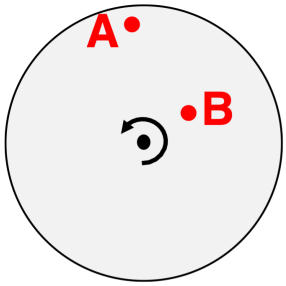
Angular vs. Linear Velocity

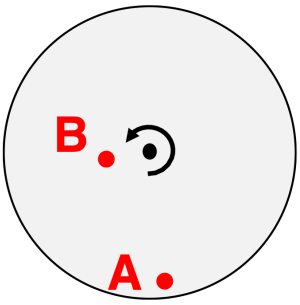
Activity 1: Turntable Physics
Question Group 1
Questions 1

Consider the two objects – A and B – on the rotating turntable. Which object has the greatest angular velocity?
Object A has the greatest angular velocity.
Object B has the greatest angular velocity.
Both objects have the same angular velocity.



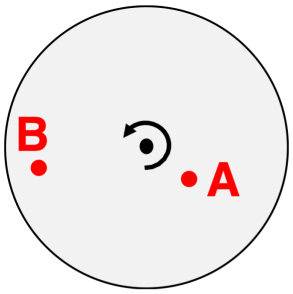
Questions 2

Consider the two objects – A and B – on the rotating turntable. Which object has the greatest angular velocity?
Object A has the greatest angular velocity.
Object B has the greatest angular velocity.
Both objects have the same angular velocity.



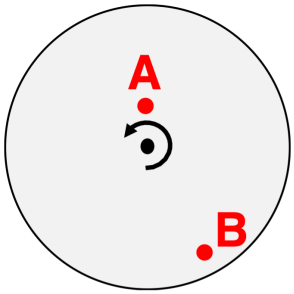
Questions 3

Consider the two objects – A and B – on the rotating turntable. Which object has the greatest angular velocity?
Object A has the greatest angular velocity.
Object B has the greatest angular velocity.
Both objects have the same angular velocity.



Questions 4

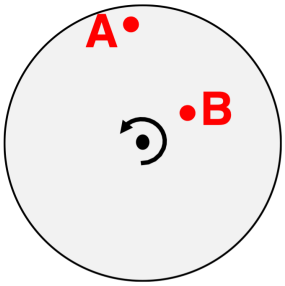
Consider the two objects – A and B – on the rotating turntable. Which object has the greatest angular velocity?
Object A has the greatest angular velocity.
Object B has the greatest angular velocity.
Both objects have the same angular velocity.



Question Group 2

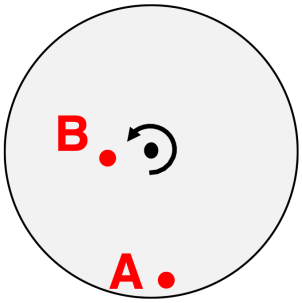
Questions 5

Consider the two objects – A and B – on the rotating turntable. Which object has the greatest linear velocity?
Object A has the greatest linear velocity.
Object B has the greatest linear velocity.
Both objects have the same linear velocity.



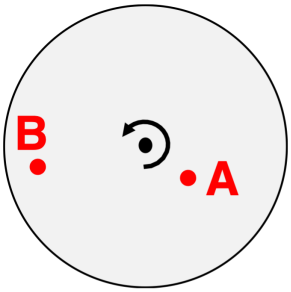
Questions 6

Consider the two objects – A and B – on the rotating turntable.
Which object has the greatest linear velocity?
Object A has the greatest linear velocity.
Object B has the greatest linear velocity.
Both objects have the same linear velocity.



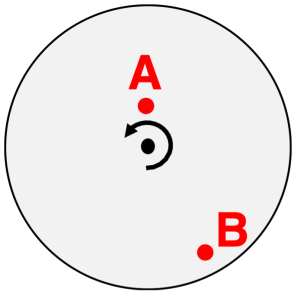
Questions 7

Consider the two objects – A and B – on the rotating turntable. Which object has the greatest linear velocity?
Object A has the greatest linear velocity.
Object B has the greatest linear velocity.
Both objects have the same linear velocity.



