Relations and Functions Unit Test

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

1. Identify the domain of this relation.
\[ \{(8,10),(5,7),(9,-11),(6,-8)\} \]
   a. \{5,6,9,10\}  
   b. \{5,6,8,9\}  
   c. \{-11,-8,7,10\}  
   d. \{-8,7,9,10\}

2. Which set of ordered pairs does not represent a function?
   a. \{(-3,-8), (-1,-6), (-2,5), (0,7)\}  
   b. \{(7,0), (4,-1), (-6,5), (-8,0)\}  
   c. \{(4,6), (5,-7), (7,9), (8,-10)\}  
   d. \{(2,5), (3,8), (4,11), (2,-1)\}

3. Identify the range of this relation.

   a. \{-6,0,7,9\}  
   b. \{7,10,12\}  
   c. \{5,7,10,12,13\}  
   d. \{-6,7,9\}

4. This graph shows the masses of people, m, as a function of age, a. Determine the range of the graph.

   a. \{15,25,35,55,80,75\}  
   b. \{20,25,35,55,70,75\}  
   c. \{4,5,6,10,12,17\}  
   d. \{3,5,6,10,14,17\}
5. This graph represents a 150-L hot-water tank being filled at a constant rate. Determine the rate of change of the relation.

![Graph of Filling a Hot-Water Tank](image)

- a. 3 L/min
- b. 25 L/min
- c. 0.33 L/min
- d. 75 L/min

6. This graph shows distance, $d$ kilometres, as a function of time, $t$ minutes. Determine the vertical and horizontal intercepts.

![Graph of Distance vs Time](image)

- a. Vertical intercept: 96
  - Horizontal intercept: 80
- b. Vertical intercept: 80
  - Horizontal intercept: 96
- c. Vertical intercept: 64
  - Horizontal intercept: 96
- d. Vertical intercept: 80
  - Horizontal intercept: 64

7. Which situation does **NOT** represent a linear relation?

- a. The value of a car decreased at a rate of 16% each year.
- b. A cashier is earns a salary of $15/hour.
- c. A car rental company charges a $30 flat fee plus $20 for each day.
- d. The total cost of purchases increases at a rate of $1.50 a bag.
8. This set of ordered pairs represents a linear relation. Determine its rate of change.
   \[ \left\{ (-10, 16), (-4, 13), (2, 10), (8, 7), (14, 4) \right\} \]
   a. \[ \frac{1}{2} \]  
   b. \[ \frac{1}{2} \]  
   c. \[ 2 \]  
   d. \[ -2 \]

9. This graph shows the volume of water remaining in a leaking hot tub as a function of time. Determine the domain and range.

   ![Graph of Volume vs. Time]

   a. Domain: \( t \leq 123 \)  
      Range: \( 0 \leq V \leq 1600 \)  
   b. Domain: \( 0 \leq V \leq 1600 \)  
      Range: \( t \leq 123 \)  
   c. Domain: \( 0 \leq t \leq 123 \)  
      Range: \( V \leq 1600 \)  
   d. Domain: \( 0 \leq t \leq 123 \)  
      Range: \( 0 \leq V \leq 1600 \)

10. This table shows the cost, \( C \) dollars, of different numbers of tickets sold, \( n \). Identify the range.

<table>
<thead>
<tr>
<th>Number of Tickets, ( n )</th>
<th>Cost, ( C ) ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>9.50</td>
</tr>
<tr>
<td>2</td>
<td>19.00</td>
</tr>
<tr>
<td>3</td>
<td>28.50</td>
</tr>
<tr>
<td>4</td>
<td>38.00</td>
</tr>
<tr>
<td>5</td>
<td>47.50</td>
</tr>
</tbody>
</table>

   a. \{1, 2, 3, 4, 5, \ldots \}  
   b. \{9.50, 19.00, 28.50, 38.00, 47.50, \ldots \}  
   c. \{1, 2, 3, 4, 5, 9.50, 19.00, 28.50, 38.00, 47.50\}  
   d. \{1, 9.50, 2, 19.00, 3, 28.50, 4, 38.00, 5, 47.50, \ldots \}
11. Which graph represents the linear function \( f(x) = -3x + 4 \)?

a. 

b. 

c. 

d. 

