A. Introduction to Proportionality

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Proportionality	
A regular mathematical relationship between two variables. Used very frequently in physics to understand formulas.	
Direct Proportionality	
A linear proportionality relationship in which, if one variable increases, the other increases by the same proportion.	
Inverse Proportionality	
If one variable increase, the other *decreases* by the same proportion.	

1. Use the following formula (Newton's Second Law) to fill out the following table.

$$\Sigma F = ma \tag{1}$$

Net Force (N)	mass (kg)	Acceleration (m/s^2)
10	10	
20	10	
30	10	
40	10	
50	10	
60	10	
70	10	
80	10	
90	10	
100	10	

2. Which two variables change? 3. Which variable remains constant?

4. Make a graph of Net Force and Acceleration from the table on the previous page. This graph represents a *Direct Proportion*.
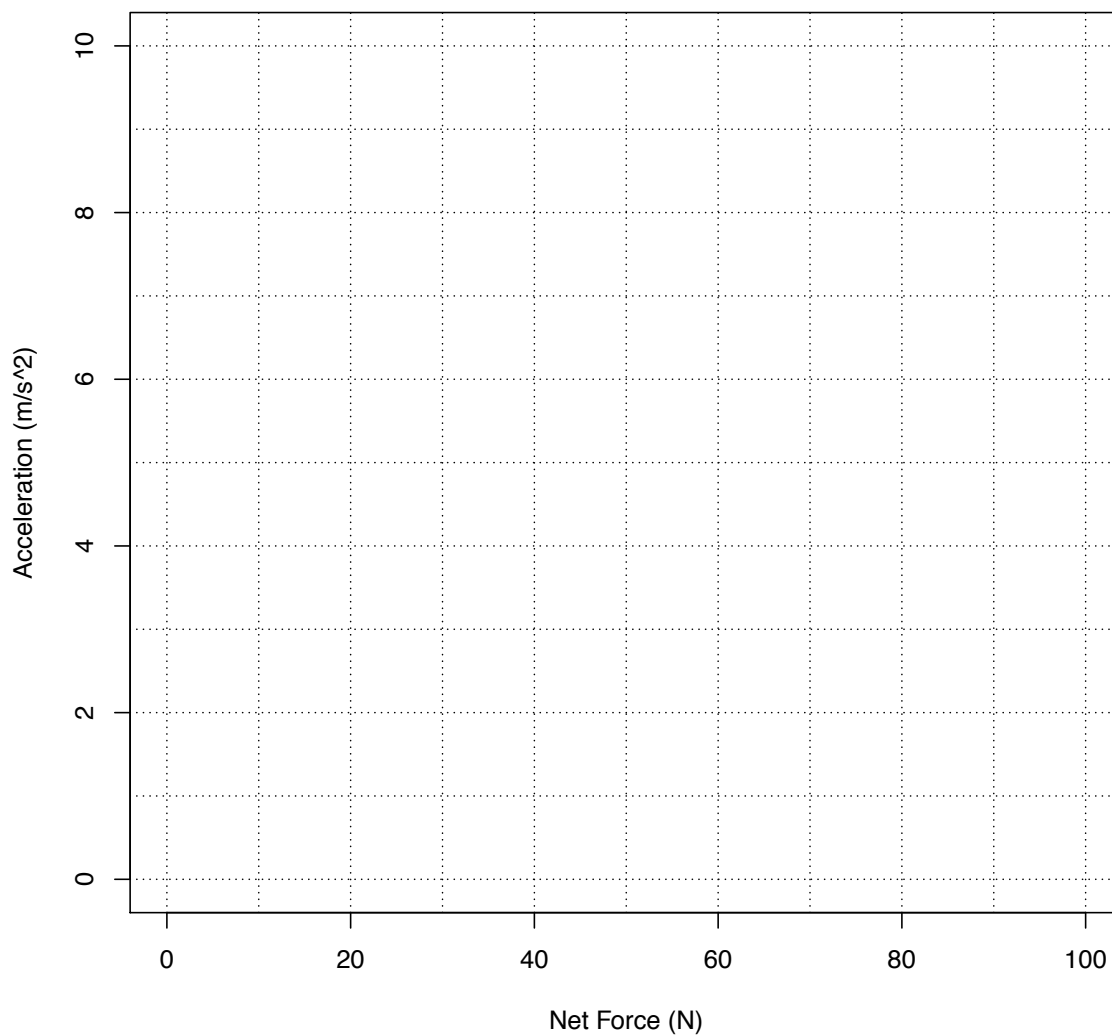
5. Use the equation (Newton's Second Law) to fill out the following table.