Questions 8

Consider the two objects – A and B – on the rotating turntable.
Which object has the greatest linear velocity?
Object A has the greatest linear velocity.
Object B has the greatest linear velocity.
Both objects have the same linear velocity.

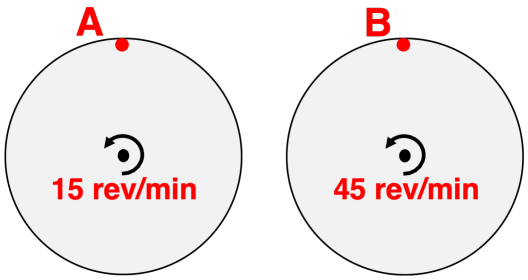


Question Group 3

Questions 9

Two objects – A and B – are located on the outer edge of two different rotating turntables, each having the same radius but a different turning rate. Which object has the greatest linear velocity?

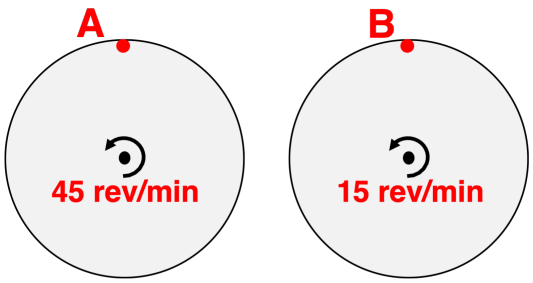
Object A has the greatest linear velocity.
Object B has the greatest linear velocity.
Both objects have the same linear velocity.



Questions 10

Two objects – A and B – are located on the outer edge of two different rotating turntables, each having the same radius but a different turning rate. Which object has the greatest linear velocity?

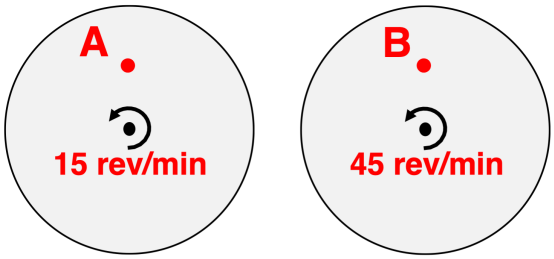
Object A has the greatest linear velocity.
Object B has the greatest linear velocity.
Both objects have the same linear velocity.



Questions 11

Two objects – A and B – are located halfway from the center to the outer edge of two different rotating turntables. Each turntable has the same radius but a different turning rate. Which object has the greatest linear velocity?

Object A has the greatest linear velocity.
Object B has the greatest linear velocity.
Both objects have the same linear velocity.



Questions 12

Two objects – A and B – are located halfway from the center to the outer edge of two different rotating turntables. Each turntable has the same radius but a different turning rate. Which object has the greatest linear velocity?

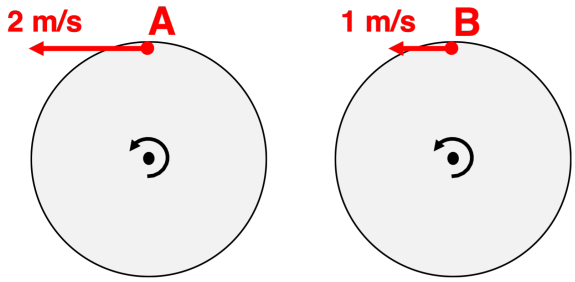
Object A has the greatest linear velocity.
Object B has the greatest linear velocity.
Both objects have the same linear velocity.

Question Group 4

Questions 13

Two objects – A and B – are located on the outer edge of two different rotating turntables, each having the same radius but a different turning rate. The linear velocity of each object is shown. Which object has the greatest angular velocity?

