

## PreCalc 11 Final Review Pack v1

### Answer Section

#### MULTIPLE CHOICE

1. ANS: A                      PTS: 1                      DIF: Difficult                      REF: 1.1 Arithmetic Sequences  
LOC: 11.RF9                      TOP: Relations and Functions                      KEY: Procedural Knowledge
2. ANS: C                      PTS: 1                      DIF: Difficult                      REF: 1.1 Arithmetic Sequences  
LOC: 11.RF9                      TOP: Relations and Functions  
KEY: Conceptual Understanding | Procedural Knowledge
3. ANS: C                      PTS: 1                      DIF: Difficult                      REF: 1.2 Arithmetic Series  
LOC: 11.RF9                      TOP: Relations and Functions                      KEY: Procedural Knowledge
4. ANS: A                      PTS: 1                      DIF: Easy                      REF: 1.2 Arithmetic Series  
LOC: 11.RF9                      TOP: Relations and Functions                      KEY: Procedural Knowledge
5. ANS: C                      PTS: 1                      DIF: Difficult                      REF: 1.2 Arithmetic Series  
LOC: 11.RF9                      TOP: Relations and Functions                      KEY: Procedural Knowledge
6. ANS: C                      PTS: 1                      DIF: Easy                      REF: 1.3 Geometric Sequences  
LOC: 11.RF10                      TOP: Relations and Functions                      KEY: Conceptual Understanding
7. ANS: D                      PTS: 1                      DIF: Difficult                      REF: 1.3 Geometric Sequences  
LOC: 11.RF10                      TOP: Relations and Functions                      KEY: Procedural Knowledge
8. ANS: A                      PTS: 1                      DIF: Moderate                      REF: 1.3 Geometric Sequences  
LOC: 11.RF10                      TOP: Relations and Functions                      KEY: Procedural Knowledge
9. ANS: D                      PTS: 1                      DIF: Moderate                      REF: 1.4 Geometric Series  
LOC: 11.RF10                      TOP: Relations and Functions                      KEY: Procedural Knowledge
10. ANS: D                      PTS: 1                      DIF: Moderate                      REF: 1.4 Geometric Series  
LOC: 11.RF10                      TOP: Relations and Functions                      KEY: Procedural Knowledge
11. ANS: D                      PTS: 1                      DIF: Moderate                      REF: 1.4 Geometric Series  
LOC: 11.RF10                      TOP: Relations and Functions                      KEY: Procedural Knowledge
12. ANS: C                      PTS: 1                      DIF: Easy                      REF: 1.5 Graphing Geometric Sequences and Series                      LOC: 11.RF9 | 11.RF10  
TOP: Relations and Functions                      KEY: Conceptual Understanding
13. ANS: A                      PTS: 1                      DIF: Moderate                      REF: 1.5 Graphing Geometric Sequences and Series                      LOC: 11.RF9 | 11.RF10  
TOP: Relations and Functions                      KEY: Conceptual Understanding
14. ANS: C                      PTS: 1                      DIF: Easy                      REF: 1.6 Infinite Geometric Series  
LOC: 11.RF10                      TOP: Relations and Functions                      KEY: Procedural Knowledge
15. ANS: A                      PTS: 1                      DIF: Easy                      REF: 1.6 Infinite Geometric Series  
LOC: 11.RF10                      TOP: Relations and Functions                      KEY: Procedural Knowledge
16. ANS: B                      PTS: 1                      DIF: Moderate                      REF: 1.6 Infinite Geometric Series  
LOC: 11.RF10                      TOP: Relations and Functions                      KEY: Procedural Knowledge
17. ANS: C                      PTS: 0                      DIF: Moderate                      REF: 2.1 Absolute Value of a Real Number                      LOC: 11.AN1  
TOP: Relations and Functions                      KEY: Conceptual Understanding | Procedural Knowledge
18. ANS: D                      PTS: 0                      DIF: Moderate                      REF: 2.3 Adding and Subtracting Radical Expressions                      LOC: 11.AN2  
TOP: Relations and Functions                      KEY: Procedural Knowledge

