

1. Sydney Harbour Bridge in Australia is usually wide for a long-span bridge. It carries two rail lines, eight road lanes, a cycle lane, and a walkway.

a. Factor the expression  $10x^2 - 7x - 3$  to find the length and the width of the bridge.



$$\begin{aligned}
 &10x^2 - 7x - 3 \\
 &10x^2 + 3x - 10x - 3 \\
 &x(10x + 3) - (10x + 3) \\
 &(10x + 3)(x - 1)
 \end{aligned}$$

$\swarrow$  length       $\searrow$  width  
 $\downarrow$  length

M	A	N
-30	-7	3, -10

b. If  $x$  represents 50 m, what are the length and the width of the bridge, in metres?

$$\begin{aligned}
 \text{length} &= 10x + 3 \\
 &= 10(50) + 3 \\
 &= 503 \text{ m}
 \end{aligned}$$

$$\begin{aligned}
 \text{width} &= x - 1 \\
 &= 50 - 1 \\
 &= \underline{49 \text{ m}}
 \end{aligned}$$

2. The height of a ball thrown from the top of a building can be approximated by the formula  $h = -5t^2 + 15t + 20$ , where  $t$  is the time, in seconds, and  $h$  is the height, in metres.

a. Write the formula in factored form. Hint: Remove the GCF first

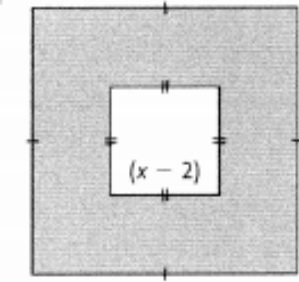
$$\begin{aligned}
 &= -5(t^2 - 3t - 4) \\
 &= -5(t + 1)(t - 4)
 \end{aligned}$$

3. Determine a simplified **factored** expression for the area of shaded region.

a.

$$\begin{aligned}
 \text{Area of Big Circle} &= \pi r_1^2 = \pi(3x+2)^2 \\
 \text{Area of Small Circle} &= \pi r_2^2 = \pi(x+1)^2 \\
 \text{Shaded Area} &= \pi(3x+2)^2 - \pi(x+1)^2 \Rightarrow \text{DOS} \\
 &= \pi \left[ (3x+2)^2 - (x+1)^2 \right] \\
 &= \pi (3x+2 - x-1)(3x+2 + x+1) \\
 &= \pi (2x+1)(4x+3)
 \end{aligned}$$

b.



Area of Big Square =  $(4x + 5)^2$

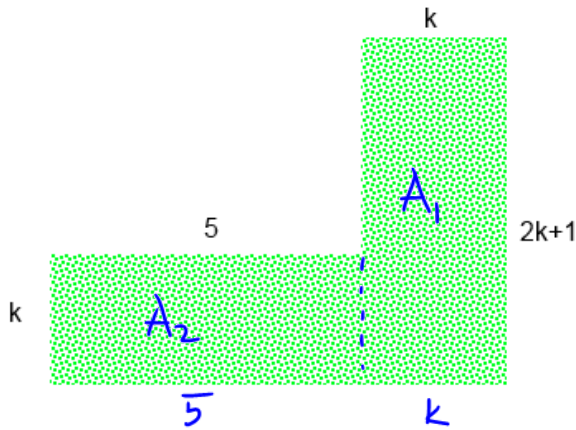
Area of small  $\square = (x - 2)^2$

Shaded Area =  $(4x + 5)^2 - (x - 2)^2$

=  $(4x + 5 - x + 2)(4x + 5 + x - 2)$

=  $(3x + 7)(5x + 3)$

c.



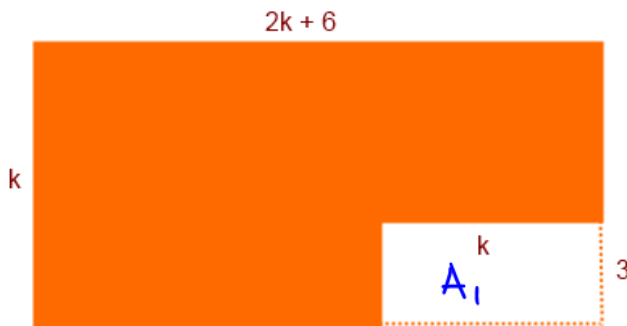
$A_1 = k(2k + 1) = 2k^2 + k$

$A_2 = k(5) = 5k$

Total area =  $2k^2 + k + 5k = 2k^2 + 6k$

=  $2k(k + 3)$

d.



Shaded Area = Area of big  $\square$  - Area of small  $\square$

=  $k(2k + 6) - k(3)$

=  $2k^2 + 6k - 3k$

=  $2k^2 + 3k$

=  $k(2k + 3)$

4. The volume of a rectangular prism is represented by the polynomial  $2x^3 - 24x^2 + 72x$ .

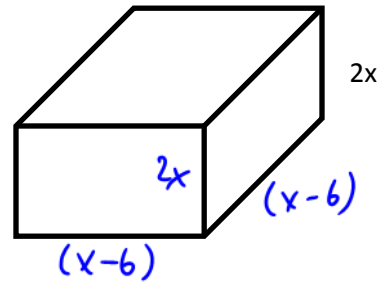
a. Factor the polynomial completely to determine the dimensions of the prism.

Remember that  $V = lwh$

$$2x(x^2 - 12x + 36)$$

$$= 2x(x - 6)(x - 6)$$

M	A	N
36	-12	-6-6



b. If  $x$  represents 8cm, what are the possible dimensions of the prism?

$$\text{Length} = x - 6$$

$$= 8 - 6$$

$$= 2\text{cm}$$

$$\text{width} = x - 6$$

$$= 8 - 6$$

$$= 2\text{cm}$$

$$\text{height} = 2x$$

$$= 2(8)$$

$$= 16\text{cm}$$

c. Could  $x$  represent 5 cm? Explain.

No, b/c a dimension cannot be a negative value.

5. Write a polynomial with three terms that when factored has a GCF of  $3x^4y^2z$ .

$$9x^4y^2z^2 + 3x^5y^3z + 36xyz$$

Answers will vary

6. Determine a possible value of  $k$  such that  $x^2 + kx - 10$  can be factored as a simple trinomial.

①  $k = 1 - 10$   
 $k = -9$

②  $k = -1 + 10$   
 $k = 9$

M	A	N
-10	k	1 -10 2 -5 -1, 10 -2, 5

③  $k = 2 - 5$   
 $k = -3$

④  $k = -2 + 5$   
 $k = 3$