Student Name: _____ Date: _____	Contact Person Name: _____ Phone Number: _____

Texas Assessment of Knowledge and Skills

Exit Level Math Review

Lesson 20

Nets and Surface Area

TAKS Objective 7 – Demonstrate an understanding of two- and three-dimensional representations of geometric relationships and shapes

Lesson Objectives:

- Identify a solid based on the net provided
- Find the surface area of a solid based on the net provided
- Find the area and perimeter of composite shapes
- Find the area of a shaded region

Authors:

Tim Wilson, B.A.
Jason March, B.A., M.S.Ed

Editor:

Linda Shanks

Graphics:

Tim Wilson
Jason March

The Texas Assessment of Knowledge and Skills (TAKS) exit level exam covers ten learning objectives. These lessons are designed to teach math concepts specific to each objective as well as strategies to consider when approaching typical TAKS questions. To successfully complete the TAKS exit level exam, the student should be able to:

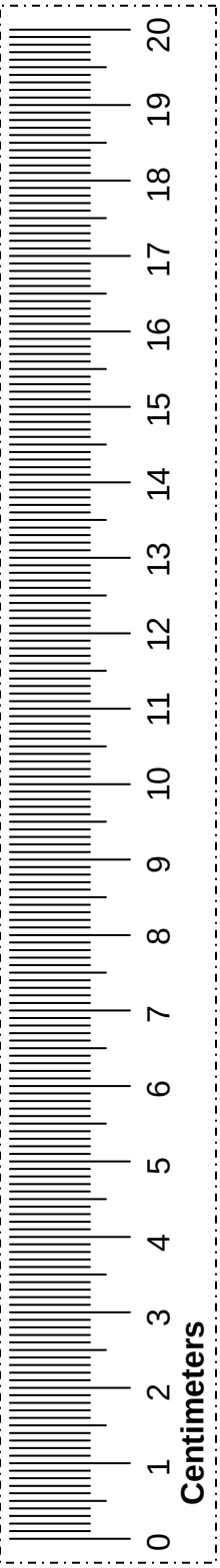
1) **Describe functional relationships in a variety of ways.**
2) **Demonstrate an understanding of the properties and attributes of functions.**
3) **Demonstrate an understanding of linear functions.**
4) **Formulate and use linear equations and inequalities.**
5) **Demonstrate an understanding of quadratic equations and other nonlinear functions.**
6) **Demonstrate an understanding of geometric relationships and spatial reasoning.**
7) **Demonstrate an understanding of two- and three-dimensional representations of geometric relationships and shapes.**
8) **Demonstrate an understanding of concepts and uses of measurement and similarity.**
9) **Demonstrate an understanding of percents, proportional relationships, probability, and statistics in application problems.**
10) **Demonstrate an understanding of the mathematical processes and tools used in problem solving.**

National PASS Center
Geneseo Migrant Center
3 Mt. Morris – Leicester Road
Leicester, NY 14481
(585) 658-7960
(585) 658-7969 (fax)
www.migrant.net/pass

Developed by the National PASS Center under the leadership of the National PASS Coordinating Committee with funding from the Region 20 Education Service Center, San Antonio, Texas, as part of the Mathematics Achievement = Success (MAS) Migrant Education Program Consortium Incentive project.

Genesee Valley Educational Partnership
success stories written here

TAKS Mathematics Chart



Length

Metric	Customary
1 kilometer = 1000 meters	1 mile = 1760 yards
1 meter = 100 centimeters	1 mile = 5280 feet
1 centimeter = 10 millimeters	1 yard = 3 feet
	1 foot = 12 inches

Capacity and Volume

Metric	Customary
1 liter = 1000 milliliters	1 gallon = 4 quarts
	1 gallon = 128 fluid ounces
	1 quart = 2 pints
	1 pint = 2 cups
	1 cup = 8 fluid ounces

Mass and Weight

Metric	Customary
1 kilogram = 1000 grams	1 ton = 2000 pounds
1 gram = 1000 milligrams	1 pound = 16 ounces

