Wrap It Right: Nets to Surface Area

Teacher		**Class**	Grade 6
Subject	Math	**Topic**	Nets and surface area
Date		**Room**	
Lesson length	60 minutes	**Country**	United Kingdom

Students learn to show solids as nets and add face areas. They design a gift-box net and find wrapping paper needed.

Curriculum links

- Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures.
- Learn and use the formulas for finding the surface area of rectangular prisms to solve problems, including real-life scenarios, with the help of objects, diagrams, nets, and formulas. [1]

Learning objectives

- Students will represent prisms and pyramids using nets of rectangles and triangles.
- Students will find surface area by adding areas of all faces in a net.
- Students will solve real-world wrapping problems using nets and surface area.

Success criteria

- I can match a solid to its net made of rectangles and triangles.
- I can find surface area by adding all face areas in square units.
- I can use a net to find wrapping paper needed for a box.

What students already know

2-minute check: show a 4 in. by 3 in. rectangle and a triangle with base 4 in. and height 3 in. Ask for each area.

Key words

net	a flat pattern that can be folded to make a solid shape [9]
surface area	total amount covering the outside of a solid, counted in square units [9]
face	one flat side of a solid shape [4]
rectangular prism	a box shape with six rectangle sides in three matching pairs [4]
triangular prism	a solid with two triangle ends and three rectangle sides [8]

Materials

- Slides 1-12 with projector and speakers
- Video clip 1 (0:00-4:05) and Video clip 4 (0:00-4:43)
- grid paper (1 sheet per student)
- rulers marked in inches
- colored pencils
- price cards in dollars ($0.05 per square inch)
- printed Worksheet Task A, Task B, Task D (1 copy each per student)

Before the lesson

- Print Worksheet Task A, Task B, and Task D, one of each per student
- Print price cards showing $0.05 per square inch and starter net outline with length and width marked beside each rectangle
- Test Slides 1-12 and Video clip 1 (0:00-4:05) and Video clip 4 (0:00-4:43) for sound and picture
- Set out grid paper, rulers marked in inches, and colored pencils for pairs

Lesson outline

0–8 min **Starter** 8 min · Whole class

Activate area knowledge and hook students on nets as gift-shop wrapping problems.

YOU DO

1. Show Slide 1 title and Slide 2 objectives, read the three goals with the class.
2. Show Slide 3 cards and ask students to name the rectangular prism, cube, and triangular prism from faces.
3. Show Slide 4 fact and deliver the hook: You run a gift shop — how much paper do you need to wrap this box with zero waste?
4. Take quick answers on what shapes they would see if a box was cut open and laid flat.

STUDENTS DO

1. Read objectives and repeat the hook question with a partner.
2. Name solids from face clues and predict what flat shapes a cut-open box shows.
3. Share one idea for how flat paper tells us about wrapping a box.

Say: Today we turn boxes into flat patterns and back again. A net is a 2-dimensional shape that can be folded to form a solid showing each face [9]. A cube has 11 different nets, but they all fold into the same cube with six square faces [7].

Ask: What shapes make up the net of a triangular prism? (Two triangles plus three rectangles [8].) · What shapes make up the net of a square pyramid? (One square and four triangles [7].)

Check understanding: Cold-call 3 students to name faces for each solid; if unsure, hold up plastic solids and recount faces together before moving on.

Support: Show a small box and point to front, side, and top while students say rectangle. **Stretch:** Ask which solid has six matching squares and why a cube is a special prism.

Use: Slides 1-4

8–18 min **Teaching** 10 min · Whole class

Teach what a net shows and how prism and pyramid nets are built.

YOU DO

1. Show Slide 5 question: How do you know a net shows the whole surface? Take pair ideas.
2. Play Video clip 1 (0:00-4:05) on Slide 6 and ask students to spot the three pairs of rectangles.
3. Explain prism and pyramid rules using models: a prism has two identical parallel bases with rectangles for sides, a pyramid has one base with triangles meeting at a point [4][12].
4. Model finger-tracing a fold to find where faces would overlap, since some arrangements overlap and are not nets [8].