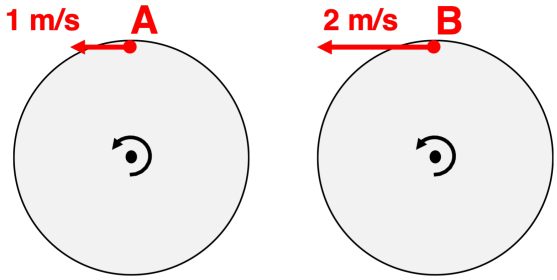
Object A has the greatest angular velocity.
Object B has the greatest angular velocity.
Both objects have the same angular velocity.



Questions 14

Two objects – A and B – are located on the outer edge of two different rotating turntables, each having the same radius but a different turning rate. The linear velocity of each object is shown. Which object has the greatest angular velocity?

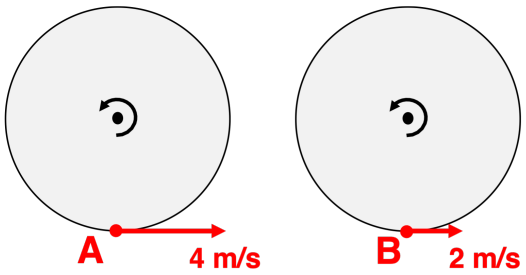
Object A has the greatest angular velocity.
Object B has the greatest angular velocity.
Both objects have the same angular velocity.



Questions 15

Two objects – A and B – are located on the outer edge of two different rotating turntables, each having the same radius but a different turning rate. The linear velocity of each object is shown. Which object has the greatest angular velocity?

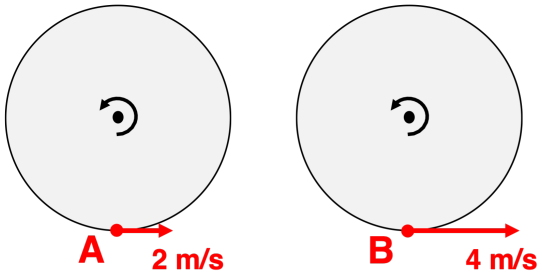
Object A has the greatest angular velocity.
Object B has the greatest angular velocity.
Both objects have the same angular velocity.



Questions 16

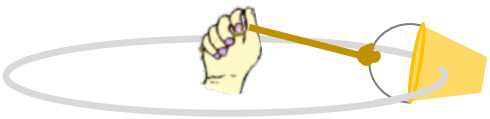
Two objects – A and B – are located on the outer edge of two different rotating turntables, each having the same radius but a different turning rate. The linear velocity of each object is shown. Which object has the greatest angular velocity?

Object A has the greatest angular velocity.
Object B has the greatest angular velocity.
Both objects have the same angular velocity.



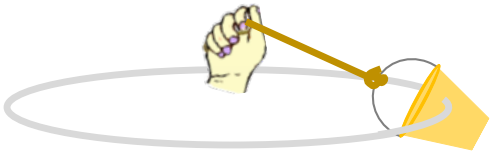
Activity 2: Case Studies
Question Group 5
Questions 17
In the World Peace Lab, a bucket filled with peas is whirled in a horizontal circle with varying radii and spin rates. The circle radius (R) and spin rate (in rev/min) for Case A and Case B are shown. How does the linear velocity of the two buckets compare to one another?