$$\Sigma F = ma$$ (2)

Net Force (N)	mass (kg)	Acceleration (m/s^2)
100	10	
100	20	
100	30	
100	40	
100	50	
100	60	
100	70	
100	80	
100	90	
100	100	

6. Which two variables change? 7. Which variable remains constant?

8. Create a graph of mass and acceleration from the previous page. This graph represents two quantities with an *Inverse Proportion*
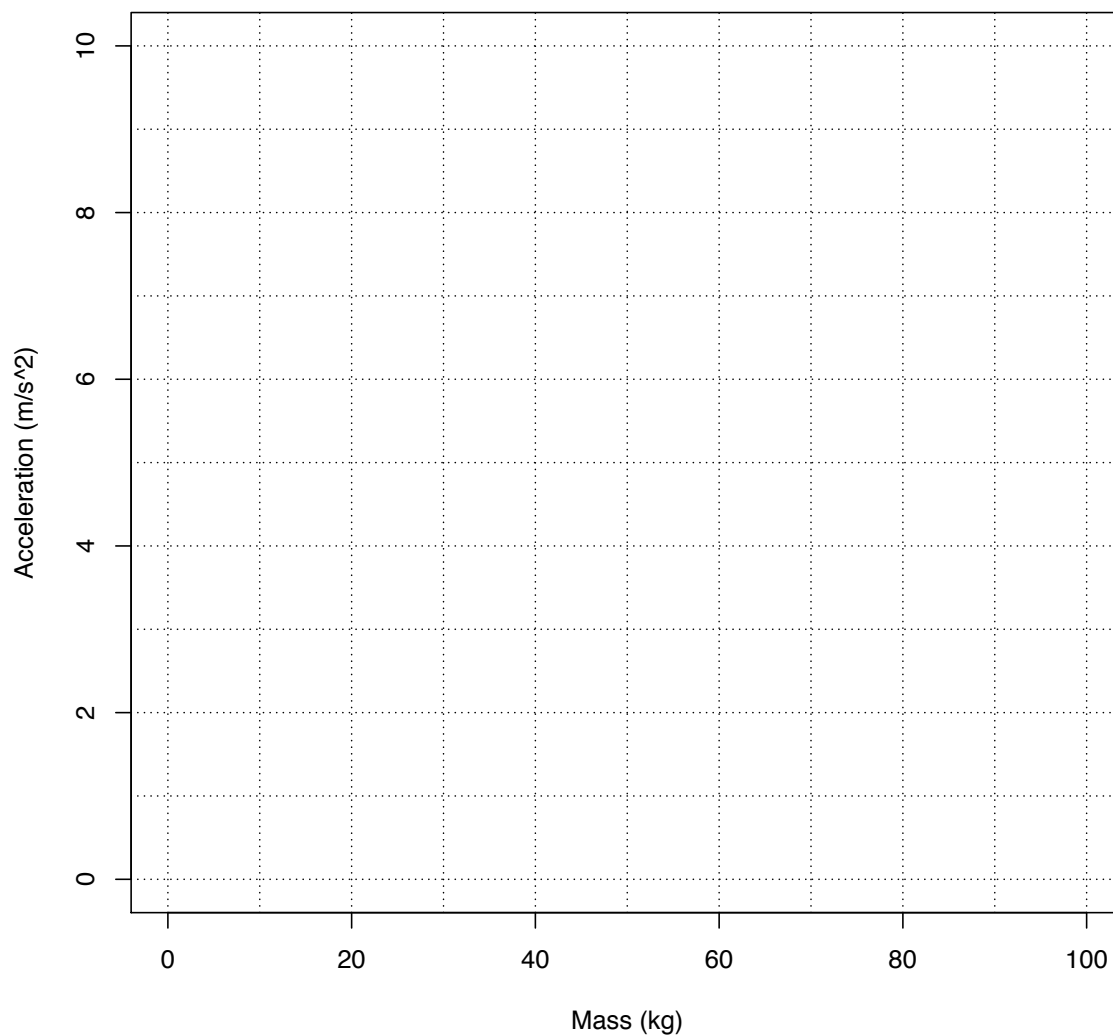
B. Analyzing Graphs for Proportionality

