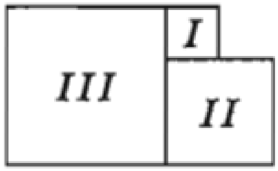
1 / 23

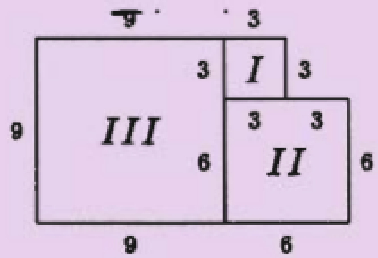
1995 Q6

6. Figures I, II and III are squares. The perimeter of I is 12 and the perimeter of II is 24. The perimeter of III is

(A) 9 **(B)** 18 **(C)** 36 **(D)** 72 **(E)** 81



6. **(C)** Since the perimeter of I is 12, its side is 3. Similarly, the side of II is 6. Hence the side of III is $3 + 6 = 9$. Thus the perimeter of III is $4 \times 9 = 36$.



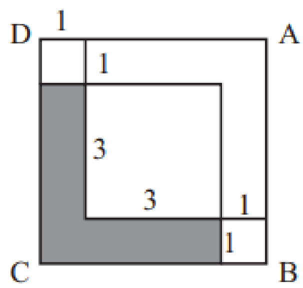
Query. Is it a coincidence that the perimeter of III equals the sum of the perimeters of I and II?

2 / 23

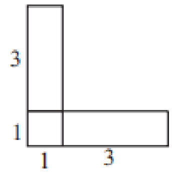
2000 Q6

6. Figure $ABCD$ is a square. Inside this square three smaller squares are drawn with side lengths as labeled. the area of the shaded L-shaped region is

(A) 7 **(B)** 10 **(C)** 12.5 **(D)** 14 **(E)** 15

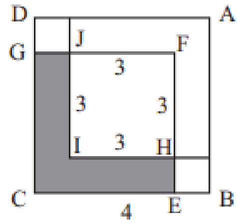


6. **Answer (A):** The L-shaped region is made up of two rectangles with area $3 \times 1 = 3$ plus the corner square with area $1 \times 1 = 1$, so the area of the L-shaped figure is $2 \times 3 + 1 = 7$.

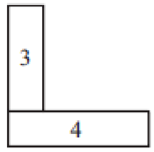


OR

Square $FECG-$ square $FHIJ = 4 \times 4 - 3 \times 3 = 16 - 9 = 7$.



OR

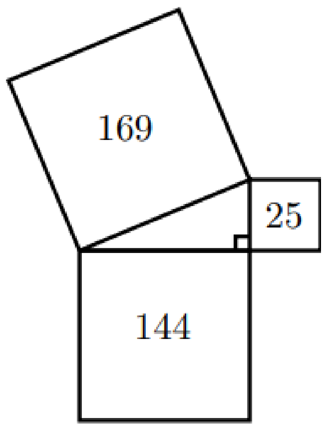


The L-shaped region can be decomposed into a 4×1 rectangle and a 3×1 rectangle. So the total area is 7.

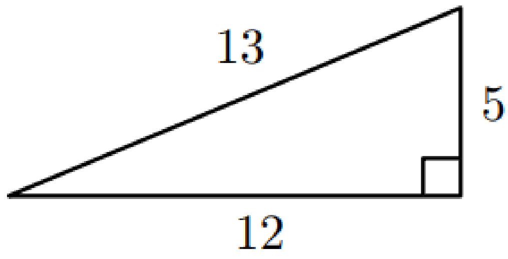
2003 Q6

6. Given the areas of the three squares in the figure, what is the area of the interior triangle?

(A) 13 **(B)** 30 **(C)** 60 **(D)** 300 **(E)** 1800



6. **(B)**



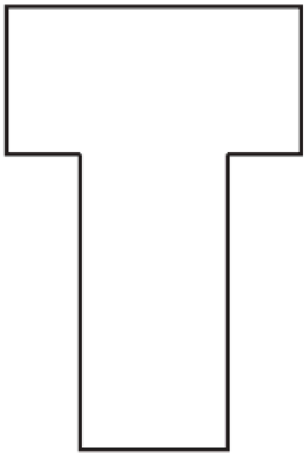
$$A = \frac{1}{2}(\sqrt{144})(\sqrt{25})$$
$$A = \frac{1}{2} \cdot 12 \cdot 5$$
$$A = 30 \text{ square units}$$

