

Polynomial Word Problems

Worksheet - Answer Key

1. Find the area of a rectangle that has a width of x and a length of $(3x + 1)$

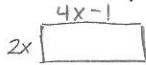


$$A = (L)(W)$$

$$A = (3x+1)(x)$$

$$A = 3x^2 + x$$

2. Find the perimeter of a rectangle that has a width of $2x$ and a length of $(4x - 1)$



$$P = 2(L) + 2(W)$$

$$P = 2(4x-1) + 2(2x)$$

$$P = 8x - 2 + 4x$$

$$P = 12x - 2$$

3. A square has a side length of $(2x + 3)$. What is its area and perimeter?



$$P = 4(\text{side})$$

$$P = 4(2x+3)$$

$$P = 8x + 12$$

4. If $x = 2$, what is the numerical area of the rectangle in question 2?

$$\begin{aligned} \text{Length} &= 4x - 1 \\ &= 4(2) - 1 \\ &= 8 - 1 \\ &= 7 \end{aligned}$$

$$\begin{aligned} \text{width} &= 2x \\ &= 2(2) \\ &= 4 \end{aligned}$$

$$\begin{aligned} \text{Area} &= (\text{Length})(\text{width}) \\ &= (7)(4) \\ &= 28 \text{ units}^2 \end{aligned}$$

5. A triangle has a base of $2x$ and a height of $(3x + 1)$. What is its area?

$$\begin{aligned} \text{Area}_{\Delta} &= \left(\frac{b \cdot h}{2}\right) = \frac{(2x)(3x+1)}{2} \\ &= \frac{6x^2 + 2x}{2} \\ &= 3x^2 + x \end{aligned}$$

6. If an isosceles triangle has a base of x and its other sides are three times the length of the base, what is the perimeter of the triangle?



$$P = a + b + c$$

$$P = 3x + x + 3x$$

$$P = 7x$$

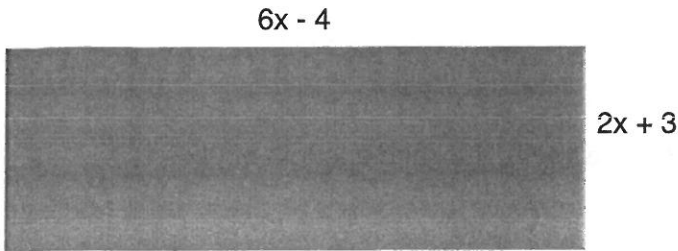
7. If the perimeter of the triangle in question 5 is 28, what are its dimensions?

$$\begin{aligned} P &= 7x \\ 28 &= 7x \\ \frac{28}{7} &= \frac{7x}{7} \\ x &= 4 \end{aligned}$$

$$\begin{aligned} \text{Side}_{1+2} &= 3x \\ &= 3(4) \\ &= 12 \text{ units} \end{aligned}$$

$$\begin{aligned} \text{Side}_3 &= x \\ &= 4 \text{ units} \end{aligned}$$

8. If the perimeter of the rectangle below is 62, what is the numerical area?



- a) Find the algebraic expression for the perimeter

$$\begin{aligned}
 P &= 2(\text{Length}) + 2(\text{width}) \\
 P &= 2(6x+4) + 2(2x+3) \\
 P &= 12x+8 + 4x+6 \\
 P &= 16x+14
 \end{aligned}$$

- b) Solve for x

$$\begin{aligned}
 P &= 16x+14 \\
 62 &= 16x+14 \\
 62-14 &= 16x \\
 48 &= 16x \\
 \frac{48}{16} &= \frac{16x}{16} \\
 x &= 3
 \end{aligned}$$

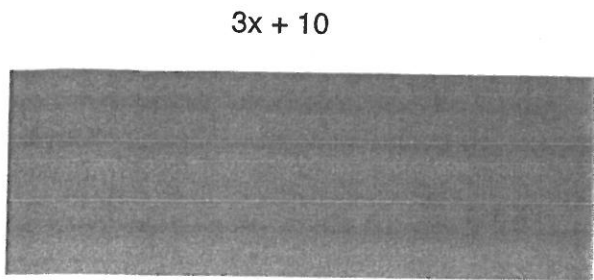
- c) Find the algebraic expression for the area

$$\begin{aligned}
 A &= (\text{Length})(\text{width}) \\
 &= (6x-4)(2x+3) \\
 &= 12x^2+18x-8x-12 \\
 &= 12x^2+10x-12
 \end{aligned}$$

- d) Use x to find the numerical area

$$\begin{aligned}
 A &= 12x^2+10x-12 \quad \text{and} \quad x=3 \\
 A &= 12(3)^2+10(3)-12 \\
 A &= 12(9)+10(3)-12 \\
 A &= 108+30-12 \\
 A &= 126 \text{ units}^2
 \end{aligned}$$