19. ANS: C                   PTS: 0                   DIF: Difficult  
REF: 2.2 Simplifying Radical Expressions                   LOC: 11.AN2  
TOP: Relations and Functions                   KEY: Conceptual Understanding | Procedural Knowledge
20. ANS: C                   PTS: 0                   DIF: Easy  
REF: 2.3 Adding and Subtracting Radical Expressions                   LOC: 11.AN2  
TOP: Relations and Functions                   KEY: Procedural Knowledge
21. ANS: A                   PTS: 0                   DIF: Moderate  
REF: 2.1 Absolute Value of a Real Number                   LOC: 11.AN1  
TOP: Relations and Functions                   KEY: Conceptual Understanding | Procedural Knowledge
22. ANS: D                   PTS: 0                   DIF: Moderate  
REF: 2.3 Adding and Subtracting Radical Expressions                   LOC: 11.AN2  
TOP: Relations and Functions                   KEY: Conceptual Understanding | Procedural Knowledge
23. ANS: C                   PTS: 0                   DIF: Moderate  
REF: 2.4 Multiplying and Dividing Radical Expressions                   LOC: 11.AN2  
TOP: Relations and Functions                   KEY: Conceptual Understanding | Procedural Knowledge
24. ANS: D                   PTS: 0                   DIF: Moderate  
REF: 3.1 Factoring Polynomial Expressions                   LOC: 11.RF1  
TOP: Relations and Functions                   KEY: Procedural Knowledge
25. ANS: D                   PTS: 0                   DIF: Moderate  
REF: 3.2 Solving Quadratic Equations by Factoring                   LOC: 11.AN3  
TOP: Algebra and Number                   KEY: Conceptual Understanding
26. ANS: C                   PTS: 0                   DIF: Difficult                   REF: 2.5 Solving Radical Equations  
LOC: 11.AN3                   TOP: Relations and Functions  
KEY: Conceptual Understanding | Procedural Knowledge
27. ANS: A                   PTS: 0                   DIF: Moderate  
REF: 3.4 Developing and Applying the Quadratic Formula                   LOC: 11.RF5  
TOP: Relations and Functions                   KEY: Procedural Knowledge
28. ANS: D                   PTS: 0                   DIF: Easy  
REF: 3.2 Solving Quadratic Equations by Factoring                   LOC: 11.RF5  
TOP: Relations and Functions                   KEY: Procedural Knowledge
29. ANS: A                   PTS: 0                   DIF: Moderate  
REF: 3.4 Developing and Applying the Quadratic Formula                   LOC: 11.RF5  
TOP: Relations and Functions                   KEY: Procedural Knowledge
30. ANS: C                   PTS: 0                   DIF: Easy                   REF: 3.5 Interpreting the Discriminant  
LOC: 11.RF5                   TOP: Relations and Functions                   KEY: Conceptual Understanding
31. ANS: C                   PTS: 0                   DIF: Moderate                   REF: 3.5 Interpreting the Discriminant  
LOC: 11.RF5                   TOP: Relations and Functions                   KEY: Conceptual Understanding
32. ANS: C                   PTS: 0                   DIF: Moderate                   REF: 3.5 Interpreting the Discriminant  
LOC: 11.RF5                   TOP: Relations and Functions  
KEY: Conceptual Understanding | Procedural Knowledge
33. ANS: C                   PTS: 0                   DIF: Moderate                   REF: 3.5 Interpreting the Discriminant  
LOC: 11.RF5                   TOP: Relations and Functions  
KEY: Conceptual Understanding | Procedural Knowledge
34. ANS: C                   PTS: 0                   DIF: Moderate  
REF: 4.1 Properties of a Quadratic Function                   LOC: 11.RF4  
TOP: Relations and Functions                   KEY: Procedural Knowledge