4 / 23

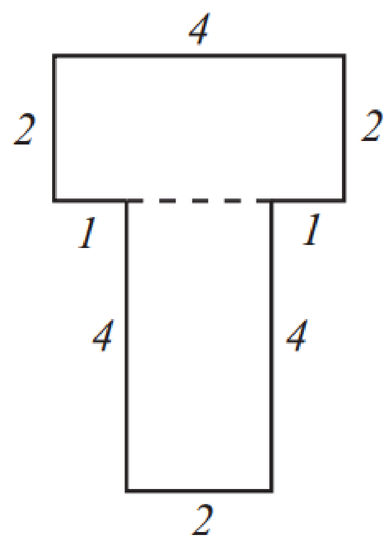
2006 Q6

6. The letter T is formed by placing two 2 inch $\times$ 4 inch rectangles next to each other, as shown. What is the perimeter of the T, in inches?

(A) 12 **(B)** 16 **(C)** 20 **(D)** 22 **(E)** 24



6. **(C)**



The perimeter is $4+2+1+4+2+4+1+2=20$ inches.

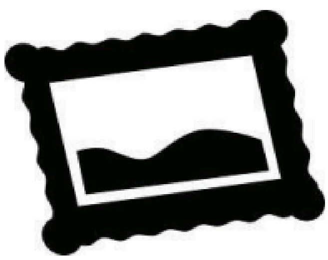
OR

Each rectangle has perimeter $= 2l + 2w = 2(4) + 2(2) = 8 + 4 = 12$ inches. When the two rectangles are positioned to form the T, a two-inch segment of each rectangle is inside the T and is not on the perimeter of the T. So the perimeter of the T is $2(12) - 2(2) = 24 - 4 = 20$ inches.

2012 Q6

6. A rectangular photograph is placed in a frame that forms a border two inches wide on all sides of the photograph. The photograph measures 8 inches high and 10 inches wide. What is the area of the border, in square inches?

(A) 36 **(B)** 40 **(C)** 64 **(D)** 72 **(E)** 88



6. **Answer (E):** The width of the frame is $10+2+2=14$ inches, and its height is $8+2+2=12$ inches. It encloses an area of $14\times12=168$ square inches. The photograph occupies $10\times8=80$ square inches of that area, so the area of the border itself is $168-80=88$ square inches.

6 / 23

2014 Q6

6. Six rectangles each with a common base width of 2 have lengths of $1, 4, 9, 16, 25$, and 36. What is the sum of the areas of the six rectangles?

(A) 91 **(B)** 93 **(C)** 162 **(D)** 182 **(E)** 202

6. **Answer (D):** The areas of the six rectangles are 2, 8, 18, 32, 50, and 72. Adding yields 182.

OR

The sum of areas is

$$2\cdot1+2\cdot4+2\cdot9+2\cdot16+2\cdot25+2\cdot36=2(1+4+9+16+25+36)=2\cdot91=182.$$

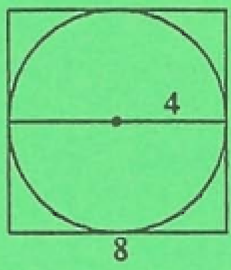
7 / 23

1997 Q7

7. The area of the smallest square that will contain a circle of radius 4 is

(A) 8 **(B)** 16 **(C)** 32 **(D)** 64 **(E)** 128

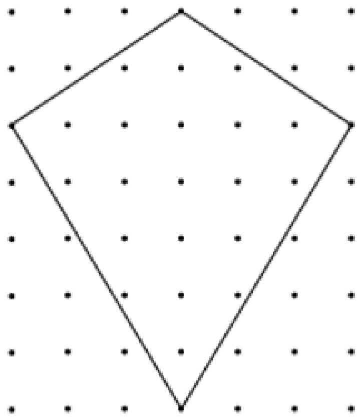
7. **(D)** The smallest square has side 8 and area $8^2 = 64$.



