

# MCP

Mathematics Coaching Program



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<http://mcp-coaching.osu.edu>



NEWARK

# EXAMINING THE GEOMETRY CONTENT OF STATE STANDARDIZED EXAMS USING THE VAN HIELE MODEL

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# Van Hiele Model (1986)

- Geometry
- Development
- Instruction based



# Van Hiele Model

- Level 1 – Visual
- Level 2 – Descriptive
- Level 3 – Informal deduction
- Level 4 – Formal Deduction
- Level 5 – Rigor



van Hiele level	examples
1 Visual	“Triangle and square are different. One has 4 sides and the other has 3.”
2 Descriptive	“Square is one type of rectangle.”
3 Informal	“The sum of the two acute angles of a right triangle is 90 degree.”
4 Deductive	“Since $a \perp b$ , $b \perp c$ , then the congruence of corresponding triangles indicates $a \parallel b$ .”
5 Rigor	“The argument above only works in 2-dimensional space.”

# Research Questions

- What levels of knowledge are tested? (OAT  
3<sup>rd</sup> 5<sup>th</sup> 8<sup>th</sup> Grade)
- Student performance?
- Why did they do so? (conjectures)



# OAT Structure

Grade	Level 1 # of questions	Level 2 # of questions	Level 3 # of questions	Total number of questions
3	6 (86%)	1 (14%)	0	7
5	2 (25%)	4 (50%)	2 (25%)	8
8	1 (17%)	3 (50%)	2 (33%)	6

➤ focus on Level 1&2



# Student Performance

Grade	Level 1	Level 2	Level 3
3	61%	51%	NA
5	46%	36%	30%
8	67%	49%	37%
All	55%	44%	32%

- Student performance declined as the question level increased



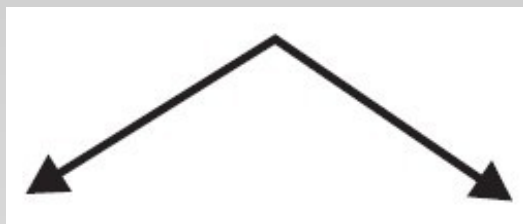


# Sample Problems

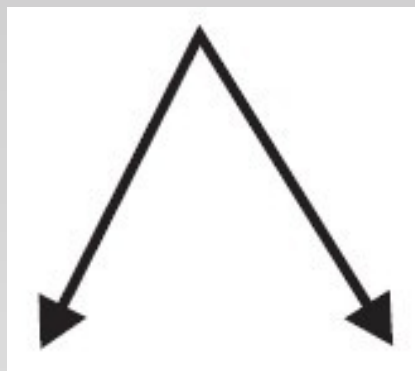
*(Third grade) (C. 26%)*

*Which picture shows a right angle?*

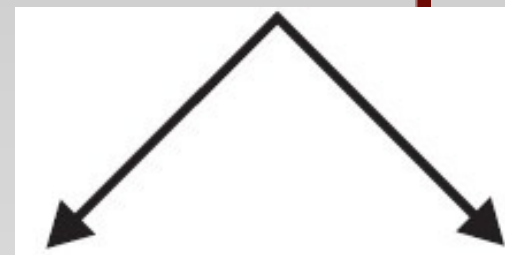
A.



B.



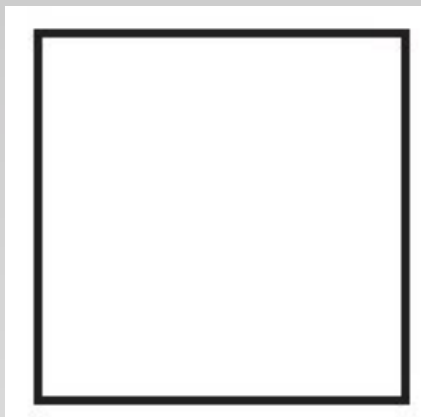
C.