Case A



R = 80 cm
60 rev/min

Case B

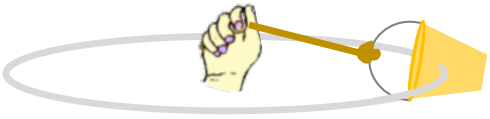


R = 80 cm
30 rev/min

The linear velocity in Case A is _____ the linear velocity in Case B.
the same as two times greater than four times greater than
two times less than four times less than

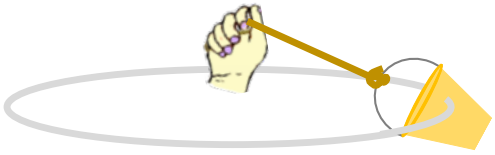
Questions 18
In the World Peace Lab, a bucket filled with peas is whirled in a horizontal circle with varying radii and spin rates. The circle radius (R) and spin rate (in rev/min) for Case A and Case B are shown. How does the linear velocity of the two buckets compare to one another?

Case A



R = 75 cm
80 rev/min

Case B



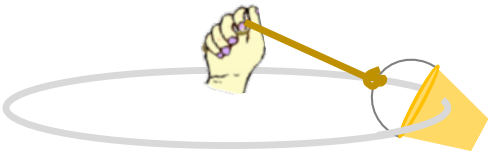
R = 75 cm
40 rev/min

The linear velocity in Case A is _____ the linear velocity in Case B.
the same as two times greater than four times greater than
two times less than four times less than

Questions 19

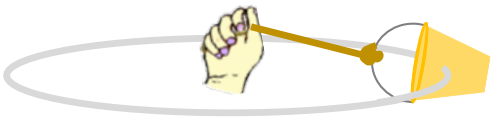
In the World Peace Lab, a bucket filled with peas is whirled in a horizontal circle with varying radii and spin rates. The circle radius (R) and spin rate (in rev/min) for Case A and Case B are shown. How does the linear velocity of the two buckets compare to one another?

Case A



R = 75 cm
45 rev/min

Case B



R = 75 cm
90 rev/min

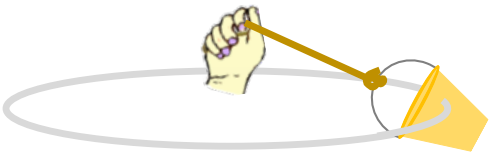
The linear velocity in Case A is _____ the linear velocity in Case B.

the same as | two times greater than | four times greater than
two times less than | four times less than

Questions 20

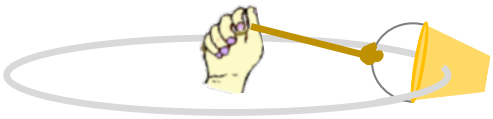
In the World Peace Lab, a bucket filled with peas is whirled in a horizontal circle with varying radii and spin rates. The circle radius (R) and spin rate (in rev/min) for Case A and Case B are shown. How does the linear velocity of the two buckets compare to one another?

Case A



R = 100 cm
25 rev/min

Case B



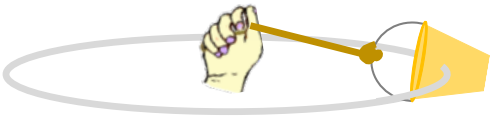
R = 100 cm
50 rev/min

The linear velocity in Case A is _____ the linear velocity in Case B.

the same as | two times greater than | four times greater than
two times less than | four times less than

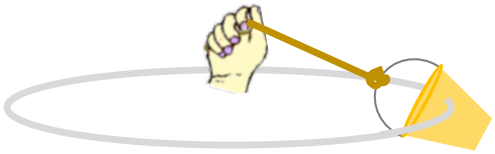
Question Group 6
Questions 21
In the World Peace Lab, a bucket filled with peas is whirled in a horizontal circle with varying radii and linear velocities. The circle radius (R) and linear velocity (v) for Case A and Case B are shown. How does the angular velocity of the two buckets compare to one another?