8 / 23

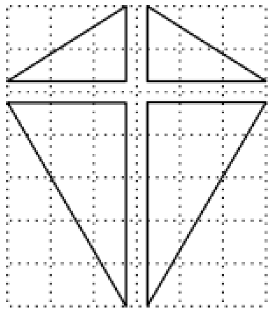
2001 Q7

To promote her school's annual Kite Olympics, Genevieve makes a small kite and a large kite for a bulletin board display. The kites look like the one in the diagram. For her small kite Genevieve draws the kite on a one-inch grid. For the large kite she triples both the height and width of the entire grid.



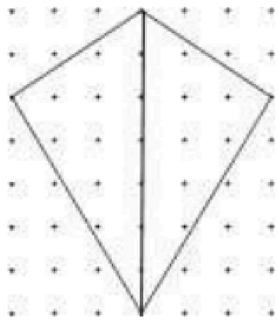
7. What is the number of square inches in the area of the small kite?

(A) 21 (B) 22 (C) 23 (D) 24 (E) 25



7. (A) The area is made up of two pairs of congruent triangles. The top two triangles can be arranged to form a 2×3 rectangle. The bottom two triangles can be arranged to form a 5×3 rectangle. The kite's area is $6+15 = 21$ square inches.

OR



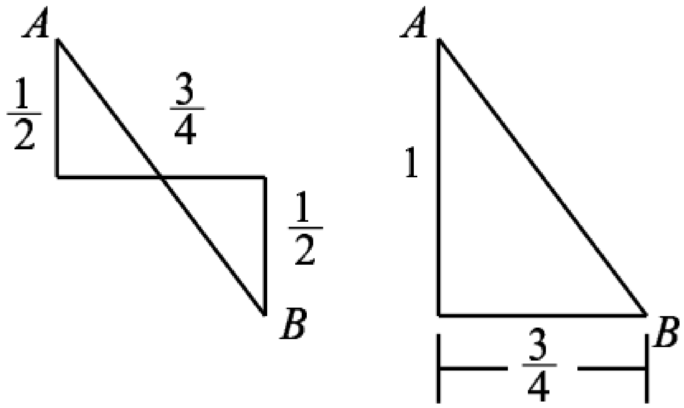
The kite can be divided into two triangles, each with base 7 and altitude 3. Each area is $(1/2)(7)(3) = 10.5$, so the total area is $2(10.5) = 21$ square inches.

2005 Q7

7. Bill walks $\frac{1}{2}$ mile south, then $\frac{3}{4}$ mile east, and finally $\frac{1}{2}$ mile south. How many miles is he, in a direct line, from his starting point?

(A) 1 **(B)** $1\frac{1}{4}$ **(C)** $1\frac{1}{2}$ **(D)** $1\frac{3}{4}$ **(E)** 2

7. **(B)** The diagram on the left shows the path of Bill's walk. As the diagram on the right illustrates, he could also have walked from A to B by first walking 1 mile south then $\frac{3}{4}$ mile east.



By the Pythagorean Theorem,

$$(AB)^2 = 1^2 + \left(\frac{3}{4}\right)^2 = 1 + \frac{9}{16} = \frac{25}{16},$$

so $AB = \frac{5}{4} = 1\frac{1}{4}$.

2006 Q7

7. Circle X has a radius of π. Circle Y has a circumference of 8π. Circle Z has an area of 9π. List the circles in order from smallest to largest radius.

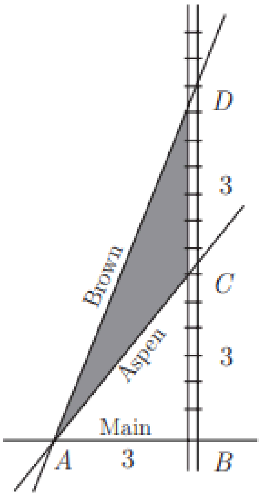
(A) X, Y, Z **(B)** Z, X, Y **(C)** Y, X, Z **(D)** Z, Y, X **(E)** X, Z, Y

7. **(B)** Because circumference $C = 2\pi r$ and circle Y has circumference 8π, its radius is $\frac{8\pi}{2\pi} = 4$. Because area $A = \pi r^2$ and circle Z has area 9π, its radius is $\sqrt{9} = 3$. Ordering the radii gives $3 < \pi < 4$, so the circles in ascending order of radii length are Z, X and Y.