12. The function \( C(f) = \frac{5}{9}(f - 32) \) converts a temperature, \( f \) degrees Fahrenheit, to \( C \) degrees Celsius. Determine \( C(27) \) to the nearest degree.

a. 17°C  
  b. 81°C  
  c. –3°C  
  d. 3°C
13. Consider the relation represented by this arrow diagram. Represent the relation as a set of ordered pairs.

\[
\text{(House P, 7), (House Q, 8), (House R, 5), (House S, 9)}
\]

14. This set of ordered pairs shows the years of some Winter Olympics and the host city in each year. Represent the relation as a table.

\[
\text{Year} \quad \text{Host City} \\
1988 \quad \text{Calgary} \\
1992 \quad \text{Albertville} \\
1994 \quad \text{Lillehammer} \\
1998 \quad \text{Nagano} \\
2002 \quad \text{Salt Lake City} \\
2006 \quad \text{Beijing} \\
2010 \quad \text{Vancouver}
\]

\[
\text{Host City} \quad \text{Year} \\
\text{Nagano} \quad 1998 \\
\text{Albertville} \quad 1992 \\
\text{Lillehammer} \quad 1994 \\
\text{Calgary} \quad 1998 \\
\text{Salt Lake City} \quad 2002 \\
\text{Turin} \quad 2006 \\
\text{Vancouver} \quad 2010
\]
15. Each point on this graph represents an animal. Which animal has the least mass?

![Graph of Ages and Masses of Animals]

- a. A
- b. B
- c. C
- d. D

16. Determine the range of this graph.

- a. $1 \leq x \leq 5$
- b. $-5 \leq y \leq 3$
- c. $-5 \leq x \leq 3$
- d. $1 \leq y \leq 5$

17. For a consultation, a lawyer charges a $70 flat fee, plus $50 for every 15 min worked. Determine the rate of change of this linear relation.

- a. 200
- b. 70
- c. 120
- d. 270
18. Which graph best represents the cost of renting a kayak as a function of time?

a. 

b. 

c. 

d. 

Short Answer

19. For the function \( f(x) = -3x + 8 \), determine \( f(-4) \).

20. For the function \( g(x) = 2x - 9 \), determine \( x \) when \( g(x) = -13 \).
21. Determine the domain of the graph of this function.

![Graph of a function]

22. Determine the range of the graph.

![Graph of a circle]

23. Write $y = 2x - 2$ in function notation.
24. This table of values represents a linear relation. Determine the rate of change of the relation.

<table>
<thead>
<tr>
<th>Time (s)</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance (m)</td>
<td>0</td>
<td>5</td>
<td>10</td>
<td>15</td>
<td>20</td>
</tr>
</tbody>
</table>

25. This is a graph of the function \( g(x) = -2x + 3 \). Determine the range value when the domain value is \(-1\).

26. The relation between \( x \) and \( y \) is linear. Which number would complete this table?

<table>
<thead>
<tr>
<th>( x )</th>
<th>3</th>
<th>7</th>
<th>11</th>
<th>15</th>
<th>19</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y )</td>
<td>24</td>
<td>15</td>
<td>6</td>
<td></td>
<td>-12</td>
</tr>
</tbody>
</table>
Relations and Functions Unit Test
Answer Section

MULTIPLE CHOICE

1. B
2. D
3. A
4. B
5. A
6. B
7. A
8. A
9. D
10. B
11. B
12. C
13. A
14. B
15. A
16. B
17. A
18. B

SHORT ANSWER

19. 20
20. –2
21. $x \leq 4$
22. $0 \leq y \leq 4$
23. $f(x) = 2x - 2$
24. 5 m/s
25. 5
26. –3
Relations and Functions Unit Test

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

1. Identify the domain of this relation.
   \[ \{(7,9), (4,6), (8,-10), (5,-7)\} \]
   a. \{-7,6,8,9\}          c. \{4,5,7,8\}
   b. \{4,5,8,9\}          d. \{-10,-7,6,9\}