Time

1 year = 365 days

1 year = 12 months

1 year = 52 weeks

1 week = 7 days

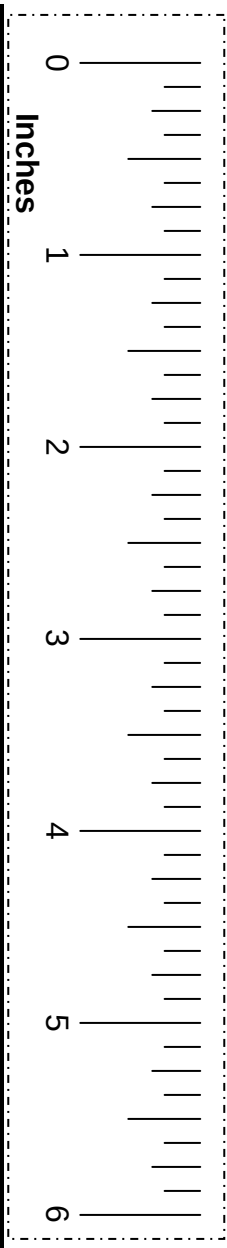
1 day = 24 hours

1 hour = 60 minutes

1 minute = 60 seconds

TAKS Mathematics Chart

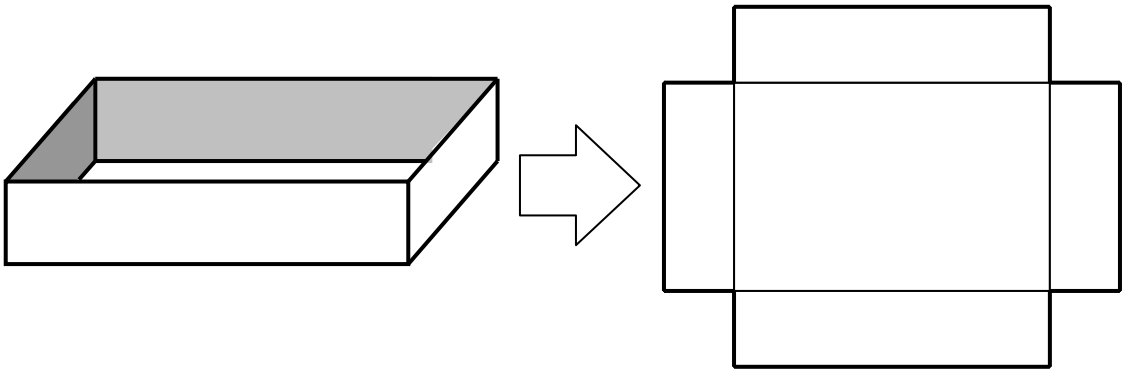
Perimeter	Rectangle	$P = 2l + 2w$ or $P = 2(l + w)$
Circumference	Circle	$C = 2\pi r$ or $C = \pi d$
Area	Rectangle	$A = lw$ or $A = bh$
	Triangle	$A = \frac{1}{2}bh$ or $A = \frac{bh}{2}$
	Trapezoid	$A = \frac{1}{2}(b_1 + b_2)h$ or $A = \frac{(b_1+b_2)h}{2}$
	Regular polygon	$A = \frac{1}{2}aP$
	Circle	$A = \pi r^2$
P represents the perimeter of the base of a three-dimensional figure.		
B represents the area of the base of a three-dimensional figure.		
Surface Area	Cube (total)	$S = 6s^2$
	Prism (lateral)	$S = Ph$
	Prism (total)	$S = Ph + 2B$
	Pyramid (lateral)	$S = \frac{1}{2}Pl$
	Pyramid (total)	$S = \frac{1}{2}Pl + B$
	Cylinder (lateral)	$S = 2\pi rh$
	Cylinder (total)	$S = 2\pi rh + 2\pi r^2$ or $S = 2\pi r(h + r)$
	Cone (lateral)	$S = \pi rl$
	Cone (total)	$S = \pi rl + \pi r^2$ or $S = \pi r(l + r)$
	Sphere	$S = 4\pi r^2$
Volume	Prism or Cylinder	$V = Bh$
	Pyramid or Cone	$V = \frac{1}{3}Bh$
	Sphere	$V = \frac{4}{3}\pi r^3$
Special Right Triangles	30°, 60°, 90°	$x,\ x\sqrt{3},\ 2x$
	45°, 45°, 90°	$x,\ x,\ x\sqrt{2}$
Pythagorean Theorem		$a^2 + b^2 = c^2$
Distance Formula		$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
Slope of a Line		$m = \frac{y_2 - y_1}{x_2 - x_1}$
Midpoint Formula		$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$
Quadratic Formula		$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Slope-Intercept Form of an Equation		$y = mx + b$
Point-Slope Form of an Equation		$y - y_1 = m(x - x_1)$
Standard Form of an Equation		$Ax + By = C$
Simple Interest Formula		$I = prt$



