**PreCalc 11**

**Multiple Choice**

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

**\_\_\_\_ 1.** In the arithmetic sequence: –18, –10, –2, 6, ...; which term has the value 222?

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 2.** Determine the common difference, *d*, of this arithmetic sequence: –32.1, –27.8, –23.5, –19.2, ...

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** | The sequence has no common difference. |

**\_\_\_\_ 3.** The sum of the first 22 terms of an arithmetic series is 2288. The sum of the first 23 terms is 2484. The common difference is 8. Determine the first 4 terms of the series.

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 4.** Which sequence could be geometric?

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** | 3, –1.2, 0.48, –0.192 | **C.** | –2, –2.1, –2.2, –2.3, ... |
| **B.** | –9, –6, –3, 0, ... | **D.** | –10, –50, –250, –1250, ... |

**\_\_\_\_ 5.** ** is a term in which geometric sequence?

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** | 2, 4, 8, 16, ... | **C.** | 2, 12, 72, 432, ... |
| **B.** | 4, 24, 144, 864, ... | **D.** | 3, 6, 12, 24, ... |

**\_\_\_\_ 6.** Determine the 8th term of this geometric sequence: 7, 21, 63, 189, ...

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 7.** Determine the 6th term of this geometric sequence: –9, 27, –81, 243, ...

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 8.** To reproduce, a single bacterium splits into two. Assume it takes a single bacterium 20 min to split. When will there be 128 bacteria?

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** | 140 min | **C.** | 168 min |
| **B.** | 176 min | **D.** | 480 min |

**\_\_\_\_ 9.** Jane deposited $1500 in a long-term savings account on her 23rd birthday. She did not make any more deposits or withdrawals. The account earned 7% per year. How much money did she have in the account when she turned 40?

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** | $4428.25 | **C.** | $3867.80 |
| **B.** | $5424.79 | **D.** | $27 285.00 |

**\_\_\_\_ 10.** Write the first 4 terms of the geometric sequence with *t*1 = 405 and *r* = .

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** | 405, , , | **C.** | 405, , , |
| **B.** | 405, , , | **D.** | 405, –1215, 3645, –10935 |

**\_\_\_\_ 11.** The sum of the first 12 terms of which geometric series is 5460?

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 12.** The sum of the first *n* terms of a geometric series is: 

For this series:

I. The common ratio is 5.

II. The first 3 terms are 4, 20, and 100.

III. The difference between the common ratio and the 1st term is 1.

IV. The difference between *S*6 and *S*5 is the same as the difference between *S*4 and *S*3.

|  |  |
| --- | --- |
| **A.** | Statements I, II, III, and IV are correct. |
| **B.** | Statements I, II, and III are correct. |
| **C.** | Statements I, III, and IV are correct. |
| **D.** | All of the statements are correct. |

**\_\_\_\_ 13.** Determine the sum of the first 9 terms of this geometric series:  ...

Write the sum to the nearest hundredth if necessary.

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 14.** Determine the common ratio of a geometric series that has these partial sums: , , 

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 15.** The sum of the first 5 terms of a geometric series is 682. The common ratio is . Determine the 3rd term.

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 16.** Which geometric sequence could this graph represent?



|  |  |  |  |
| --- | --- | --- | --- |
| **A.** | –1, , , , ... | **C.** | –1, –2, –4, –8, ... |
| **B.** | –1, –3, –9, –27, ... | **D.** | –1, 2, –4, 8, ... |

**\_\_\_\_ 17.** Which geometric series could this graph represent?



|  |  |  |  |
| --- | --- | --- | --- |
| **A.** | 6 +  +  +  + ... | **C.** |  |
| **B.** | 6 + 12 + 24 + 48 + ... | **D.** | 6 + 18 + 54 + 162 + ... |

**\_\_\_\_ 18.** Which value of *r* could be the common ratio of the geometric series represented by this graph?



|  |  |  |  |
| --- | --- | --- | --- |
| **A.** | *r* = 2 | **C.** | *r* = –2 |
| **B.** | *r* = | **D.** | *r* = |

**\_\_\_\_ 19.** Determine whether this infinite geometric series has a finite sum: 

If it does, determine the sum.

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** | This series does not have a finite sum. | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 20.** A geometric series has  and . Determine the common ratio.

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 21.** Evaluate: 

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **A.** | 384 | **B.** | –68 | **C.** | 429 | **D.** | –384 |

**\_\_\_\_ 22.** Write this entire radical as a mixed radical: 

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **A.** |  | **B.** |  | **C.** |  | **D.** |  |

**\_\_\_\_ 23.** For which values of the variable, *x*, is this radical defined?



|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** | the radical is never defined |

**\_\_\_\_ 24.** Which radical expression simplifies to ?

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **A.** |  | **B.** |  | **C.** |  | **D.** |  |

**\_\_\_\_ 25.** Which radical expression simplifies to ?

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 26.** Which radical expression simplifies to ?

|  |  |
| --- | --- |
| **A.** |  |
| **B.** |  |
| **C.** |  |
| **D.** |  |

**\_\_\_\_ 27.** Which radical expression simplifies to 

|  |  |
| --- | --- |
| **A.** |  |
| **B.** |  |
| **C.** |  |
| **D.** |  |

**\_\_\_\_ 28.** Simplify this radical, if possible: 

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** | cannot be simplified |

**\_\_\_\_ 29.** Simplify by adding or subtracting like terms: 

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 30.** Expand and simplify this expression: 

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 31.** Solve this equation: 

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **A.** | *x* = –3 | **B.** | *x* = 9 | **C.** | *x* = 3 | **D.** | *x* = –9 |

**\_\_\_\_ 32.** Factor this polynomial: 

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** | ()() | **C.** | ()() |
| **B.** | ()() | **D.** | ()() |

**\_\_\_\_ 33.** Which statement is true for the equation ?

|  |  |
| --- | --- |
| **A.** | 7 and –1 are roots. |
| **B.** | 7 is a root of the original equation and –1 is an extraneous root. |
| **C.** | 1 is a root of the original equation and –7 is an extraneous root. |
| **D.** | 7 and 1 are both extraneous roots. |

**\_\_\_\_ 34.** Solve by factoring: 

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 35.** For which quadratic equation is  a solution?

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 36.** Determine the value of  that makes  a perfect square.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **A.** | 169 | **B.** | 84.5 | **C.** | 6.5 | **D.** | 42.25 |

**\_\_\_\_ 37.** Solve ** by completing the square.

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 38.** The roots of any quadratic equation are:  and 

Which expression represents the product of these roots?

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **A.** |  | **B.** |  | **C.** |  | **D.** |  |

**\_\_\_\_ 39.** Without solving, determine the number of real roots of this equation: 

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **A.** | 2 | **B.** | 0 | **C.** | 1 |

**\_\_\_\_ 40.** For a quadratic function, which characteristic of its graph is equivalent to the zero of the function?

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** | minimum point | **C.** | *x*-intercept |
| **B.** | maximum point | **D.** | *y*-intercept |

**\_\_\_\_ 41.** Which statement below is NOT true for the graph of a quadratic function?

|  |  |
| --- | --- |
| **A.** | The vertex of a parabola is its highest or lowest point. |
| **B.** | When the coefficient of  is positive, the vertex of the parabola is a minimum point. |
| **C.** | The axis of symmetry intersects the parabola at the vertex. |
| **D.** | The parabola is symmetrical about the *y*-axis. |

**\_\_\_\_ 42.** Which graph represents the quadratic function ?

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 43.** Identify the quadratic function that this table of values represents, then determine the value of *y* when *x* = 7.

|  |  |
| --- | --- |
| ***x*** | ***y*** |
| –1 | –9 |
| 0 | –3 |
| 3 | –33 |

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** | ; 185 | **C.** | ; –185 |
| **B.** | ; 185 | **D.** | ; –182 |

**\_\_\_\_ 44.** Which of the following describes the translation that would be applied to the graph of  to get the graph of ?

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** | Translate 4 units right | **C.** | Translate 4 units up |
| **B.** | Translate 4 units left | **D.** | Translate 4 units down |

**\_\_\_\_ 45.** Which statement is NOT true for the graph of ?

|  |  |
| --- | --- |
| **A.** | When *q* is positive, the graph lies above the *x*-axis. |
| **B.** | As *q* increases, the graph moves up. |
| **C.** | When *q* is negative, the vertex is above the *x*-axis. |
| **D.** | The graph has the same size and shape as the graph of . |

**\_\_\_\_ 46.** Which statement is NOT true for the graph of ?

|  |  |
| --- | --- |
| **A.** | When *a* is greater than 1, the graph is the image of the graph of  after a vertical stretch. |
| **B.** | When *,* the graph is the image of the graph of  after a vertical compression and a reflection in the *x*-axis. |
| **C.** | The vertex of the graph is always at the origin. |
| **D.** | When *a* is less than , the graph is the image of the graph of  after a vertical stretch and a reflection in the *x*-axis. |

**\_\_\_\_ 47.** Determine an equation of this graph of a quadratic function.



|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 48.** Match the quadratic function  to a graph below.

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 49.** Determine an equation of a quadratic function with the given characteristics of its graph: coordinates of the vertex: V(0, 2); passes through A(–2, –18)

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 50.** Which equation represents the same quadratic function as ?

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 51.** Which equation represents the same quadratic function as ?

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 52.** Two numbers have a difference of 12 and their product is a minimum. Determine the numbers.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **A.** | –6 and 6 | **B.** | –3 and 9 | **C.** | 6 and 18 | **D.** | 0 and 12 |

**\_\_\_\_ 53.** Which coordinates are a solution of the inequality ?

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **A.** | (2, 8) | **B.** | (0, 1) | **C.** | (3, 7) | **D.** | (5, 8) |

**\_\_\_\_ 54.** Match the inequality  to its graph.

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 55.** Write an inequality to describe this graph.



|  |  |  |  |
| --- | --- | --- | --- |
| **A.** | –3*x* + 3*y*  –9 | **C.** | 3*x* – 3*y*  –9 |
| **B.** | 3*x* – 3*y*  –9 | **D.** | –3*x* + 3*y*  –9 |

**\_\_\_\_ 56.** Which ordered pair is a solution of the quadratic inequality ?

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **A.** | (3, 36) | **B.** | (1, 1) | **C.** | (–1, 2) | **D.** | (2, 19) |

**\_\_\_\_ 57.** Which statement describes an error in the graph of ?



|  |  |
| --- | --- |
| **A.** | The incorrect region is shaded. |
| **B.** | The parabola opens in the wrong direction. |
| **C.** | The vertex is incorrect. |
| **D.** | The parabola should be a broken line. |

**\_\_\_\_ 58.** Which graph represents the inequality ?

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 59.** Write an inequality to describe this graph.



|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 60.** Use a graphing calculator. Which graph represents this system of equations?





|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 61.** Point P(9, 4) is on the terminal arm of an angle ** in standard position. To the nearest tenth, determine the distance from the origin to P.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **A.** | 6.5 | **B.** | 9.8 | **C.** | 13.0 | **D.** | 5.1 |

**\_\_\_\_ 62.** Point P(*x*, *y*) is on the terminal arm of a 35° angle in standard position. The distance *r* between P and the origin is 7. To the nearest tenth, determine the coordinates of P.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **A.** | (5.7, 4.0) | **B.** | (4.0, 5.7) | **C.** | (2.4, 6.6) | **D.** | (8.0, 11.5) |

**\_\_\_\_ 63.** A helicopter is ascending vertically. On the ground, a searchlight is 175 m from the point where the helicopter lifted off. It shines on the helicopter and the angle the beam makes with the ground is 50. To the nearest metre, how high is the helicopter at this point?

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **A.** | 147 m | **B.** | 134 m | **C.** | 209 m | **D.** | 272 m |

**\_\_\_\_ 64.** In DEF, DE = 8 cm and D = 60°. When EF = 7 cm, how many triangles are possible?

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **A.** | 0 | **B.** | 2 | **C.** | 3 | **D.** | 1 |

**\_\_\_\_ 65.** In XYZ, XY = 6 cm and X = 33°. For which value of YZ is no triangle possible?

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **A.** | 6 cm | **B.** | 3 cm | **C.** | 4 cm | **D.** | 12 cm |

**\_\_\_\_ 66.** In LMN, LM = 9.7 m and L = 56°. For which value of MN can an isosceles triangle be drawn?

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **A.** | 8 m | **B.** | 9.7 m | **C.** | 8.3 m | **D.** | 11.7 m |

**\_\_\_\_ 67.** In DEF, DE = 11 cm and EF = 9 cm. For which measure of D is it possible to draw two scalene triangles?

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **A.** | 54° | **B.** | 65° | **C.** | 58° | **D.** | 90° |

**\_\_\_\_ 68.** In PQR, PQ = 6.2 cm and P = 46°. For what value of QR is PQR a right triangle with ? Where necessary, give the answer to the nearest tenth.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **A.** | 4.5 cm | **B.** | 5.9 cm | **C.** | 8.6 cm | **D.** | 6.2 cm |

**\_\_\_\_ 69.** For PQR, determine the length of QR to the nearest tenth of a centimetre.



|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **A.** | 6.2 cm | **B.** | 3.4 cm | **C.** | 15.2 cm | **D.** | 4.6 cm |

**\_\_\_\_ 70.** For XYZ, determine the measure of Z to the nearest degree and the measure of XZ to the nearest tenth of a centimetre.



|  |  |  |  |
| --- | --- | --- | --- |
| **A.** | Z = 28°; XZ = 7.3 cm | **C.** | Z = 53°; XZ = 8.0 cm |
| **B.** | Z = 30°; XZ = 12.1 cm | **D.** | Z = 59°; XZ = 4.8 cm |

**\_\_\_\_ 71.** In PQR, determine the measure of R to the nearest degree.



|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **A.** | 42° | **B.** | 86° | **C.** | 83° | **D.** | 7° |

**\_\_\_\_ 72.** Which of the following are the non-permissible values for this rational expression?



|  |  |  |  |
| --- | --- | --- | --- |
| **A.** | , , and | **C.** | and |
| **B.** | , , and | **D.** | and |

**\_\_\_\_ 73.** Simplify this rational expression and state the non-permissible values of the variable.



|  |  |  |  |
| --- | --- | --- | --- |
| **A.** | ;  and | **C.** | ;  and |
| **B.** | ;  and | **D.** | ;  and |

**\_\_\_\_ 74.** Simplify this expression:



|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 75.** Simplify.



|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 76.** Simplify.



|  |  |  |  |
| --- | --- | --- | --- |
| **A.** | , | **C.** | , |
| **B.** | , | **D.** | , |

**\_\_\_\_ 77.** Simplify.



|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 78.** Simplify.



|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 79.** Which expression is equivalent to ?