2. Which set of ordered pairs does not represent a function?
   a. \{(10,0),(7,2),(-9,8),(-11,0)\}   c. \{(0,-11),(2,-9),(1,8),(3,10)\}
   b. \{(7,9),(8,-10),(10,12),(11,13)\}  d. \{(5,8),(6,11),(7,14),(5,2)\}

3. Identify the range of this relation.
   a. \{-5,0,6,8\}          c. \{4,6,9,11,12\}
   b. \{6,9,11\}          d. \{-5,6,8\}

4. This graph shows the masses of people, \( m \), as a function of age, \( a \). Determine the range of the graph.
   a. \{4,5,8,12,14,17\}          c. \{20,25,45,65,80,85\}
   b. \{3,5,8,10,14,17\}          d. \{15,25,45,55,80,85\}
5. This graph represents a 150-L hot-water tank being filled at a constant rate. Determine the rate of change of the relation.

![Graph of Filling a Hot-Water Tank]

a. 25 L/min  
b. 0.33 L/min  
c. 75 L/min  
d. 3 L/min

6. This graph shows distance, $d$ kilometres, as a function of time, $t$ minutes. Determine the vertical and horizontal intercepts.

![Graph of Distance vs. Time]

a. Vertical intercept: 120  
   Horizontal intercept: 100  
b. Vertical intercept: 80  
   Horizontal intercept: 120  
c. Vertical intercept: 100  
   Horizontal intercept: 80  
d. Vertical intercept: 100  
   Horizontal intercept: 120

7. Which situation does **NOT** represent a linear relation?

a. The value of a car decreased at a rate of 16% each year.  
b. A cashier is earns a salary of $15/hour.  
c. A car rental company charges a $30 flat fee plus $20 for each day.  
d. The total cost of purchases increases at a rate of $1.50 a bag.
8. This set of ordered pairs represents a linear relation. Determine its rate of change.
\[ \{(-6, 15), (3, 10), (12, 5), (21, 0), (30, -5)\} \]

a. \( \frac{9}{5} \)  

b. \( \frac{5}{9} \)  
c. \( \frac{9}{5} \)
d. \( \frac{5}{9} \)

9. This graph shows the volume of water remaining in a leaking hot tub as a function of time. Determine the domain and range.

[Graph of water volume remaining in a leaking hot tub]

a. Domain: \( 0 \leq t \leq 138 \)  

Range: \( V \leq 1800 \)
b. Domain: \( 0 \leq V \leq 1800 \)  

Range: \( t \leq 138 \)
c. Domain: \( 0 \leq t \leq 138 \)  

Range: \( V \leq 1800 \)
d. Domain: \( t \leq 138 \)  

Range: \( 0 \leq V \leq 1800 \)

10. This table shows the cost, \( C \) dollars, of different numbers of tickets sold, \( n \). Identify the range.

<table>
<thead>
<tr>
<th>Number of Tickets, ( n )</th>
<th>Cost, ( C ) ($)</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>12.50</td>
</tr>
<tr>
<td>2</td>
<td>25.00</td>
</tr>
<tr>
<td>3</td>
<td>37.50</td>
</tr>
<tr>
<td>4</td>
<td>50.00</td>
</tr>
<tr>
<td>5</td>
<td>62.50</td>
</tr>
</tbody>
</table>

a. \{1, 2, 3, 4, 5, ...\}
b. \{1, 12.50, 2, 25.00, 3, 37.50, 4, 50.00, 5, 62.50, ...\}
c. \{1, 2, 3, 4, 5, 12.50, 25.00, 37.50, 50.00, 62.50\}
d. \{12.50, 25.00, 37.50, 50.00, 62.50, ...\}
11. Which graph represents the linear function \( f(x) = -3x + 4 \)?

a.  

\[ \begin{array}{c}
\text{Graph a.} \\
\end{array} \]

b.  

\[ \begin{array}{c}
\text{Graph b.} \\
\end{array} \]

c.  

\[ \begin{array}{c}
\text{Graph c.} \\
\end{array} \]

d.  

\[ \begin{array}{c}
\text{Graph d.} \\
\end{array} \]

12. The function \( C\left( f \right) = \frac{5}{9}(f - 32) \) converts a temperature, \( f \) degrees Fahrenheit, to \( C \) degrees Celsius. Determine \( C(33) \) to the nearest degree.

a. 27°C  

b. -1°C  

c. 1°C  

d. 91°C
13. Consider the relation represented by this arrow diagram. Represent the relation as a set of ordered pairs.