STUDENTS DO

1. Think, pair, share why a net shows the whole surface.
2. Watch the video and count pairs of matching rectangles.
3. Trace folds in the air to test overlap on a non-net of six squares.

Say: A net shows all faces laid out flat, so nothing is hidden [7]. In a rectangular prism there are three pairs of parallel and identical rectangles [4]. Listen for how we add all faces to get surface area, the total area of all faces [9][11].

Worked example: Show a cube net of six 4-in. squares: one face is 4 x 4 = 16 sq in. Surface area is the area of one face times 6 [12], so 16 x 6 = 96 sq in.

Ask: How is the net of a prism different from the net of a pyramid? (Prism has two bases plus rectangles; pyramid has one base plus triangles [4].) · Why does a net help find surface area? (It shows every face, so we can add all faces with none missing [8][11].)

Check understanding: Thumbs up or down: does this pattern of six squares fold to a cube? Re-teach overlap with paper squares if many are wrong.

Support: Let students hold the solid while tracing each face to the flat net [7]. **Stretch:** Sketch a different arrangement of the same six squares that would still fold correctly.

Use: Slides 5-6, Video clip 1 (0:00-4:05)

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18–30 min **Guided Practice** 12 min · Whole class

Model finding surface area from a net by adding rectangle and triangle areas.

YOU DO

1. Show Slide 7 steps: lay net flat, label every face, find each area, check opposites match, add in square units.
2. Model rectangle area as length times width and triangle area as base times height divided by two [12].
3. Work the triangular prism example on the board, writing each face area beside it before adding [8].
4. Have class complete Worksheet Task A for area recall, then check answers together.

STUDENTS DO

1. Copy the steps and face areas for the triangular prism example.
2. Complete Worksheet Task A: find area of each shape and show each multiply step.
3. Compare answers with a partner and check opposite faces are equal.

Say: We label every face, then add the areas of each face to get combined surface area [11]. Opposite faces of a prism are the same, so we check they match [9]. Rectangle areas use length times width, triangle areas use half the base times the height [12].

Worked example: Triangular prism net: two triangles with base 4 in. and height 3 in. Each is 0.5 x 4 x 3 = 6 sq in., so 12 sq in. together. Three rectangles 4 in. by 5 in. = 20, 3 in. by 5 in. = 15, 5 in. by 5 in. = 25. Total = 6 + 6 + 20 + 15 + 25 = 72 sq in.

Ask: A rectangle is 12 in. by 8 in. What is its area? (96 sq in. because 12 x 8 = 96 [12].) · A triangle has base 4 in. and height 3 in. What is its area? (6 sq in. because 0.5 x 4 x 3 = 6 [12].)

Check understanding: Mini-whiteboards: write the two triangle areas and total for the example; reteach 0.5 x base x height if errors are common.

Support: Give a reference card showing area of a rectangle and area of a triangle for quick checking [12]. **Stretch:** Work backward to find a missing edge length when given total surface area.

Use: Slide 7, Worksheet Task A

30–52 min **Main Activity** 22 min · Pairs

Use a box net to calculate wrapping paper needed and cost in a real problem.

YOU DO

1. Show Slide 8 and play Video clip 4 (0:00-4:43) to model front, side, and top areas.
2. Show Slide 9 task and hand out grid paper, rulers, colored pencils, price cards, and Worksheet Task B.
3. Direct pairs to sketch the 12 in. by 8 in. by 3 in. box net, label six face areas, match opposites, and add for total.
4. Circulate to check totals, then ask pairs to multiply square inches by $0.05 to get cost in dollars.

STUDENTS DO

1. Draw and color the net on grid paper, label each rectangle with length, width, and area.
2. Add six face areas to find total square inches and multiply by price to find dollars.
3. Complete Worksheet Task B to practice rectangular prisms and cubes using their nets.

Say: Your gift shop box is 12 inches wide, 8 inches tall, and 3 inches deep. Front and back are 12 in. by 8 in., sides are 3 in. by 8 in., top and bottom are 12 in. by 3 in. [7]. Find each rectangle by length times width [12], add all faces [11], then find the price.