35. ANS: D                   PTS: 0                   DIF: Moderate  
REF: 4.1 Properties of a Quadratic Function                   LOC: 11.RF4  
TOP: Relations and Functions                   KEY: Procedural Knowledge
36. ANS: D                   PTS: 0                   DIF: Easy  
REF: 4.3 Transforming the Graph of  $y = x^2$                    LOC: 11.RF3  
TOP: Relations and Functions                   KEY: Conceptual Understanding
37. ANS: B                   PTS: 0                   DIF: Easy  
REF: 4.3 Transforming the Graph of  $y = x^2$                    LOC: 11.RF3  
TOP: Relations and Functions                   KEY: Conceptual Understanding
38. ANS: D                   PTS: 0                   DIF: Easy  
REF: 4.3 Transforming the Graph of  $y = x^2$                    LOC: 11.RF3  
TOP: Relations and Functions                   KEY: Conceptual Understanding
39. ANS: D                   PTS: 0                   DIF: Moderate  
REF: 4.4 Analyzing Quadratic Functions of the Form  $y = a(x - p)^2 + q$   
LOC: 11.RF3           TOP: Relations and Functions  
KEY: Conceptual Understanding | Procedural Knowledge
40. ANS: C                   PTS: 0                   DIF: Moderate  
REF: 4.4 Analyzing Quadratic Functions of the Form  $y = a(x - p)^2 + q$   
LOC: 11.RF3           TOP: Relations and Functions  
KEY: Conceptual Understanding | Procedural Knowledge
41. ANS: B                   PTS: 0                   DIF: Moderate  
REF: 4.5 Equivalent Forms of the Equation of a Quadratic Function  
LOC: 11.RF4           TOP: Relations and Functions  
KEY: Conceptual Understanding | Procedural Knowledge
42. ANS: A                   PTS: 0                   DIF: Moderate  
REF: 4.7 Modelling and Solving Problems with Quadratic Functions  
LOC: 11.RF4           TOP: Relations and Functions                   KEY: Procedural Knowledge
43. ANS: C                   PTS: 0                   DIF: Moderate  
REF: 4.6 Analyzing Quadratic Functions of the Form  $y = ax^2 + bx + c$   
LOC: 11.RF4           TOP: Relations and Functions                   KEY: Procedural Knowledge
44. ANS: C                   PTS: 0                   DIF: Easy  
REF: 5.2 Graphing Linear Inequalities in Two Variables                   LOC: 11.RF7  
TOP: Relations and Functions                   KEY: Procedural Knowledge
45. ANS: A                   PTS: 0                   DIF: Easy  
REF: 5.3 Graphing Quadratic Inequalities in Two Variables                   LOC: 11.RF7  
TOP: Relations and Functions                   KEY: Procedural Knowledge
46. ANS: D                   PTS: 0                   DIF: Easy  
REF: 5.3 Graphing Quadratic Inequalities in Two Variables                   LOC: 11.RF7  
TOP: Relations and Functions                   KEY: Procedural Knowledge
47. ANS: D                   PTS: 0                   DIF: Easy  
REF: 5.3 Graphing Quadratic Inequalities in Two Variables                   LOC: 11.RF7  
TOP: Relations and Functions                   KEY: Procedural Knowledge
48. ANS: C                   PTS: 0                   DIF: Moderate  
REF: 5.5 Solving Systems of Equations Algebraically                   LOC: 11.RF6  
TOP: Relations and Functions                   KEY: Procedural Knowledge
49. ANS: A                   PTS: 0                   DIF: Moderate  
REF: 6.1 Angles in Standard Position in Quadrant 1                   LOC: 11.T2  
TOP: Trigonometry                   KEY: Procedural Knowledge | Problem-Solving Skills