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 80.** Simplify.



|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** | none of the above |

**\_\_\_\_ 81.** Simplify.



|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 82.** Which statement about the absolute value function  is NOT true?

|  |  |
| --- | --- |
| **A.** | Its graph is the same as the graph of  when . |
| **B.** | Its graph is the same as the graph of  when . |
| **C.** | Its graph is the same as the graph of  when . |
| **D.** | Its graph is the same as the graph of  when . |

**\_\_\_\_ 83.** Which absolute value function is represented by this graph?



|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 84.** The graph of which absolute value function would have *x*-intercepts  and  and *y*-intercept 4?

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 85.** Which absolute value function is represented by this graph?



|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 86.** Sketch the graph of the absolute value function .

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 87.** Which absolute value function is represented by this graph?



|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 88.** The function  is linear. The line  intersects the graph of  at (6, 14) and (–8, 14). The line  intersects the graph of  at (2, 6) and (–4, 6). What is an equation for the function ?

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 89.** For the function , write the equation of its reciprocal function.

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 90.** This is the graph of a linear function. Which graph below represents the reciprocal function and its asymptotes?



|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 91.** The graph of the reciprocal of a linear function has this vertical asymptote. What is the linear function?



|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 92.** Which graph represents the function  and its reciprocal function ?

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 93.** Which graph represents the function  and its reciprocal function ?

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 94.** The equation of the vertical asymptote of the graph of the reciprocal of a linear function is . Which is a possible equation of the reciprocal function?

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 95.** The equation of the vertical asymptote of the graph of the reciprocal of a linear function is *x* = . Which is a possible equation of the reciprocal function?

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 96.** The graphs of two distinct linear functions  and  are parallel. Their reciprocal functions,  and , are graphed on the same grid. Which graph below is a possible graph of the two reciprocal functions?

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 97.** This is the graph of the reciprocal of a linear function. Which graph below represents the linear function?



|  |  |  |  |
| --- | --- | --- | --- |
| **A.** |  | **C.** |  |
| **B.** |  | **D.** |  |

**\_\_\_\_ 98.** Without graphing, determine the equations of the vertical asymptotes of the graph of *y* = .

|  |  |  |  |
| --- | --- | --- | --- |
| **A.** | and | **C.** | and |
| **B.** |  | **D.** | no vertical asymptotes |

**\_\_\_\_ 99.** This is a graph of . Identify the vertical asymptotes of the graph of the reciprocal function.



|  |  |  |  |
| --- | --- | --- | --- |
| **A.** | and | **C.** | and |
| **B.** | and | **D.** | no vertical asymptotes |

**\_\_\_\_ 100.** This is a graph of . Identify the vertical asymptotes of the graph of the reciprocal function.



|  |  |  |  |
| --- | --- | --- | --- |
| **A.** | and | **C.** | and |
| **B.** | and | **D.** | no vertical asymptotes |

**Problem**

**1.** Tempel 1 is a periodic comet that orbits the Sun every 5.5 years and was last seen in the year 2005. If Tempel 1 maintains its current orbit around the Sun, will it appear in the year 2093?

**2.** A convention centre uses square tables arranged in a single row as shown below. Each square table seats 4 people, but adding another square table adds only 2 more seats. The number of seats for a given number of tables can be represented by an arithmetic sequence.



a) Determine the first 5 terms of the arithmetic sequence.

b) How many seats are there if 10 tables are arranged in a single row?

**3.** In this arithmetic sequence, *k* is a natural number:  ...

a) Determine *t*6.

b) Write an expression for *tn*.

c) Suppose ; determine the value of *k*.

**4.** Use the given data about each arithmetic series to determine the indicated value.

a)  ...; determine *S*16

b) **; determine *S*17

c) ; determine *S*94

**5.** Use the given data about each arithmetic series to determine the indicated value.

a) ; determine *t*1

b) ; determine *n*

**6.** a) A geometric sequence has these terms:

*t*4 = , *t*5 = , *t*6 = 

State the common ratio, then write the first 3 terms of the sequence.

b) Identify the sequence as convergent or divergent. Explain.

**7.** The first term in a geometric sequence is 0.0005. Each term is double the previous term.

What is term 25?

**8.** The sum of the first 6 terms of a geometric series is –315. The common ratio is 2. Determine *t*1.

**9.** A robotic frog is programmed to make a sequence of jumps, each jump  the length of the preceding one. A frog is programmed to jump to a position 12 m away in 12 jumps. Determine the horizontal distance of each of the first 3 jumps. Give your answers to the nearest hundredth of a metre.

**10.** Suppose the lengths of a frog’s jumps form a geometric series. After 12 jumps, the frog has travelled a horizontal distance of approximately 6265.56 cm. The common ratio is .

Determine the length of the frog’s first jump.

**11.** a) Without graphing, describe the graph of this geometric sequence:

3, 9, 27, 81, 243, 729, ...

b) Without graphing, describe the graph of the partial sums of this geometric series:  ...

c) Verify your descriptions by graphing. Sketch and label each graph on a grid below.



**12.** An infinite geometric series with  is represented by this equation: 

a) Determine the first 4 terms of the series.

b) Determine whether the series diverges or converges.

c) If the series has a finite sum, determine the sum.

**13.** Yvette created the design shown below. The perimeter of the largest square is 13 in. The perimeter of each subsequent square is 75% of the perimeter of the previous square. Suppose Yvette could continue her design indefinitely. Determine the sum of the perimeters of all the squares. Explain your work.



**14.**

|  |  |
| --- | --- |
| A circle with radius 1.0 cm is inscribed inside an equilateral triangle, as shown. Smaller circles are then inscribed in the remaining space as shown. The radius of each smaller circle is  the radius of the previous circle. Suppose the process continues indefinitely.  Determine the sum of the areas of the circles. |  |

**15.** Mark each number on the number line below and indicate its distance from 0.

A = 12 B = 9 C =  D = –18.5



**16.** When 8 is added to an integer, *x*, the absolute value of the sum is 5. Determine a value for *x*. How many different values of *x* are possible? Show how you solved the problem.

**17.** A right triangle has legs of lengths  and .

**a)** What are the restrictions on the variable *x*?

**b)**  Write an expression for the length of the hypotenuse. Show your work.

**18.** Three congruent rectangles are joined as shown. The length of each rectangle is 3 times its width. The area of each rectangle is 39 square units. In simplest form, write a radical expression for the perimeter of the shape formed. Show your work.



**19.** A squuare with area 44 square units is cut from a larger square, then placed beside it as shown.

|  |  |
| --- | --- |
| The side length of the larger square is  times as long as the side length of the smaller square. In simplest form, write a radical expression for the perimeter of the shaded region. Show your work. |  |

**20.** Expand and simplify this expression: 

Show your work.

**21.** The side length of a square is  units.

|  |  |
| --- | --- |
| Write, then simplify, a radical expression for the area of the square.  Show your work. |  |

**22.** Rectangles A and B are placed side by side to form a large rectangle as shown.

|  |  |
| --- | --- |
| Write, then simplify, a radical expression for the area of the large rectangle.  Show your work. |  |

**23.** a) Identify the values of the variables for which this expression is defined.

b) Write the expression in simplest form. Show your work.



**24.** Does this equation have a real root? Justify your answer.



**25.** The formula  relates the volume, *V*, of the cylinder to its radius, *r*, and its height, *h*.

|  |  |
| --- | --- |
| This cylinder has volume 260.4 cm3, and height 18.6 cm. What is the radius of the cylinder to the nearest tenth of a centimetre? |  |

**26.** The volume of water in Lake Ontario is about 1710 km3.

a) To the nearest kilometre, determine the edge length of a cube with the same volume.

b) To the nearest kilometre, determine the radius of a sphere with the same volume.

**27.** Consider the polynomial . Determine a value for *k* so that  is a factor of the polynomial. Explain your strategy.

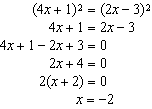
**28.** The perimeter, *P*, of a rectangular concrete slab is 46 m and its area, *A*, is 90 m2.

Use the formula . Determine the dimensions of the slab. Show your work.

**29.** Solve this equation, then verify the solution: 

Explain your steps.

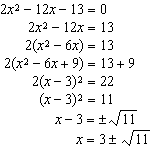
**30.** A student wrote the solution below to solve this equation: 



Identify the error, then write the correct solution.

**31.** Solve  by completing the square. Show your work.

**32.** A student wrote the solution below to solve this quadratic equation: 



The roots are:  and 

Identify the error, then write the correct solution.

**33.** Solve this equation  using each strategy below. Which strategy do you prefer? Explain why.

a) factoring

b) completing the square

c) using the quadratic formula

**34.** Consider this quadratic equation: *x*2 *x*  = 0

a) Rewrite the equation so that it does not contain fractions.

b) Solve the equation. Explain your answer.

**35.** Determine the values of *k* for which the equation  has exactly one real root, then write a possible equation.

**36.** Determine the values of *k* for which the equation  has no real roots, then write a possible equation.

**37.** Create two different quadratic equations whose discriminant is 64. Explain your strategy.

**38.** Use a graphing calculator to graph the quadratic function .

Determine:

a) the intercepts

b) the coordinates of the vertex

c) the equation of the axis of symmetry

d) the domain of the function

e) the range of the function

Write the answers to the nearest hundredth, if necessary.

**39.** A toy rocket is launched from a platform. The height of the rocket, *h* metres, *t* seconds after launch is modelled by the equation **.

a) Use a graphing calculator to graph the quadratic function.

b) Determine the *t*-intercepts of the graph, to the nearest hundredth. What do they represent?

c) To the nearest metre, what is the greatest height that the rocket reached? Explain how you know.

d) What is the domain? What does it represent?

**40.** Use graphing technology to solve this equation: 

Explain your strategy.

**41.** Graph each quadratic function on the same grid without using a table of values or a graphing calculator. Explain your strategy each time.

a) 

b) 



**42.** Graph each quadratic function on the same grid without using a table of values or a graphing calculator. Explain your strategy each time.

a) 

b) 



**43.** Determine an equation of a quadratic function with the given characteristics of its graph.

coordinates of the vertex: V(5, 4); *y*-intercept 79

**44.** For the quadratic function 

a) Identify:

i) the direction of opening

ii) the vertex

iii) the equation of the axis of symmetry

iv) the intercepts

v) the domain and range of the function

b) Sketch a graph. Explain your strategy.



**45.** What are the coordinates of the vertex of the parabola with equation ? Show your work.

**46.** Write  in standard form, then identify the coordinates of the vertex. Show your work.

**47.** a) Do the equations  and  represent the same quadratic function? Show your work.

b) What are the advantages of rewriting  in standard form? Identify the characteristics of the graph of the function.

**48.** Write  in standard form. Explain your steps.

**49.** Sketch a graph of this quadratic function: 

Explain your steps.



**50.** A bridge spans a horizontal distance of 70 m and has a parabolic arch. At the centre of the bridge, the arch is 25 m high. Determine an equation that represents this parabolic arch. Explain your strategy.

**51.** Identify the minimum value or the maximum value of this quadratic function:  Explain how you know.

**52.** A toy rocket is launched from a platform. Its height, *h* metres, after *t* seconds is modelled by the equation *.* Use a graphing calculator to determine the maximum height of the rocket and the amount of time the rocket was in the air.

**53.** Maribel is building rectangular pens for her dogs, as shown below. She will fence the entire rectangular area with 78 m of fencing. What dimensions enclose the total maximum area? Show your work.



**54.** A baseball is hit upward from a platform that is 2 m high at an initial speed of 20 m/s. The approximate height of the baseball, *h* metres, after *t* seconds is given by the equation . Determine the time period for which the baseball is higher than 18 m.

Explain your strategy.

**55.** Graph each inequality for the given restrictions on the variables. Explain your strategy and describe the solution.

a) ; for 



b) ; for 



**56.** An electronics store makes a profit of $24 on the sale of a cordless phone and a profit of $30 on the sale of a cordless phone with answering machine. The manager’s profit target is at least $180 a day from the sales of these phones.

a) Write an inequality that describes the profit.

b) Graph the inequality. What is the solution of the inequality?



c) This table shows the numbers of phones sold on 3 consecutive days.

|  |  |  |
| --- | --- | --- |
| **Day** | **Cordless Phone** | **Cordless Phone with Answering Machine** |
| 1 | 2 | 5 |
| 2 | 3 | 3 |
| 3 | 5 | 2 |

Use the graph to determine if the manager’s profit target was met each day.

