

# Unit 5 - Polynomials

Answers are on Slides 32 - 41

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## Multiple Choice

Identify the choice that best completes the statement or answers the question.

- \_\_\_\_ 1. A large white square represents an  $x^2$ -tile, a black rectangle represents a  $-x$ -tile, and a small white square represents a 1-tile.

Write the polynomial represented by this set of algebra tiles.





- a.  $-2x^2 + 3x + 4$     **b.**  $2x^2 - 3x + 4$     c.  $2x^2 - x^3 + 4$     d.  $2x - 3x^2 + 4$


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2. A large white square represents an  $x^2$ -tile, a large black square represents a  $-x^2$ -tile, a small white square represents a 1-tile, and a small black square represents a  $-1$ -tile.

How would you model the polynomial  $-3x^2 - 4$  with algebra tiles?

a. 

b. 

c. 

d.  $3$    $+ 4$  

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3. Which of the following expressions are polynomials?

i)  $\frac{1}{2}x$

ii)  $1 - 5.5n^2$

iii)  $2\sqrt{t}$

iv)  $3.5$

a. i, iii, and iv      b. ii and iv      c. i, ii, and iii      d. i, ii, and iv

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4. Identify the polynomials that can be represented by the same set of algebra tiles.

- i)  $2x^2 - 5 + 6x$        $2x^2$      $+6x$      $-5$
- ii)  $2x^2 - 6x + 5$        $2x^2$      $-6x$      $+5$
- iii)  $-5 + 6x - 2x^2$        $-2x^2$      $+6x$      $-5$
- iv)  $6x - 5 + 2x^2$        $2x^2$      $+6x$      $-5$

- a. i and iv
- b. iii and iv
- c. ii and iv
- d. i and ii

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5. Identify the polynomial that is equivalent to  $4 - 6v - 7v^2$ .       $-7v^2$      $-6v$      $+4$

- i)  $7v^2 + 6v - 4$        $7v^2$      $+6v$      $-4$
- ii)  $4 + 7v^2 - 6v$        $7v^2$      $-6v$      $+4$
- iii)  $-7v^2 - 6v + 4$        $-7v^2$      $-6v$      $+4$
- iv)  $-7v^2 - 4 + 6v$        $-7v^2$      $+6v$      $-4$

- a. iv
- b. ii
- c. i
- d. iii

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6. Combine like terms. Sketch algebra tiles if it helps.  
 $3x + 10 + 7x - 4$

a.  $13x + 3$

b.  $10x + 6$

c.  $16x$

d.  $10x - 6$

$$3x + 10 + 7x - 4$$

$$3x + 7x + 10 - 4$$

$$10x + 6$$

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7. Combine like terms. Sketch algebra tiles if it helps.  
 $9x^2 - 7x + 2x - 6x^2$

a.  $-2x^2$

b.  $3x^2 - 5x$

c.  $2x^2 - 4x$

d.  $3x^2 + 5x$

$$9x^2 - 7x + 2x - 6x^2$$

$$9x^2 - 6x^2 - 7x + 2x$$

$$3x^2 - 5x$$

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8. Simplify:  $10x^2 - 8 + 3x + 5 - 6x^2 - 6x$

a.  $4x^2 - 3x + 3$

b.  $4x^2 - 3x - 3$

c.  $4x^2 + 3x + 3$

d.  $4x^4 - 3x^2 - 3$

$$10x^2 - 8 + 3x + 5 - 6x^2 - 6x$$

$$10x^2 - 6x^2 + 3x - 6x - 8 + 5$$

$$4x^2 - 3x - 3$$

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9. Add:  $(2x^2 - 6) + (5x^2 - 8x - 4)$