Case A



R = 80 cm
v = 4 m/s

Case B

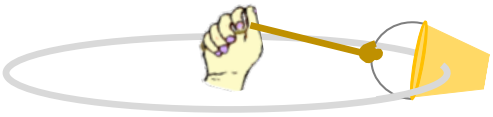


R = 80 cm
v = 2 m/s

The angular velocity in Case A is _____ the angular velocity in Case B.
the same as two times greater than four times greater than
two times less than four times less than

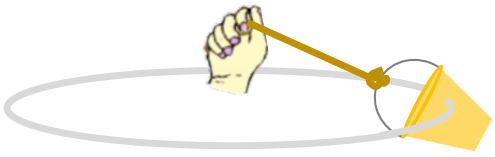
Questions 22
In the World Peace Lab, a bucket filled with peas is whirled in a horizontal circle with varying radii and linear velocities. The circle radius (R) and linear velocity (v) for Case A and Case B are shown. How does the angular velocity of the two buckets compare to one another?

Case A



R = 100 cm
v = 6 m/s

Case B



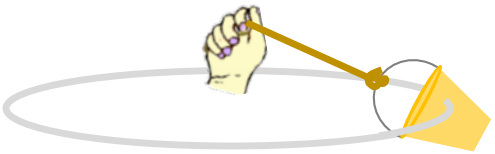
R = 100 cm
v = 3 m/s

The angular velocity in Case A is _____ the angular velocity in Case B.
the same as two times greater than four times greater than
two times less than four times less than

Questions 23

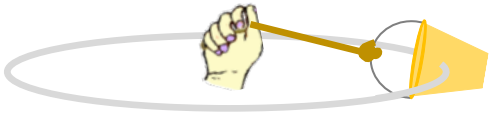
In the World Peace Lab, a bucket filled with peas is whirled in a horizontal circle with varying radii and linear velocities. The circle radius (R) and linear velocity (v) for Case A and Case B are shown. How does the angular velocity of the two buckets compare to one another?

Case A



R = 60 cm
v = 1.5 m/s

Case B



R = 60 cm
v = 3.0 m/s

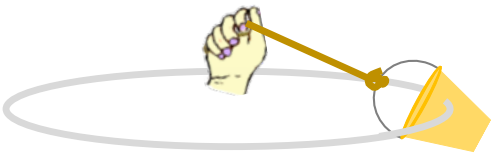
The angular velocity in Case A is _____ the angular velocity in Case B.

the same as | two times greater than | four times greater than
two times less than | four times less than

Questions 24

In the World Peace Lab, a bucket filled with peas is whirled in a horizontal circle with varying radii and linear velocities. The circle radius (R) and linear velocity (v) for Case A and Case B are shown. How does the angular velocity of the two buckets compare to one another?

Case A



R = 120 cm
v = 2.5 m/s

Case B

R = 120 cm
v = 5.0 m/s

The angular velocity in Case A is _____ the angular velocity in Case B.

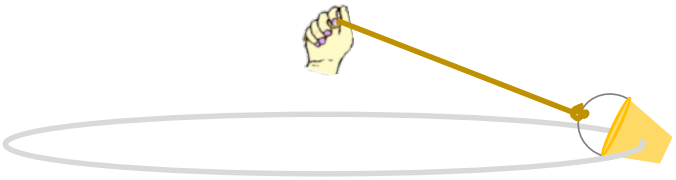
the same as | two times greater than | four times greater than
two times less than | four times less than

Question Group 7
Questions 25
In the World Peace Lab, a bucket filled with peas is whirled in a horizontal circle with varying radii and linear velocities. The circle radius (R) and linear velocity (v) for Case A and Case B are shown. How does the angular velocity of the two buckets compare to one another?

Case A

R = 60 cm
v = 4.0 m/s

Case B



R = 120 cm
v = 4.0 m/s

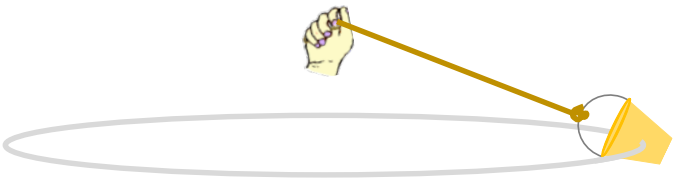
The angular velocity in Case A is _____ the angular velocity in Case B.
the same as two times greater than four times greater than
two times less than four times less than

Questions 26
In the World Peace Lab, a bucket filled with peas is whirled in a horizontal circle with varying radii and linear velocities. The circle radius (R) and linear velocity (v) for Case A and Case B are shown. How does the angular velocity of the two buckets compare to one another?