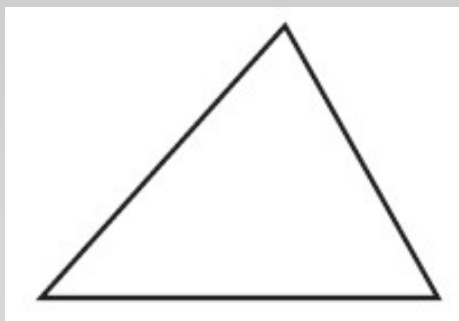
(Third grade) (most common choice B)

*Which shape is three-dimensional?*

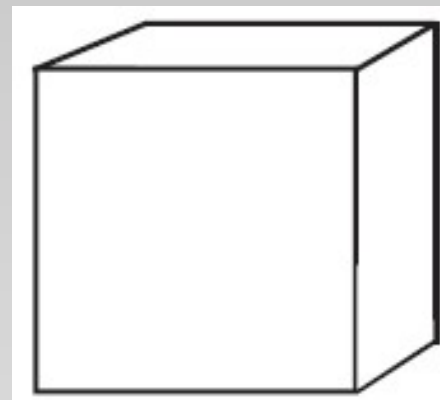
A.



B.



C.



(Fifth grade) (most common choice B)

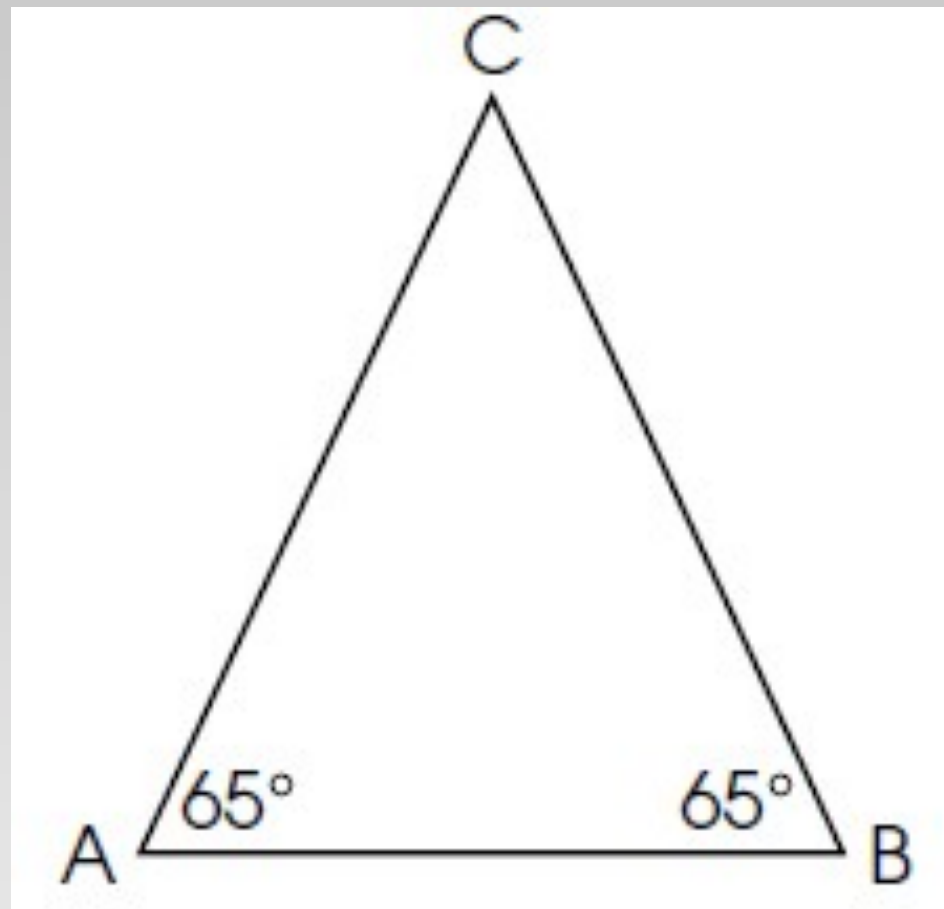
*Triangle ABC is shown. What is the measure of angle C?*

A.  $50^\circ$

B.  $65^\circ$

C.  $90^\circ$

D.  $180^\circ$



(Fifth grade) (most common choice A)

