PHYSICS 12

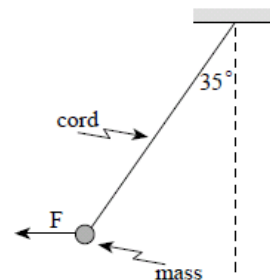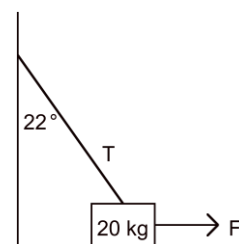## *Translational Equilibrium*

1. A mass of 5.0 kg is suspended from a cord as shown in the diagram below. What horizontal force F is necessary to hold the mass in the position shown?

2. Find the tension, T, in the cord.

3. A 20.0 N child sitting on a playground swing is being pushed by her father. When the rope makes an angle of 27° to the vertical what is the force exerted by her father? What is the tension in the rope, T?
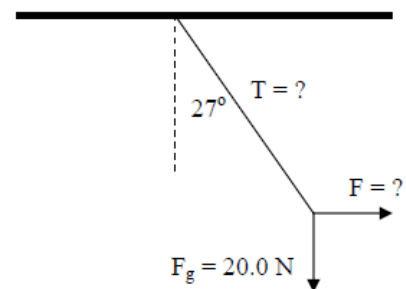
4. A 15 kg object rests on a table. A cord is attached to this object and also to a wall. Another object is hung from this cord as shown. If the coefficient of friction between the 15 kg object and the table is 0.27, what is the maximum mass that can be hung, without movement?
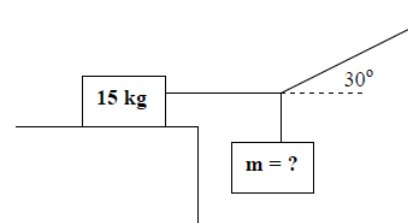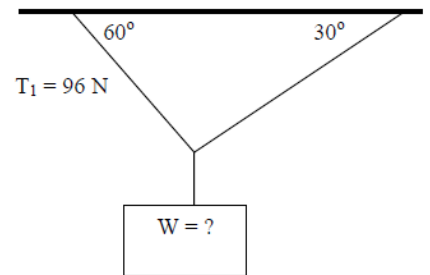
5. A mass suspended by a string is held 24° from vertical by a force of 13.8 N as shown. Find the mass.

24°

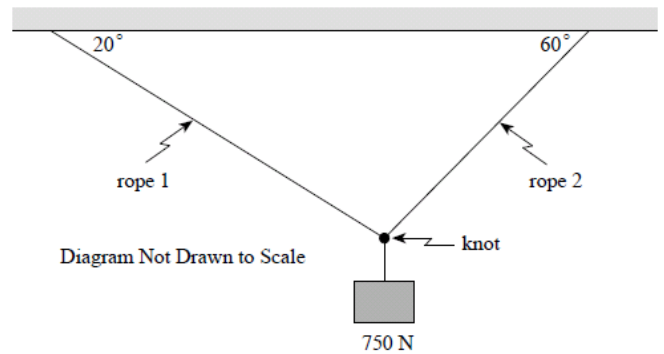string

F = 13.8 N
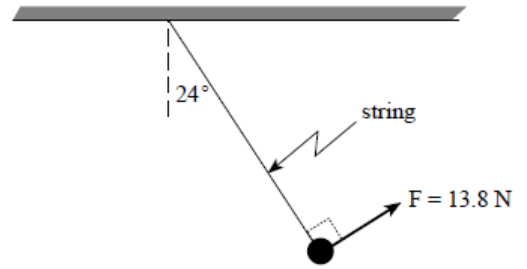
6. A 675 N object is pulled horizontally by a force of 410 N as shown. What is the angle, θ, between the rope and the vertical?
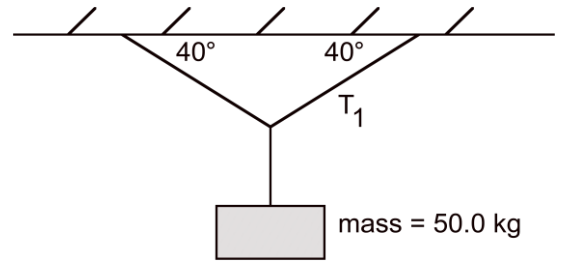
θ