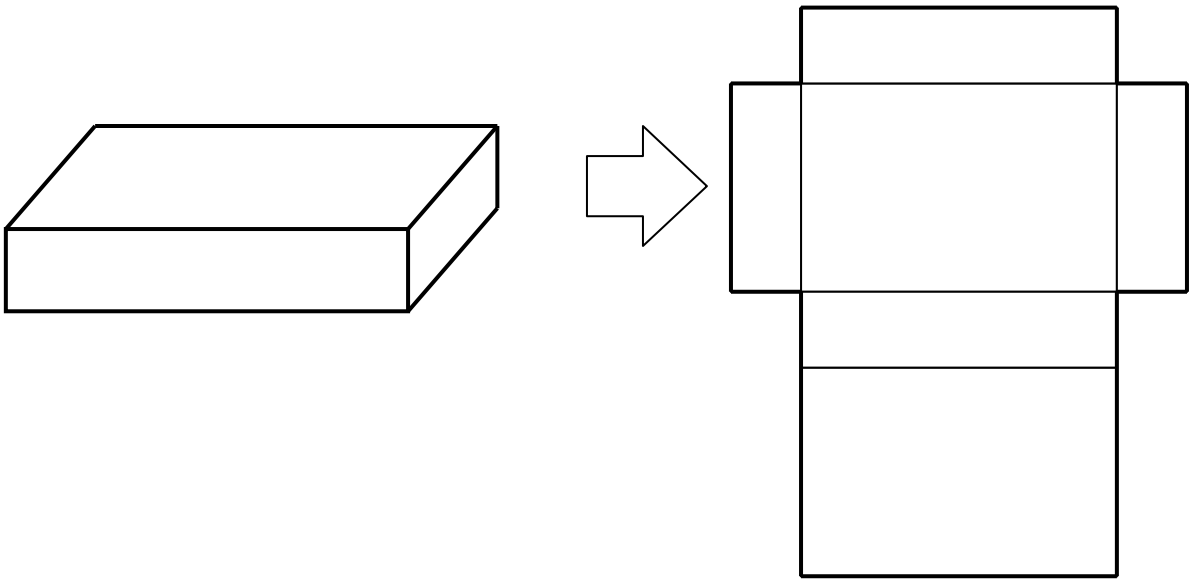
Flatten each side of a cardboard box without removing any cardboard. This representation is called a **net**.

- A **net** is a flat representation of the faces of a prism. It is similar to breaking down a cardboard box until it is flat.

Below is an example of a box with an open top and the net that represents it.



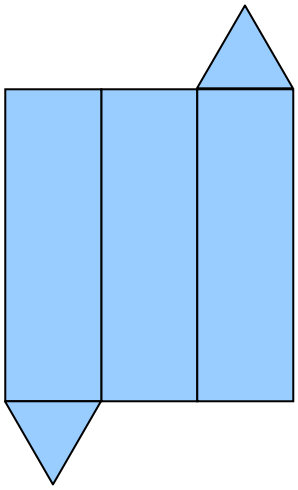
Above, the large rectangle in the middle of the net represents the base of the box, while the four smaller rectangles represent the sides that get folded up. If the box were a rectangular prism, it would have two large rectangular bases. The net for that shape is represented below.



To identify a solid from its net, you need to identify the base(s) and the faces. Generally, the shape that occurs least is the base, and the shape that occurs most is a face.

Example

Which solid does the following net represent?