![Arrow Diagram]

a. \{ (House P, 5), (House Q, 6), (House R, 3), (House S, 7) \}

b. \{ (5, House P), (6, House Q), (3, House R), (7, House S) \}

c. \{ (3, House P), (5, House Q), (6, House R), (7, House S) \}

d. \{ (House P, 3), (House Q, 5), (House R, 6), (House S, 7) \}

14. This set of ordered pairs shows the years of some Winter Olympics and the host city in each year. Represent the relation as a table.


<table>
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<td>1998</td>
</tr>
<tr>
<td>Salt Lake City</td>
<td>2002</td>
</tr>
<tr>
<td>Turin</td>
<td>2008</td>
</tr>
<tr>
<td>Vancouver</td>
<td>2010</td>
</tr>
</tbody>
</table>
15. Each point on this graph represents an animal. Which animal has the least mass?

![Graph of Ages and Masses of Animals]

- A
- B
- C
- D

16. Determine the range of this graph.

- \(-5 \leq x \leq 3\)
- \(1 \leq x \leq 5\)
- \(1 \leq y \leq 5\)
- \(-5 \leq y \leq 3\)

17. For a consultation, a lawyer charges a $65 flat fee, plus $50 for every 15 min worked. Determine the rate of change of this linear relation.

- 265
- 65
- 200
- 115
18. Which graph best represents the cost of renting a kayak as a function of time?
   a. 
   b. 
   c. 
   d. 

Short Answer

19. For the function \( f(x) = -3x + 8 \), determine \( f(-2) \).

20. For the function \( g(x) = 2x - 9 \), determine \( x \) when \( g(x) = -15 \).
21. Determine the domain of the graph of this function.

![Graph of a function with domain and range](image1)

22. Determine the range of the graph.

![Graph of a circle with domain and range](image2)

23. Write $y = 8x - 8$ in function notation.

$y = f(x)$
24. This table of values represents a linear relation. Determine the rate of change of the relation.

<table>
<thead>
<tr>
<th>Time (s)</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance (m)</td>
<td>0</td>
<td>5</td>
<td>10</td>
<td>15</td>
<td>20</td>
</tr>
</tbody>
</table>

25. This is a graph of the function \( g(x) = -2x + 3 \). Determine the range value when the domain value is 2.

26. The relation between \( x \) and \( y \) is linear. Which number would complete this table?

<table>
<thead>
<tr>
<th>( x )</th>
<th>3</th>
<th>7</th>
<th>11</th>
<th>15</th>
<th>19</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y )</td>
<td>19</td>
<td>11</td>
<td>3</td>
<td>-13</td>
<td></td>
</tr>
</tbody>
</table>
Relations and Functions Unit Test
Answer Section

MULTIPLE CHOICE

1. C
2. D
3. A
4. C
5. D
6. D
7. A
8. B
9. A
10. D
11. A
12. C
13. B
14. B
15. A
16. D
17. C
18. A

SHORT ANSWER

19. 14
20. -3
21. \( x \leq 4 \)
22. \( -3 \leq y \leq 3 \)
23. \( f(x) = 8x - 8 \)
24. 5 m/s
25. -1
26. -5
Relations and Functions Unit Test

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

1. Identify the domain of this relation.
\( \{(6,8), (3,5), (7,-9), (4,-6)\} \)
   a. \{-6,5,7,8\}  
   b. \{3,4,6,7\}  
   c. \{3,4,7,8\}  
   d. \{-9,-6,5,8\}