9. If the perimeter of the rectangle below is 64, what is the numerical ^{area} perimeter?

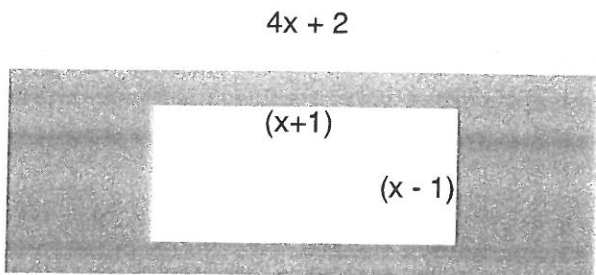


$$\begin{aligned} \text{Area} &= (\text{Length})(\text{width}) \\ &= (3x+10)(2x-4) \\ &= 6x^2 - 12x + 20x - 40 \\ &= 6x^2 + 8x - 40 \end{aligned}$$

$$\begin{aligned} A &= 6(5.2)^2 + 8(5.2) - 40 \\ A &= 6(27.04) + 41.6 - 40 \\ A &= 162.24 + 41.6 - 40 \\ A &= 207.84 \text{ units}^2 \end{aligned}$$

$$\begin{aligned} \text{Perimeter} &= 64 \text{ units}^2 \\ P &= 2(\text{Length}) + 2(\text{width}) \\ P &= 2(3x+10) + 2(2x-4) \\ P &= 6x + 20 + 4x - 8 \\ P &= 10x + 12 \\ \downarrow \\ 64 &= 10x + 12 \\ 64 - 12 &= 10x \\ \frac{52}{10} &= \frac{10x}{10} \\ x &= 5.2 \end{aligned}$$

9. Ashley has a pool that is surrounded by grass. If she wants to replace the grass with cement, what is the area of the section she wants to redo? (what is the area of the grass)

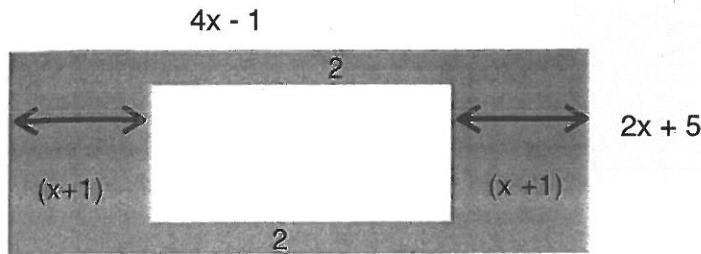


$$\begin{aligned} A_{\text{big}} &= (\text{Length})(\text{width}) \\ &= (4x+2)(3x+3) \\ &= 12x^2 + 12x + 6x + 6 \\ &= 12x^2 + 18x + 6 \end{aligned}$$

$$\begin{aligned} A_{\text{small}} &= (\text{length})(\text{width}) \\ &= (x+1)(x-1) \\ &= x^2 - x + x - 1 \\ &= x^2 - 1 \end{aligned}$$

$$\begin{aligned} \text{Area to Redo} &= A_{\text{big}} - A_{\text{small}} \\ &= (12x^2 + 18x + 6) - (x^2 - 1) \\ &= 12x^2 + 18x + 6 - x^2 + 1 \\ &= 11x^2 + 18x + 5 \end{aligned}$$

10. What is the area of the grey section?



a) The dimensions of the smaller rectangle

$$\begin{aligned} \text{Length} &= (4x-1) - (x+1) - (x+1) \\ &= 4x-1-x-1-x-1 \\ &= 2x-3 \end{aligned}$$

$$\begin{aligned} \text{Width} &= (2x+5) - (2) - (2) \\ &= 2x+5-2-2 \\ &= 2x+1 \end{aligned}$$

b) The perimeter of the smaller rectangle

$$\begin{aligned} P &= 2(\text{Length}) + 2(\text{Width}) \\ P &= 2(2x-3) + 2(2x+1) \\ P &= 4x-6 + 4x+2 \\ P &= 8x-4 \end{aligned}$$

c) If the numerical perimeter of the smaller rectangle is 52, what is x?

$$\begin{aligned} P &= 8x-4 \\ 52 &= 8x-4 \\ 52+4 &= 8x \\ \frac{56}{8} &= \frac{8x}{8} \end{aligned}$$

$$\boxed{x = 7}$$

d) Find the numerical area of the small rectangle

$$\begin{aligned} \text{Length} &= 2x-3 & \text{width} &= 2x+1 \\ &= 2(7)-3 & &= 2(7)+1 \\ &= 14-3 & &= 14+1 \\ &= 9 & &= 15 \end{aligned}$$

$$\begin{aligned} \text{Area} &= (\text{Length})(\text{width}) \\ &= (9)(15) \\ &= 135 \text{ units}^2 \end{aligned}$$

e) Find the numerical area of the big rectangle

$$\begin{aligned} \text{Length} &= 4x-1 & \text{width} &= 2x+5 \\ &= 4(7)-1 & &= 2(7)+5 \\ &= 28-1 & &= 14+5 \\ &= 27 & &= 19 \end{aligned}$$

$$\begin{aligned} \text{Area} &= (\text{Length})(\text{width}) \\ &= (27)(19) \\ &= 513 \text{ units}^2 \end{aligned}$$

f) Find the area of the grey section

$$\begin{aligned} A_{\text{GREY}} &= A_{\text{BIG}} - A_{\text{SMALL}} \\ &= 513 - 135 \\ &= 378 \text{ units}^2 \end{aligned}$$