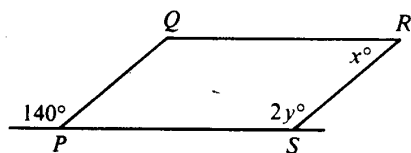# *Category 11 Quadrilateral & Other Polygons*

1. **What is the area of a square with perimeter P ?**

   (A) $16P^2$

   (B) $4P$

   (C) $\dfrac{P^2}{4}$

   (D) $\dfrac{P}{16}$

   (E) $\dfrac{P^2}{16}$

2. **If the area of a square region having sides of length 6 centimeters is equal to the area of a rectangular region having width 2.5 centimeters, then the length of the rectangle, in centimeters, is**

   (A) 8.5

   (B) 9.5

   (C) 9.6

   (D) 10.5

   (E) 14.4

3. **In the figure above, if $PQRS$ is a parallelogram, then $y - x =$**
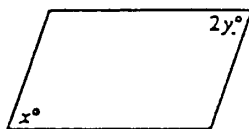
   (A) 30   (B) 35   (C) 40   (D) 70   (E) 100

4. A rectangular circuit board is designed to have width w inches, perimeter p inches, and area k square inches. Which of the following equations must be true?

   (A) $w^2 + pw + k = 0$

   (B) $w^2 - pw + 2k = 0$

   (C) $2w^2 + pw + 2k = 0$

   (D) $2w^2 - pw - 2k = 0$

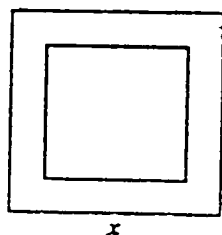   (E) $2w^2 - pw + 2k = 0$

5. The size of a television screen is given as the length of the screen's diagonal. If the screens were flat, then the area of a square 21-inch screen would be how many square inches greater than the area of a square 19-inch screen?

   (A)   2

   (B)   4

   (C)   16

   (D)   38

   (E)   40

6. If the figure above is a parallelogram, what is the value of y in terms of x ?
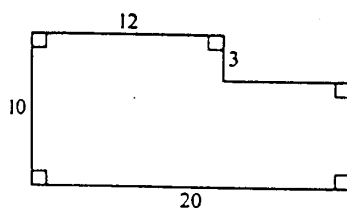
   (A) $\dfrac{x}{2}$

   (B) $2x$

   (C) $90 - x$

   (D) $180 - \dfrac{x}{2}$

   (E) $\dfrac{180 - x}{2}$

Note : **Not drawn to scale.**

7. The figure above represents a square plot measuring x feet on a side. The plot consists of a rectangular garden, 48 square feet in area, surrounded by a walk that is 3 feet wide on two opposite sides and 2 feet wide on the other two sides. What is the value of x ?

   (A)   8

   (B)   10

   (C)   12

   (D)   16

   (E)   18

8. What is the area of the region enclosed by the figure above?

   (A)   116

   (B)   144

   (C)   176

   (D)   179

   (E)   284

9. The sum of the interior angles of any polygon with n sides is $180(n-2)$ degrees. If the sum of the interior angles of polygon P is three times the sum of the interior angles of quadrilateral Q, how many sides does P have?

   (A)   6

   (B)   8

   (C)   10

   (D)   12

   (E)   14

10. The perimeter of a rectangular flower bed is 100 feet. What is the area of the flower bed, in square feet, if its length is 10 feet greater than its width?

(A)   400

(B)   500

(C)   600

(D)   900

(E)   2,400
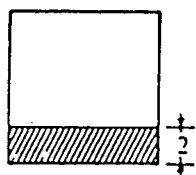
11. In the figure above, the shaded rectangular portion of the square region has perimeter 20. What is the perimeter of the unshaded portion?

(A)   28

(B)   34

(C)   36

(D)   40

(E)   68
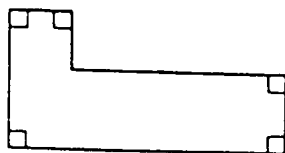

12. In the figure above, $x =$

(A)   75
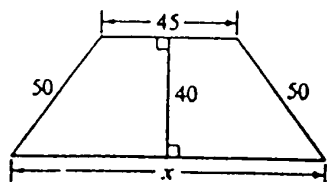
(B)   90

(C)   100

(D)   105

(E)   150

13. A square picture frame has an outer perimeter of 36 inches and is 1 inch wide on all sides. What is the inner perimeter of the frame, in inches?