a.  $10x^2 - 8x - 24$

b.  $7x^2 - 14x - 4$

c.  $7x^2 - 8x - 10$

d.  $7x^2 - 8x + 10$

$$(2x^2 - 6) + (5x^2 - 8x - 4)$$

$$2x^2 + 5x^2 - 8x - 6 - 4$$

$$7x^2 - 8x - 10$$

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10. Add:  $(-3x^2 + 3 - 5x) + (5 + x^2 + 8x)$

a.  $-2x^2 + 3x + 8$

b.  $-2x^2 - 3x + 8$

c.  $-4x^2 - 3x + 8$

d.  $-4x^2 + 3x + 8$

$$(-3x^2 + 3 - 5x) + (5 + x^2 + 8x)$$

$$\begin{array}{r} -3x^2 + x^2 - 5x + 8x + 3 + 5 \\ -2x^2 + 3x + 8 \end{array}$$

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11. Subtract:  $(3x - 7x^2 + 2) - (4x^2 - 5 + 6x)$

a.  $-11x^2 + 3x - 7$

b.  $-11x^2 - 9x - 3$

c.  $-11x^2 - 3x + 7$

d.  $11x^2 + 3x - 7$

$$(3x - 7x^2 + 2) - (4x^2 - 5 + 6x)$$

$$3x - 7x^2 + 2 - 4x^2 + 5 - 6x$$

$$-7x^2 - 4x^2 + 3x - 6x + 2 + 5$$

$$-11x^2 - 3x + 7$$

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\_\_\_ 12. Subtract:  $(3y^2 - 5x^2 + 4) - (2x - 8 + 4y^2)$

a.  $-1y^2 - 5x^2 - 2x - 4$

b.  $3y^2 - 7x^2 + 12$

c.  $-4x + 12$

d.  $-1y^2 - 5x^2 - 2x + 12$

$$(3y^2 - 5x^2 + 4) - (2x - 8 + 4y^2)$$

$$3y^2 - 5x^2 + 4 - 2x + 8 - 4y^2$$

$$3y^2 - 4y^2 - 5x^2 - 2x + 4 + 8$$

$$\boxed{-y^2 - 5x^2 - 2x + 12}$$

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\_\_\_ 13. Multiply:  $7(2x^2 - 5x)$

a.  $14x^2 - 5x$

b.  $14x^2 + 2x$

c.  $14x^2 - 35x$

d.  $9x^2 - 2x$

$$7(2x^2 - 5x)$$

$$14x^2 - 35x$$

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14. Multiply:  $(-2)(4c^2 - 6c - 7)$

a.  $-8c^2 - 12c - 14$

b.  $2c^2 - 8c - 9$

c.  $-8c^2 + 12c + 14$

d.  $-8c^2 - 6c - 7$

$$(-2)(4c^2 - 6c - 7)$$

$$-8c^2 + 12c + 14$$

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15. Divide:  $\frac{20p - 28}{4}$

a.  $5p - 28$

b.  $5p - 7$

c.  $20p - 24$

d.  $16p - 24$

$$\frac{20p - 28}{4}$$

$$\frac{20p}{4} \quad \frac{-28}{4}$$

$$5p - 7$$

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16. Divide:  $\frac{-20p^2 - 16p}{-4p}$

a.  $5p^2 - 16p$

b.  $5p + 4$

c.  $80p^2 - 64$

d.  $5p + 4p$

$$\frac{-20p^2 - 16p}{-4p}$$

$$\frac{-20p^2}{-4p} \quad \frac{-16p}{-4p}$$

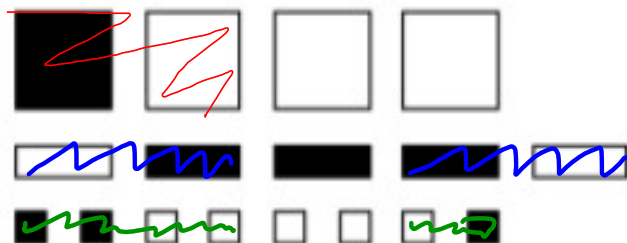
$$5p + 4$$

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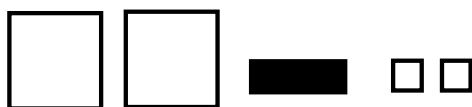
Short Answer

17. A large white square represents an  $x^2$ -tile, a large black square represents a  $-x^2$ -tile, a white rectangle represents an  $x$ -tile, a black rectangle represents a  $-x$ -tile, a small white square represents a 1-tile, and a small black square represents a  $-1$ -tile.