A Cube

B Triangular Prism

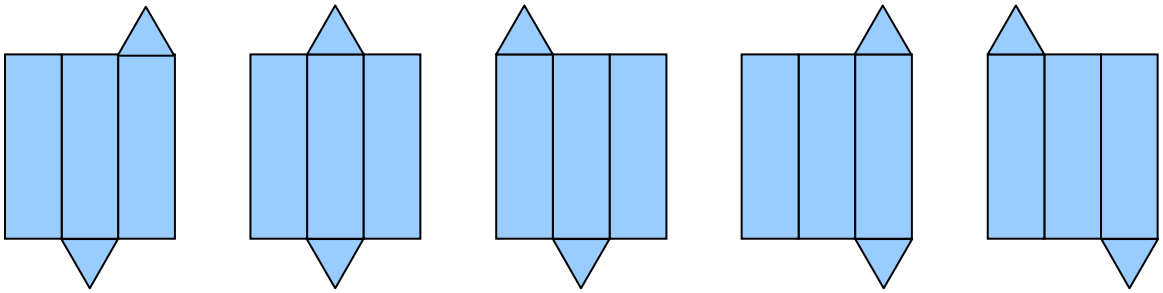
C Triangular Pyramid

D Rectangular Pyramid

Solution

This net is made up of triangles and rectangles. There are only two triangles, so we will assume that these are the bases. The only solid with two triangular bases is a triangular prism. The answer is choice **B**.

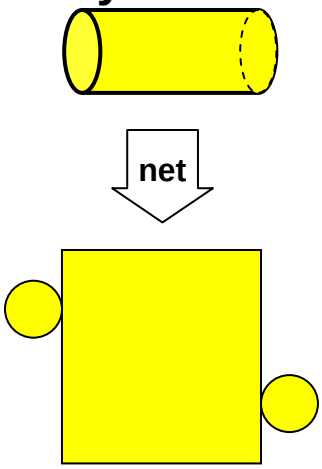
The same triangular prism can be represented by several different nets.



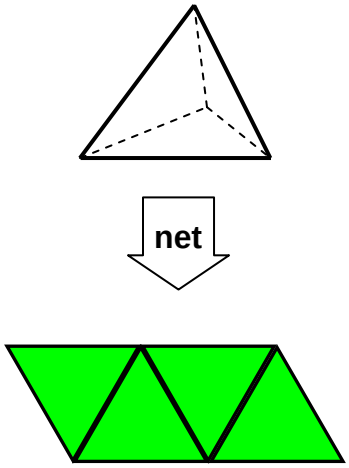
It is difficult to memorize the different nets that can represent a solid. It is best to visualize folding the net into a solid in your mind.

Here are some other common solids and their net representations. Use these examples to practice fitting the net to the solid mentally.