Explain your strategy.

**57.** For B(–4, *b*) to be a solution of , what must be true about *b*?

Show and explain your work.

**58.** For A(*a*, 3) to be a solution of , what must be true about *a*?

Show and explain your work.

**59.** Two numbers are related in this way: 8 minus 4 times the square of one number is greater than the sum of 2 and 2 times the other number.

a) Graph an inequality that represents this relationship.



b) Use the graph to list 3 pairs of integer values for the 2 numbers.

Show and explain your strategy.

**60.** The length of a rectangle is 10 less than twice the square of a number. The width is 5 times another number. The length of the rectangle is greater than its width.

a) Sketch a graph to represent this situation.



b) Use the graph to list 3 possible sets of dimensions for the rectangle.

Show your work.

**61.** Use a graphing calculator. Graph this system of equations.





a) Sketch the graphs on the same grid.



b) Write the coordinates of the points of intersection.

**62.** Two numbers are related in this way:

The sum of 5 times the first number and 6 times the second number is 0.

When twice the second number is subtracted from the square of the first number, the result is equal to 20 minus the first number.

a) Create a system of equations to represent this relationship.

b) Solve the system to determine the numbers. Explain the strategy you used.

**63.** A stuntman jumped from an elevation of 500 m and was in free fall before he opened his parachute. His elevation, *h* metres, *t* seconds after jumping is modelled by these equations:

, before the parachute was opened

, after the parachute was opened

a) How many seconds after the stuntman jumped did he open the parachute?

b) What was his elevation when he opened the parachute?

Explain your strategy. Give your answers to the nearest tenth of a unit.

**64.** A football is kicked upward at an initial speed of 10 m/s. The approximate height of the ball, *h* metres, after *t* seconds is modelled by the equation . A soccer ball is kicked upward with an initial speed of 12 m/s. The approximate height of the ball, *h* metres, after *t* seconds is modelled by the equation .

a) The soccer ball is kicked 1 s after the football is kicked. Determine when both balls reached the same height.

b) What is this height?

Explain your strategy. Give your answers to the nearest tenth of a unit.

**65.** Determine the measures of A and B to the nearest tenth of a degree. Explain your strategy.



**66.** A rectangular lawn has the dimensions shown. A gardener wants to use an electric lawnmower to mow the lawn. The electrical outlet is located at O.

a) Determine the length of cord needed to reach corner B, to the nearest tenth of a metre.

b) Determine the distance between the electrical outlet and corner N, to the nearest tenth of a metre.

Explain your work.



**67.** Point P(–1, –5) is a terminal point of an angle ** in standard position.

a) Determine the ratios , , and .

b) Determine the measure of ** to the nearest degree.

Show your work.

**68.** Point P(9, –4) is a terminal point of an angle ** in standard position. Determine ** to the nearest degree, then sketch the angle. Show your work.

**69.** A coast guard patrol boat is due west of the Carmanah lighthouse. An overturned fishing boat is due north of the lighthouse. The patrol boat travels 9.1 km directly to the fishing boat. The angle between due east and the patrol boat’s path is 54°. To the nearest tenth of a kilometre, determine the distance between the fishing boat and the lighthouse. Explain your work.

**70.** In , AB = 35 cm, BC = 19 cm, and .

a) Explain why it is possible to draw two different triangles with these measures.

b) Sketch a diagram to show both triangles.

**71.** In ABC, AB = 8.3 cm and BC = 5.3 cm.

a) Describe the possible triangles.

b) To the nearest degree, determine possible measures of acute A.

Show your work.

**72.** In ABC, AB = 6 cm and . Complete the chart below for your own values of BC.

|  |  |  |  |
| --- | --- | --- | --- |
| **Length of BC (cm)** | **Value of** | **How does  compare with sin A?** | **Description of possible triangles** |
|  |  |  | No triangles are possible. |
|  |  |  | 1 isosceles triangle |
|  |  |  | 1 scalene triangle |
|  |  |  | 2 scalene triangles |

**73.** Two firefighters want to rescue a cat stuck in a tree. The cat is at an angle of elevation of 38° with respect to one firefighter and 80° with respect to the other firefighter. The firefighters are 30 m apart, and on opposite sides of the tree. To the nearest tenth of a metre, how high off the ground is the cat? Explain your strategy.

**74.** Two divers are 50 m apart. Each diver sees a treasure chest on the sea floor. The treasure chest is vertically below the line between the divers. From the divers, the angles of depression to the treasure chest are 35° and 51°. To the nearest metre, how far is the treasure chest from each diver? Consider possible cases and show your work.

**75.** Two fishing boats are 18 m apart. The fishermen in each boat see a school of fish vertically below the line through the boats. From the boats, the angles of depression to the fish are 35° and 51°. To the nearest metre, how far below sea level is the school of fish? Consider possible cases and show your work.

**76.** In DEF, DE = 7.5 cm, D = 70°, and EF = 9 cm.

a) Determine how many triangles can be drawn.

b) Solve the triangle(s). Give angle measures to the nearest degree and side lengths to the nearest tenth of a centimetre.

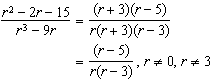
Show your work.

**77.** In trapezoid ABCD, calculate the length of diagonal AC to the nearest tenth. Show your work.



**78.** Explain why  is not an equivalent form of the expression .

**79.** Here is a student’s solution for simplifying a rational expression. Identify the error, then write a correct solution.



**80.** Write this rational expression in simplest form. State the non-permissible values of the variable. Show your work.



**81.** This rational expression is the quotient of two different rational expressions. What might the rational expressions have been? Describe your strategy.



**82.** Write a polynomial *M* such that the product of the two rational expressions below simplifies to 1. Describe your strategy.



**83.** The optical power of a thin lens is approximately the sum of the reciprocals of two distances: the distance from an object to a lens, , and the distance from a lens to the image it produces, . Write a simplified rational expression to represent the optical power of a thin lens. Show your work.

**84.** Simplify and show your work.



**85.** Write a rational equation with 3 as a solution and –3 as an extraneous root. Describe your strategy.

**86.** Ginelle is a master carpenter, and Tonya is her apprentice. It takes Tonya 18 h longer to install a subfloor for a new home than it takes Ginelle. Working together, they can install a subfloor in 12 h. How long would it take each person to install a subfloor working alone? Explain your solution.

**87.** A cyclist rode from town A to town B and back, a distance of about 3 km each way. On the trip out, there was a 8-km/h tailwind. On the return trip, there was a 6-km/h headwind. The total riding time was 5 h. To the nearest tenth of a kilometre per hour, what is the cyclist’s average speed when there is no wind? Explain your solution.

**88.** Complete this table of values, then sketch the graphs of  and  on the same grid.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| *x* | –2 | –1 | 0 | 1 | 2 | 3 |
|  | –6 | –4 |  |  | 2 | 4 |
|  |  |  | 2 | 0 |  |  |



**89.** Complete this table of values, then sketch the graphs of *y* = *f*(*x*) and  on the same grid. Identify the intercepts, domain, and range of the absolute value function.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *x* | –2 | –1 | 0 | 1 | 2 |
|  |  |  | –5 | 0 |  |
|  |  |  |  |  |  |



**90.** The function  is linear. Two points on the graph of  are S(–6, 3) and T(3, 6).

a) Graph the functions  and .

b) Determine the equations of the two functions and their intercepts.

c) Calculate the value of  when .

Explain your strategy.



**91.** Solve the equation . Use a graph to justify your answer.

Graph of :



**92.** Solve the equation . Show your work.

**93.** The graphs of the linear functions  and  are perpendicular. That is, their slopes are negative reciprocals. Do the graphs of their reciprocal functions intersect? How do you know?

**94.** a) Write a reciprocal function that describes the time, *t* hours, it takes an athlete to run 1 km, as a function of her speed, *s* kilometres per hour.

b) What are the domain and range of the reciprocal function in part a?

c) Sketch a graph of the reciprocal function in part a.



**95.** Predict the number of vertical asymptotes of the graph of each reciprocal function. Explain your answer. Write the equation of each vertical asymptote you identify.

a) 

b) 

**96.** Match each graph of a quadratic function on the left to the corresponding graph of its reciprocal function on the right. Justify your answers.

|  |  |
| --- | --- |
| a) | i) |
| b) | ii) |
| c) | iii) |

**97.** This is the graph of a quadratic function *y* = . Sketch a graph of the reciprocal function  and identify the vertical asymptotes, if they exist. Describe your strategy.



**98.** The graph of the reciprocal of a quadratic function has one vertical asymptote, . Points  and  are common to the graphs of the quadratic function and its reciprocal.

a) Sketch the graphs of the quadratic function and its reciprocal on the same grid.

b) Determine the equations of both the quadratic function and its reciprocal.

Describe your strategy.



**99.** Graph the functions  and  on the same grid. Describe your strategy.



**100.** Determine the values of *k* for which each reciprocal function has the given number of vertical asymptotes. Explain your work.

a) ; no vertical asymptotes

b) ; one vertical asymptote

c) ; two vertical asymptotes

**PreCalc 11**

**Answer Section**

**MULTIPLE CHOICE**

**1.** ANS: D PTS: 1 DIF: Moderate REF: 1.1 Arithmetic Sequences

LOC: 11.RF9 TOP: Procedural Knowledge

**2.** ANS: C PTS: 1 DIF: Easy REF: 1.1 Arithmetic Sequences

LOC: 11.RF9 TOP: Relations and Functions KEY: Procedural Knowledge

**3.** ANS: C PTS: 1 DIF: Moderate REF: 1.2 Arithmetic Series

LOC: 11.RF9 TOP: Relations and Functions KEY: Procedural Knowledge

**4.** ANS: D PTS: 1 DIF: Easy REF: 1.3 Geometric Sequences

LOC: 11.RF10 TOP: Relations and Functions KEY: Conceptual Understanding

**5.** ANS: A PTS: 1 DIF: Difficult REF: 1.3 Geometric Sequences

LOC: 11.RF10 TOP: Relations and Functions KEY: Procedural Knowledge

**6.** ANS: D PTS: 1 DIF: Easy REF: 1.3 Geometric Sequences

LOC: 11.RF10 TOP: Relations and Functions KEY: Procedural Knowledge

**7.** ANS: C PTS: 1 DIF: Easy REF: 1.3 Geometric Sequences

LOC: 11.RF10 TOP: Relations and Functions KEY: Procedural Knowledge

**8.** ANS: A PTS: 1 DIF: Difficult REF: 1.3 Geometric Sequences

LOC: 11.RF10 TOP: Relations and Functions

KEY: Problem-Solving Skills | Procedural Knowledge

**9.** ANS: A PTS: 1 DIF: Difficult REF: 1.3 Geometric Sequences

LOC: 11.RF10 TOP: Relations and Functions

KEY: Problem-Solving Skills | Procedural Knowledge

**10.** ANS: A PTS: 1 DIF: Moderate REF: 1.3 Geometric Sequences

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: B PTS: 1 DIF: Difficult REF: 1.4 Geometric Series

LOC: 11.RF10 TOP: Relations and Functions KEY: Procedural Knowledge

**13.** ANS: C PTS: 1 DIF: Moderate REF: 1.4 Geometric Series

LOC: 11.RF10 TOP: Relations and Functions KEY: Procedural Knowledge

**14.** ANS: D PTS: 1 DIF: Moderate REF: 1.4 Geometric Series

LOC: 11.RF10 TOP: Relations and Functions

KEY: Conceptual Understanding | Procedural Knowledge

**15.** ANS: B PTS: 1 DIF: Moderate REF: 1.4 Geometric Series

LOC: 11.RF10 TOP: Relations and Functions KEY: Procedural Knowledge

**16.** 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

**17.** ANS: B PTS: 1 DIF: Easy

REF: 1.5 Graphing Geometric Sequences and Series LOC: 11.RF9 | 11.RF10

TOP: Relations and Functions KEY: Procedural Knowledge

**18.** ANS: D PTS: 1 DIF: Moderate

REF: 1.5 Graphing Geometric Sequences and Series LOC: 11.RF9 | 11.RF10

TOP: Relations and Functions KEY: Conceptual Understanding | Procedural Knowledge

**19.** ANS: A PTS: 1 DIF: Easy REF: 1.6 Infinite Geometric Series

LOC: 11.RF10 TOP: Relations and Functions

KEY: Conceptual Understanding | Procedural Knowledge

**20.** ANS: C PTS: 1 DIF: Moderate REF: 1.6 Infinite Geometric Series

LOC: 11.RF10 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: A PTS: 0 DIF: Moderate

REF: 2.2 Simplifying Radical Expressions LOC: 11.AN2

TOP: Relations and Functions KEY: Procedural Knowledge

**23.** ANS: D PTS: 0 DIF: Moderate

REF: 2.2 Simplifying Radical Expressions LOC: 11.AN2

TOP: Relations and Functions KEY: Conceptual Understanding | Procedural Knowledge

**24.** ANS: B PTS: 0 DIF: Easy

REF: 2.3 Adding and Subtracting Radical Expressions LOC: 11.AN2

TOP: Relations and Functions KEY: Procedural Knowledge

**25.** ANS: B PTS: 0 DIF: Easy

REF: 2.3 Adding and Subtracting Radical Expressions LOC: 11.AN2

TOP: Relations and Functions KEY: Procedural Knowledge

**26.** ANS: D PTS: 0 DIF: Moderate

REF: 2.3 Adding and Subtracting Radical Expressions LOC: 11.AN2

TOP: Relations and Functions KEY: Procedural Knowledge

**27.** ANS: A PTS: 0 DIF: Moderate

REF: 2.3 Adding and Subtracting Radical Expressions LOC: 11.AN2

TOP: Relations and Functions KEY: Conceptual Understanding | Procedural Knowledge