50. ANS: A                   PTS: 0                   DIF: Moderate           REF: 6.3 Constructing Triangles  
LOC: 11.T3                TOP: Trigonometry           KEY: Procedural Knowledge
51. ANS: C                   PTS: 0                   DIF: Moderate           REF: 7.1 Equivalent Rational Expressions  
LOC: 11.AN4            TOP: Algebra and Number  
KEY: Conceptual Understanding | Procedural Knowledge
52. ANS: D                   PTS: 0                   DIF: Moderate           REF: 6.2 Angles in Standard Position in All Quadrants   LOC: 11.T2  
TOP: Trigonometry                   KEY: Conceptual Understanding | Procedural Knowledge
53. ANS: D                   PTS: 0                   DIF: Easy               REF: 7.1 Equivalent Rational Expressions  
LOC: 11.AN4            TOP: Algebra and Number           KEY: Conceptual Understanding
54. ANS: B                   PTS: 0                   DIF: Moderate           REF: 7.1 Equivalent Rational Expressions  
LOC: 11.AN4            TOP: Algebra and Number  
KEY: Conceptual Understanding | Procedural Knowledge
55. ANS: B                   PTS: 0                   DIF: Moderate           REF: 7.1 Equivalent Rational Expressions  
LOC: 11.AN4            TOP: Algebra and Number  
KEY: Conceptual Understanding | Procedural Knowledge
56. ANS: A                   PTS: 1                   DIF: Moderate           REF: 7.2 Multiplying and Dividing Rational Expressions   LOC: 11.AN5  
TOP: Algebra and Number           KEY: Conceptual Understanding | Procedural Knowledge
57. ANS: D                   PTS: 1                   DIF: Easy               REF: 7.2 Multiplying and Dividing Rational Expressions   LOC: 11.AN5  
TOP: Algebra and Number           KEY: Conceptual Understanding | Procedural Knowledge
58. ANS: B                   PTS: 0                   DIF: Moderate           REF: 7.4 Adding and Subtracting Rational Expressions with Binomial and Trinomial Denominators  
LOC: 11.AN5            TOP: Algebra and Number  
KEY: Conceptual Understanding | Procedural Knowledge
59. ANS: B                   PTS: 0                   DIF: Easy               REF: 7.3 Adding and Subtracting Rational Expressions with Monomial Denominators  
LOC: 11.AN5            TOP: Algebra and Number  
KEY: Conceptual Understanding | Procedural Knowledge
60. ANS: D                   PTS: 0                   DIF: Easy               REF: 7.3 Adding and Subtracting Rational Expressions with Monomial Denominators  
LOC: 11.AN5            TOP: Algebra and Number  
KEY: Conceptual Understanding | Procedural Knowledge
61. ANS: C                   PTS: 0                   DIF: Easy               REF: 7.4 Adding and Subtracting Rational Expressions with Binomial and Trinomial Denominators  
LOC: 11.AN5            TOP: Algebra and Number  
KEY: Conceptual Understanding | Procedural Knowledge
62. ANS: B                   PTS: 0                   DIF: Moderate           REF: 8.1 Absolute Value Functions  
LOC: 11.RF2            TOP: Relations and Functions  
KEY: Conceptual Understanding | Problem-Solving Skills
63. ANS: D                   PTS: 0                   DIF: Moderate           REF: 8.1 Absolute Value Functions  
LOC: 11.RF2            TOP: Relations and Functions  
KEY: Conceptual Understanding | Procedural Knowledge
64. ANS: C                   PTS: 0                   DIF: Easy               REF: 8.1 Absolute Value Functions  
LOC: 11.RF2            TOP: Relations and Functions           KEY: Conceptual Understanding
65. ANS: C                   PTS: 0                   DIF: Moderate           REF: 8.1 Absolute Value Functions  
LOC: 11.RF2            TOP: Relations and Functions  
KEY: Conceptual Understanding | Procedural Knowledge

66. ANS: A                   PTS: 0                   DIF: Difficult                   REF: 8.1 Absolute Value Functions  
 LOC: 11.RF2               TOP: Relations and Functions  
 KEY: Conceptual Understanding | Procedural Knowledge
67. ANS: C                   PTS: 0                   DIF: Moderate                   REF: 8.1 Absolute Value Functions  
 LOC: 11.RF2               TOP: Relations and Functions  
 KEY: Conceptual Understanding | Procedural Knowledge
68. ANS: A                   PTS: 0                   DIF: Moderate                   REF: 8.1 Absolute Value Functions  
 LOC: 11.RF2               TOP: Relations and Functions  
 KEY: Conceptual Understanding | Procedural Knowledge
69. ANS: D                   PTS: 0                   DIF: Easy  
 REF: 8.2 Solving Absolute Value Equations                   LOC: 11.RF2  
 TOP: Relations and Functions                   KEY: Conceptual Understanding | Procedural Knowledge
70. ANS: A                   PTS: 0                   DIF: Easy  
 REF: 8.3 Graphing Reciprocals of Linear Functions                   LOC: 11.RF11  
 TOP: Relations and Functions                   KEY: Conceptual Understanding
71. ANS: B                   PTS: 0                   DIF: Moderate                   REF: 8.1 Absolute Value Functions  
 LOC: 11.RF2               TOP: Relations and Functions  
 KEY: Conceptual Understanding | Procedural Knowledge
72. ANS: D                   PTS: 0                   DIF: Moderate                   REF: 8.3 Graphing Reciprocals of Linear Functions                   LOC: 11.RF11  
 TOP: Relations and Functions                   KEY: Conceptual Understanding | Procedural Knowledge
73. ANS: B                   PTS: 0                   DIF: Easy  
 REF: 8.4 Using Technology to Graph Reciprocals of Quadratic Functions  
 LOC: 11.RF11               TOP: Relations and Functions                   KEY: Conceptual Understanding
74. ANS: A                   PTS: 0                   DIF: Moderate                   REF: 8.3 Graphing Reciprocals of Linear Functions                   LOC: 11.RF11  
 TOP: Relations and Functions                   KEY: Conceptual Understanding | Procedural Knowledge
75. ANS: B                   PTS: 0                   DIF: Easy  
 REF: 8.4 Using Technology to Graph Reciprocals of Quadratic Functions  
 LOC: 11.RF11               TOP: Relations and Functions                   KEY: Conceptual Understanding
76. ANS: B                   PTS: 0                   DIF: Moderate                   REF: 8.4 Using Technology to Graph Reciprocals of Quadratic Functions  
 LOC: 11.RF11               TOP: Relations and Functions  
 KEY: Conceptual Understanding | Procedural Knowledge
77. ANS: C                   PTS: 0                   DIF: Moderate                   REF: 8.5 Graphing Reciprocals of Quadratic Functions                   LOC: 11.RF11  
 TOP: Relations and Functions                   KEY: Conceptual Understanding | Procedural Knowledge
78. ANS: B                   PTS: 0                   DIF: Moderate                   REF: 8.5 Graphing Reciprocals of Quadratic Functions                   LOC: 11.RF11  
 TOP: Relations and Functions                   KEY: Conceptual Understanding | Procedural Knowledge
79. ANS: B                   PTS: 0                   DIF: Difficult                   REF: 8.5 Graphing Reciprocals of Quadratic Functions                   LOC: 11.RF11  
 TOP: Relations and Functions                   KEY: Conceptual Understanding | Procedural Knowledge