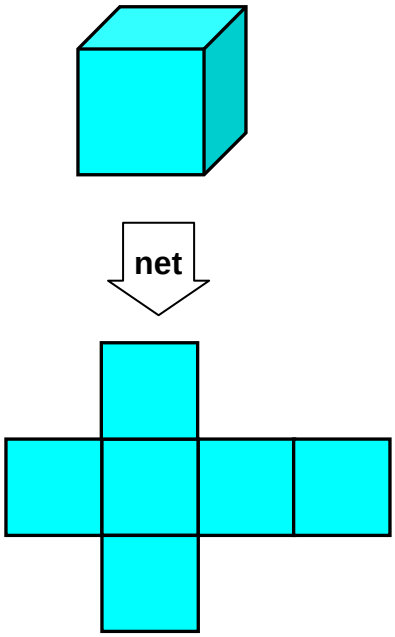
cylinder



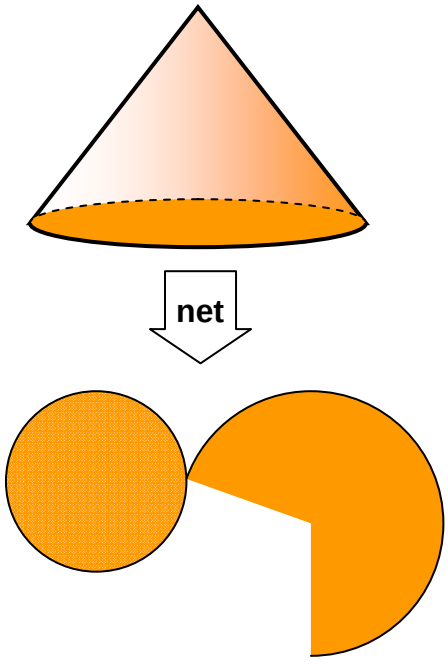
triangular pyramid



cube

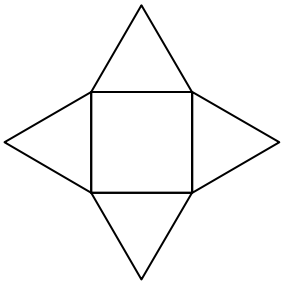


cone



Example

Which solid is represented by the following net?



A Triangular Pyramid

B Triangular Prism

C Square Pyramid

D Cone

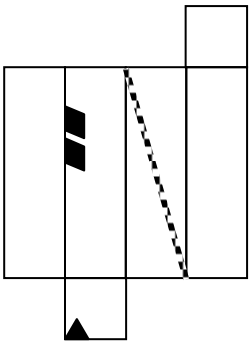
Solution

The two shapes that create this net are a triangle and a square. There is only one square, so we will assume that this is the base. The only solid with one square base is the square pyramid, so the answer is choice **C**.

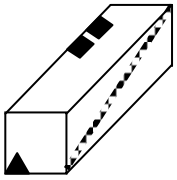
Sometimes we need to determine which shape with patterns can be made from a net.

Example

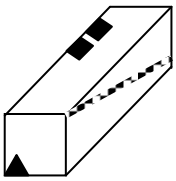
Which prism can be made from the net shown?



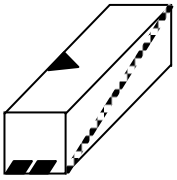
A



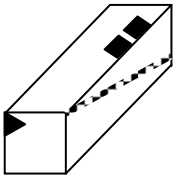
B



C

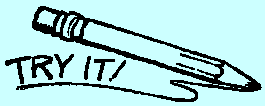


D

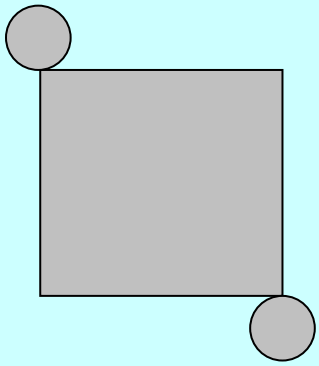


Solution

To solve this problem, we need to mentally picture what the net would look like if it were folded into a rectangular prism. First, we see the two smaller squares represent the two bases. There is a black triangle on the square at the bottom, which means the base should have this triangle. Therefore, we can eliminate choice **C** since it does not have a triangle on the square base. If we fold the square base down, the triangle stays at the bottom of the square, and the two parallelograms should end up on the top side of the prism. Thus, we can eliminate choice **D**. Lastly, when we fold down the side with the patterned line, the line should be at the bottom corner on the side that is nearest the front. This means that choice **A** is the answer.



1) Which solid does the following net represent?



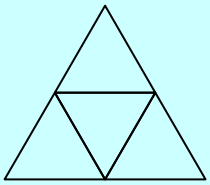
A Cylinder

B Cone

C Triangular Pyramid

D Rectangular Prism

2) Which solid does the following net represent?



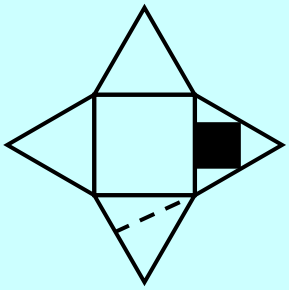
A Cylinder

B Cone

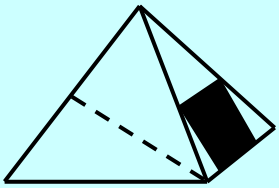
C Triangular Pyramid

D Triangular Prism

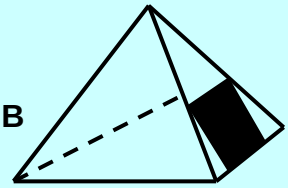
3) Which prism can be made from the net shown?