**28.** ANS: D PTS: 0 DIF: Easy

REF: 2.3 Adding and Subtracting Radical Expressions LOC: 11.AN2

TOP: Relations and Functions KEY: Procedural Knowledge | Conceptual Understanding

**29.** ANS: A PTS: 0 DIF: Moderate

REF: 2.3 Adding and Subtracting Radical Expressions LOC: 11.AN2

TOP: Relations and Functions KEY: Conceptual Understanding | Procedural Knowledge

**30.** ANS: D PTS: 0 DIF: Moderate

REF: 2.4 Multiplying and Dividing Radical Expressions LOC: 11.AN2

TOP: Relations and Functions KEY: Conceptual Understanding | Procedural Knowledge

**31.** ANS: D PTS: 0 DIF: Difficult REF: 2.5 Solving Radical Equations

LOC: 11.AN3 TOP: Relations and Functions

KEY: Conceptual Understanding | Procedural Knowledge

**32.** ANS: B PTS: 0 DIF: Easy

REF: 3.1 Factoring Polynomial Expressions LOC: 11.RF1

TOP: Relations and Functions KEY: Procedural Knowledge

**33.** ANS: B PTS: 0 DIF: Moderate

REF: 3.2 Solving Quadratic Equations by Factoring LOC: 11.AN3

TOP: Algebra and Number KEY: Conceptual Understanding

**34.** ANS: A PTS: 0 DIF: Easy

REF: 3.2 Solving Quadratic Equations by Factoring LOC: 11.RF5

TOP: Relations and Functions KEY: Procedural Knowledge

**35.** ANS: A PTS: 0 DIF: Moderate

REF: 3.3 Using Square Roots to Solve Quadratic Equations LOC: 11.RF5

TOP: Relations and Functions KEY: Procedural Knowledge

**36.** ANS: D PTS: 0 DIF: Easy

REF: 3.3 Using Square Roots to Solve Quadratic Equations LOC: 11.RF5

TOP: Relations and Functions KEY: Procedural Knowledge

**37.** ANS: A PTS: 0 DIF: Moderate

REF: 3.3 Using Square Roots to Solve Quadratic Equations LOC: 11.RF5

TOP: Relations and Functions KEY: Procedural Knowledge

**38.** ANS: C PTS: 0 DIF: Moderate REF: 3.5 Interpreting the Discriminant

LOC: 11.RF5 TOP: Relations and Functions

KEY: Conceptual Understanding | Procedural Knowledge

**39.** ANS: B PTS: 0 DIF: Easy REF: 3.5 Interpreting the Discriminant

LOC: 11.RF5 TOP: Relations and Functions KEY: Conceptual Understanding

**40.** ANS: C PTS: 0 DIF: Easy

REF: 4.1 Properties of a Quadratic Function LOC: 11.RF4

TOP: Relations and Functions KEY: Conceptual Understanding

**41.** ANS: D PTS: 0 DIF: Easy

REF: 4.1 Properties of a Quadratic Function LOC: 11.RF4

TOP: Relations and Functions KEY: Conceptual Understanding

**42.** ANS: D PTS: 0 DIF: Moderate

REF: 4.1 Properties of a Quadratic Function LOC: 11.RF4

TOP: Relations and Functions KEY: Procedural Knowledge

**43.** ANS: C PTS: 0 DIF: Moderate

REF: 4.1 Properties of a Quadratic Function LOC: 11.RF4

TOP: Relations and Functions KEY: Procedural Knowledge

**44.** ANS: A PTS: 0 DIF: Easy

REF: 4.3 Transforming the Graph of y = x^2 LOC: 11.RF3

TOP: Relations and Functions KEY: Conceptual Understanding

**45.** ANS: C PTS: 0 DIF: Easy

REF: 4.3 Transforming the Graph of y = x^2 LOC: 11.RF3

TOP: Relations and Functions KEY: Conceptual Understanding

**46.** 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

**47.** ANS: B 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: Procedural Knowledge

**48.** ANS: D 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

**49.** 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

**50.** ANS: B PTS: 0 DIF: Easy

REF: 4.5 Equivalent Forms of the Equation of a Quadratic Function

LOC: 11.RF4 TOP: Relations and Functions KEY: Procedural Knowledge

**51.** ANS: D PTS: 0 DIF: Easy

REF: 4.5 Equivalent Forms of the Equation of a Quadratic Function

LOC: 11.RF4 TOP: Relations and Functions KEY: Procedural Knowledge

**52.** 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

**53.** ANS: A PTS: 0 DIF: Easy

REF: 5.2 Graphing Linear Inequalities in Two Variables LOC: 11.RF7

TOP: Relations and Functions KEY: Procedural Knowledge

**54.** ANS: D PTS: 0 DIF: Easy

REF: 5.2 Graphing Linear Inequalities in Two Variables LOC: 11.RF7

TOP: Relations and Functions KEY: Conceptual Understanding | Procedural Knowledge

**55.** ANS: B PTS: 0 DIF: Moderate

REF: 5.2 Graphing Linear Inequalities in Two Variables LOC: 11.RF7

TOP: Relations and Functions KEY: Conceptual Understanding | Procedural Knowledge

**56.** 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

**57.** ANS: D PTS: 0 DIF: Easy

REF: 5.3 Graphing Quadratic Inequalities in Two Variables LOC: 11.RF7

TOP: Relations and Functions KEY: Conceptual Understanding

**58.** ANS: B PTS: 0 DIF: Easy

REF: 5.3 Graphing Quadratic Inequalities in Two Variables LOC: 11.RF7

TOP: Relations and Functions KEY: Conceptual Understanding | Procedural Knowledge

**59.** ANS: D PTS: 0 DIF: Moderate

REF: 5.3 Graphing Quadratic Inequalities in Two Variables LOC: 11.RF7

TOP: Relations and Functions KEY: Conceptual Understanding | Procedural Knowledge

**60.** ANS: A PTS: 0 DIF: Easy

REF: 5.4 Solving Systems of Equations Graphically LOC: 11.RF6

TOP: Relations and Functions KEY: Procedural Knowledge

**61.** ANS: B PTS: 0 DIF: Easy

REF: 6.1 Angles in Standard Position in Quadrant 1 LOC: 11.T1

TOP: Trigonometry KEY: Conceptual Understanding | Procedural Knowledge

**62.** ANS: A PTS: 0 DIF: Moderate

REF: 6.1 Angles in Standard Position in Quadrant 1 LOC: 11.T2

TOP: Trigonometry KEY: Conceptual Understanding | Procedural Knowledge

**63.** ANS: C 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

**64.** ANS: B PTS: 0 DIF: Easy REF: 6.3 Constructing Triangles

LOC: 11.T3 TOP: Trigonometry KEY: Procedural Knowledge

**65.** ANS: B PTS: 0 DIF: Easy REF: 6.3 Constructing Triangles

LOC: 11.T3 TOP: Trigonometry KEY: Procedural Knowledge

**66.** ANS: B PTS: 0 DIF: Easy REF: 6.3 Constructing Triangles

LOC: 11.T3 TOP: Trigonometry KEY: Procedural Knowledge

**67.** ANS: A PTS: 0 DIF: Moderate REF: 6.3 Constructing Triangles

LOC: 11.T3 TOP: Trigonometry KEY: Procedural Knowledge

**68.** ANS: A PTS: 0 DIF: Moderate REF: 6.3 Constructing Triangles

LOC: 11.T3 TOP: Trigonometry KEY: Procedural Knowledge

**69.** ANS: A PTS: 0 DIF: Moderate REF: 6.4 The Sine Law

LOC: 11.T3 TOP: Trigonometry

KEY: Conceptual Understanding | Procedural Knowledge

**70.** ANS: B PTS: 0 DIF: Moderate REF: 6.4 The Sine Law

LOC: 11.T3 TOP: Trigonometry

KEY: Conceptual Understanding | Procedural Knowledge

**71.** ANS: A PTS: 1 DIF: Moderate REF: 6.5 The Cosine Law

LOC: 11.T3 TOP: Trigonometry

KEY: Conceptual Understanding | Procedural Knowledge

**72.** ANS: A PTS: 0 DIF: Moderate

REF: 7.1 Equivalent Rational Expressions LOC: 11.AN4

TOP: Algebra and Number KEY: Conceptual Understanding | Procedural Knowledge

**73.** ANS: C PTS: 0 DIF: Moderate

REF: 7.1 Equivalent Rational Expressions LOC: 11.AN4

TOP: Algebra and Number KEY: Conceptual Understanding | Procedural Knowledge

**74.** ANS: D PTS: 1 DIF: Moderate

REF: 7.2 Multiplying and Dividing Rational Expressions LOC: 11.AN5

TOP: Algebra and Number KEY: Conceptual Understanding | Procedural Knowledge

**75.** ANS: A 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

**76.** ANS: C 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

**77.** ANS: B 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

**78.** ANS: C 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

**79.** 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

**80.** ANS: B 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

**81.** ANS: B 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

**82.** ANS: B PTS: 0 DIF: Easy REF: 8.1 Absolute Value Functions

LOC: 11.RF2 TOP: Relations and Functions KEY: Conceptual Understanding

**83.** ANS: A PTS: 0 DIF: Moderate REF: 8.1 Absolute Value Functions

LOC: 11.RF2 TOP: Relations and Functions

KEY: Conceptual Understanding | Procedural Knowledge

**84.** ANS: C PTS: 0 DIF: Moderate REF: 8.1 Absolute Value Functions

LOC: 11.RF2 TOP: Relations and Functions

KEY: Conceptual Understanding | Procedural Knowledge

**85.** ANS: C PTS: 0 DIF: Moderate REF: 8.1 Absolute Value Functions

LOC: 11.RF2 TOP: Relations and Functions

KEY: Conceptual Understanding | Procedural Knowledge

**86.** ANS: A PTS: 0 DIF: Moderate REF: 8.1 Absolute Value Functions

LOC: 11.RF2 TOP: Relations and Functions

KEY: Procedural Knowledge | Communication

**87.** ANS: C PTS: 0 DIF: Moderate REF: 8.1 Absolute Value Functions

LOC: 11.RF2 TOP: Relations and Functions

KEY: Conceptual Understanding | Procedural Knowledge

**88.** ANS: A PTS: 0 DIF: Difficult

REF: 8.2 Solving Absolute Value Equations LOC: 11.RF2

TOP: Relations and Functions KEY: Conceptual Understanding | Procedural Knowledge

**89.** ANS: A PTS: 0 DIF: Easy

REF: 8.3 Graphing Reciprocals of Linear Functions LOC: 11.RF11

TOP: Relations and Functions KEY: Conceptual Understanding

**90.** ANS: C PTS: 0 DIF: Moderate

REF: 8.3 Graphing Reciprocals of Linear Functions LOC: 11.RF11

TOP: Relations and Functions KEY: Conceptual Understanding | Procedural Knowledge

**91.** ANS: C PTS: 0 DIF: Moderate

REF: 8.3 Graphing Reciprocals of Linear Functions LOC: 11.RF11

TOP: Relations and Functions KEY: Conceptual Understanding | Procedural Knowledge

**92.** 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

**93.** 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

**94.** 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

**95.** ANS: C PTS: 0 DIF: Moderate

REF: 8.3 Graphing Reciprocals of Linear Functions LOC: 11.RF11

TOP: Relations and Functions KEY: Conceptual Understanding | Procedural Knowledge

**96.** ANS: B PTS: 0 DIF: Difficult

REF: 8.3 Graphing Reciprocals of Linear Functions LOC: 11.RF11

TOP: Relations and Functions KEY: Conceptual Understanding | Procedural Knowledge

**97.** ANS: C PTS: 0 DIF: Moderate

REF: 8.3 Graphing Reciprocals of Linear Functions LOC: 11.RF11

TOP: Relations and Functions KEY: Conceptual Understanding | Procedural Knowledge

**98.** ANS: C 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

**99.** ANS: C PTS: 0 DIF: Easy

REF: 8.5 Graphing Reciprocals of Quadratic Functions LOC: 11.RF11

TOP: Relations and Functions KEY: Conceptual Understanding | Procedural Knowledge

**100.** ANS: D PTS: 0 DIF: Easy

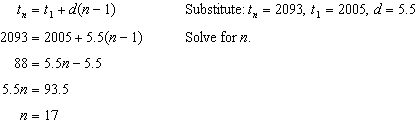
REF: 8.5 Graphing Reciprocals of Quadratic Functions LOC: 11.RF11

TOP: Relations and Functions KEY: Conceptual Understanding | Procedural Knowledge

**PROBLEM**

**1.** ANS:

The years in which the comet appears form an arithmetic sequence. The arithmetic sequence for Tempel 1 has  and . To determine whether Tempel 1 should appear in 2093, determine whether 2093 is a term of its sequence.

**

Since the year 2093 is the 17th term in the sequence, Tempel 1 should appear in 2093.

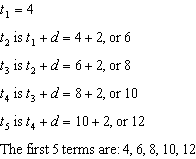
PTS: 1 DIF: Moderate REF: 1.1 Arithmetic Sequences

LOC: 11.RF9 TOP: Relations and Functions

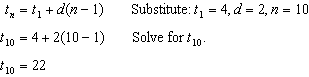
KEY: Communication | Problem-Solving Skills

**2.** ANS:

a) , 



b) The arithmetic sequence has , , and .