## SHORT ANSWER

80. ANS:

 $r = 1.5$ , so the sum is not finite.

PTS: 1 DIF: Easy REF: 1.6 Infinite Geometric Series

LOC: 11.RF10 TOP: Relations and Functions

KEY: Conceptual Understanding | Procedural Knowledge

81. ANS:

i)  $-4$ ii)  $26$ iii)  $12$ iv)  $52$ The values of the expressions from greatest to least are:  $52, 26, 12, -4$ 

PTS: 0 DIF: Moderate REF: 2.1 Absolute Value of a Real Number

LOC: 11.AN1 TOP: Relations and Functions

KEY: Conceptual Understanding | Procedural Knowledge

82. ANS:

 $3(27x + 8y + 3)(27x - 8y - 21)$ 

PTS: 0 DIF: Moderate REF: 3.1 Factoring Polynomial Expressions

LOC: 11.RF1 TOP: Relations and Functions KEY: Procedural Knowledge

83. ANS:

 $162 \text{ m}^2$ 

PTS: 0 DIF: Moderate

REF: 4.7 Modelling and Solving Problems with Quadratic Functions

LOC: 11.RF4 TOP: Relations and Functions

KEY: Problem-Solving Skills | Procedural Knowledge

84. ANS:

A linear-quadratic system may have 2 solutions, 1 solution, or no solution.

A quadratic-quadratic system may have 2 solutions, 1 solution, no solution, or infinite solutions.

PTS: 0 DIF: Easy REF: 5.5 Solving Systems of Equations Algebraically

LOC: 11.RF6 TOP: Relations and Functions

KEY: Communication | Conceptual Understanding

85. ANS:

a) coordinates of the vertex:  $(0, 50)$ b)  $x = 0$ c)  $x$ -intercepts:  $-45, 45$  $y$ -intercept:  $50$ 

PTS: 0 DIF: Easy

REF: 4.4 Analyzing Quadratic Functions of the Form  $y = a(x - p)^2 + q$ 

LOC: 11.RF3 TOP: Relations and Functions KEY: Conceptual Understanding

86. ANS:

approximately  $56.3^\circ$ 

PTS: 0                      DIF: Moderate              REF: 6.1 Angles in Standard Position in Quadrant 1

LOC: 11.T2                      TOP: Trigonometry

KEY: Procedural Knowledge | Problem-Solving Skills

87. ANS:

a) The reference angle is  $7^\circ$ .

b) The other angles that have the same reference angle are:

 $187^\circ$  $353^\circ$ 

PTS: 0                      DIF: Moderate              REF: 6.2 Angles in Standard Position in All Quadrants

LOC: 11.T1                      TOP: Trigonometry                      KEY: Conceptual Understanding

