McRoberts Secondary

Physics 12 Unit 1 Test: Statics 2025-09-29

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Only clearly marked and positionally accurate crosses will be processed!

Answers 1 - 15

	a	b	c	d
1	☐	☐	☐	☐
2	☐	☐	☐	☐
3	☐	☐	☐	☐
4	☐	☐	☐	☐
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9	☐	☐	☐	☐
10	☐	☐	☐	☐
11	☐	☐	☐	☐
12	☐	☐	☐	☐
13	☐	☐	☐	☐
14	☐	☐	☐	☐
15	☐	☐	☐	☐
	a	b	c	d

Answers 16 - 20

	a	b	c	d
16	☐	☐	☐	☐
17	☐	☐	☐	☐
18	☐	☐	☐	☐
19	☐	☐	☐	☐
20	☐	☐	☐	☐
	a	b	c	d

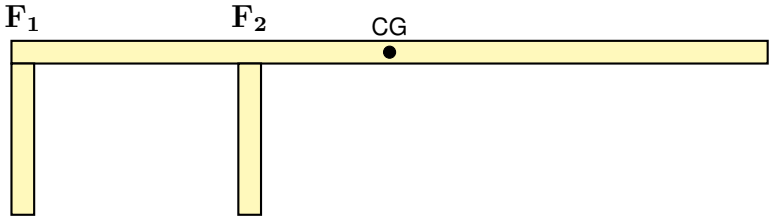
1. What conditions are necessary for a body to be in static equilibrium? Note that $\sum \vec{\mathbf{F}}$ is the net force on the body and $\sum \vec{\boldsymbol{\tau}}$ is the net torque on the body.

   a. $\sum \vec{\mathbf{F}} = 0$
   b. $\sum \vec{\boldsymbol{\tau}} = 0$
   c. $\sum \vec{\mathbf{F}} = 0$ and $\sum \vec{\boldsymbol{\tau}} = 0$
   d. $\sum \vec{\mathbf{F}} = 0$ or $\sum \vec{\boldsymbol{\tau}} = 0$ (but not both)

2. A rocket moves through outer space with a constant velocity of $9.8\,\mathrm{m/s}$ toward the Andromeda galaxy. What is the net force acting on the rocket?

   a. A force equal to the gravity acting on it.
   b. Cannot be determined without more information.
   c. A force equal to its weight on Earth, mg.
   d. The net force is zero.

3. A cantilever is held in static equilibrium by two vertical supports as shown in the figure. The beam is fastened to the supports with screws so that each support could apply an upward or downward force. The centre of gravity (CG) of the beam is to the right of the second support. In which direction must $\mathbf{F_1}$ and $\mathbf{F_2}$ point to keep the beam in static equilibrium?



   a. $\mathbf{F_1}$ and $\mathbf{F_2}$ both point upward
   b. $\mathbf{F_1}$ and $\mathbf{F_2}$ both point downward
   c. $\mathbf{F_1}$ points upward while $\mathbf{F_2}$ points downward
   d. $\mathbf{F_1}$ points downward while $\mathbf{F_2}$ points upward

4. A heavy child and a lightweight child are balanced on a massless seesaw. If both children move forward so that they are at half of their original distance from the pivot, what will happen to the seesaw?

   a. The side the heavy child is sitting on will tilt downward.
   b. It is impossible to determine without knowing the masses and distances.
   c. The seesaw will still be balanced.
   d. The side the lightweight child is sitting on will tilt downward.

5. A heavy seesaw is balanced with no one sitting on it. Then, a lightweight child sits on one side and a heavy child sits on the other side. They sit at different distances from the pivot so that the seesaw remains balanced. Now, if both children move forward so that they are at half of their original distance from the pivot, what will happen to the seesaw?

   a. It is impossible to determine without knowing the masses and distances.
   b. The side the heavy child is sitting on will tilt downward.
   c. The seesaw will still be balanced.
   d. The side the lightweight child sitting on will tilt downward.

6. A heavy seesaw is out of balance. A lightweight child sits on the end that is tilted downward, and a heavy child sits on the other side so that the seesaw now balances. If both children then move forward so that they are at half of their original distance from the pivot, what will happen to the seesaw?

    a. The side the heavy child is sitting on will now tilt downward.
    b. The seesaw will still be balanced.
    c. It is impossible to determine without knowing the masses and distances.
    d. The side the lightweight child sitting on will once again tilt downward.

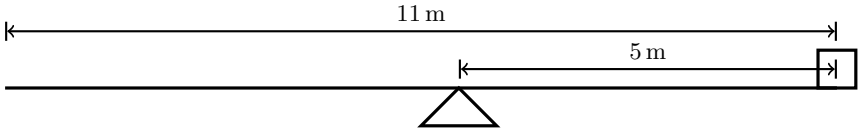
7. A person weighing 949 N stands with one foot on each of two bathroom scales. Which statement is correct about this situation?

    a. Each scale should read 949 N
    b. The sum of the two scale readings should be 949 N
    c. Each scale should read 474.5 N
    d. None of the other statements are true.