There are 22 seats when 10 tables are arranged in a single row.

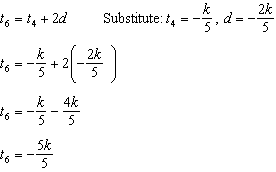
PTS: 1 DIF: Moderate REF: 1.1 Arithmetic Sequences

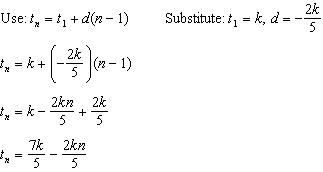
LOC: 11.RF9 TOP: Relations and Functions

KEY: Communication | Problem-Solving Skills

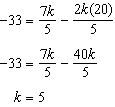
**3.** ANS:

a) The common difference, *d*, is: 



b) 

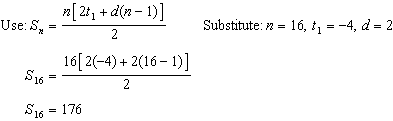
c) 

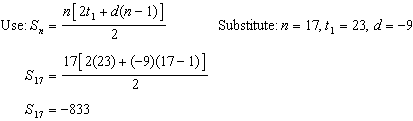


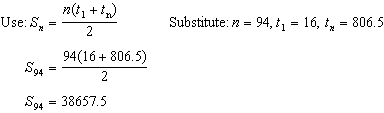
PTS: 1 DIF: Difficult REF: 1.1 Arithmetic Sequences

LOC: 11.RF9 TOP: Relations and Functions KEY: Problem-Solving Skills

**4.** ANS:

a) 

b) 

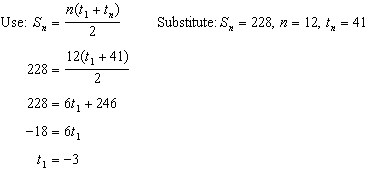
c) 

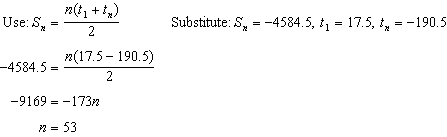
PTS: 1 DIF: Moderate REF: 1.2 Arithmetic Series

LOC: 11.RF9 TOP: Relations and Functions

KEY: Conceptual Understanding | Procedural Knowledge

**5.** ANS:

a) 

b) 

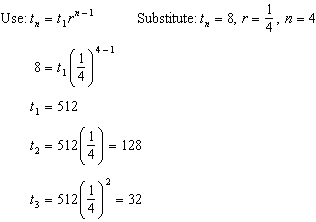
PTS: 1 DIF: Moderate REF: 1.2 Arithmetic Series

LOC: 11.RF9 TOP: Relations and Functions

KEY: Conceptual Understanding | Procedural Knowledge

**6.** ANS:

a) 



The first 3 terms are:



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

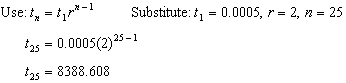
PTS: 1 DIF: Moderate REF: 1.3 Geometric Sequences

LOC: 11.RF10 TOP: Relations and Functions

KEY: Communication | Conceptual Understanding | Problem-Solving Skills

**7.** ANS:

The geometric sequence has first term 0.0005 and common ratio 2.



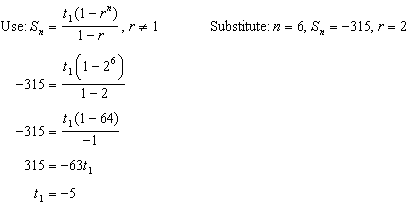
Term 25 is 8388.608.

PTS: 1 DIF: Moderate REF: 1.3 Geometric Sequences

LOC: 11.RF10 TOP: Relations and Functions

KEY: Communication | Problem-Solving Skills

**8.** ANS:



So, the first term is –5.

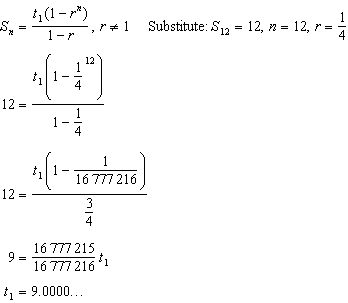
PTS: 1 DIF: Moderate REF: 1.4 Geometric Series

LOC: 11.RF10 TOP: Relations and Functions

KEY: Problem-Solving Skills | Procedural Knowledge

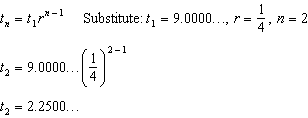
**9.** ANS:

To determine *t*1, use:



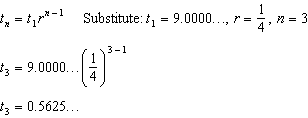
The 1st jump is approximately 9.00 m.

To determine *t*2, use:



The 2nd jump is approximately 2.25 m.

To determine *t*3, use:



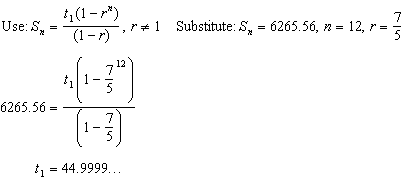
The 3rd jump is approximately 0.56 m.

PTS: 1 DIF: Difficult REF: 1.4 Geometric Series

LOC: 11.RF10 TOP: Relations and Functions

KEY: Communication | Conceptual Understanding | Problem-Solving Skills

**10.** ANS:



The length of the frog’s first jump was approximately 45 cm.

PTS: 1 DIF: Difficult REF: 1.4 Geometric Series

LOC: 11.RF10 TOP: Relations and Functions

KEY: Communication | Problem-Solving Skills

**11.** ANS:

a) 

b) 

c)



To graph the geometric series, determine the partial sums.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *S*1 | *S*2 | *S*3 | *S*4 | *S*5 | *S*6 |
| 3 |  |  |  |  |  |

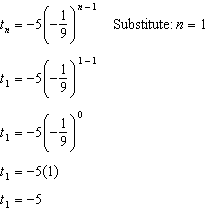


PTS: 1 DIF: Moderate REF: 1.5 Graphing Geometric Sequences and Series

LOC: 11.RF9 | 11.RF10 TOP: Relations and Functions

KEY: Communication | Conceptual Understanding | Procedural Knowledge

**12.** ANS:

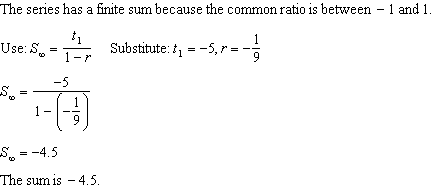
a) 

*t*2 is: –5  

*t*3 is:   

*t*4 is:   

b) , so the series converges.

c) 

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

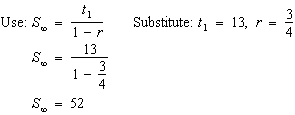
LOC: 11.RF10 TOP: Relations and Functions

KEY: Communication | Problem-Solving Skills

**13.** ANS:

The perimeter of the first square is 13 in., so .

The perimeter of each subsequent square is 75% of the perimeter of the previous square, so .



The sum of the perimeters of all the squares is 52 in.

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

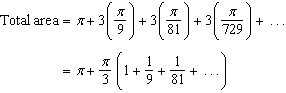
LOC: 11.RF10 TOP: Relations and Functions

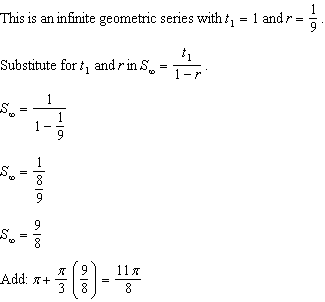
KEY: Communication | Problem-Solving Skills

**14.** ANS:

|  |  |
| --- | --- |
| Area of first circle | Area of second circles |
| Area of third circles | Area of fourth circles |

The values of the areas of the circles form an infinite geometric series.





So, the sum of the areas of the circles is **cm2**

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

LOC: 11.RF10 TOP: Relations and Functions

KEY: Communication | Problem-Solving Skills

**15.** ANS:



Point A: |12| = 12, so Point A is 12 units from 0.

Point B: |9| = 9, so Point B is 9 units from 0.

Point C: || = , so Point C is  units from 0.

Point D: |–18.5| = 18.5, so Point D is 18.5 units from 0.

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

LOC: 11.AN1 TOP: Relations and Functions KEY: Conceptual Understanding

**16.** ANS:

Write, then solve an equation: **

Since |5*| =* 5and ** = 5

then, ** or **

So, two values of *x* are possible: –3 or –13

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

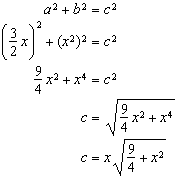
LOC: 11.AN1 TOP: Relations and Functions

KEY: Procedural Knowledge | Communication | Problem-Solving Skills

**17.** ANS:

**a)**  The length of a leg of a triangle must be greater than 0, so .

**b)** The Pythagorean Theorem states that in a right triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides. So, , where the lengths of the legs are represented by *a* and *b*, and the length of the hypotenuse by *c*.

Substitute: *a* =  and *b* = 

An expression for the length of the hypotenuse is: 

PTS: 0 DIF: Moderate REF: 2.2 Simplifying Radical Expressions

LOC: 11.AN2 TOP: Relations and Functions

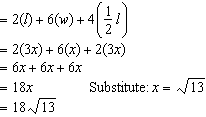
KEY: Procedural Knowledge | Communication

**18.** ANS:

Use the formula for the area, *A*, of a rectangle: 

Substitute:  and 



Perimeter of shape formed 

An expression for the perimeter of the shape formed is: 

PTS: 0 DIF: Moderate REF: 2.3 Adding and Subtracting Radical Expressions

LOC: 11.AN2 TOP: Relations and Functions

KEY: Procedural Knowledge | Communication | Problem-Solving Skills

**19.** ANS:

The side length of a square is the square root of its area.

So, the side length of the smaller square is:  units

The side length of the larger square is:  units

The difference in their lengths is:  units

Perimeter of shaded region is the sum of 5 times the side length of the smaller square + the side length of the larger square + 3 times the difference in their side lengths



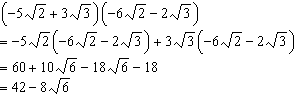
So, a radical expression for the perimeter of the shaded region is : 

PTS: 0 DIF: Moderate REF: 2.3 Adding and Subtracting Radical Expressions

LOC: 11.AN2 TOP: Relations and Functions

KEY: Procedural Knowledge | Communication | Problem-Solving Skills

**20.** ANS:

**

PTS: 0 DIF: Easy REF: 2.4 Multiplying and Dividing Radical Expressions

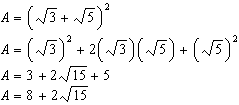
LOC: 11.AN2 TOP: Relations and Functions

KEY: Procedural Knowledge | Communication

**21.** ANS:

Use the formula for the area, *A*, of a square: 





PTS: 0 DIF: Moderate REF: 2.4 Multiplying and Dividing Radical Expressions

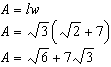
LOC: 11.AN2 TOP: Relations and Functions

KEY: Procedural Knowledge | Communication

**22.** ANS:

Use the formula for the area, *A*, of a rectangle: 

Substitute:  and 

**

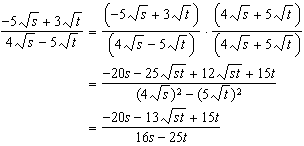
PTS: 0 DIF: Easy REF: 2.4 Multiplying and Dividing Radical Expressions

LOC: 11.AN2 TOP: Relations and Functions

KEY: Procedural Knowledge | Communication

**23.** ANS:

a) 

b) 

PTS: 0 DIF: Moderate REF: 2.4 Multiplying and Dividing Radical Expressions

LOC: 11.AN2 TOP: Relations and Functions

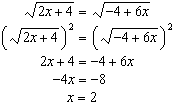
KEY: Conceptual Understanding | Procedural Knowledge | Communication

**24.** ANS:

Since , then** 

Since , then** 

So, for both radicals to be defined, 

**

Since *x* = 2 lies in the set of possible values for *x*,  is a root of the equation.

PTS: 0 DIF: Moderate REF: 2.5 Solving Radical Equations

LOC: 11.AN3 TOP: Relations and Functions

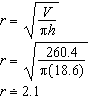
KEY: Conceptual Understanding | Procedural Knowledge | Communication

**25.** ANS:

Use the formula  to write an equation for the radius, *r*.



Substitute:  and 



The radius of the cylinder is approximately 2.1 cm.

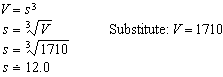
PTS: 0 DIF: Moderate REF: 2.5 Solving Radical Equations

LOC: 11.AN3 TOP: Relations and Functions

KEY: Procedural Knowledge | Problem-Solving Skills

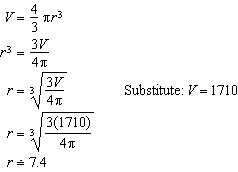
**26.** ANS:

a) Use the formula for the volume, *V*, of a cube: , where *s* represents the edge length of the cube.



A cube with the same volume as Lake Ontario would have an edge length of about 12.0 km.

b) Use the formula for the volume, *V*, of a sphere: , where *r* represents the radius of the sphere.



A sphere with the same volume as Lake Ontario would have a radius of about 7.4 km.

PTS: 0 DIF: Difficult REF: 2.5 Solving Radical Equations

LOC: 11.AN3 TOP: Relations and Functions

KEY: Procedural Knowledge | Problem-Solving Skills

**27.** ANS:

Write  = 

Equate the constant terms.