Case A

R = 80 cm
v = 4.0 m/s

Case B



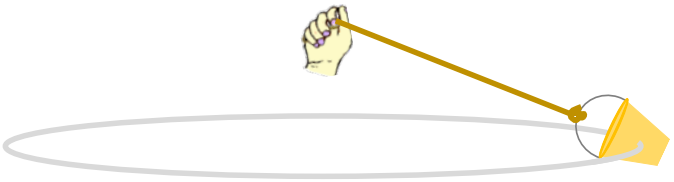
R = 160 cm
v = 4.0 m/s

The angular velocity in Case A is _____ the angular velocity in Case B.

the same as two times greater than four times greater than
two times less than four times less than

Questions 27
In the World Peace Lab, a bucket filled with peas is whirled in a horizontal circle with varying radii and linear velocities. The circle radius (R) and linear velocity (v) for Case A and Case B are shown. How does the angular velocity of the two buckets compare to one another?

Case A



R = 150 cm
v = 6.0 m/s

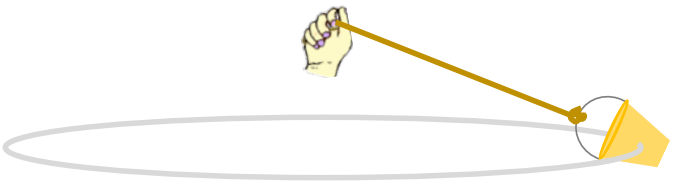
Case B

R = 75 cm
v = 6.0 m/s

The angular velocity in Case A is _____ the angular velocity in Case B.
the same as two times greater than four times greater than
two times less than four times less than

Questions 28
In the World Peace Lab, a bucket filled with peas is whirled in a horizontal circle with varying radii and linear velocities. The circle radius (R) and linear velocity (v) for Case A and Case B are shown. How does the angular velocity of the two buckets compare to one another?

Case A



R = 120 cm
v = 8.0 m/s

Case B

R = 60 cm
v = 8.0 m/s

The angular velocity in Case A is _____ the angular velocity in Case B.
the same as two times greater than four times greater than

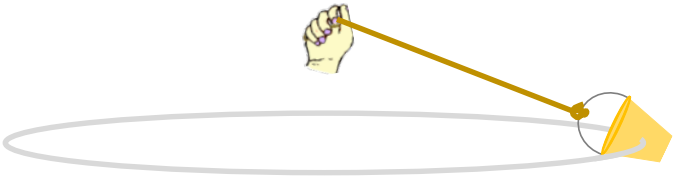
two times less than four times less than

Question Group 8
Questions 29
In the World Peace Lab, a bucket filled with peas is whirled in a horizontal circle with varying radii and linear velocities. The circle radius (R) and linear velocity (v) for Case A and Case B are shown. How does the angular velocity of the two buckets compare to one another?

Case A

R = 60 cm
v = 4.0 m/s

Case B

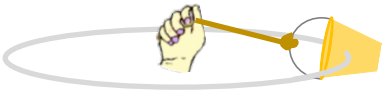


R = 120 cm
v = 2.0 m/s

The angular velocity in Case A is _____ the angular velocity in Case B.
the same as two times greater than four times greater than
two times less than four times less than

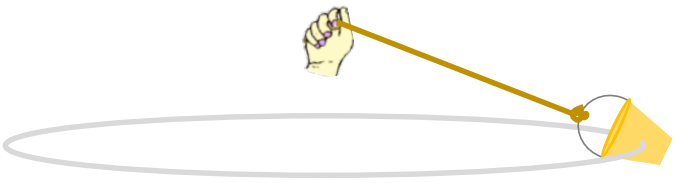
Questions 30
In the World Peace Lab, a bucket filled with peas is whirled in a horizontal circle with varying radii and linear velocities. The circle radius (R) and linear velocity (v) for Case A and Case B are shown. How does the angular velocity of the two buckets compare to one another?