2009 Q7

7. The triangular plot of land ACD lies between Aspen Road, Brown Road and a railroad. Main Street runs east and west, and the railroad runs north and south. The numbers in the diagram indicate distances in miles. The width of the railroad track can be ignored. How many square miles are in the plot of land ACD?

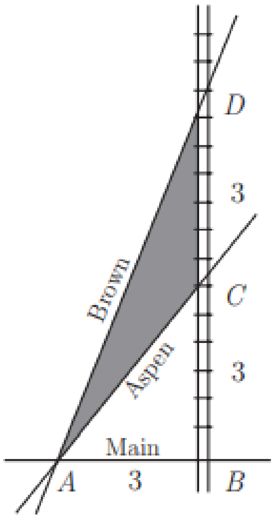
(A) 2 **(B)** 3 **(C)** 4.5 **(D)** 6 **(E)** 9



7. **Answer (C):** The area of $\triangle ABC$ is $\frac{1}{2}(3)(3) = \frac{9}{2}$ square miles. The area of $\triangle ABD = \frac{1}{2}(3)(6) = 9$ square miles. The shaded area is the area of $\triangle ABD$ minus the area of $\triangle ABC$, which is $9 - \frac{9}{2} = \frac{9}{2} = 4.5$ square miles.

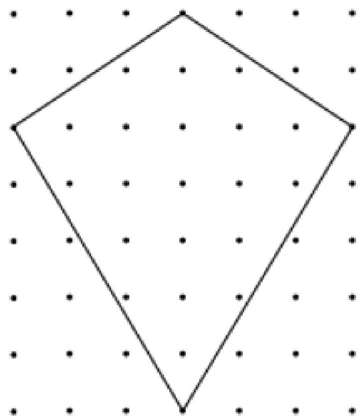
OR

The base $\overline{CD}$ of $\triangle ACD$ is 3 miles. The altitude $\overline{AB}$ of $\triangle ACD$ is 3 miles. The area of $\triangle ACD$ is $\frac{1}{2} \cdot 3 \cdot 3 = \frac{9}{2} = 4.5$ squares miles.



2001 Q8

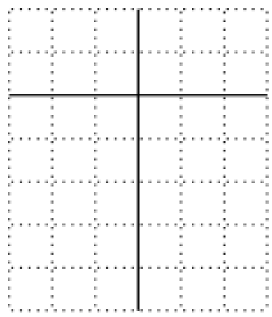
To promote her school's annual Kite Olympics, Genevieve makes a small kite and a large kite for a bulletin board display. The kites look like the one in the diagram. For her small kite Genevieve draws the kite on a one-inch grid. For the large kite she triples both the height and width of the entire grid.



7. What is the number of square inches in the

8. Genevieve puts bracing on her large kite in the form of a cross connecting opposite corners of the kite. How many inches of bracing material does she need?

(A) 30 (B) 32 (C) 35 (D) 38 (E) 39



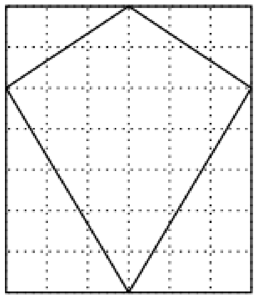
8. (E) The small kite is 6 inches wide and 7 inches high, so the larger kite is 18 inches wide and 21 inches high. The amount of bracing needed is $18 + 21 = 39$ inches.

2001 Q9

9. The large kite is covered with gold foil. The foil is cut from a rectangular piece that just covers the entire grid. How many square inches of waste material are cut off from the four corners?

(A) 63 (B) 72 (C) 180 (D) 189 (E) 264

9. (D) The upper corners can be arranged to form a 6×9 rectangle and the lower corners can be arranged to form a 15×9 rectangle. The total area is $54 + 135 = 189$ square inches. (Note that the kite's area is also 189 square inches.)