If  is a factor, then , so 

Substitute this value for *h* in , then expand.



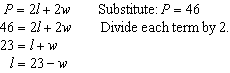
The value of *k* is 12.

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

LOC: 11.RF1 TOP: Relations and Functions

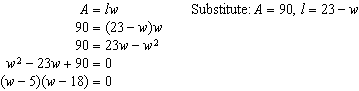
KEY: Communication | Problem-Solving Skills

**28.** ANS:



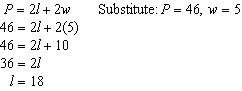
The length of the slab, in metres, is .

The area of the slab is 90 m2. Use the formula .



Either *w* = 5 or *w* = 18

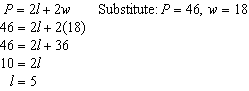
Determine the value of *l* when *w* = 5.



The width of the slab is 5 m and its length is 18 m.

Or

Determine the value of *l* when *w* = 18.



The width of the slab is 18 m and its length is 5 m.

So, there is one slab of dimensions 18 m by 5 m.

PTS: 0 DIF: Difficult REF: 3.2 Solving Quadratic Equations by Factoring

LOC: 11.RF5 TOP: Relations and Functions

KEY: Communication | Problem-Solving Skills

**29.** ANS:

|  |  |
| --- | --- |
|  | Square each side of the equation.  Combine like terms.  Factor.  Solve using the zero product property. |

Either  or 

Check for extraneous roots.

In , substitute:  and 

|  |  |
| --- | --- |
| L.S.  R.S. | L.S.  R.S. |

For , the left side does not equal the right side, so  is not a root of the radical equation.

For , the left side is equal to the right side, so this solution is verified.

The root is: 

PTS: 0 DIF: Difficult REF: 3.2 Solving Quadratic Equations by Factoring

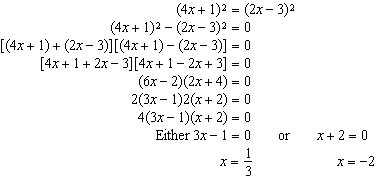
LOC: 11.AN3 TOP: Algebra and Number

KEY: Communication | Problem-Solving Skills

**30.** ANS:

The student should not have taken the square root of each side to solve the equation.

The correct solution is:

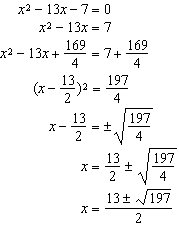


PTS: 0 DIF: Moderate REF: 3.2 Solving Quadratic Equations by Factoring

LOC: 11.RF5 TOP: Relations and Functions

KEY: Communication | Problem-Solving Skills

**31.** ANS:



The roots are:  and 

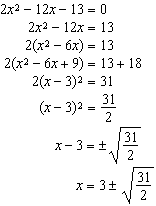
PTS: 0 DIF: Moderate REF: 3.3 Using Square Roots to Solve Quadratic Equations

LOC: 11.RF5 TOP: Relations and Functions

KEY: Communication | Problem-Solving Skills

**32.** ANS:

The student should have added 18 () instead of 9 to the right side of the equation.



The roots are:  and 

PTS: 0 DIF: Difficult REF: 3.3 Using Square Roots to Solve Quadratic Equations

LOC: 11.RF5 TOP: Relations and Functions

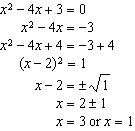
KEY: Communication | Problem-Solving Skills

**33.** ANS:

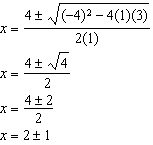
a) Find two numbers whose product is 3 and whose sum is –4. The numbers are –1 and –3.





b) 

c) Substitute:  in: 



 or 

Sample response: I prefer factoring because it takes less time and less space.

PTS: 0 DIF: Moderate REF: 3.4 Developing and Applying the Quadratic Formula

LOC: 11.RF5 TOP: Relations and Functions

KEY: Communication | Problem-Solving Skills

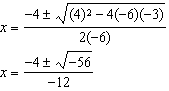
**34.** ANS:

a) Multiply each side by the common denominator, 6, to remove the fractions.

*x*2 *x*  = 0

 = 0

b) Substitute:  in: 



Since  is not a real number, the equation has no real roots.

PTS: 0 DIF: Moderate REF: 3.4 Developing and Applying the Quadratic Formula

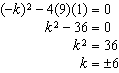
LOC: 11.RF5 TOP: Relations and Functions

KEY: Communication | Problem-Solving Skills

**35.** ANS:

For an equation to have exactly one real root, 

Substitute: 



For  to have exactly one real root, *k* must be equal to .

Sample response: A possible value of *k* is 6. So, an equation with exactly one real root is: 

PTS: 0 DIF: Moderate REF: 3.5 Interpreting the Discriminant

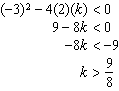
LOC: 11.RF5 TOP: Relations and Functions

KEY: Communication | Problem-Solving Skills

**36.** ANS:

For an equation to have no real roots, 

Substitute: 



For  to have no real roots, *k* must be greater than .

Sample response: A possible value of *k* is 3. So, an equation with no real roots is: 

PTS: 0 DIF: Moderate REF: 3.5 Interpreting the Discriminant

LOC: 11.RF5 TOP: Relations and Functions

KEY: Communication | Problem-Solving Skills

**37.** ANS:

Use guess and test to determine two values of *a*, *b*, and *c* so that: 

Substitute: 



This is satisfied by ** and **.

So, one equation is: 

Substitute: 



This is satisfied by ** and **.

So, another equation is: 

PTS: 0 DIF: Difficult REF: 3.5 Interpreting the Discriminant

LOC: 11.RF5 TOP: Relations and Functions

KEY: Communication | Problem-Solving Skills

**38.** ANS:

a) *x*-intercepts: –1.70, 0.95

*y*-intercept: 3.25

b) vertex: (–0.38, 3.53)

c) axis of symmetry: 

d) domain: 

e) range: , 

PTS: 0 DIF: Moderate REF: 4.1 Properties of a Quadratic Function

LOC: 11.RF4 TOP: Relations and Functions

KEY: Communication | Procedural Knowledge

**39.** ANS:

b) The *t*-intercepts are –0.11 and 5.82. The *t*-intercepts represent the times at which the height of the rocket is 0 m. Time cannot be negative, so the height of the rocket is 0 m at about 5.82 s.

c) The maximum value of the function represents the greatest height of the rocket. The greatest height that the rocket reached was approximately 43 m.

d) The domain is: . The domain represents the time the toy rocket was in the air: about 5.82 s.

PTS: 0 DIF: Difficult REF: 4.1 Properties of a Quadratic Function

LOC: 11.RF4 TOP: Relations and Functions

KEY: Conceptual Understanding | Problem-Solving Skills | Procedural Knowledge

**40.** ANS:

For , graph . On a graphing calculator, press:  . Move the cursor to the left of the 1st *x*-intercept, then press ; move the cursor to the right of the intercept and press . The screen displays . Repeat the process for the 2nd *x*-intercept to get . The roots are  and .

PTS: 0 DIF: Moderate REF: 4.2 Solving a Quadratic Equation Graphically

LOC: 11.RF5 TOP: Relations and Functions

KEY: Communication | Problem-Solving Skills

**41.** ANS:

I first sketched the graph of  as a broken curve.

a) I translated the graph of  1 unit up to get the graph of .

b) I translated the graph of  2 units down to get the graph of .



PTS: 0 DIF: Moderate REF: 4.3 Transforming the Graph of y = x^2

LOC: 11.RF3 TOP: Relations and Functions

KEY: Communication | Conceptual Understanding | Procedural Knowledge

**42.** ANS:

I first sketched the graph of  as a broken curve.

a) I translated the graph of  3 units left to get the graph of .

b) I translated the graph of  4 units right to get the graph of .



PTS: 0 DIF: Moderate REF: 4.3 Transforming the Graph of y = x^2

LOC: 11.RF3 TOP: Relations and Functions

KEY: Communication | Conceptual Understanding | Procedural Knowledge

**43.** ANS:

An equation has the form .

The vertex is at V(5, 4), so  and .

The equation becomes .

Substitute the coordinates of the *y*-intercept: (0, 79)





So, the equation of the function is: 

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: Communication | Procedural Knowledge

**44.** ANS:

Compare  with .

a) i) *a* is negative, so the graph opens down.

ii) *p* = 4 and *q* = –8, so the coordinates of the vertex are: (4, –8)

iii) In general, the equation of the axis of symmetry is ; so for this graph it is .

iv) For the *y*-intercept, substitute  in .



The *y*-intercept is –40.

For the *x*-intercept, substitute  in .



This equation has no solution because a square number cannot be negative.

So, there are no *x*-intercepts.

v) The domain is: 

The graph opens down, so the vertex is a minimum point with *y*-coordinate –8. The range is: , 

b) The graph of  is congruent to the graph of .

On a grid, mark a point at the vertex (4, –8). Use the step pattern. Multiply each vertical step by 2 because the graph is a vertical expansion of factor 2 of the graph of .



PTS: 0 DIF: Moderate

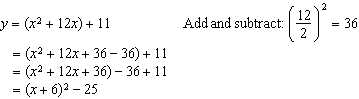
REF: 4.4 Analyzing Quadratic Functions of the Form y = a(x - p)^2 + q

LOC: 11.RF3 TOP: Relations and Functions

KEY: Communication | Conceptual Understanding | Procedural Knowledge

**45.** ANS:

Write  in standard form: 



Compare this with .

The vertex of the parabola has coordinates .

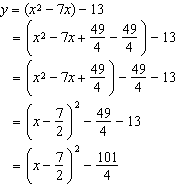
PTS: 0 DIF: Moderate

REF: 4.5 Equivalent Forms of the Equation of a Quadratic Function

LOC: 11.RF4 TOP: Relations and Functions

KEY: Communication | Procedural Knowledge

**46.** ANS:

Add and subtract: 

Compare this with .

The vertex of the parabola has coordinates .

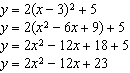
PTS: 0 DIF: Moderate

REF: 4.5 Equivalent Forms of the Equation of a Quadratic Function

LOC: 11.RF4 TOP: Relations and Functions

KEY: Communication | Procedural Knowledge

**47.** ANS:

a) Expand: 

This matches the other equation. So, the equations represent the same quadratic function.

b) From the standard form, it is easier to identify the coordinates of the vertex, the equation of the axis of symmetry, the direction of opening, and the *y*-intercept. These characteristics can be used to sketch a graph of the function.

i) The coordinates of the vertex are (3, 5).

ii) The equation of the axis of symmetry is .

iii) The graph of the function opens up.

iv) The *y*-intercept can be determined by substituting  into the equation:



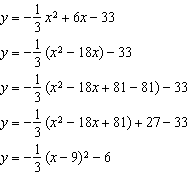
PTS: 0 DIF: Moderate

REF: 4.5 Equivalent Forms of the Equation of a Quadratic Function

LOC: 11.RF4 TOP: Relations and Functions

KEY: Communication | Conceptual Understanding | Procedural Knowledge

**48.** ANS:



Step 1: Remove  as a common factor from the first 2 terms.

Step 2: Add and subtract the square of one half of 18, the coefficient of *x*.

Step 3: Take –81 outside of the brackets by multiplying it by .

Step 4: Write the terms in the brackets as a perfect square. Simplify the terms outside of the brackets.

PTS: 0 DIF: Difficult

REF: 4.5 Equivalent Forms of the Equation of a Quadratic Function

LOC: 11.RF4 TOP: Relations and Functions

KEY: Communication | Procedural Knowledge

**49.** ANS:

Check whether the equation factors.

The value of the discriminant is: 

Since 121 is a perfect square, the equation factors.

Use decomposition to factor.



The *x*-intercepts are:  and 3, or –2.5 and 3

The *x-*coordinate of the vertex is: 

Determine the *y*-coordinate of the vertex.

Substitute  in .



The coordinates of the vertex are: 

On a grid, mark points at the vertex and the intercepts. Draw a smooth curve through the points.



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: Communication | Procedural Knowledge

**50.** ANS:

Sketch the parabola on coordinate axes, with one end of the arch at the origin. Since the arch is 70 m wide, the other end of the arch has coordinates (70, 0).

The centre of the arch is at the vertex of the parabola. The height of the arch is the *y*-coordinate of the vertex; that is, . The *x*-coordinate of the vertex is halfway between 0 and 70; that is, .



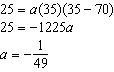
The *x*-intercepts are 0 and 70, so use the factored form of the equation of a quadratic function: 

Substitute:  and 

The equation becomes: , or 

Use the coordinates of the vertex to determine the value of *a*.

Substitute  and  in .



Substitute  in .

An equation of the quadratic function is: 

PTS: 0 DIF: Difficult

REF: 4.6 Analyzing Quadratic Functions of the Form y = ax^2 + bx + c

LOC: 11.RF4 TOP: Relations and Functions

KEY: Communication | Problem-Solving Skills

**51.** ANS:

Compare the equation to .

*a* is positive, so the function has a minimum value.

The coordinates of the vertex are: (6, 6)

So, the minimum value is 6.

PTS: 0 DIF: Easy

REF: 4.7 Modelling and Solving Problems with Quadratic Functions

LOC: 11.RF4 TOP: Relations and Functions

KEY: Communication | Procedural Knowledge

**52.** ANS:

Graph the equation. Use the CALC feature to determine the coordinates of the vertex.

The *h*-coordinate of the vertex is the maximum height of the rocket: approximately 22.4 m.