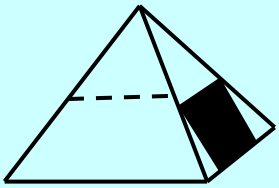
A



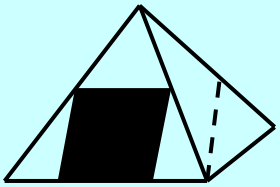
B



C



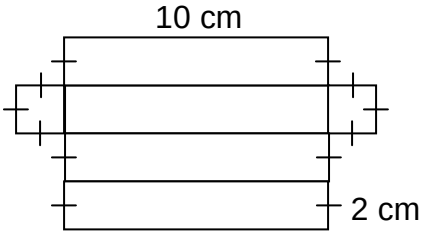
D



Nets can be used to find the surface area of a solid. The surface area is the area of all the sides added together. When we have the net of a solid, we have all the faces laid flat. We can find the area of each face, and then add them up.

Example

Find the surface area of the rectangular prism using the net provided.



Solution

The dash over each side shows that the sides are congruent. The rectangular prism is made of two small squares and four long rectangles. First, we will find the area of the two small squares. Multiply the sides of one to get its area.

$$2 \cdot 2 = 4 \text{ cm}^2$$

Each small square has an area of 4 square centimeters. Since there are two squares, their combined areas is $2 \cdot 4 = 8 \text{ cm}^2$.

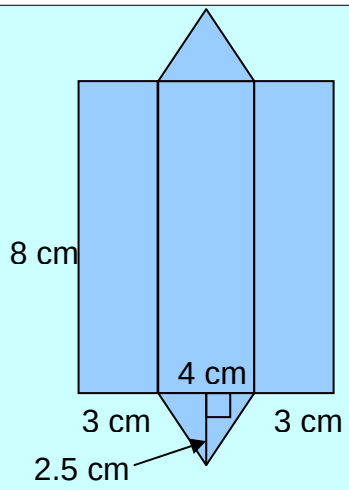
Next, find the area of one rectangle.

$$2 \cdot 10 = 20 \text{ cm}^2$$

The four rectangles are 20 square centimeters each. That means their total area is $4 \cdot 20 = 80 \text{ cm}^2$. Lastly, we need to add the area of all the sides.

$$\underset{\text{(squares)}}{2 \cdot 4 \text{ cm}^2} + \underset{\text{(rectangles)}}{4 \cdot 20 \text{ cm}^2} = 8 \text{ cm}^2 + 80 \text{ cm}^2 = 88 \text{ cm}^2$$

4) Find the surface area of the triangular prism using the net provided.



A 32 cm^2

B 80 cm^2

C 90 cm^2

D 100 cm^2

Review

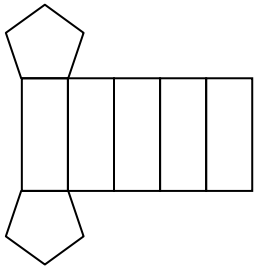
Know these concepts:

1. Prisms and cylinders have two bases, while pyramids and cones have one base.
2. The number of lateral faces matches the number of sides the base has
3. The surface area is the sum of the areas of all the faces of a solid.

Practice Problems
Lesson 20

Directions: Write your answers in your math journal. Label this exercise TAKS Review – Lesson 20.

1) Which solid does the following net represent?



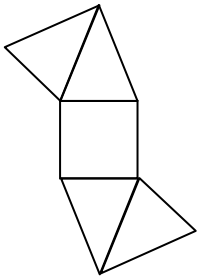
A Pentagonal Prism

B Hexagonal Prism

C Triangular Pyramid

D Rectangular Prism

2) Which solid does the following net represent?



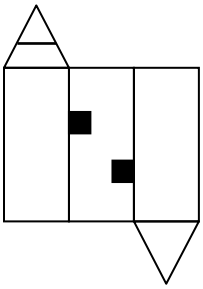
A Square Pyramid

B Triangular Prism

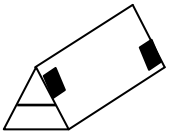
C Triangular Pyramid

D Rectangular Prism

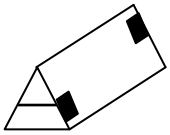
3) Which prism can be made from the net shown?