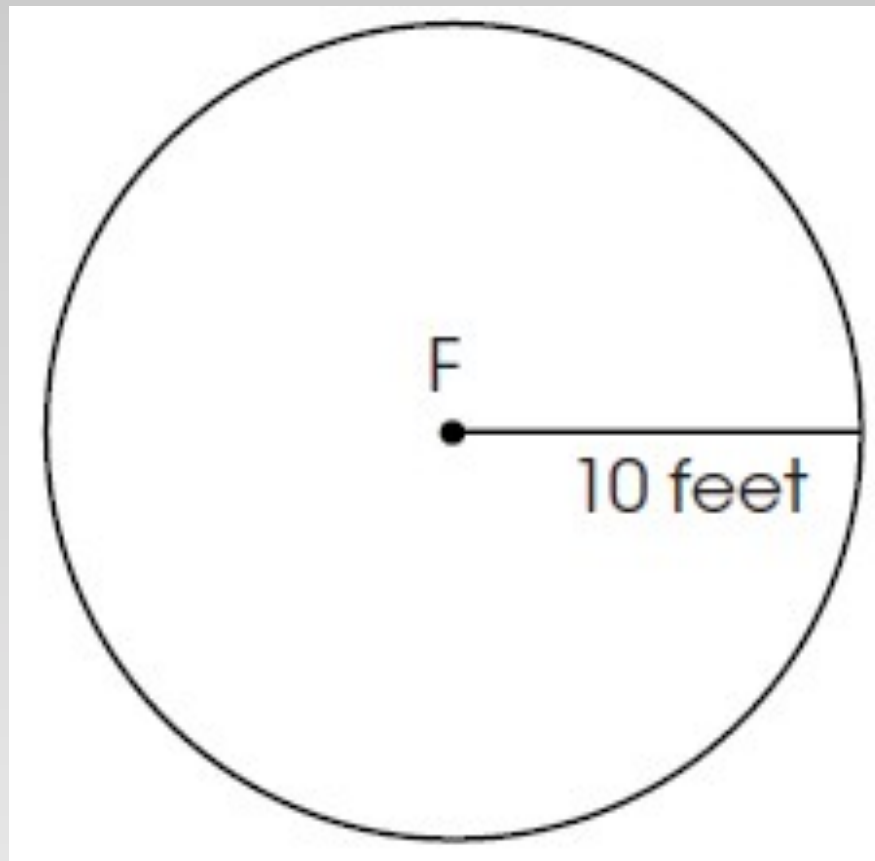
*Point F is the center of the circle shown. What is the diameter of this circle?*

*A. 10 feet*

*B. 20 feet*

*C. 30 feet*

*D. 100 feet*

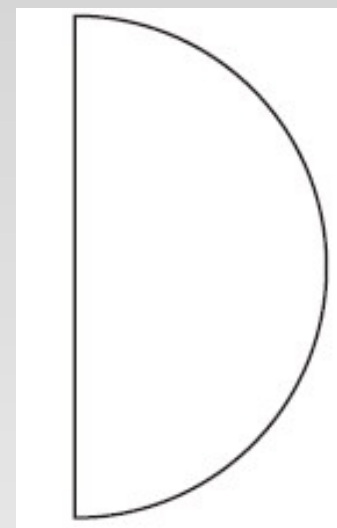


(Fifth grade) (most common choice A)

*Malcolm needed to measure the distance across a circular tablecloth. He folded the tablecloth in half as shown. Malcolm measured the length of a folded side. Which part of the circular tablecloth did Malcolm measure?*

*A. center      B. circumference*

*C. diameter      D. radius*



*(Eighth grade)* **(most common choice B)**

*Circle A has a radius that is twice the length of the radius of Circle B. Which is an accurate statement about the relationship of the areas of Circles A and B?*

- A. The area of Circle A is four times the area of Circle B.*
- B. The area of Circle A is twice the area of Circle B.***
- C. The area of Circle A is one-half the area of Circle B.*
- D. The area of Circle A is one-fourth the area of Circle B.*

# Conjectures about factors that effect

- past experiences and concept images
- linguistic clues
- words from personal experiences





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THANK  
YOU !!



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