   (A)   27

   (B) $27\frac{1}{2}$

   (C)   28

   (D) $31\frac{1}{2}$

   (E)   32

\<High Level Questions\>

14. The figure shown above has area A . If the length of each side were doubled, what would then be the area in terms of A ?

   (A) $2\,A$

   (B) $4\,A$

   (C) $6\,A$

   (D) $8\,A$

   (E) $20\,A$

15. The area of a rectangular garden would be increased by 150 square feet if either the length were increased by 7.5 feet or the width were increased by 5 feet. What is the area of the garden, in square feet?

   (A)   600

   (B)   525

   (C)   375

   (D)   300

   (E)   225
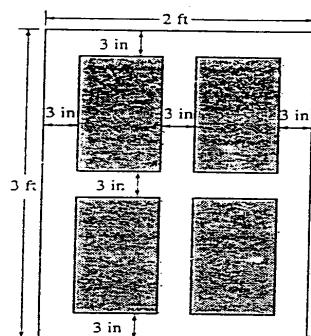
16. The figure above represents a window, with the shaded regions representing the openings for the glass. If all line segments in the figure are either horizontal or vertical ad the openings are all the same size, what are the dimensions, in inches, of each opening? (1 foot = 12 inches)

(A)   12.0 by 18.0
(B)   10.5 by 16.5
(C)   9.0 by 15.0
(D)   8.0 by 10.0
(E)   7.5 by 13.5
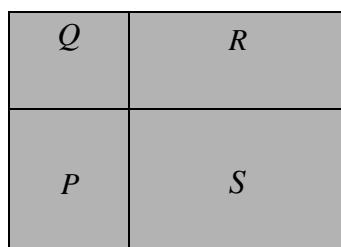
17. The figure above shows a rectangular parcel of undeveloped land partitioned into four regions, P, Q, R, and S. In square meters, the area of square region Q is x^2, the area of rectangular region R is $5x$, and the area of rectangular region P is $4x$. What is the area, in square meters, of rectangular region S?

(A) $x^2 - x$
(B) $x^2 + 9x$
(C) $20x - x^2$
(D) 9
(E) 20

18. A rectangular-shaped carpet remnant that measures x feet by y feet is priced at $50. What is the cost of the carpet, in dollars per square yard? (9 square feet = 1 square yard)

(A) $50xy$

(B) $450xy$

(C) $\dfrac{xy}{9}$

(D) $\dfrac{xy}{50}$

(E) $\dfrac{450}{xy}$

19. A rectangular circuit board is designed to have width w inches, perimeter p inches, and area k square inches. Which of the following equations must be true?

(A) $w^2 + pw + k = 0$

(B) $w^2 - pw + 2k = 0$

(C) $2w^2 + pw + 2k = 0$

(D) $2w^2 - pw - 2k = 0$

(E) $2w^2 - pw + 2k = 0$

20. The size of a television screen is given as the length of the screen's diagonal. If the screens were flat, then the area of a square 21-inch screen would be how many square inches greater than the area of a square 19-inch screen?

(A) 2

(B) 4

(C) 16

(D) 38

(E) 40

21.   The dimensions of a rectangular floor are 16 feet by 20 feet. When a rectangular rug is placed on the floor, a strip of floor 3 feet wide is exposed on all sides. What are the dimensions of the rug, in fee?

(A)   10 by 14

(B)   10 by 17

(C)   13 by 14

(D)   13 by 17

(E)   14 by 16

22. A square board that has an area of 25 square inches is to be cut into pieces, each of which is a square with sides of length 1, 2, or 3 inches. What is the least number of such square pieces into which the board can be cut?
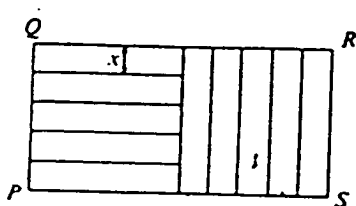
(A)   5

(B)   6

(C)   7

(D)   8

(E)   9
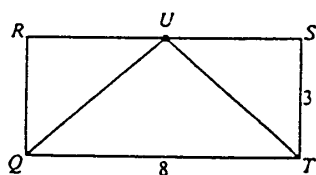
23. In rectangle $QRST$ above, $RU = SU$. What is the ratio of the perimeter of $\triangle QUT$ to the perimeter of rectangle $QRST$?
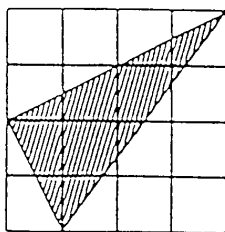
(A) $\dfrac{3}{8}$ (B) $\dfrac{1}{2}$ (C) $\dfrac{5}{8}$ (D) $\dfrac{3}{4}$ (E) $\dfrac{9}{11}$