OR

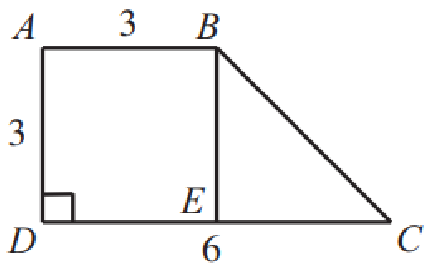
The area cut off equals the area of the kite. If each dimension is tripled, the area is $3 \times 3 = 9$ times as large as the original area and $21 \times 9 = 189$ square inches. In general, if one dimension is multiplied by a number x and the other by a number y, the area is multiplied by $x \times y$.

14 / 23

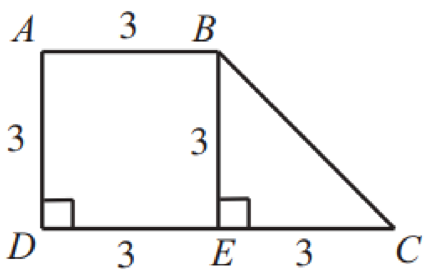
2007 Q8

8. In trapezoid $ABCD$, $\overline{AD}$ is perpendicular to $\overline{DC}$, $AD = AB = 3$, and $DC = 6$. In addition, E is on $\overline{DC}$, and $\overline{BE}$ is parallel to $\overline{AD}$. Find the area of $\triangle BEC$.

(A) 3 **(B)** 4.5 **(C)** 6 **(D)** 9 **(E)** 18



8. **(B)** Note that $ABED$ is a square with side 3. Subtract DE from DC, to find that $\overline{EC}$, the base of $\triangle BEC$, has length 3. The area of $\triangle BEC$ is $\frac{1}{2} \cdot 3 \cdot 3 = \frac{9}{2} = 4.5$.



OR

The area of the $\triangle BEC$ is the area of the trapezoid $ABCD$ minus the area of the square $ABED$. The area of $\triangle BEC$ is $\frac{1}{2}(3+6)3 - 3^2 = 13.5 - 9 = 4.5$.

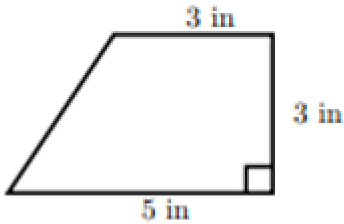
2003 Q8

Problems 8, 9 and 10 use the data found in the accompanying paragraph and figures.

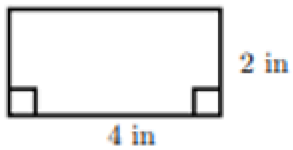
Bake Sale

Four friends, Art, Roger, Paul and Trisha, bake cookies, and all cookies have the same thickness. The shapes of the cookies differ, as shown.

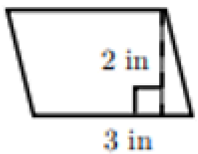
- Art's cookies are trapezoids:



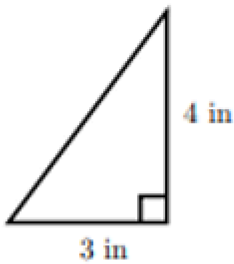
- Roger's cookies are rectangles:



- Paul's cookies are parallelograms:



- Trisha's cookies are triangles:



Each friend uses the same amount of dough, and Art makes exactly 12 cookies.

8. Who gets the fewest cookies from one batch of cookie dough?

(A) Art **(B)** Paul **(C)** Roger **(D)** Trisha **(E)** There is a tie for fewest.

8. **(A)** Because all of the cookies have the same thickness, only the surface area of their shapes needs to be considered. The surface area of each of Art's trapezoid cookies is $\frac{1}{2} \cdot 3 \cdot 8 = 12$ in^2. Since he makes 12 cookies, the surface area of the dough is $12 \times 12 = 144$ in^2.

Roger's rectangle cookies each have surface area $2 \cdot 4 = 8$ in^2; therefore, he makes $144 \div 8 = 18$ cookies.