8. A boy and a girl are balanced on a massless seesaw. The boy's mass is 42 kg and the girl's mass is 33 kg. If the boy is sitting 2.8 m from the pivot, how far from the pivot must the girl be sitting on the other side of the seesaw?

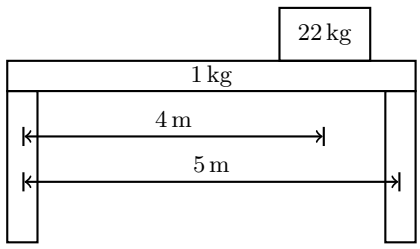
    a. 5.0 m
    b. 4.7 m
    c. 3.6 m
    d. 5.3 m

9. A lever is 11 m long. The distance from the fulcrum to the load to be lifted is 5 m. If a rock weighing 9000 N is to be lifted, how much force must be exerted on the lever?



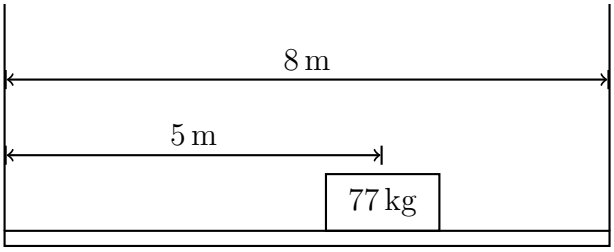
    a. 4910 N
    b. 7500 N
    c. 4810 N
    d. 4090 N

10. A uniform 1 kg beam, 5 m long, supports a 22 kg box. The beam is supported by two vertical columns and the centre of gravity of the box is 4 m from the left column. Calculate the force on the right column.



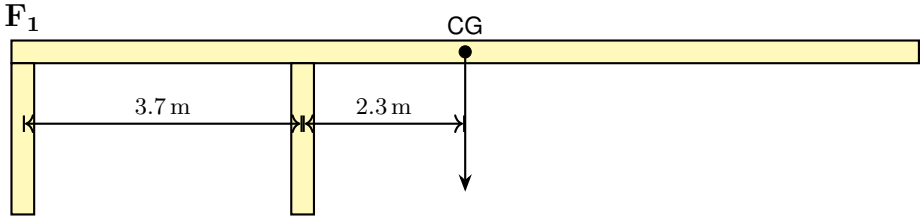
    a. 1560 N
    b. 177 N
    c. 47.6 N
    d. 81.4 N

11. A scaffold of negligible mass is hanging horizontally from wires on each end. The scaffold is 8 m long. A 77 kg box sits 5 m from the left end. What is the tension in the left wire?



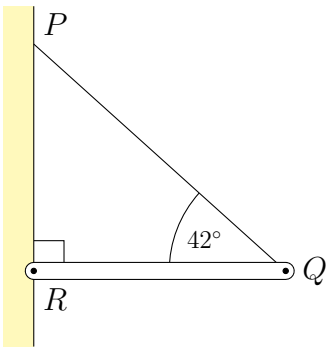
a. 188 000 N
b. 206 000 N
c. 283 N
d. 22 700 N

12. A cantilever beam is held in static equilibrium by two vertical supports separated by 3.7 m. The beam's mass is 74 kg and its centre of gravity (CG) is 2.3 m from the second support. What is the magnitude of the force applied by the first support, $\mathbf{F_1}$?



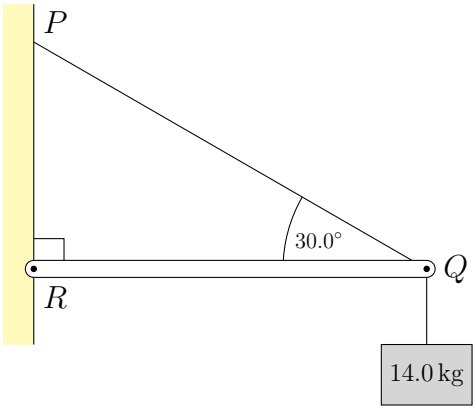
a. 450 N
b. 770 N
c. 600 N
d. 900 N

13. A 2.0 m long uniform beam of mass 8.0 kg, QR, is mounted by a hinge on a wall and held in a horizontal position by wire PQ, forming a 42° angle at point Q as shown in the figure. What is the magnitude of the tension in wire PQ?