The amount of time the rocket was in the air is the positive *t*-intercept: approximately 4.2 s.

PTS: 0 DIF: Moderate

REF: 4.7 Modelling and Solving Problems with Quadratic Functions

LOC: 11.RF4 TOP: Relations and Functions

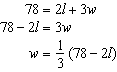
KEY: Problem-Solving Skills | Procedural Knowledge

**53.** ANS:

Let the width of each rectangle be *w* metres. Let the length of the rectangle made up of the 2 smaller rectangles be *l* metres.

The area, *A* square metres, is given by the equation .

The perimeter of the rectangular pens is 78 m.

So, 

So, 

The coefficient of *l*2 is negative, so the graph has a maximum value.

From the equation, the *l*-intercepts are: 0, 39

The *l*-coordinate of the vertex is 19.5. So, 

Then, 

The maximum area is 253.5 m2.



The dimensions that enclose the maximum area are 19.5 m by 13 m.

PTS: 0 DIF: Difficult

REF: 4.7 Modelling and Solving Problems with Quadratic Functions

LOC: 11.RF4 TOP: Relations and Functions

KEY: Communication | Problem-Solving Skills

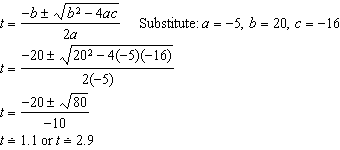
**54.** ANS:

Rearrange the equation to isolate *h*: 

An inequality that represents the situation is: 

A related quadratic equation is: 

Solve the equation.



Substitute into the inequality.

When , such as ,  and ; so  does not satisfy the inequality.

When , such as ,  and ; so  does not satisfy the inequality.

When , such as ,  and ; so  does satisfy the inequality.

The solution is: 

So, the baseball is higher than 18 m between 1.1 s and 2.9 s after it is hit.

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

**55.** ANS:

a) Since , the graph is in Quadrant 4.

The graph of the related function has slope –3 and *y*-intercept 4.

Draw a broken line to represent the related function in Quadrant 4.

Shade the region below the line.

The axes bounding the graph are broken lines.



b) Since , the graph is in Quadrant 3.

Graph the related function.

When , .

When , .

Draw a solid line to represent the related function in Quadrant 3.

Use (0, 0) as a test point.

L.S. = 6; R.S. = 0

Since 6 > 0, the origin is not in the shaded region.

Shade the region below the line.

The axes bounding the graph are solid lines.



PTS: 0 DIF: Difficult REF: 5.2 Graphing Linear Inequalities in Two Variables

LOC: 11.RF7 TOP: Relations and Functions

KEY: Communication | Procedural Knowledge

**56.** ANS:

a) Let *x* represent the number of cordless phones sold and *y* represent the number of cordless phones with answering machines sold.

An inequality is: 

b) The solution of the inequality is the points, with whole-number coordinates, in the region above the line and the points, with whole-number coordinates, on the line.



c) Day 1: the point (2, 5) is in the shaded region, so the manager’s profit target was met.

Day 2: the point (3, 3) is not in the shaded region, nor is it on the line, so the manager’s profit target was not met.

Day 3: the point (5, 2) is on the line, so the manager’s profit target was met.

PTS: 0 DIF: Difficult REF: 5.2 Graphing Linear Inequalities in Two Variables

LOC: 11.RF7 TOP: Relations and Functions

KEY: Communication | Problem-Solving Skills

**57.** ANS:

In , substitute: , 



PTS: 0 DIF: Moderate REF: 5.3 Graphing Quadratic Inequalities in Two Variables

LOC: 11.RF7 TOP: Relations and Functions

KEY: Communication | Procedural Knowledge

**58.** ANS:

In , substitute: , 

|  |  |
| --- | --- |
|  | Solve for *a*.  Divide both sides by –3.  Square both sides. |

That is, 

PTS: 0 DIF: Moderate REF: 5.3 Graphing Quadratic Inequalities in Two Variables

LOC: 11.RF7 TOP: Relations and Functions

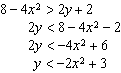
KEY: Communication | Procedural Knowledge

**59.** ANS:

a) Let the numbers be represented by *x* and *y*.

An inequality is: 

Write the inequality in general form.



Use transformations to graph the corresponding function: 

The graph is the image of  after a vertical stretch of factor 2, a reflection in the *x*-axis, and a translation of 3 units up.

The coordinates of the vertex are: (0, 3).

Draw a broken curve.

To determine the region to be shaded, use the origin as a test point.

Substitute  and  in .

L.S. = 0 and R.S. = 3

Since (0, 0) satisfies the inequality, the origin is a solution.

Shade the region that contains the origin.



b) Choose 3 lattice points that are in the shaded region.

Sample response: (0, 3), (1, –1), (, –2)

Three pairs of integers are: 0 and 3; 1 and –1; and  and –2

PTS: 0 DIF: Difficult REF: 5.3 Graphing Quadratic Inequalities in Two Variables

LOC: 11.RF7 TOP: Relations and Functions

KEY: Communication | Problem-Solving Skills

**60.** ANS:

a) Let the length of the rectangle be represented by () units and the width by 5*y* units.

The length is greater than the width so an inequality is: , or 

The graph of the related function is congruent to  and its vertex is (0, 2).

The curve is broken.

Since *y* cannot be negative, only the region above the *x*-axis is shaded.

Also, , so .

Shade the region that satisfies these inequalities: , , 



b) Sample response:

Three sets of coordinates are: (4, 2), (5, 4), (6, 3)

So, 3 possible sets of dimensions are:

length: ; width: 

length: ; width: 

length: ; width: 

Possible dimensions are: 22 units by 10 units; 40 units by 20 units; 62 units by 15 units

PTS: 0 DIF: Difficult REF: 5.3 Graphing Quadratic Inequalities in Two Variables

LOC: 11.RF7 TOP: Relations and Functions

KEY: Communication | Problem-Solving Skills

**61.** ANS:



PTS: 0 DIF: Moderate REF: 5.4 Solving Systems of Equations Graphically

LOC: 11.RF6 TOP: Relations and Functions

KEY: Problem-Solving Skills | Procedural Knowledge

**62.** 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: 

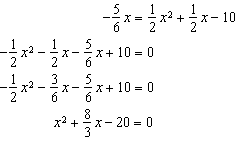
The statement that when twice the second number is subtracted from the square of the first number, the result is equal to 20 minus the first number can be modelled with the equation: 

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

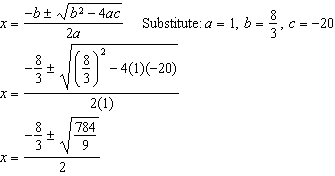
 

 

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



Use the quadratic formula.



So,  or 

Substitute each value of *x* in equation .

|  |  |
| --- | --- |
| When : | When : |

The solutions are: 6 and 5;  and 

Verify the solutions using the statement of the problem.

For  and :

The sum of 5 times 6 and 6 times 5 is 0.

When 2 times 5 is subtracted from , the result is equal to 20 minus .

These numbers satisfy the problem statement.

For  and :

The sum of 5 times  and 6 times  is 0.

When 2 times  is subtracted from , the result is equal to 20 minus .

These numbers satisfy the problem statement.

So, the numbers are: 6 and 5; or  and 

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

LOC: 11.RF6 TOP: Relations and Functions

KEY: Communication | Problem-Solving Skills

**63.** ANS:

a) Solve the system formed by the 2 equations:

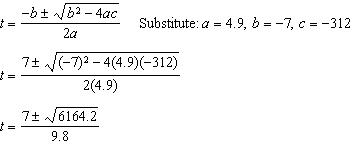
 

 

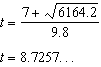
From equation , substitute  in equation .



Use the quadratic formula.



Since time cannot be negative, ignore the negative root.



The stuntman opened his parachute approximately 8.7 s after he jumped.

b) Substitute  in equation .



The stuntman opened his parachute at an elevation of approximately 144.4 m.

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

LOC: 11.RF6 TOP: Relations and Functions

KEY: Communication | Problem-Solving Skills

**64.** ANS:

a) Write an equation that represents the height of the soccer ball *t* seconds after the football is kicked.

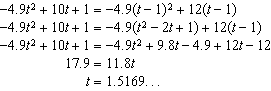


Solve the system formed by the 2 equations*:*

 

 

From equation , substitute  in equation .



The football and the soccer ball reached the same height after approximately 1.5 s.

b) Substitute  in equation .



After 1.5 s, both balls are at a height of approximately 4.9 m.

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

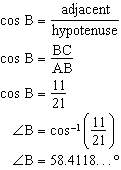
LOC: 11.RF6 TOP: Relations and Functions

KEY: Communication | Problem-Solving Skills

**65.** ANS:

First determine the measure of B.

In right ABC,



In a right triangle, when one acute angle is **, the other acute angle is .



So, B is approximately 58.4 and A is approximately 31.6.

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

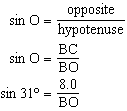
LOC: 11.T2 TOP: Trigonometry

KEY: Conceptual Understanding | Communication

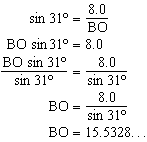
**66.** ANS:

a) In right BCO, BO is the hypotenuse, BC is opposite O, and CO is adjacent to O.

To determine the length of BO, use the sine ratio.

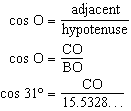


Solve the equation for BO.

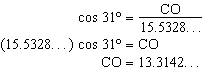


The length of cord needed to reach corner B is approximately 15.5 m.

b) In right BCO, to determine the length of CO, use the cosine ratio.



Solve the equation for CO.



To determine the distance between the electrical outlet and corner N, subtract CO from CN.



The distance between the electrical outlet and corner N is approximately 21.7 m.

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

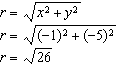
LOC: 11.T2 TOP: Trigonometry

KEY: Communication | Problem-Solving Skills

**67.** ANS:

a) Determine the distance *r* from the origin to P.

, 









b) The reference angle is: 

Since ** is in Quadrant 3, the angle ** is approximately: 

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

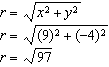
LOC: 11.T2 TOP: Trigonometry

KEY: Procedural Knowledge | Communication

**68.** ANS:

Determine the distance *r* from the origin to P.

, 



Use: 

The reference angle, to the nearest degree, is:



Since *x* is positive and *y* is negative, the terminal arm is in Quadrant 4, and ** is approximately .



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

LOC: 11.T2 TOP: Trigonometry

KEY: Procedural Knowledge | Communication

**69.** ANS:

Draw a labelled diagram to represent the problem.

In right FLP, FP is the hypotenuse and FL is the side opposite P.

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

|  |  |
| --- | --- |
| Solve the equation for FL. |  |

The distance between the fishing boat and the lighthouse is approximately 7.4 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

**70.** ANS:

a) , or 0.5428...



Since , there are two possible triangles with the given measures.

b) 

PTS: 0 DIF: Moderate REF: 6.3 Constructing Triangles

LOC: 11.T3 TOP: Trigonometry

KEY: Communication | Problem-Solving Skills

**71.** ANS:

a) Since , the following situations are possible:

i) No triangle is possible.

ii) Two scalene triangles are possible.

b) i) A is acute, so A < 90°

For no triangle, 





For an acute angle **, as ** increases,  also increases.

So, for no triangle, 

ii) For two scalene triangles, 

, so 

Since , ; so, for two scalene triangles, .

PTS: 0 DIF: Difficult REF: 6.3 Constructing Triangles

LOC: 11.T3 TOP: Trigonometry

KEY: Conceptual Understanding | Communication | Problem-Solving Skills

**72.** ANS:

Possible solution:



|  |  |  |  |
| --- | --- | --- | --- |
| **Length of BC (cm)** | **Value of** | **How does  compare with sin A?** | **Description of possible triangles** |
| 5 | 0.8333... |  | No triangles are possible. |
| 6 | 1 |  | 1 isosceles triangle |
| 7 | 1.1666... |  | 1 scalene triangle |
| 5.9 | 0.9833... |  | 2 scalene triangles |

PTS: 0 DIF: Moderate REF: 6.3 Constructing Triangles

LOC: 11.T3 TOP: Trigonometry

KEY: Conceptual Understanding | Problem-Solving Skills

**73.** ANS:

Sketch a diagram for the situation.

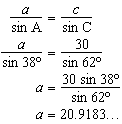
C represents the position of the cat and *h* represents its height above the ground. AB represents the distance between firefighters A and B.



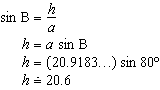
Use the angle sum in a triangle.



Use the Sine Law to determine *a*, the length of BC.



Use the sine ratio in right .



The cat is approximately 20.6 m above the ground.

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

LOC: 11.T3 TOP: Trigonometry

KEY: Communication | Problem-Solving Skills

**74.** ANS:

The treasure chest could be between the two divers or on one side of both divers.

Case 1: The treasure chest C is between the two divers, A and B.

|  |  |
| --- | --- |
|  |  |

The treasure chest is approximately 29 m and 39 m from the divers.

Case 2: The treasure chest C is on one side of both divers A and B.

|  |  |
| --- | --- |
|  |  |

The treasure chest is approximately 104 m and 141 m from the divers.

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

LOC: 11.T3 TOP: Trigonometry

KEY: Communication | Problem-Solving Skills

**75.** ANS:

Let C represent the location of the school of fish and *d* represent its distance below sea level.

The school of fish could be between the two boats or on one side of both boats.

Case 1: The school of fish is between boats A and B.

|  |  |
| --- | --- |
|  |  |

The school of fish is approximately 8 m below sea level.