Write the simplified polynomial.



$$= 2x^2 - x + 2$$



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18. Combine like terms. Sketch algebra tiles if it helps.

$$3x^2 - 6x + 4x^2 + 3x - 6$$

$$3x^2 + 4x^2 - 6x + 3x - 6$$

$$7x^2 - 3x - 6$$

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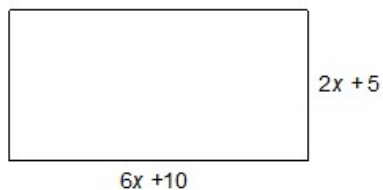
19. Add:  $(10x^2 - 7x + 6) + (-2x^2 + 2x - 9)$

$$10x^2 - 2x^2 - 7x + 2x + 6 - 9$$

$$8x^2 - 5x - 3$$

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20. Write the perimeter of this rectangle as a polynomial in simplest form.



$$P = (2x + 5) + (6x + 10) + (2x + 5) + (6x + 10)$$

$$P = 2x + 6x + 2x + 6x + 10 + 5 + 5 + 10$$

$$P = 16x + 30$$

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21. Subtract:  $(9x^2 - 6x + 4) - (5x^2 - 4x - 5)$

$$9x^2 - 6x + 4 - 5x^2 + 4x + 5$$

$$9x^2 - 5x^2 - 6x + 4x + 4 + 5$$

$$4x^2 - 2x + 9$$

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22. Subtract:  $(4x^2 + 9x - 3) - (x^2 - 11x + 5)$

$$4x^2 + 9x - 3 - x^2 + 11x - 5$$

$$4x^2 - x^2 + 9x + 11x - 3 - 5$$

$$3x^2 + 20x - 8$$

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23. Multiply:  $5(-2x^2 - 5)$

$$-10x^2 - 25$$

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24. Multiply:  $-2(-8 + 2x - 5x^2)$

$$8 - 4x + 10x^2$$

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25. Divide:  $\frac{12m - 20m^2}{-4m}$

$$\frac{12m}{-4m} \quad \frac{-20m^2}{-4m}$$

$$\boxed{-3 + 5m}$$

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26. Determine the product:  $(-2x)(4x + 3y - 5z)$

$$-8x^2 - 6xy + 10xz$$

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27. Determine the quotient:  $(-10x^2 + 4xy - 6xz) \div (-2x)$

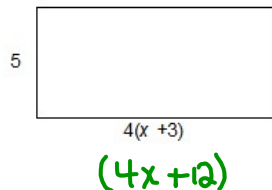
$$\frac{-10x^2}{-2x} + \frac{4xy}{-2x} - \frac{6xz}{-2x}$$

$$5x - 2y + 3z$$

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## Problem

28. a) Write the multiplication sentence modelled by this rectangle.  
 b) Determine the area of the rectangle when  $x = 12$ .  
 Show your work.



$$\begin{aligned} \text{a) } A &= 5(4x+12) \\ A &= 20x + 60 \end{aligned}$$

$$\begin{aligned} \text{b) } A &= 20x + 60 \\ A &= 20(12) + 60 \\ A &= 240 + 60 \\ A &= 300 \end{aligned}$$

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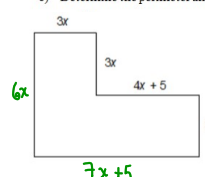
29. The area of a rectangular deck, in square metres, is given by the polynomial  $40p^2 + 24p$ .  
 The deck is  $8p$  metres wide.
- a) Write a polynomial to represent the length of the deck.  
 b) Determine the length, width, and area of the deck when  $p = 4$  m.