F = 410 N

675 N
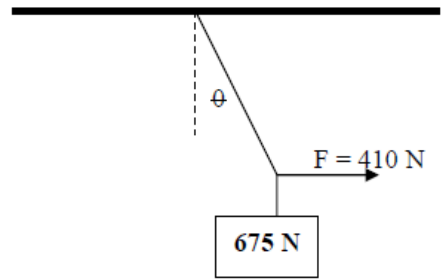
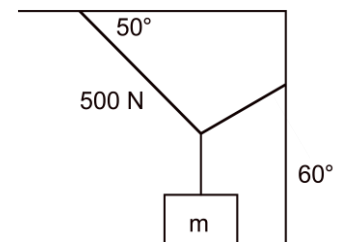7. Given the following diagram, find W and T2.

60°   30°

T₁ = 96 N

W = ?

8. A 750 N weight is supported by two ropes fastened together by a knot, as shown in the diagram below.

20°   60°

rope 1   rope 2

Diagram Not Drawn to Scale   knot

750 N

9. Find the tension, T_1.
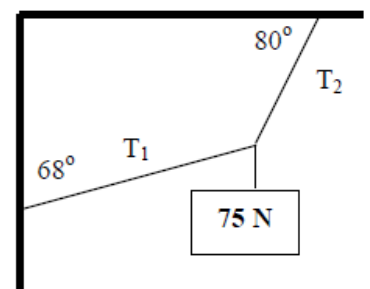
40°   40°

T_1

mass = 50.0 kg

10. Find the mass, m.

50°

500 N

60°

m

11. What will the angle ø be when the pulley system below is at static equilibrium? Hint: The rope connecting the two 200 N weights has the same tension throughout: 200 N

◄—1.5 m—► ◄—1.5 m—►

θ

200 N   200 N

80 N
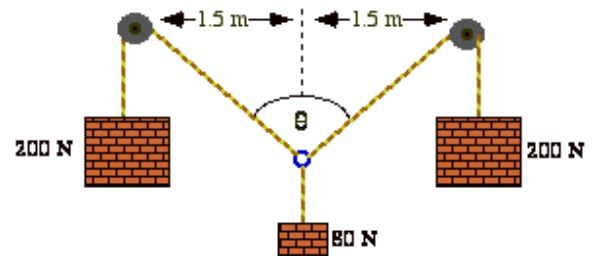
12. Find the tensions T_1 and T_2 in the ropes shown in the diagram.

80°

T_2

T_1

68°

75 N

13. A 75 kg traffic light is held stationary midway between two supports, as shown in the diagram below. What is the tension in the cord?
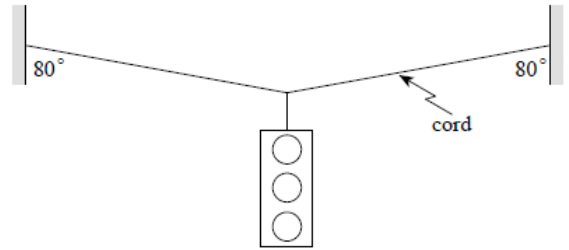
14. A circus performer walks across a wire stretched between two vertical posts. When the performer stands at position **X** as shown below, the tension in the short length of wire attached to post **B** is 1.8×10^3 N.
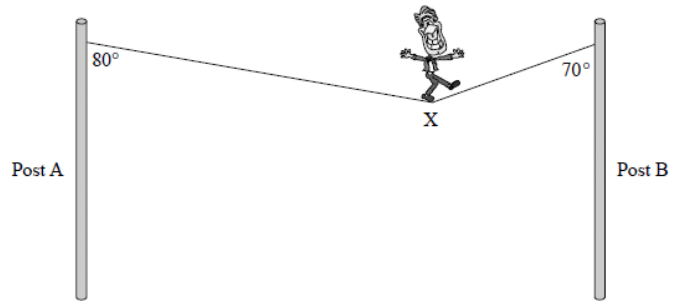
Draw and label a free body diagram showing the forces acting at position **X**.
What is the mass of the circus performer?

Answers:

1. 34 N
2. 211 N
3. 10.2 N, 22.4 N
4. 2.34 kg
5. 3.5 kg
6. 31.3°
7. 110 N, 55 N

8. 381 N, 716 N
9. 381 N
10. 58 kg
11. 157°
12. 15.4 N, 82 N
13. 2.1×10^3 N

14.

93 kg