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| **Graph for Direct Proportionality** |
| The graph for a direct proportionality is a straight line with a positive, finite slope that goes *through the origin*. |
| **Graph for Inverse Proportionality** |
| The graph for inverse proportionality is called a *hyperbola*. |
| It is made by creating an *asymptote* on each of the two axes. |
| It never touches the axes. |

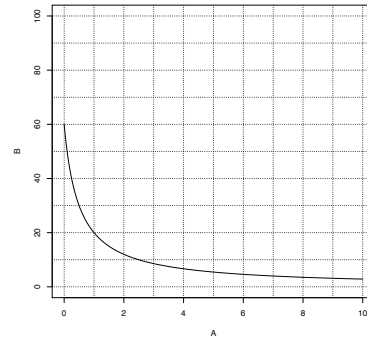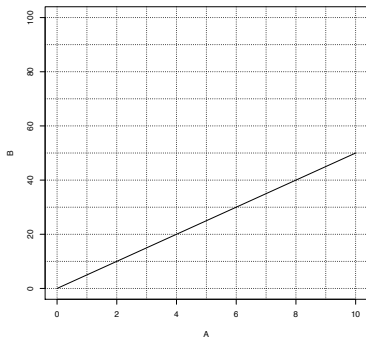For each graph, state whether is represents direct proportionality, inverse proportionality, or neither.
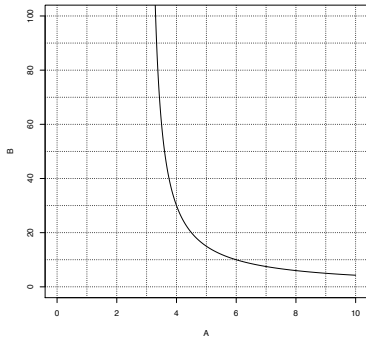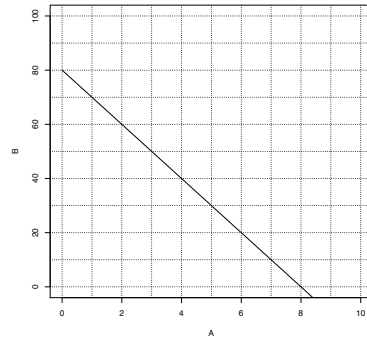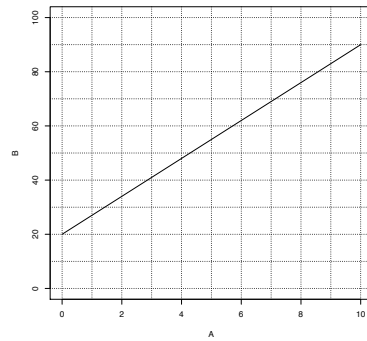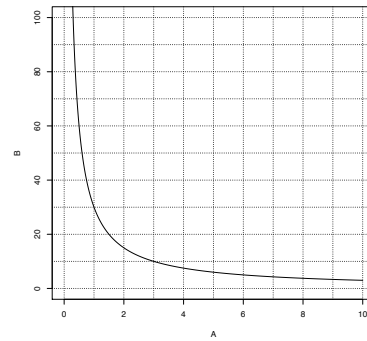
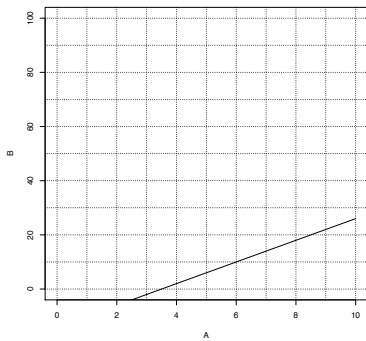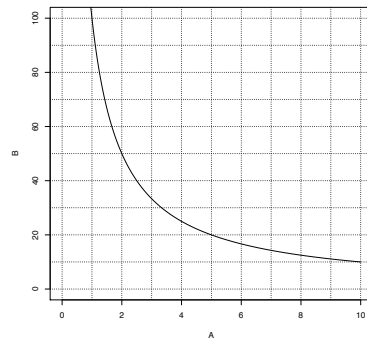| A	D	G
B	**E**	**H**
C	**F**	**I**
		xxx

Answers

A – neither, it is not inverse proportionality because the vertical asymptote is located at x = 4, not x = 0.

B – direct proportionality

C – neither, for direct proportionality the line must go through the origin

D – neither

E – neither, once again, the line does not go through the origin

F – inverse proportionality (if, as the graph continues, it forms asymptote on the two axes)

G – neither, it cannot be inverse proportionality because the curve touches the y-axis

H – inverse proportionality)