$$\begin{aligned} \text{a) } \frac{40p^2 + 24p}{8p} \\ = 5p + 3 \end{aligned}$$

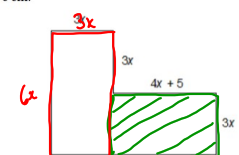
|    |          |        |
|----|----------|--------|
| b) | $5p+3$   | $8p$   |
|    | $5(4)+3$ | $8(4)$ |
|    | $20+3$   | $32$   |
|    | $23$     |        |

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30. a) Determine a polynomial for the perimeter of the shape below.  
 b) Determine a polynomial for the area of the shape below.  
 c) Determine the perimeter and area when  $x = 6$  cm.



$P = 6x + 3x + 3x + 4x + 3x + 7x + 5 + 5$   
 $P = 26x + 10$   
 c)  $P = 26(6) + 10$   
 $P = 156 + 10$   
 $P = 166$



$A = (3x)(4x + 5)$   
 $A = 12x^2 + 15x$   
 $A = (3x)(6x)$   
 $A = 18x^2$   
 $T_A = 18x^2 + 12x^2 + 15x$   
 $T_A = 30x^2 + 15x$   
 c)  $A = 30(6)^2 + 15(6)$   
 $= 30(36) + 90$   
 $= 1080 + 90$   
 $= 1170$

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**Review for Grade 9 Math Exam on Unit 5 - Polynomials  
 Answer Section**

**MULTIPLE CHOICE**

1. ANS: B      PTS: 1      DIF: Easy      REF: 5.1 Modelling Polynomials  
 LOC: 9.PR5      TOP: Patterns and Relations (Variables and Equations)  
 KEY: Conceptual Understanding
2. ANS: B      PTS: 1      DIF: Easy      REF: 5.1 Modelling Polynomials  
 LOC: 9.PR5      TOP: Patterns and Relations (Variables and Equations)  
 KEY: Conceptual Understanding
3. ANS: D      PTS: 1      DIF: Easy      REF: 5.1 Modelling Polynomials  
 LOC: 9.PR5      TOP: Patterns and Relations (Variables and Equations)  
 KEY: Conceptual Understanding
4. ANS: A      PTS: 1      DIF: Moderate      REF: 5.1 Modelling Polynomials  
 LOC: 9.PR5      TOP: Patterns and Relations (Variables and Equations)  
 KEY: Procedural Knowledge
5. ANS: D      PTS: 1      DIF: Moderate      REF: 5.1 Modelling Polynomials  
 LOC: 9.PR5      TOP: Patterns and Relations (Variables and Equations)  
 KEY: Procedural Knowledge

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6. ANS: B            PTS: 1            DIF: Easy            REF: 5.2 Like Terms and Unlike Terms  
LOC: 9.PR5            TOP: Patterns and Relations (Variables and Equations)  
KEY: Procedural Knowledge
7. ANS: B            PTS: 1            DIF: Easy            REF: 5.2 Like Terms and Unlike Terms  
LOC: 9.PR5            TOP: Patterns and Relations (Variables and Equations)  
KEY: Procedural Knowledge
8. ANS: B            PTS: 1            DIF: Moderate        REF: 5.2 Like Terms and Unlike Terms  
LOC: 9.PR5            TOP: Patterns and Relations (Variables and Equations)  
KEY: Procedural Knowledge
9. ANS: C            PTS: 1            DIF: Moderate        REF: 5.3 Adding Polynomials  
LOC: 9.PR6            TOP: Patterns and Relations (Variables and Equations)  
KEY: Procedural Knowledge
10. ANS: A            PTS: 1            DIF: Moderate        REF: 5.3 Adding Polynomials  
LOC: 9.PR6            TOP: Patterns and Relations (Variables and Equations)  
KEY: Procedural Knowledge
11. ANS: C            PTS: 1            DIF: Moderate        REF: 5.4 Subtracting Polynomials  
LOC: 9.PR6            TOP: Patterns and Relations (Variables and Equations)  
KEY: Procedural Knowledge
12. ANS: D            PTS: 1            DIF: Difficult        REF: 5.4 Subtracting Polynomials  
LOC: 9.PR6            TOP: Patterns and Relations (Variables and Equations)  
KEY: Procedural Knowledge