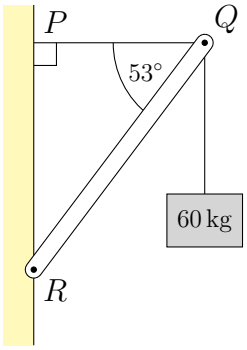
a. 5.9 N
b. 9.7 N
c. 59 N
d. 120 N

14. A 3.0 m long uniform beam of mass 7.00 kg, QR, is mounted by a hinge on a wall and held in a horizontal position by wire PQ, forming a 30.0° angle at point Q as shown in the figure. A load of mass 14.0 kg hangs vertically down from point Q. What is the magnitude of the tension in wire PQ?



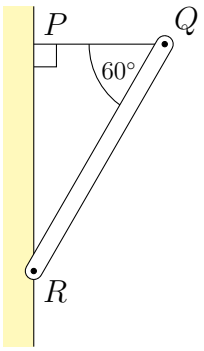
a. 34.3 N
b. 668 N
c. 343 N
d. 686 N

15. A uniform beam QR, 1.0 m long with negligible mass, is mounted by a hinge on a wall and held in position by a horizontal wire PQ as shown in the figure. The beam supports a load of mass 60 kg hanging vertically down from point Q. What is the magnitude of the force on the hinge at point R?



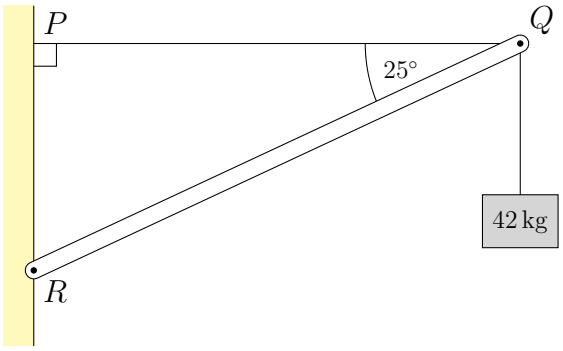
a. 640 N
b. 668 N
c. 516 N
d. 736 N

16. A 3.0 m long uniform beam of mass 48 kg (QR) is mounted by a hinge on a wall and held in position by a horizontal wire (PQ), forming a 60° angle at point Q as shown in the figure. What is the tension in the horizontal wire PQ?



a. 1360 N
b. 136 N
c. 13.6 N
d. 1220 N

17. A uniform beam QR, 2.0 m long with negligible mass, is mounted by a hinge on a wall and held in position by a horizontal wire PQ as shown in the figure. The beam supports a load of mass 42 kg hanging vertically down from point Q. What is the tension in the horizontal wire PQ?



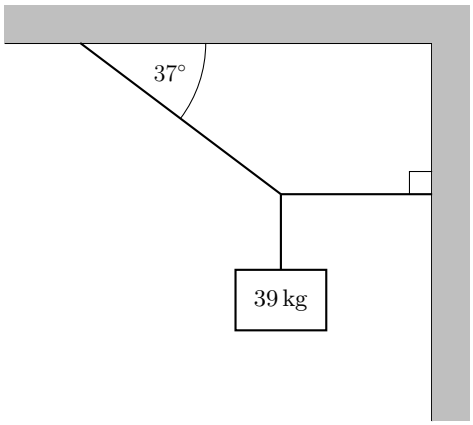
a. 1460 N
b. 883 N
c. 1210 N
d. 1090 N

18. Two scales are separated by 8.0 m, and a plank of mass 2.0 kg is placed between them. Each scale is observed to read 1.0 kg. A rock is placed somewhere on the plank, after which the left scale reads 50.0 kg and the right scale reads 80.0 kg. How far from the left scale was the rock placed?

a. 7.61 m
b. 6.54 m
c. 4.94 m
d. 6.3 m

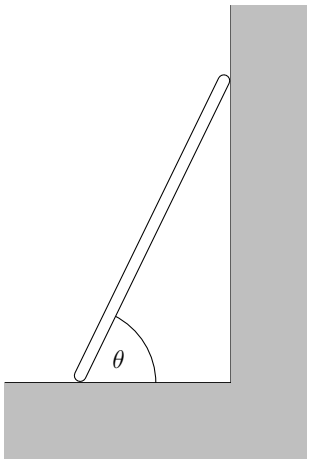
19. A box of mass 39 kg hangs down from three attached cords secured to the ceiling and wall

as shown in the diagram. Find the maximum tension in any one of the three cords.



a. 814 N
b. 397 N
c. 635 N
d. 746 N

20. A uniform ladder of mass 4 kg and length 3 m leans against a frictionless wall. Let θ be the angle that the ladder makes with the ground. If the coefficient of static friction between the ladder and the ground is 0.58, what is the minimum value of θ at which the ladder will not slip?



a. 50°
b. 52°
c. 44°
d. 41°