Case A



R = 80 cm
v = 6.0 m/s

Case B



R = 160 cm
v = 3.0 m/s

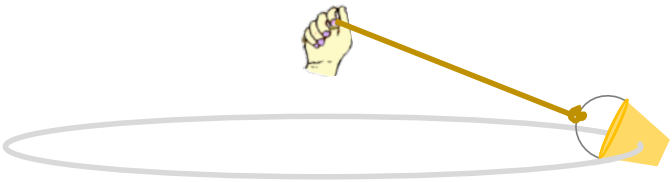
The angular velocity in Case A is _____ the angular velocity in Case B.

the same as | two times greater than | four times greater than
two times less than | four times less than

Questions 31

In the World Peace Lab, a bucket filled with peas is whirled in a horizontal circle with varying radii and linear velocities. The circle radius (R) and linear velocity (v) for Case A and Case B are shown. How does the angular velocity of the two buckets compare to one another?

Case A



R = 160 cm
v = 4.0 m/s

Case B

R = 80 cm
v = 8.0 m/s

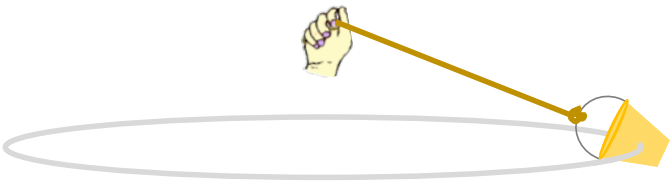
The angular velocity in Case A is _____ the angular velocity in Case B.

the same as | two times greater than | four times greater than
two times less than | four times less than

Questions 32

In the World Peace Lab, a bucket filled with peas is whirled in a horizontal circle with varying radii and linear velocities. The circle radius (R) and linear velocity (v) for Case A and Case B are shown. How does the angular velocity of the two buckets compare to one another?

Case A



R = 160 cm
v = 4.0 m/s

Case B

R = 80 cm
v = 8.0 m/s

The angular velocity in Case A is _____ the angular velocity in Case B.

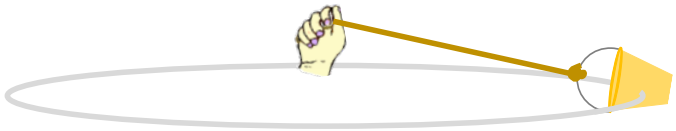
the same as | two times greater than | four times greater than
two times less than | four times less than

Question Group 9
Questions 33
In the World Peace Lab, a bucket filled with peas is whirled in a horizontal circle with varying radii and linear velocities. The circle radius (R) and linear velocity (v) for Case A and Case B are shown. How does the angular velocity of the two buckets compare to one another?

Case A

R = 60 cm
v = 2.0 m/s

Case B



R = 120 cm
v = 4.0 m/s

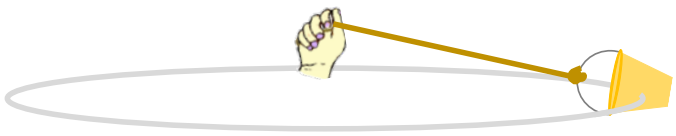
The angular velocity in Case A is _____ the angular velocity in Case B.
the same as | two times greater than | four times greater than
two times less than | four times less than

Questions 34
In the World Peace Lab, a bucket filled with peas is whirled in a horizontal circle with varying radii and linear velocities. The circle radius (R) and linear velocity (v) for Case A and Case B are shown. How does the angular velocity of the two buckets compare to one another?