24. The area of each of the 16 square regions in the figure above is T. What is the area of the shaded region?

(A) $\dfrac{13T}{3}$

(B) $5T$

(C) $\dfrac{16T}{3}$

(D) $\dfrac{11T}{2}$

(E) $7T$

25. Rectangular region $PQRS$ shown above is partitioned into ten identical smaller rectangular regions, each of which has width x. What is the perimeter of $PQRS$ in terms of x?

(A) $15x$

(B) $25x$

(C) $30x$

(D) $50x$

(E) It cannot be determined from the information given.

STOP

Category 11 Quadrilateral & Other Polygons

1. What is the area of a square with perimeter P ?

   (A) $16P^2$

   (B) $4P$

   (C) $\dfrac{P^2}{4}$

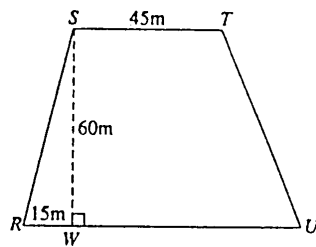   (D) $\dfrac{P}{16}$

   (E) $\dfrac{P^2}{16}$

   P $\dfrac{p}{4}$, $(\dfrac{p}{4})^2 = \dfrac{p^2}{16}$

   ☞   (E)

2. If the area of a square region having sides of length 6 centimeters is equal to the area of a rectangular region having width 2.5 centimeters, then the length of the rectangle, in centimeters, is

   (A)   8.5

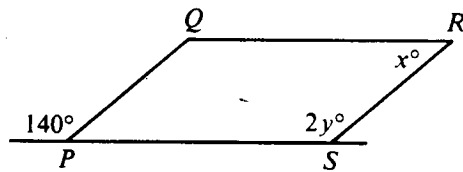   (B)   9.5

   (C)   9.6

   (D)   10.5

   (E)   14.4

   6   2.5 centimeters   ,

   $. 36 = 2.5 \times P \Rightarrow P = 14.4$

   ☞   (E)

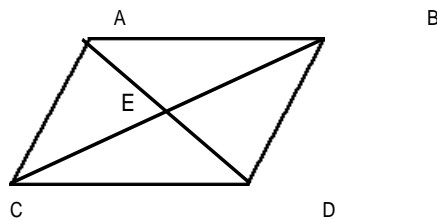3. **In the figure above, if** *PQRS* **is a parallelogram, then** $y - x =$

 (A) **30**   (B) 35   (C) 40   (D) 70   (E) 100

PQ   RS   . 2y   x   (

180   )   2y = 140, x = 40   .   y = 70   . $y - x = 30$

☞   (A)

<Properties of Parallelograms(   )>

 ● *AB ||CD, AC ||BD*
 ● *AB = CD, AC = BD*
 ● ∠*A = ∠D, ∠B = ∠C*
 ● *AE = ED, CE = EB*
 ● ∠*A + ∠B = 180, ∠B + ∠D = 180, ∠D + ∠C = 180, ∠C + ∠A = 180*

4. **A rectangular circuit board is designed to have width** *w* **inches, perimeter** *p* **inches, and area** *k* **square inches. Which of the following equations must be true?**

 (A) $w^2 + pw + k = 0$
 (B) $w^2 - pw + 2k = 0$
 (C) $2w^2 + pw + 2k = 0$
 (D) $2w^2 - pw - 2k = 0$
 (E) $2w^2 - pw + 2k = 0$

① *= length ´ width(=w) = k*, ② *= 2length + 2w*

length   *L*   *L ´ w = k, 2L + 2w = P.*   L

L = $2w^2 - pw + 2k = 0$

☞   (E)

5. The size of a television screen is given as the length of the screen's diagonal. If the screens were flat, then the area of a square 21-inch screen would be how many square inches greater than the area of a square 19-inch screen?