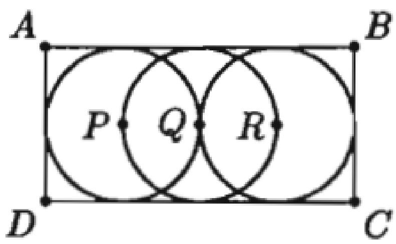
Paul's parallelogram cookies each have surface area $2 \cdot 3 = 6$ in^2. He makes $144 \div 6 = 24$ cookies.

Trisha's triangle cookies each have surface area $\frac{1}{2} \cdot 4 \cdot 3 = 6$ in^2. She makes $144 \div 6 = 24$ cookies.

So Art makes the fewest cookies.

1995 Q9

9. Three congruent circles with centers P, Q and R are tangent to the sides of rectangle $ABCD$ as shown. The circle centered at Q has diameter 4 and passes through points P and R. The area of the rectangle is



(A) 16 **(B)** 24 **(C)** 32
(D) 64 **(E)** 128

9. **(C)** Since the length of $\overline{BC}$ is the same as the diameter of the circle with center Q, it follows that $BC = 4$. Since the circles with centers P and R are tangent to the parallel sides $\overline{AB}$ and $\overline{DC}$, the diameters of these circles are also 4. The sum of the diameters of the circles with centers P and R gives the length of $\overline{AB}$, so $AB = 4 + 4 = 8$. Hence the area of the rectangle is $8 \times 4 = 32$.

OR

The radius of the circle with center Q is $4/2 = 2$, so $PQ = RQ = 2$. But $\overline{PQ}$ and $\overline{RQ}$ are also radii of the circles with centers P and R, respectively, so all three circles have radius 2. Hence $AB = 8$ and $BC = 4$, so the area of the rectangle is $8 \times 4 = 32$.

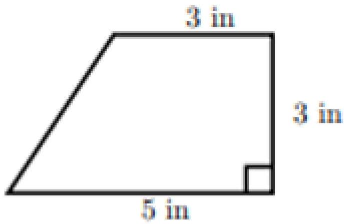
2003 Q9

Problems 8, 9 and 10 use the data found in the accompanying paragraph and figures.

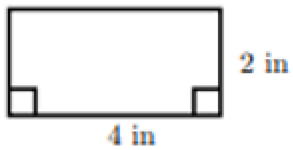
Bake Sale

Four friends, Art, Roger, Paul and Trisha, bake cookies, and all cookies have the same thickness. The shapes of the cookies differ, as shown.

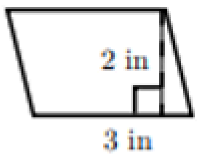
- Art's cookies are trapezoids:



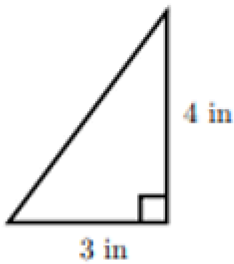
- Roger's cookies are rectangles:



- Paul's cookies are parallelograms:



- Trisha's cookies are triangles:



Each friend uses the same amount of dough, and Art makes exactly 12 cookies.

9. Art's cookies sell for 60¢ each. To earn the same amount from a single batch, how much should one of Roger's cookies cost?

(A) 18¢ **(B)** 25¢ **(C)** 40¢ **(D)** 75¢ **(E)** 90¢

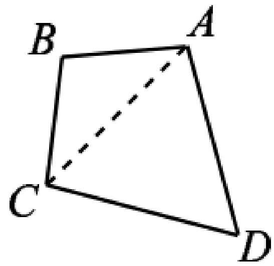
9. **(C)** Art's 12 cookies sell for $12 \times \$0.60 = \$7.20$. Roger's 18 cookies should cost $\$7.20 \div 18 = \$.40$ each.

OR

The trapezoid's area is 12 in^2 and the rectangle's area is 8 in^2. So the cost of a rectangle cookie should be $\left(\frac{8}{12}\right) 60¢ = 40¢$.

2005 Q9

9. In quadrilateral $ABCD$, sides $\overline{AB}$ and $\overline{BC}$ both have length 10, sides $\overline{CD}$ and $\overline{DA}$ both have length 17, and the measure of angle ADC is 60°. What is the length of diagonal $\overline{AC}$?