88. ANS:

$$\frac{4m^3 - 36m + mn^2 - 3n^2}{4mn^3}, m \neq 0, n \neq 0$$

PTS: 0                      DIF: Moderate

REF: 7.3 Adding and Subtracting Rational Expressions with Monomial Denominators

LOC: 11.AN5                      TOP: Algebra and Number

KEY: Conceptual Understanding | Procedural Knowledge

89. ANS:

$$\frac{25x + 131}{14(x + 3)(3x + 2)}, x \neq -3, x \neq -\frac{2}{3}$$

PTS: 0                      DIF: Moderate

REF: 7.4 Adding and Subtracting Rational Expressions with Binomial and Trinomial Denominators

LOC: 11.AN5                      TOP: Algebra and Number

KEY: Conceptual Understanding | Procedural Knowledge

90. ANS:

Yes, the Sine Law can be used;  $KL = 12.0$  cm.

PTS: 0                      DIF: Moderate              REF: 6.4 The Sine Law

LOC: 11.T3                      TOP: Trigonometry

KEY: Conceptual Understanding | Procedural Knowledge

## PROBLEM

91. ANS:

The prices of the tickets form an arithmetic sequence with first 3 terms \$85, \$77, \$69, ...

The total cost of Joe's tickets is the sum of the first 8 terms of the arithmetic series:

$$\$85 + \$77 + \$69 + \dots$$

$$\text{Use: } S_n = \frac{n[2t_1 + d(n-1)]}{2} \quad \text{Substitute: } n = 8, t_1 = 85, d = -8$$

$$S_8 = \frac{8[2(85) - 8(8-1)]}{2}$$

$$S_8 = 456$$

To buy 1 ticket from each section, Joe will have to spend \$456.

PTS: 1

DIF: Difficult

REF: 1.2 Arithmetic Series

LOC: 11.RF9

TOP: Relations and Functions

KEY: Communication | Conceptual Understanding | Problem-Solving Skills

92. ANS:

$$\text{a) } S_n = \frac{n[2t_1 + d(n-1)]}{2} \quad \text{Substitute: } n = 196, t_1 = 7, d = 7$$

$$S_{196} = \frac{196[2(7) + 7(196-1)]}{2}$$

$$S_{196} = 135\,142$$

$$\text{b) } t_n = t_1 + d(n-1) \quad \text{Substitute: } t_1 = 7, d = 7, n = 196$$

$$t_{196} = 7 + 7(196-1)$$

$$t_{196} = 1372$$

PTS: 1

DIF: Moderate

REF: 1.2 Arithmetic Series

LOC: 11.RF9

TOP: Relations and Functions

KEY: Conceptual Understanding | Problem-Solving Skills



93. ANS:

a)  $r$  is  $\frac{\frac{3}{5}}{3} = \frac{1}{5}$

Use:  $t_n = t_1 r^{n-1}$       Substitute:  $t_n = 3, r = \frac{1}{5}, n = 4$

$$3 = t_1 \left(\frac{1}{5}\right)^{4-1}$$

$$t_1 = 375$$

$$t_2 = 375 \left(\frac{1}{5}\right) = 75$$

$$t_3 = 375 \left(\frac{1}{5}\right)^2 = 15$$

The first 3 terms are:

$$t_1 = 375, t_2 = 75, t_3 = 15$$

b) The sequence is convergent because the terms approach a constant value of 0.

PTS: 1      DIF: Moderate      REF: 1.3 Geometric Sequences

LOC: 11.RF10      TOP: Relations and Functions

KEY: Communication | Conceptual Understanding | Problem-Solving Skills

94. ANS:

Write  $5x^2 + kx - 4 = (5x - 2)(x + h)$

Equate the constant terms.

If  $5x - 2$  is a factor, then  $-4 = -2h$ , so  $h = 2$

Substitute this value for  $h$  in  $(5x - 2)(x + h)$ , then expand.

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

The value of  $k$  is 8.

PTS: 0      DIF: Difficult      REF: 3.1 Factoring Polynomial Expressions

LOC: 11.RF1      TOP: Relations and Functions

KEY: Communication | Problem-Solving Skills

95. ANS:

Write an inequality to represent the problem.

Let  $x$  m represent the width of the garden.

Then its length is  $(x + 5)$  m.

And its area, in square metres, is  $x(x + 5)$ .

The area is at least  $45 \text{ m}^2$ .