(A) 2　　　(B) 4　　　(C) 16　　　(D) 38　　　(E) **40**

Television screen ,

21 inch 19 inch

．

21 x (x^2) : $2x^2 = 21^2 \Rightarrow x^2 = \dfrac{441}{2}$

19 y (y^2) : $2y^2 = 19^2 \Rightarrow y^2 = \dfrac{361}{2}$

$$= \frac{441}{2} - \frac{361}{2} = 40$$

☞ (E)
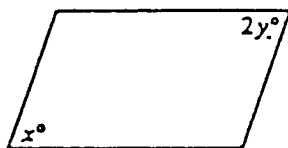
6. If the figure above is a parallelogram, what is the value of y in terms of x?

(A) $\dfrac{x}{2}$

(B) $2x$

(C) $90 - x$
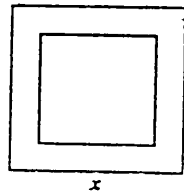
(D) $180 - \dfrac{x}{2}$

(E) $\dfrac{180 - x}{2}$

" " ． x = 2y ．

y $y = \dfrac{x}{2}$

☞ (A)

Note : **Not drawn to scale.**

7. The figure above represents a square plot measuring x feet on a side. The plot consists of a rectangular garden, 48 square feet in area, surrounded by a walk that is 3 feet wide on two opposite sides and 2 feet wide on the other two sides. What is the value of x ?

    (A)   8

    (B)   10

    (C)   12

    (D)   16

    (E)   18

(plot)   48 square feet   ,   3 feet

2 feet x .

a   b $ab = 48$.   6 ,   4

. $a + 6 = b + 4$ ﬔ $a - b = -2$

① $a \cdot b = 48$ ② $a - b = -2$ ①   ② $a = 6 , b = 8$

a   b $a + 6$ $b + 4$ x .

☞   (C)
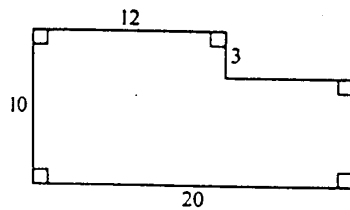

<   >

Quadrilaterals(   ) > Trapezoid(   ) > Parallelogram(   ) >
Rectangle(   ) >   Square(   )
Rhombus(   )

:   ,   .

:

:

8. **What is the area of the region enclosed by the figure above?**

   (A)   116   (B)   144   (C)   **176**   (D)   179   (E)   284

☞   (C)

9. **The sum of the interior angles of any polygon with** n **sides is** $180(n-2)$ **degrees. If the sum of the interior angles of polygon** P **is three times the sum of the interior angles of quadrilateral** Q, **how many sides does** P **have?**

   (A)   6   (B)   **8**   (C)   10   (D)   12   (E)   14

   $180(n-2)$ 3

$180(n-2) = 3(360) \Rightarrow n = 8$

☞   (B)

10.   **The perimeter of a rectangular flower bed is 100 feet. What is the area of the flower bed, in square feet, if its length is 10 feet greater than its width?**

   (A)   400
   (B)   500
   (C)   **600**
   (D)   900
   (E)   2,400

   length = L, width = W   2L + 2W = 100feet.   L = W + 10
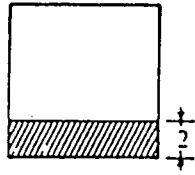
            .   2L + 2W = 100feet   W = 20, L = 30.
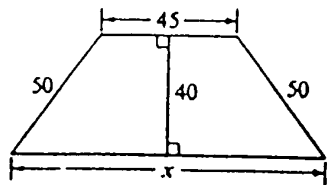
600   .

☞   (C)

11. In the figure above, the shaded rectangular portion of the square region has perimeter 20. What is the perimeter of the unshaded portion?

  (A) **28**
  (B) 34
  (C) 36
  (D) 40
  (E) 68

shaded   2   20   8   .   8

                                                8   unshaded

$8 - 2 = 6.$ unshaded $8 + 8 + 6 + 6 = 28$

✍ (A)

12. In the figure above, $x =$

  (A) 75
  (B) 90
  (C) 100
  (D) **105**
  (E) 150
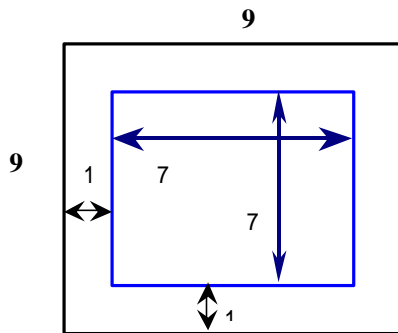
.

