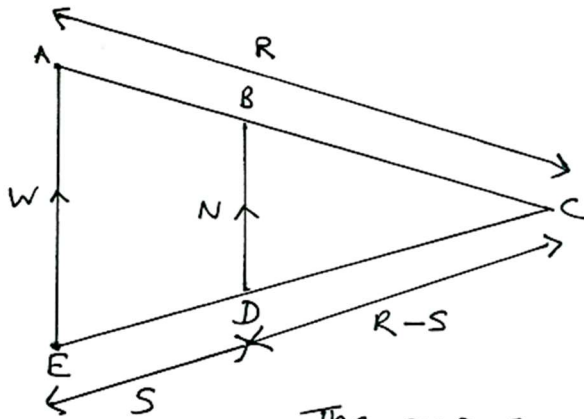
Narrow diameter = zero in a cone. ~~Then roll radius = slant length.~~

2d Draw the cone as a triangle. ~~The~~ The scale drawing lets you find the roll radius.

Eg a cup has wide diameter $3\frac{1}{2}$ " narrow diameter $2\frac{1}{4}$ " slant length 3"
This method will work for any cup - you just measure the roll radius.



Judi



N = narrow diameter
W = wide diameter
S = slant length
R = roll radius

$\triangle ACE$ is similar to $\triangle BCD$

The cup scenario can be modeled using similar triangles.

$$\text{So } \frac{R}{W} = \frac{R-S}{N}$$

$$\text{and } RN = WR - S.$$