(A) 13.5 **(B)** 14 **(C)** 15.5 **(D)** 17 **(E)** 18.5

9. **(D)** Triangle ACD is an isosceles triangle with a 60° angle, so it is also equilateral. Therefore, the length of $\overline{AC}$ is 17.

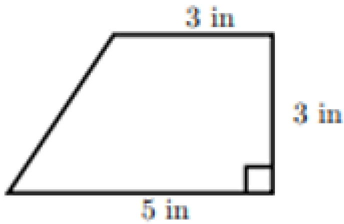
2003 Q10

Problems 8, 9 and 10 use the data found in the accompanying paragraph and figures.

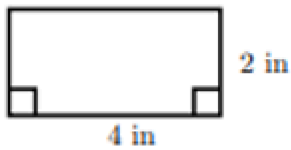
Bake Sale

Four friends, Art, Roger, Paul and Trisha, bake cookies, and all cookies have the same thickness. The shapes of the cookies differ, as shown.

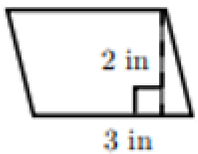
- Art's cookies are trapezoids:



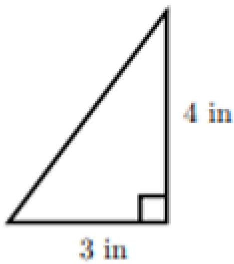
- Roger's cookies are rectangles:



- Paul's cookies are parallelograms:



- Trisha's cookies are triangles:



Each friend uses the same amount of dough, and Art makes exactly 12 cookies.

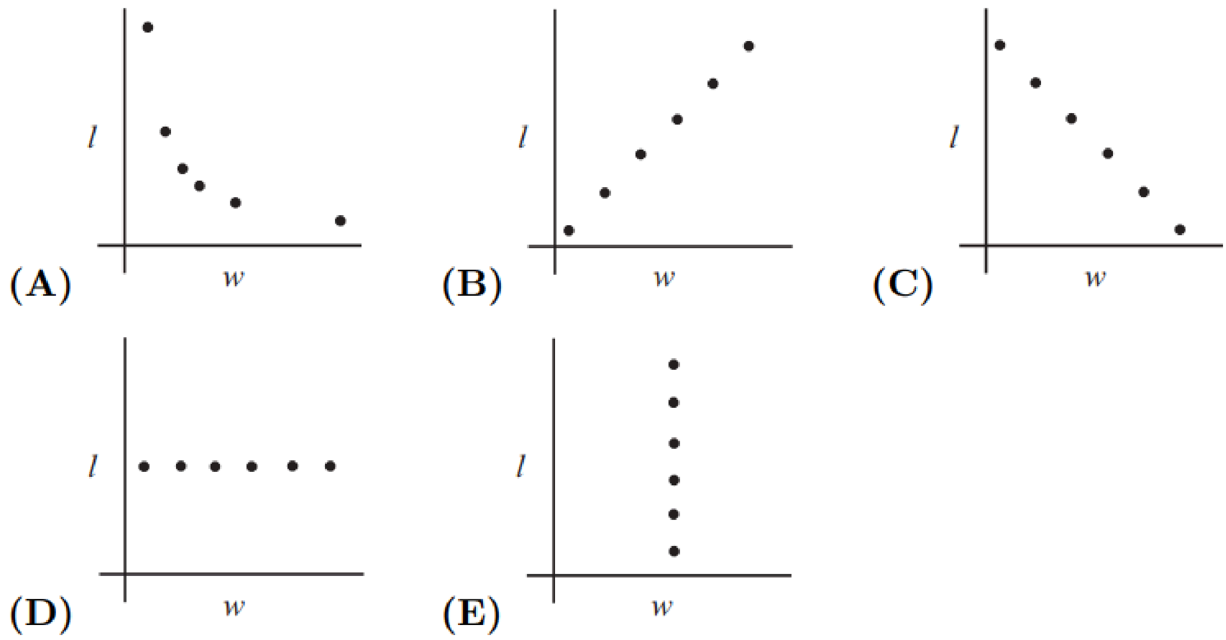
10. How many cookies will be in one batch of Trisha's cookies?