        50   40 $50^2 = 40^2 + a^2$. $a = 30.$

$x = 30 + 45 + 30 = 105$

✍ (D)

13. A square picture frame has an outer perimeter of 36 inches and is 1 inch wide on all sides. What is the inner perimeter of the frame, in inches?

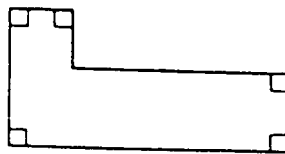(A) 27 (B) $27\frac{1}{2}$ (C) 28 (D) $31\frac{1}{2}$ (E) 32

Inner frame   4×7 = 28
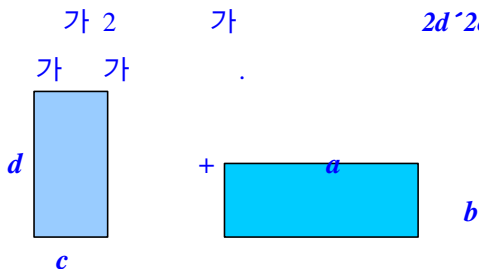
☞   (C)

\<High Level Questions\>

14. The figure shown above has area A. If the length of each side were doubled, what would then be the area in terms of A?

(A) $2A$ (B) $4A$ (C) $6A$ (D) $8A$ (E) $20A$

$$cd + ab = A$$.

2   2d´2c = 4dc   2a´2b =4ab   A   4

.

d   +   a

c   b

▦   (B)

15. The area of a rectangular garden would be increased by 150 square feet if either the length were increased by 7.5 feet or the width were increased by 5 feet. What is the area of the garden, in square feet?

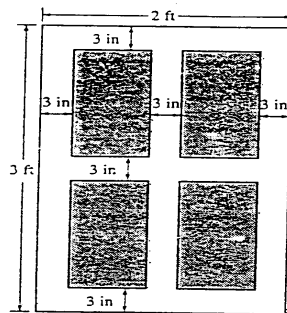   (A) **600**   (B)   525   (C)   375   (D)   300   (E)   225

area( ) A, length( ) L, width( ) W :

① $(L + 7.5)(W) = A + 150,$ ② $L´(W + 5) = A + 150$

$L´W = A$ $L´W$ A $L = 20, W=30$
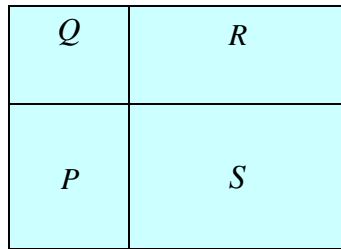
600 .

(A)

16. The figure above represents a window, with the shaded regions representing the openings for the glass. If all line segments in the figure are either horizontal or vertical ad the openings are all the same size, what are the dimensions, in inches, of each opening? (1 foot = 12 inches)

    (A)   12.0 by 18.0

    (B)   10.5 by 16.5

    (C)   9.0 by 15.0

    (D)   8.0 by 10.0

    (E)   **7.5 by 13.5**

3ft = 36 inches   36 inches − (3+3+3) = 27 inches   2

13.5 inches .   13.5   (E)   !

.

(E)

Q	R
P	S

17. The figure above shows a rectangular parcel of undeveloped land partitioned into four regions, P, Q, R, and S. In square meters, the area of square region Q is x^2, the area of rectangular region R is $5x$, and the area of rectangular region P is $4x$. What is the area, in square meters, of rectangular region S?

(A) $x^2 - x$

(B) $x^2 + 9x$

(C) $20x - x^2$

(D) 9

(E) **20**

S . S R

     P .

   Q x R x R $5x$ 5

    . P 4   . S 20.

(E)

18. A rectangular-shaped carpet remnant that measures x feet by y feet is priced at \$50. What is the cost of the carpet, in dollars per square yard? (9 square feet = 1 square yard)

(A) $50xy$ (B) $450xy$ (C) $\dfrac{xy}{9}$ (D) $\dfrac{xy}{50}$ (E) $\dfrac{450}{xy}$

$x \times y\,feet = 50\,dollars \Rightarrow 1$ square feet $= \dfrac{1}{9}$ square yard

1 square yard $= \dfrac{450}{xy}$

(E)

19. A rectangular circuit board is designed to have width w inches, perimeter p inches, and area k square inches. Which of the following equations must be true?