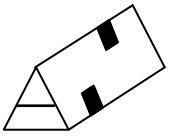
A



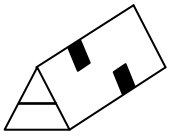
B



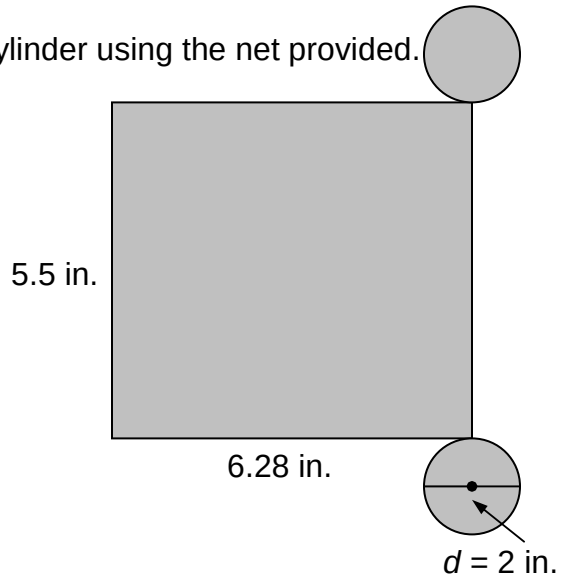
C



D



4) Find the approximate surface area of the cylinder using the net provided.



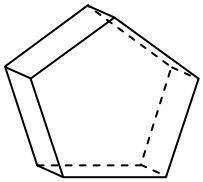
A 34.54 in.^{2}

B 40.82 in.^{2}

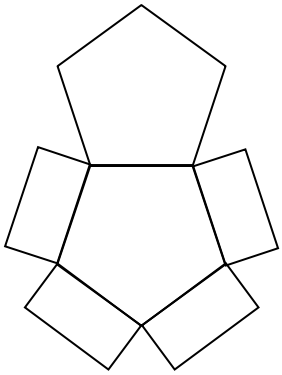
C 37.68 in.^{2}

D 32.56 in.^{2}

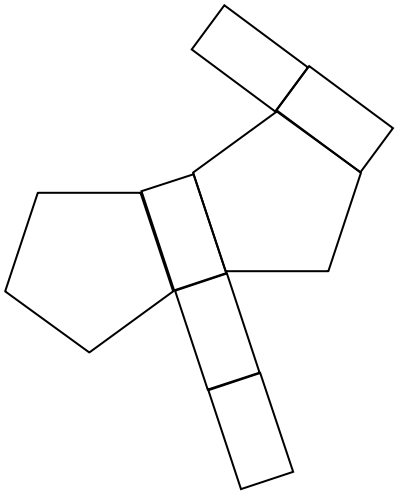
5) Which net represents the prism below?



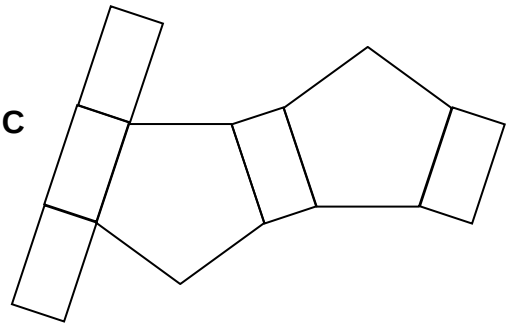
A



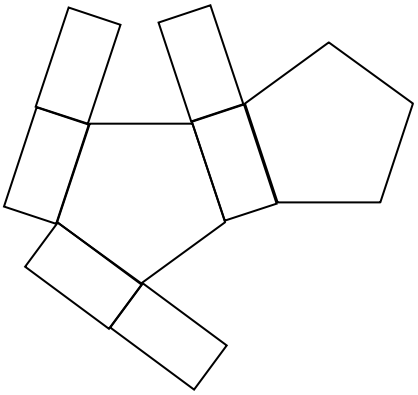
B



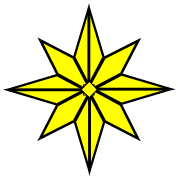
C



D



1) A
2) C
3) A
4) C



End of Lesson 20