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13. ANS: C            PTS: 1            DIF: Moderate  
REF: 5.5 Multiplying and Dividing a Polynomial by a Constant  
LOC: 9.PR7            TOP: Patterns and Relations (Variables and Equations)  
KEY: Procedural Knowledge
14. ANS: C            PTS: 1            DIF: Moderate  
REF: 5.5 Multiplying and Dividing a Polynomial by a Constant  
LOC: 9.PR7            TOP: Patterns and Relations (Variables and Equations)  
KEY: Procedural Knowledge
15. ANS: B            PTS: 1            DIF: Moderate  
REF: 5.5 Multiplying and Dividing a Polynomial by a Constant  
LOC: 9.PR7            TOP: Patterns and Relations (Variables and Equations)  
KEY: Procedural Knowledge
16. ANS: B            PTS: 1            DIF: Moderate  
REF: 5.6 Multiplying and Dividing a Polynomial by a Monomial  
LOC: 9.PR7            TOP: Patterns and Relations (Variables and Equations)  
KEY: Procedural Knowledge

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**SHORT ANSWER**

17. ANS:

$$2x^2 - x + 2$$

PTS: 1                      DIF: Moderate              REF: 5.2 Like Terms and Unlike Terms  
LOC: 9.PR5                      TOP: Patterns and Relations (Variables and Equations)  
KEY: Procedural Knowledge

18. ANS:

$$7x^2 - 3x - 6$$

PTS: 1                      DIF: Moderate              REF: 5.2 Like Terms and Unlike Terms  
LOC: 9.PR5                      TOP: Patterns and Relations (Variables and Equations)  
KEY: Procedural Knowledge

19. ANS:

$$8x^2 - 5x - 3$$

PTS: 1                      DIF: Moderate              REF: 5.3 Adding Polynomials  
LOC: 9.PR6                      TOP: Patterns and Relations (Variables and Equations)  
KEY: Procedural Knowledge

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20. ANS:

$$16x + 30$$

PTS: 1                      DIF: Moderate              REF: 5.3 Adding Polynomials  
LOC: 9.PR6                      TOP: Patterns and Relations (Variables and Equations)  
KEY: Procedural Knowledge

21. ANS:

$$4x^2 - 2x + 9$$

PTS: 1                      DIF: Moderate              REF: 5.4 Subtracting Polynomials  
LOC: 9.PR6                      TOP: Patterns and Relations (Variables and Equations)  
KEY: Procedural Knowledge

22. ANS:

$$3x^2 + 20x - 8$$

PTS: 1                      DIF: Difficult              REF: 5.4 Subtracting Polynomials  
LOC: 9.PR6                      TOP: Patterns and Relations (Variables and Equations)  
KEY: Procedural Knowledge

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23. ANS:

$$-10x^2 - 25$$

PTS: 1                    DIF: Moderate            REF: 5.5 Multiplying and Dividing a Polynomial by a Constant  
LOC: 9.PR7                TOP: Patterns and Relations (Variables and Equations)  
KEY: Procedural Knowledge

24. ANS:

$$16 - 4x + 10x^2$$

PTS: 1                    DIF: Moderate            REF: 5.5 Multiplying and Dividing a Polynomial by a Constant  
LOC: 9.PR7                TOP: Patterns and Relations (Variables and Equations)  
KEY: Procedural Knowledge