Case 2: The school of fish is on one side of both boats A and B.

|  |  |
| --- | --- |
| In right |  |

The school of fish is approximately 29 m below sea level.

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

LOC: 11.T3 TOP: Trigonometry

KEY: Communication | Problem-Solving Skills

**76.** ANS:

a) Sketch the triangle.

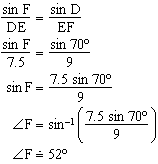


Use the ratio  to determine the number of possible triangles.



Since , one triangle is possible.

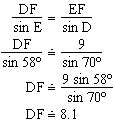
b) Solve for F:



Solve for E:



Solve for DF:



So, in DEF, the approximate measures are: E = 58°, F = 52°, and DF = 8.1 cm.

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

LOC: 11.T3 TOP: Trigonometry

KEY: Procedural Knowledge | Communication

**77.** ANS:

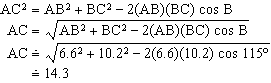
Draw lines perpendicular to AD through B and through C.

|  |  |
| --- | --- |
| In ABE: |  |

In ABC:



Use the Cosine Law to determine AC.



The length of diagonal AC is approximately 14.3 cm.

PTS: 1 DIF: Difficult REF: 6.5 The Cosine Law

LOC: 11.T3 TOP: Trigonometry

KEY: Procedural Knowledge | Communication | Problem-Solving Skills

**78.** ANS:

The expressions are not equivalent because the non-permissible values of the two expressions are not the same.

For example, when ,  = , whereas  is undefined.

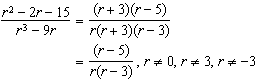
PTS: 0 DIF: Moderate REF: 7.1 Equivalent Rational Expressions

LOC: 11.AN4 TOP: Algebra and Number

KEY: Conceptual Understanding | Communication

**79.** ANS:

The error in the solution is that  must be included as a non-permissible value. Division by  is not possible when . The correct solution is:

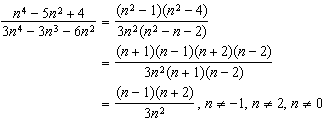


PTS: 0 DIF: Moderate REF: 7.1 Equivalent Rational Expressions

LOC: 11.AN4 TOP: Algebra and Number

KEY: Conceptual Understanding | Communication

**80.** ANS:



PTS: 0 DIF: Difficult REF: 7.1 Equivalent Rational Expressions

LOC: 11.AN4 TOP: Algebra and Number

KEY: Procedural Knowledge | Communication

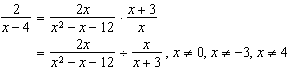
**81.** ANS:

First, write two rational expressions such that when the numerators and denominators are divided by their common factors, the final expression is .

For example:



Expand the first expression, then invert the second expression, and change the operation to division.



PTS: 1 DIF: Difficult REF: 7.2 Multiplying and Dividing Rational Expressions

LOC: 11.AN5 TOP: Algebra and Number

KEY: Procedural Knowledge | Communication | Problem-Solving Skills

**82.** ANS:

Set the product equal to 1.



Factor the polynomials.



Simply.



Expand.



PTS: 1 DIF: Difficult REF: 7.2 Multiplying and Dividing Rational Expressions

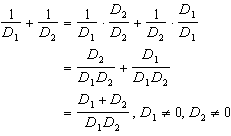
LOC: 11.AN5 TOP: Algebra and Number

KEY: Procedural Knowledge | Communication | Problem-Solving Skills

**83.** ANS:

Add: 

A common denominator is .



A rational expression for the optical power of a thin lens is: 

PTS: 0 DIF: Moderate

REF: 7.3 Adding and Subtracting Rational Expressions with Monomial Denominators

LOC: 11.AN5 TOP: Algebra and Number

KEY: Procedural Knowledge | Communication

**84.** ANS:













, 

PTS: 0 DIF: Difficult

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

LOC: 11.AN5 TOP: Algebra and Number

KEY: Procedural Knowledge | Communication

**85.** ANS:

For example:

For –3 to be an extraneous root, it must be a solution that is also a non-permissible value.

Start by writing a rational equation with  as the common denominator.



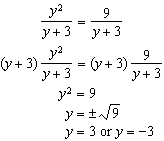
Then, write another equation with 3 and –3 as its roots:



Use the terms from the above equation as the numerators:



This equation then has the required properties:



Since  is a non-permissible value, –3 is an extraneous root.

PTS: 0 DIF: Difficult REF: 7.5 Solving Rational Equations

LOC: 11.AN6 TOP: Algebra and Number

KEY: Procedural Knowledge | Communication | Problem-Solving Skills

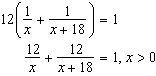
**86.** ANS:

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

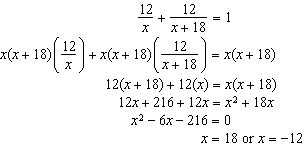
Then, the time it takes Tonya is  hours.

In 1 h, Ginelle can install  of the subfloor and Tonya can install  of the subfloor.

Working together, it takes 12 h to completely install the subfloor. So, an equation is:



Solve the equation. A common denominator is: 



Since time cannot be negative, .

So, 

It would take Ginelle 18 h to install a subfloor and it would take Tonya 36 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

**87.** ANS:

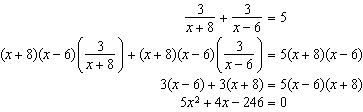
Let  km/h represent the average speed of the cyclist when there is no wind.

An equation representing the total riding time is:

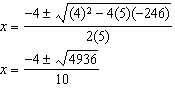


Solve the equation. A common denominator is: 

Multiply all terms in the equation by the common denominator and simplify.



Solve the equation  using the quadratic formula.



 or 

Since speed cannot be negative, .

The cyclist’s average speed when there is no wind is approximately 6.6 km/h.

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

**88.** ANS:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| *x* | –2 | –1 | 0 | 1 | 2 | 3 |
|  | –6 | –4 | –2 | 0 | 2 | 4 |
|  | 6 | 4 | 2 | 0 | 2 | 4 |



PTS: 0 DIF: Moderate REF: 8.1 Absolute Value Functions

LOC: 11.RF2 TOP: Relations and Functions

KEY: Procedural Knowledge | Communication

**89.** ANS:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *x* | –2 | –1 | 0 | 1 | 2 |
|  | 15 | 0 | –5 | 0 | 15 |
|  | 15 | 0 | 5 | 0 | 15 |

|  |  |
| --- | --- |
|  | *x*-intercepts:  *y*-intercept: 5  Domain:  Range: |

PTS: 0 DIF: Moderate REF: 8.1 Absolute Value Functions

LOC: 11.RF2 TOP: Relations and Functions

KEY: Procedural Knowledge | Communication

**90.** ANS:

|  |  |
| --- | --- |
| a) Two points on the graph of the linear function  are: S(–6, 3) and S1(3, –6). Join the points.  Reflect, in the *x*-axis, the part of the graph that is below the *x*-axis to sketch the graph of *y* = |*f*(*x*)|.  b) An equation of the linear function has the form .  Use points S and S1 to determine the slope *m*.    Use the point (–6, 3) to determine *n*.    So, an equation is:  *x*-intercept: –3; *y*-intercept: –3  An equation of the absolute value function is:  *x*-intercept: –3; *y*-intercept: 3  c) When , |  |

PTS: 0 DIF: Difficult REF: 8.1 Absolute Value Functions

LOC: 11.RF2 TOP: Relations and Functions

KEY: Procedural Knowledge | Communication | Problem-Solving Skills

**91.** ANS:

The absolute value function  creates two linear equations:

 and 

So, the equation has two solutions:  and 

Graph the line  on the same grid as :



The line  intersects the graph of  at two points: (3, 12) and (–5, 12)

These points satisfy the equation , so  and  are solutions.

PTS: 0 DIF: Moderate REF: 8.2 Solving Absolute Value Equations

LOC: 11.RF2 TOP: Relations and Functions

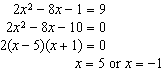
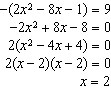
KEY: Conceptual Understanding | Procedural Knowledge | Communication

**92.** ANS:

Simplify the equation:



The absolute value function  creates two quadratic equations:

 and 

So, the solutions are , , and .

PTS: 0 DIF: Moderate REF: 8.2 Solving Absolute Value Equations

LOC: 11.RF2 TOP: Relations and Functions

KEY: Conceptual Understanding | Procedural Knowledge | Communication

**93.** ANS:

If there is a value of *x* for which the *y*-values of the reciprocal functions are the same, then the graphs of the reciprocal functions intersect.

|  |
| --- |
| Substitute  in :    *y* = |

So, the graphs of the reciprocal functions intersect at (–2, ).

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

**94.** ANS:

a) Use the formula for speed:

Substitute: *d* = 1



b) Both time and speed are positive.

The reciprocal function has vertical asymptote  and horizontal asymptote .

So, the domain is  and the range is .

c) A sketch of the reciprocal function is:



PTS: 0 DIF: Moderate REF: 8.3 Graphing Reciprocals of Linear Functions

LOC: 11.RF11 TOP: Relations and Functions

KEY: Procedural Knowledge | Communication | Problem-Solving Skills

**95.** ANS:

|  |
| --- |
| a) Compare  with .  Since the value of *a* is positive and the value of *q* is negative, the related quadratic function  has 2 *x*-intercepts.  So, the graph of the reciprocal function has 2 vertical asymptotes.  is undefined when .    So, the lines  and  are vertical asymptotes. |
| b) Compare \_with .  Since the value of *a* is negative and the value of *q* is positive, the related quadratic function  has 2 *x*-intercepts.  So, the graph of the reciprocal function has 2 vertical asymptotes.  is undefined when .  and  So, the lines  and  are vertical asymptotes. |

PTS: 0 DIF: Difficult

REF: 8.4 Using Technology to Graph Reciprocals of Quadratic Functions

LOC: 11.RF11 TOP: Relations and Functions

KEY: Conceptual Understanding | Procedural Knowledge | Communication

**96.** ANS:

a) The graph that corresponds to graph a is graph iii. The graph of the quadratic function has two *x*-intercepts, so the graph of its reciprocal function has two vertical asymptotes.

b) The graph that corresponds to graph b is graph i. The graph of the quadratic function has no *x*-intercepts, so the graph of its reciprocal function has no vertical asymptotes.

c) The graph that corresponds to graph c is graph ii. The graph of the quadratic function has one *x*-intercept, so the graph of its reciprocal function has one vertical asymptote.

PTS: 0 DIF: Moderate REF: 8.5 Graphing Reciprocals of Quadratic Functions

LOC: 11.RF11 TOP: Relations and Functions

KEY: Conceptual Understanding | Procedural Knowledge | Communication

**97.** ANS:

|  |  |
| --- | --- |
| The graph of *y* =  opens up and has *x*-intercepts –1 and 4.  So, the graph of the reciprocal function has vertical asymptotes  and .  Plot points where the lines  and  intersect the graph of *y* = . These points are common to both graphs. Using these points and the asymptotes, draw smooth curves that approach the asymptotes but never touch them.The graph of the reciprocal function has Shape 3. |  |

PTS: 0 DIF: Moderate REF: 8.5 Graphing Reciprocals of Quadratic Functions

LOC: 11.RF11 TOP: Relations and Functions

KEY: Conceptual Understanding | Procedural Knowledge | Communication

**98.** ANS:

a) When the graph of a reciprocal function has one vertical asymptote, the graph of the corresponding quadratic function has one *x*-intercept. Since the vertical asymptote is , the graph of the quadratic function has vertex  and passes through the points  and . Since the points common to both graphs are above the *x*-axis, the graph of the quadratic function opens up.



b) The equation of the quadratic function has the form , where  is the vertex of the parabola, and *a* represents its size and direction. Substitute *h* = 1 and *k* = 0.



Use one of the points  and  to solve for *a*: 

The equation of the quadratic function is: 

The equation of the reciprocal function is: 

PTS: 0 DIF: Difficult REF: 8.5 Graphing Reciprocals of Quadratic Functions

LOC: 11.RF11 TOP: Relations and Functions

KEY: Conceptual Understanding | Procedural Knowledge | Communication

**99.** ANS:

|  |  |
| --- | --- |
| The graph of  opens up, has vertex , and does not intersect the *x*-axis.  So, the graph of its reciprocal function has no vertical asymptotes and has vertex .  The points  and  are on the graph of the quadratic function, so the points  and  are on the graph of the reciprocal function.  Draw smooth curves through the appropriate points to obtain the graphs. |  |

PTS: 0 DIF: Difficult REF: 8.5 Graphing Reciprocals of Quadratic Functions

LOC: 11.RF11 TOP: Relations and Functions

KEY: Conceptual Understanding | Procedural Knowledge | Communication

**100.** ANS:

|  |
| --- |
| a) The reciprocal function  has no vertical asymptotes when the related function  has no *x*-intercepts. That is, the equation has no real roots. This occurs when .    ** *< k* < |
| b) The reciprocal function  has one vertical asymptote when the related function  has one *x*-intercept. That is, the equation has equal roots. This occurs when .    *k* = 2 or |
| c) The reciprocal function  has two vertical asymptotes when the related function  has two *x*-intercepts. That is, the equation has two real roots. This occurs when .    *k* < ****or *k >* |

PTS: 0 DIF: Difficult REF: 8.5 Graphing Reciprocals of Quadratic Functions

LOC: 11.RF11 TOP: Relations and Functions

KEY: Conceptual Understanding | Procedural Knowledge | Communication