Find the Missing Force

In each of the problems below, you need to consider a missing force

One possible strategy is to assign directions to the signs of a number:

For horizontal problems:
- All forces to the right are POSITIVE
- All forces to the left are NEGATIVE

For vertical problems:
- All upward forces are POSITIVE
- All downward forces are NEGATIVE

E.1
Three forces act on an object:
345 N left   454 N right   ????? N left

Draw a free-body diagram with 3 forces. On of the forces has unknown magnitude:

The net force is 200 N left.

What is the magnitude of the missing force?

E.2
43 down   53 down   ??? up

Draw a free-body diagram with 3 forces. On of the forces has unknown magnitude:

The net force is 140 N up.

What is the magnitude of the missing force?

E.3
75 N down   75 N down   ??? up

Draw a free-body diagram with 3 forces. On of the forces has unknown magnitude:

The net force is 86 N down.

What is the magnitude of the missing force?

E.4 I'm sitting on a chair.

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The chair exerts a force 450 N up.   My weight is ?????? N down.

Draw a free-body diagram:

The net force on me is 0 N.

What is my weight [the magnitude of the downward force]?

E.5
20 N up   18 N down   ???????

The net force is 38 N down.

Find the magnitude *and direction* of the missing force:

E.6
95 N left
66 N left
??????

The net force is 500 N right

E.7
88 N left   66 N right   27 N left   ?????

The net force is 100 N right
Find the magnitude *and direction* of the missing force:

E.8
9 N down   39 N up   85 N down   59 N up   ?????

The net force is 0 N.
Find the *magnitude* and *direction* of the missing force:

E.9 An object with a mass of 50 kg is accelerating at a rate of 4 m/s² upward.
There are two force acting on the object:
500 Newtons down and an unknown force up.
a) Use Newton's Second Law to find the *magnitude* of the net force acting on the object:

Looking For	Formula	
Already Know		
Answer as equation *with unit*:		

b) What is the *direction* of the net force?

c) Draw a free-body diagram with two forces. One force has unknown magnitude.

d) What is the magnitude of the unknown force?

E.10 An object with a mass of 10 kg is accelerating at a rate of 3 m/s² to the right:
There are two forces acting on this object:
90 Newtons to the right and an unknown force to the left.
a) Use Newton's Second Law to find the *magnitude* of the net force acting on the object:

Looking For	Formula	
Already Know		
Answer as equation *with unit*:		

b) What is the *direction* of the net force?

c) Draw a free-body diagram with two forces. One force has unknown magnitude.

d) What is the magnitude of the unknown force?

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E.11 An object with a mass of 12 kg is accelerating at a rate of 6 m/s² to the left. There are three forces acting on this object:

100 N to the left   80 N to the right   ???? N to the left

a) Use Newton's Second Law to find the *magnitude* of the net force acting on the object:

Looking For	Formula	
Already Know		
Answer as equation *with unit*:		

b) What is the *direction* of the net force?

c) Draw a free-body diagram with two forces. One force has unknown magnitude.

d) What is the magnitude of the unknown force?

E.12 An object with a mass of 20 kg is accelerating at a rate of 8 m/s² to the right. There are three forces acting on this object:

160 N to the right   75 N to the left   ??????

a) Use Newton's Second Law to find the *magnitude* of the net force acting on the object:

Looking For	Formula	
Already Know		
Answer as equation *with unit*:		

b) What is the *direction* of the net force?

c) What are the *magnitude* and *direction* of the unknown force?

Answers:

E.1   309 N

E.2   236 N

E.3   64 N

E.4   450 N

E.5   40 N down

E.6   661 N right

E.7   149 N right

E.8   4 N down