So, an inequality is:

$$x(x + 5) \geq 45 \quad \text{Rearrange the inequality.}$$

$$x^2 + 5x - 45 \geq 0$$

Use a graphing calculator to graph the corresponding quadratic function:  $y = x^2 + 5x - 45$

Determine the  $x$ -intercepts:  $x = -9.6589 \dots$  and  $x = 4.6589 \dots$

From the graph, the inequality is greater than or equal to 0 for  $x \leq -9.6589 \dots$  or  $x \geq 4.6589 \dots$

Since the width of the garden is positive, the solution of the problem is:  $x \geq 4.6589 \dots$

The width of the garden is greater than or equal to approximately 4.7 m and its length is greater than or equal to approximately  $(4.7 + 5)$  m, or 9.7 m.

Verify the solution.

The area of the garden with dimensions 4.7 m and 9.7 m is:

$$(4.7 \text{ m})(9.7 \text{ m}) = 45.59 \text{ m}^2$$

This is greater than  $45 \text{ m}^2$ , so the possible dimensions are correct.

PTS: 0

DIF: Difficult

REF: 5.1 Solving Quadratic Inequalities in One Variable

LOC: 11.RF8

TOP: Relations and Functions

KEY: Communication | Problem-Solving Skills

96. ANS:

Use the formula for the surface area,  $SA$ , of a cube:  $SA = 6x^2$ , where  $x$  represents the edge length. Cube A has a surface area of  $M$  square units.

For cube B:

$$SA = 2M$$

$$6x^2 = 2M$$

$$x^2 = \frac{1}{3}M$$

$$x = \sqrt{\frac{1}{3}M}$$

For cube C:

$$SA = 9M$$

$$6x^2 = 9M$$

$$x^2 = \frac{3}{2}M$$

$$x = \sqrt{\frac{3}{2}M}$$

The edge length of cube B is  $\sqrt{\frac{1}{3}M}$  units.

The edge length of cube C is  $\sqrt{\frac{3}{2}M}$  units.

PTS: 0

DIF: Moderate

REF: 2.2 Simplifying Radical Expressions

LOC: 11.AN2

TOP: Relations and Functions

KEY: Procedural Knowledge | Communication | Problem-Solving Skills

97. ANS:

- a) Let
- $x$
- represent the first number and let
- $y$
- represent the second number.

The statement that the sum of 5 times the first number and 6 times the second number is 0 can be modelled with the equation:  $5x + 6y = 0$

The statement that when twice the second number is subtracted from the square of the first number, the result is equal to 20 minus the first number can be modelled with the equation:  $x^2 - 2y = 20 - x$

Solve each equation for  $y$  to get a system:

$$y = -\frac{5}{6}x \quad \textcircled{1}$$

$$y = \frac{1}{2}x^2 + \frac{1}{2}x - 10 \quad \textcircled{2}$$

- b) Solve the system. Since the left sides of the equations are equal, the right sides must also be equal.

$$-\frac{5}{6}x = \frac{1}{2}x^2 + \frac{1}{2}x - 10$$

$$-\frac{1}{2}x^2 - \frac{1}{2}x - \frac{5}{6}x + 10 = 0$$

$$-\frac{1}{2}x^2 - \frac{3}{6}x - \frac{5}{6}x + 10 = 0$$

$$x^2 + \frac{8}{3}x - 20 = 0$$

Use the quadratic formula.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \quad \text{Substitute: } a = 1, b = \frac{8}{3}, c = -20$$

$$x = \frac{-\frac{8}{3} \pm \sqrt{\left(\frac{8}{3}\right)^2 - 4(1)(-20)}}{2(1)}$$

$$x = \frac{-\frac{8}{3} \pm \sqrt{\frac{784}{9}}}{2}$$

$$\text{So, } x = -6 \text{ or } x = \frac{10}{3}$$

Substitute each value of  $x$  in equation  $\textcircled{1}$ .

When  $x = -6$ :

$$y = -\frac{5}{6}(-6)$$

$$y = 5$$

When  $x = \frac{10}{3}$ :

$$y = \left(-\frac{5}{6}\right)\left(\frac{10}{3}\right)$$

$$y = -\frac{25}{9}$$

The solutions are:  $-6$  and  $5$ ;  $\frac{10}{3}$  and  $-\frac{25}{9}$

Verify the solutions using the statement of the problem.

For  $x = -6$  and  $y = 5$ :

The sum of 5 times  $-6$  and 6 times  $5$  is  $0$ .

When 2 times  $5$  is subtracted from  $(-6)^2$ , the result is equal to  $20$  minus  $-6$ .

These numbers satisfy the problem statement.