2. Which set of ordered pairs does not represent a function?
   a. \{(5,8), (6,11), (7,14), (5,2)\}  
   b. \{(10,0), (7,2), (-9,8), (-11,0)\}  
   c. \{(0,-11), (2,-9), (1,8), (3,10)\}  
   d. \{(7,9), (8,-10), (10,12), (11,-13)\}

3. Identify the range of this relation.

   ![Diagram of a relation with points at (4,6), (4,11), (6,8), and (9,10)]

   a. \{-5,0,6,8\}  
   b. \{4,6,9,11,12\}  
   c. \{6,9,11\}  
   d. \{-5,6,8\}

4. This graph shows the masses of people, \( m \), as a function of age, \( a \). Determine the range of the graph.

   ![Graph showing data points at (3,20), (5,40), (7,60), (9,80), (11,100)]

   a. \{3,5,8,10,14,17\}  
   b. \{20,25,45,65,80,85\}  
   c. \{15,25,45,55,80,85\}  
   d. \{4,5,8,12,14,17\}
5. This graph represents a 150-L hot-water tank being filled at a constant rate. Determine the rate of change of the relation.

![Graph of a hot-water tank being filled]

- a. 0.33 L/min
- b. 3 L/min
- c. 75 L/min
- d. 25 L/min

6. This graph shows distance, \( d \) kilometres, as a function of time, \( t \) minutes. Determine the vertical and horizontal intercepts.

![Graph showing distance vs. time]

- a. Vertical intercept: 85
  Horizontal intercept: 102
- b. Vertical intercept: 68
  Horizontal intercept: 102
- c. Vertical intercept: 102
  Horizontal intercept: 85
- d. Vertical intercept: 85
  Horizontal intercept: 68

7. Which situation does **NOT** represent a linear relation?

- a. The total cost of purchases increases at a rate of $1.50 a bag.
- b. The value of a car decreased at a rate of 16% each year.
- c. A car rental company charges a $30 flat fee plus $20 for each day.
- d. A cashier earns a salary of $15/hour.
8. This set of ordered pairs represents a linear relation. Determine its rate of change.
\[ \left\{ (-8, 15), (-1, 11), (6, 7), (13, 3), (20, -1) \right\} \]

a. \( \frac{-4}{7} \)  

b. \( \frac{7}{4} \)  

c. \( \frac{4}{7} \)  

d. \( \frac{7}{4} \)

9. This graph shows the volume of water remaining in a leaking hot tub as a function of time. Determine the domain and range.

![Water in a Leaking Hot Tub graph]

a. Domain: \( 0 \leq t \leq 129 \)  
Range: \( V \leq 1800 \)

b. Domain: \( 0 \leq V \leq 1800 \)  
Range: \( t \leq 129 \)

c. Domain: \( 0 \leq t \leq 129 \)  
Range: \( 0 \leq V \leq 1800 \)

d. Domain: \( t \leq 129 \)  
Range: \( 0 \leq V \leq 1800 \)

10. This table shows the cost, \( C \) dollars, of different numbers of tickets sold, \( n \). Identify the range.

<table>
<thead>
<tr>
<th>Number of Tickets, ( n )</th>
<th>Cost, ( C ) ($)</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>9.50</td>
</tr>
<tr>
<td>2</td>
<td>19.00</td>
</tr>
<tr>
<td>3</td>
<td>28.50</td>
</tr>
<tr>
<td>4</td>
<td>38.00</td>
</tr>
<tr>
<td>5</td>
<td>47.50</td>
</tr>
</tbody>
</table>

a. \{1, 2, 3, 4, 5, 9.50, 19.00, 28.50, 38.00, 47.50\}  
b. \{1, 9.50, 2, 19.00, 3, 28.50, 4, 38.00, 5, 47.50, ...\}  
c. \{1, 2, 3, 4, 5, ...\}  
d. \{9.50, 19.00, 28.50, 38.00, 47.50, ...\}
11. Which graph represents the linear function \( f(x) = -3x + 1 \)?

a. 

![Graph](image1)

b. 

![Graph](image2)

c. 

![Graph](image3)

d. 