Worked example: Box 12 x 8 x 3: front/back 12 x 8 = 96 each, total 192. Sides 3 x 8 = 24 each, total 48. Top/bottom 12 x 3 = 36 each, total 72. Surface area = 192 + 48 + 72 = 312 sq in. At $0.05 per sq in., cost = 312 x $0.05 = $15.60.

Ask: Why do we only need to calculate three rectangles for this box? (There are three pairs of identical rectangles and opposite sides are the same [9].) · A student multiplies 12 x 8 x 3. Is that surface area? (No, that is volume; surface area covers the outside only, every face added in square units [8].)

Check understanding: Collect sticky totals on the board; if totals differ, compare face-by-face to find the missing back or bottom face.

Support: Provide a starter net outline with length and width marked beside each rectangle for students to complete [11]. **Stretch:** Add flaps to the design and estimate extra square inches needed; start Worksheet Task D with triangular prisms and square pyramids.

Use: Slides 8-9, Video clip 4 (0:00-4:43), Worksheet Task B, Worksheet Task D

52–60 min **Plenary** 8 min · Whole class

Review nets and surface area and check who can apply them.

YOU DO

1. Show Slide 10 mindmap and have students chorally complete: net = all faces flat, rectangles length x width, triangles half x base x height.
2. Run Slide 11 vote: Which job uses nets the most? Take reasons for designing gift boxes, wrapping presents, building model pyramids.
3. Show Slide 12 exit ticket and have students write answers on paper.
4. Preview next step: pyramids with one square base and four triangles that meet at a point [4].

STUDENTS DO

1. Complete the mindmap phrases and vote with reasons.
2. Write the exit ticket: cube total, one thing learned, one question.
3. Swap papers to check the cube total with a partner.

Say: A net of a pyramid has one base polygon and triangles for the rest [4]. Surface area is always all faces added in square units. Tell me your total and one question you still have.

Ask: A net is a square with side 4 plus four triangles. What solid is it? (Square pyramid, square base with four triangle sides [7].) · In a rectangular prism, faces 4 by 2, 3 by 2, and 4 by 3 give what total? (52 square units because 8+8+6+6+12+12=52 [4].)

Check understanding: Read exit tickets as they leave; reteach small group tomorrow if cube total is not 96 sq in.

Support: Allow sentence starters: The net shows ___ faces, so I added ___. **Stretch:** Compare cardboard needed for a pyramid and a cube with the same base edge.

Use: Slides 10-12

Common mistakes

Mistake	How to spot it	How to fix it
Multiplying length x width x height and reporting volume as surface area.	Answer is in cubic units or far too large and no face areas are listed.	Stress surface area covers the outside only: list every face area, then add in square units [8].
Counting only faces seen in a drawing and forgetting back and bottom.	Total has only 3-4 faces, often missing one pair.	Use the net which shows every face, and check opposite faces of a prism came out equal [8].
Accepting any six connected squares as a cube net.	Student cannot name opposite faces or faces overlap when folded.	Trace the fold with a finger or cut from paper; some arrangements overlap when folded [8].

Support

- Provide starter net outline with length and width marked beside each rectangle
- Color opposite faces the same to show opposite sides are the same [9]
- Keep one worked station showing each face area written beside it before adding [8]

Stretch

- Add flaps to the gift-box net and estimate extra square inches needed
- Draw a second, different net layout for the same prism and compare totals
- Test what happens to surface area when one measurement is multiplied by 2 [1]

For the LSE or teaching assistant

Sit with target pairs in main activity; prompt labeling of all six faces, check opposite pairs match, and scribe numbers if needed.

Check for understanding

Question	Answer
Surface area of cube with 4-in. sides is ___ sq in.	96 sq in. (16 x 6)
A box net has faces 12x8, 12x8, 3x8, 3x8, 12x3, 12x3. What is the surface area?	312 sq in. (192 + 48 + 72)
A square pyramid net has a 5-in. square base and four triangles with base 5 in. and height 6 in. What is the surface area?	85 sq in. (25 + 15+15+15+15)

Homework

Complete Worksheet Task D: practice prisms with triangles and square pyramids using nets.

Sources

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