For  $x = \frac{10}{3}$  and  $y = -\frac{25}{9}$ :

The sum of 5 times  $\frac{10}{3}$  and 6 times  $-\frac{25}{9}$  is  $0$ .

When 2 times  $-\frac{25}{9}$  is subtracted from  $\left(\frac{10}{3}\right)^2$ , the result is equal to  $20$  minus  $\frac{10}{3}$ .

These numbers satisfy the problem statement.

So, the numbers are:  $-6$  and  $5$ ; or  $\frac{10}{3}$  and  $-\frac{25}{9}$

PTS: 0                      DIF: Difficult                      REF: 5.5 Solving Systems of Equations Algebraically

LOC: 11.RF6                      TOP: Relations and Functions

KEY: Communication | Problem-Solving Skills

98. ANS:

Draw a labelled diagram to represent the problem.

In right  $\triangle FLP$ ,  $FP$  is the hypotenuse and  $FL$  is the side opposite  $\angle P$ .

So, use the sine ratio to determine the length of  $FL$ .

$$\sin P = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\sin P = \frac{FL}{FP}$$

$$\sin 57^\circ = \frac{FL}{8.1}$$

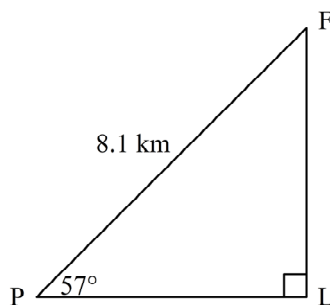
Solve the equation for  $FL$ .

$$\sin 57^\circ = \frac{FL}{8.1}$$

$$8.1 \sin 57^\circ = FL$$

$$FL = 6.7932\dots$$

The distance between the fishing boat and the lighthouse is approximately  $6.8$  km.



PTS: 0                      DIF: Moderate                      REF: 6.2 Angles in Standard Position in All Quadrants

LOC: 11.T2                      TOP: Trigonometry

KEY: Communication | Problem-Solving Skills

99. ANS:

Let  $x$  hours represent the time it takes Ginelle to install a subfloor on her own.

Then, the time it takes Tonya is  $(x + 12)$  hours.

In 1 h, Ginelle can install  $\frac{1}{x}$  of the subfloor and Tonya can install  $\frac{1}{x + 12}$  of the subfloor.

Working together, it takes 8 h to completely install the subfloor. So, an equation is:

$$8\left(\frac{1}{x} + \frac{1}{x + 12}\right) = 1$$

$$\frac{8}{x} + \frac{8}{x + 12} = 1, x > 0$$

Solve the equation. A common denominator is:  $x(x + 12)$

$$\frac{8}{x} + \frac{8}{x + 12} = 1$$

$$x(x + 12)\left(\frac{8}{x}\right) + x(x + 12)\left(\frac{8}{x + 12}\right) = x(x + 12)$$

$$8(x + 12) + 8(x) = x(x + 12)$$

$$8x + 96 + 8x = x^2 + 12x$$

$$x^2 - 4x - 96 = 0$$

$$x = 12 \text{ or } x = -8$$

Since time cannot be negative,  $x = 12$ .

So,  $x + 12 = 24$

It would take Ginelle 12 h to install a subfloor and it would take Tonya 24 h to install a subfloor.

PTS: 0

DIF: Difficult

REF: 7.6 Applications of Rational Equations

LOC: 11.AN6

TOP: Algebra and Number

KEY: Procedural Knowledge | Communication | Problem-Solving Skills

100. ANS:

a) I can equate the two reciprocals to determine if there is a value of  $x$  for which the  $y$ -values are the same. If there is, then the graphs intersect.

b) The  $y$ -values are equal when:

$$\frac{1}{f(x)} = \frac{1}{g(x)}$$

$$\frac{1}{x - 3} = \frac{1}{-3x + 5}$$

$$x - 3 = -3x + 5$$

$$4x = 8$$

$$x = 2$$

Substitute  $x = 2$  in  $y = \frac{1}{x - 3}$ :

$$y = \frac{1}{(2) - 3}$$

$$y = -1$$

The graphs of the reciprocal functions intersect at  $(2, -1)$ .

PTS: 0

DIF: Difficult

REF: 8.3 Graphing Reciprocals of Linear Functions

LOC: 11.RF11

TOP: Relations and Functions

KEY: Conceptual Understanding | Procedural Knowledge | Communication