25. ANS:

$$-3 + 5m$$

PTS: 1                    DIF: Moderate  
REF: 5.6 Multiplying and Dividing a Polynomial by a Monomial  
LOC: 9.PR7                TOP: Patterns and Relations (Variables and Equations)  
KEY: Procedural Knowledge

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26. ANS:

$$-8x^2 - 6xy + 10xz$$

PTS: 1                    DIF: Difficult  
REF: 5.6 Multiplying and Dividing a Polynomial by a Monomial  
LOC: 9.PR7                TOP: Patterns and Relations (Variables and Equations)  
KEY: Procedural Knowledge

27. ANS:

$$5x - 2y + 3z$$

PTS: 1                    DIF: Difficult  
REF: 5.6 Multiplying and Dividing a Polynomial by a Monomial  
LOC: 9.PR7                TOP: Patterns and Relations (Variables and Equations)  
KEY: Procedural Knowledge

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## PROBLEM

28. ANS:

$$\begin{aligned} \text{a) } & 5(4(x+3)) \\ & = 5(4x+12) \\ & = 20x+60 \end{aligned}$$

b) Substitute  $x = 12$  into  $20x + 60$ .  
 $20(12) + 60 = 300$

The area of the rectangle when  $x = 12$  is 300 square units.

PTS: 1                      DIF: Moderate                      REF: 5.5 Multiplying and Dividing a Polynomial by a Constant

LOC: 9.PR7                      TOP: Patterns and Relations (Variables and Equations)

KEY: Problem-Solving Skills | Communication

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29. ANS:

$$\begin{aligned} \text{a) Length of deck} &= (40p^2 + 24p) \div 8p \\ &= \frac{40p^2}{8p} + \frac{24p}{8p} \\ &= 5p + 3 \end{aligned}$$

$$\begin{aligned} \text{b) Length:} & \\ \text{Substitute } p = 4 & \text{ into } 5p + 3. \\ 5p + 3 & \\ = 5(4) + 3 & \\ = 23 & \\ \text{The length of the deck} & \text{ is 23 m.} \end{aligned}$$

$$\begin{aligned} \text{Width:} & \\ \text{Substitute } p = 4 & \text{ into } 8p. \\ 8p & \\ = 8(4) & \\ = 32 & \\ \text{The width of the deck} & \text{ is 32 m.} \end{aligned}$$

$$\begin{aligned} \text{Area:} & \\ A = l \times w & \\ = 23 \times 32 & \\ = 736 & \\ \text{The area of the deck} & \text{ is 736 m}^2. \end{aligned}$$

PTS: 1                      DIF: Difficult  
 REF: 5.6 Multiplying and Dividing a Polynomial by a Monomial  
 LOC: 9.PR7                      TOP: Patterns and Relations (Variables and Equations)  
 KEY: Problem-Solving Skills | Communication

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30. ANS:

a) Perimeter =  $3x + 3x + (4x + 5) + 3x + (4x + 5) + 3x + 3x + 3x$   
 $= 26x + 10$

b) Area =  $3x(3x) + 3x(3x + 4x + 5)$   
 $= 9x^2 + 9x^2 + 12x^2 + 15x$   
 $= 30x^2 + 15x$

c) Perimeter:  
Substitute  $x = 6$  into  $26x + 10$ .  
 $26x + 10$   
 $= 26(6) + 10$   
 $= 166$   
The perimeter of the shape is 166 cm.

Area:  
Substitute  $x = 6$  into  $30x^2 + 15x$ .  
 $30x^2 + 15x$   
 $= 30(6)^2 + 15(6)$   
 $= 1170$   
The area of the shape is 1170 cm<sup>2</sup>.

PTS: 1                      DIF: Difficult  
REF: 5.6 Multiplying and Dividing a Polynomial by a Monomial  
LOC: 9.PR7                TOP: Patterns and Relations (Variables and Equations)  
KEY: Problem-Solving Skills | Communication

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