![Graph](image4)

12. The function \( C(f) = \frac{5}{9}(f - 32) \) converts a temperature, \( f \) degrees Fahrenheit, to \( C \) degrees Celsius. Determine \( C(33) \) to the nearest degree.

a. \( 27^\circ C \)  
   b. \( -1^\circ C \)  
   c. \( 1^\circ C \)  
   d. \( 91^\circ C \)
13. Consider the relation represented by this arrow diagram. Represent the relation as a set of ordered pairs.

![Arrow diagram showing people living in different houses.

- a. \{(5, \text{House P}), (7, \text{House Q}), (8, \text{House R}), (9, \text{House S})\}

- b. \{(\text{House P}, 5), (\text{House Q}, 7), (\text{House R}, 8), (\text{House S}, 9)\}

- c. \{(7, \text{House P}), (8, \text{House Q}), (5, \text{House R}), (9, \text{House S})\}

- d. \{(\text{House P}, 7), (\text{House Q}, 8), (\text{House R}, 5), (\text{House S}, 9)\}

14. This set of ordered pairs shows the years of some Winter Olympics and the host city in each year. Represent the relation as a table.


- a. 

- b. 

- c. 

- d. 

<table>
<thead>
<tr>
<th>Year</th>
<th>Host City</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>Calgary</td>
</tr>
<tr>
<td>1992</td>
<td>Albertville</td>
</tr>
<tr>
<td>1994</td>
<td>Lillehammer</td>
</tr>
<tr>
<td>1998</td>
<td>Nagano</td>
</tr>
<tr>
<td>2002</td>
<td>Salt Lake City</td>
</tr>
<tr>
<td>2006</td>
<td>Turin</td>
</tr>
<tr>
<td>2010</td>
<td>Vancouver</td>
</tr>
</tbody>
</table>
15. Each point on this graph represents an animal. Which animal has the least mass?

- [Graph of Ages and Masses of Animals]

a. A  

b. B  

c. C  

d. D

16. Determine the range of this graph.

- [Graph of x and y coordinates]

a. $-5 \leq x \leq 3$  

b. $1 \leq x \leq 5$  

c. $-5 \leq y \leq 3$  

d. $1 \leq y \leq 5$

17. For a consultation, a lawyer charges a $70 flat fee, plus $50 for every 15 min worked. Determine the rate of change of this linear relation.

- [Graph of x and y coordinates]

a. 120  

b. 200  

c. 70  

d. 270
18. Which graph best represents the cost of renting a kayak as a function of time?

a. 

b. 

c. 

d. 

Short Answer

19. For the function \( f(x) = -3x + 8 \), determine \( f(-3) \).

20. For the function \( g(x) = 2x - 9 \), determine \( x \) when \( g(x) = -19 \).
21. Determine the domain of the graph of this function.

22. Determine the range of the graph.

23. Write \( y = 10x - 10 \) in function notation.
24. This table of values represents a linear relation. Determine the rate of change of the relation.

<table>
<thead>
<tr>
<th>Time (s)</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance (m)</td>
<td>0</td>
<td>5</td>
<td>10</td>
<td>15</td>
<td>20</td>
</tr>
</tbody>
</table>

25. This is a graph of the function $g(x) = -2x + 3$. Determine the range value when the domain value is 4.

26. The relation between $x$ and $y$ is linear. Which number would complete this table?

<table>
<thead>
<tr>
<th>$x$</th>
<th>3</th>
<th>7</th>
<th>11</th>
<th>15</th>
<th>19</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y$</td>
<td>24</td>
<td>16</td>
<td>8</td>
<td></td>
<td>-8</td>
</tr>
</tbody>
</table>
Relations and Functions Unit Test
Answer Section

MULTIPLE CHOICE

1. B  
2. A  
3. A  
4. B  
5. B  
6. A  
7. B  
8. A  
9. C  
10. D  
11. B  
12. C  
13. C  
14. D  
15. A  
16. C  
17. B  
18. B

SHORT ANSWER

19. 17  
20. –5  
21. $x \leq 3$  
22. $–1 \leq y \leq 3$  
23. $f(x) = 10x - 10$  
24. 5 m/s  
25. –5  
26. 0