(A) 10 **(B)** 12 **(C)** 16 **(D)** 18 **(E)** 24

10. **(E)** The triangle's area is 6 in^2, or half that of the trapezoid. So Trisha will make twice as many cookies as Art, or 24.

2006 Q10

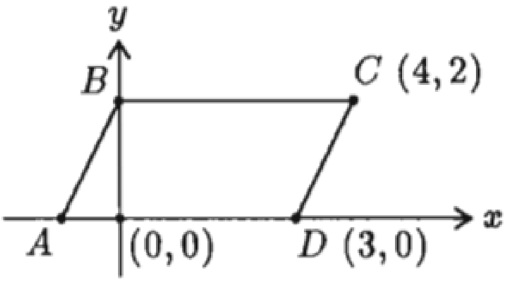
10. Jorge's teacher asks him to plot all the ordered pairs (w, l) of positive integers for which w is the width and l is the length of a rectangle with area 12. What should his graph look like?



10. **(A)** When the area of a rectangle is 12 square units and the sides are integers, the factors of 12 are the possible lengths of the sides. In point form, the side lengths could be $(1, 12), (2, 6), (3, 4), (4, 3), (6, 2)$ and $(12, 1)$. Only graph A fits these points.

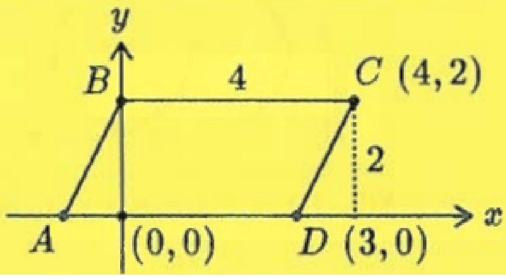
1991 Q10

10. The area in square units of the region enclosed by parallelogram $ABCD$ is



(A) 6 **(B)** 8 **(C)** 12
(D) 15 **(E)** 18

10. **(B)** The parallelogram rests on the horizontal axis. Since the coordinates of point C are $(4,2)$, it follows that the height of the parallelogram is 2. Since point B is $(0,2)$, it follows that the length of the base $\overline{BC}$ is 4. The area of a parallelogram is base times height. Thus the area is $4 \times 2 = 8$.



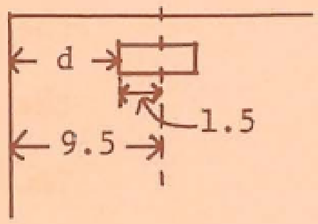
10. A picture 3 feet across is hung in the center of a wall that is 19 feet wide. How many feet from the end of the wall is the nearest edge of the picture?

A) $1\frac{1}{2}$ B) 8 C) $9\frac{1}{2}$ D) 16 E) 22

1986 Q10

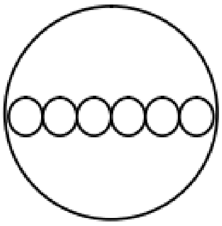
10. (B) Using the diagram, we see that the distance

d = 9.5 feet - 1.5 feet = 8 feet.



2010 Q10

10. Six pepperoni circles will exactly fit across the diameter of a 12-inch pizza when placed as shown. If a total of 24 circles of pepperoni are placed on this pizza without overlap, what fraction of the pizza is covered by pepperoni?



(A) $\frac{1}{2}$ **(B)** $\frac{2}{3}$ **(C)** $\frac{3}{4}$ **(D)** $\frac{5}{6}$ **(E)** $\frac{7}{8}$

10. **Answer (B):** If six pepperonis fit across the diameter, then each pepperoni circle has a diameter of 2 inches and a radius of 1 inch. The area of each

pepperoni is $\pi(1)^2 = \pi$ square inches. The 24 pepperoni circles cover 24π square inches of the pizza. The area of the pizza is $\pi(6)^2 = 36\pi$ square inches. The fraction of the pizza covered by pepperoni is $\frac{24\pi}{36\pi} = \frac{2}{3}$.