   (A) $w^2 + pw + k = 0$

   (B) $w^2 - pw + 2k = 0$

   (C) $2w^2 + pw + 2k = 0$

   (D) $2w^2 - pw - 2k = 0$

   (E) $2w^2 - pw + 2k = 0$

            L

  ① $2W + 2L = p$ ② $L \times W = k$

         L $2w^2 - pw + 2k = 0$

         (E)

20. The size of a television screen is given as the length of the screen's diagonal. If the screens were flat, then the area of a square 21-inch screen would be how many square inches greater than the area of a square 19-inch screen?

   (A)   2

   (B)   4

   (C) 16

   (D) 38

   (E) **40**

TV   ,   .

        21-inch   ,   19-inch

                  .

        21-inch   a a^2 .

$2a^2 = (21)^2 \Rightarrow a^2 = 441/2$

b^2 a $b^2 = 361/2$

$a^2 - b^2 = 80/2 = 40$

         (E)

21. The dimensions of a rectangular floor are 16 feet by 20 feet. When a rectangular rug is placed on the floor, a strip of floor 3 feet wide is exposed on all sides. What are the dimensions of the rug, in fee?
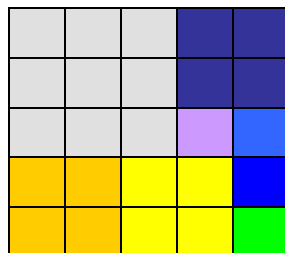
    (A) **10 by 14**
    (B) 10 by 17
    (C) 13 by 14
    (D) 13 by 17
    (E) 14 by 16

    16   20   rug   3 feet   rug
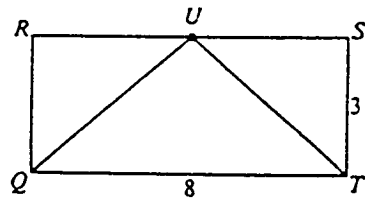   16 − 6 = 10   20 − 6 = 14   .

    (A)

22. A square board that has an area of 25 square inches is to be cut into pieces, each of which is a square with sides of length 1, 2, or 3 inches. What is the least number of such square pieces into which the board can be cut?

    (A) 5
    (B) 6
    (C) 7
    (D) **8**
    (E) 9

                            1 inch   1inch   5 inches   ,
        1, 2, or 3 inches
            8   .   !

    (D)

23. In rectangle $QRST$ above, $RU = SU$. What is the ratio of the perimeter of ΔQUT to the perimeter of rectangle $QRST$?

(A) $\dfrac{3}{8}$ (B) $\dfrac{1}{2}$ (C) $\dfrac{5}{8}$ (D) $\dfrac{3}{4}$ (E) ✓ $\dfrac{9}{11}$
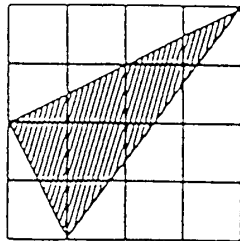
$$(QU)^2 = (UT)^2 = 4^2 + 3^2 = 5^2$$
$$\Delta QUT \qquad = 8 + 5 + 5 = 18$$
$$QRST \qquad = 8 + 8 + 3 + 3 = 22$$

the ratio of ΔQUT to $QRST = 18 : 22 = 9 : 11 = \dfrac{9}{11}$
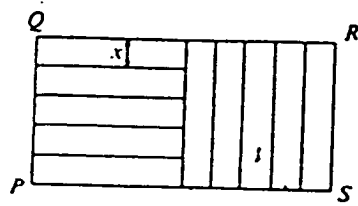
(E)

24. The area of each of the 16 square regions in the figure above is T. What is the area of the shaded region?

(A) $\dfrac{13T}{3}$ (B) $5T$ (C) $\dfrac{16T}{3}$ (D) $\dfrac{11T}{2}$ (E) $7T$

T $16\,T$ $16\,T$ unshaded region

shaded region   .

$16\,T - (4\,T + 6\,T + T) = 5\,T$

(B)

25. **Rectangular region** $PQRS$ **shown above is partitioned into ten identical smaller rectangular regions, each of which has width** x. **What is the perimeter of** $PQRS$ **in terms of** x?

   (A) $15x$

   (B) $25x$

   (C) $30x$

   (D) $50x$

   (E) It cannot be determined from the information given.

$PQ = 5x$, $RS = l$ $5x = l$.

$PS = 5x + l = 10x$

$$10x + 10x + 5x + 5x = 30x$$

(C)

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STOP