Case A

R = 80 cm
v = 3.0 m/s

Case B



R = 160 cm
v = 6.0 m/s

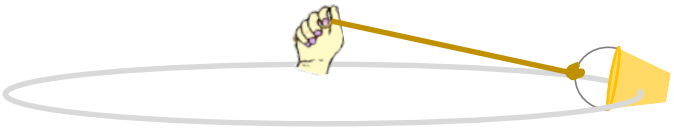
The angular velocity in Case A is _____ the angular velocity in Case B.

the same as | two times greater than | four times greater than
two times less than | four times less than

Questions 35

In the World Peace Lab, a bucket filled with peas is whirled in a horizontal circle with varying radii and linear velocities. The circle radius (R) and linear velocity (v) for Case A and Case B are shown. How does the angular velocity of the two buckets compare to one another?

Case A



R = 140 cm
v = 5.0 m/s

Case B

R = 70 cm
v = 2.50 m/s

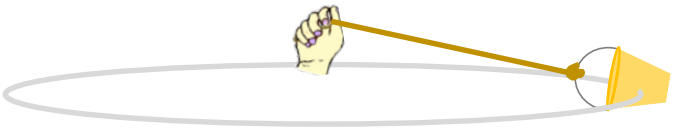
The angular velocity in Case A is _____ the angular velocity in Case B.

the same as | two times greater than | four times greater than
two times less than | four times less than

Questions 36

In the World Peace Lab, a bucket filled with peas is whirled in a horizontal circle with varying radii and linear velocities. The circle radius (R) and linear velocity (v) for Case A and Case B are shown. How does the angular velocity of the two buckets compare to one another?

Case A



R = 160 cm
v = 8.0 m/s

Case B

R = 80 cm
v = 4.0 m/s

The angular velocity in Case A is _____ the angular velocity in Case B.

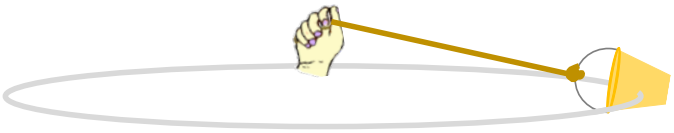
the same as | two times greater than | four times greater than
two times less than | four times less than

Question Group 10
Questions 37
In the World Peace Lab, a bucket filled with peas is whirled in a horizontal circle with varying radii and spin rates. The circle radius (R) and spin rate (in rev/min) for Case A and Case B are shown. How does the linear velocity of the two buckets compare to one another?

Case A

R = 60 cm
30 rev/min

Case B



R = 120 cm
60 rev/min

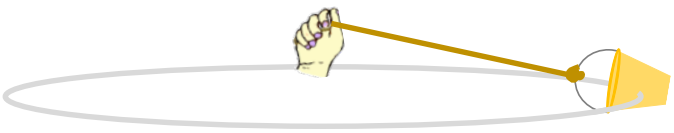
The linear velocity in Case A is _____ the linear velocity in Case B.
the same as | two times greater than | four times greater than
two times less than | four times less than

Questions 38
In the World Peace Lab, a bucket filled with peas is whirled in a horizontal circle with varying radii and spin rates. The circle radius (R) and spin rate (in rev/min) for Case A and Case B are shown. How does the linear velocity of the two buckets compare to one another?

Case A

R = 50 cm
25 rev/min

Case B

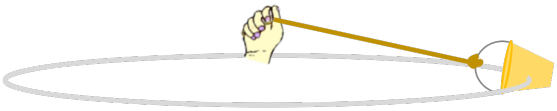


R = 100 cm
50 rev/min

The linear velocity in Case A is _____ the linear velocity in Case B.
the same as two times greater than four times greater than
two times less than four times less than

Questions 39
In the World Peace Lab, a bucket filled with peas is whirled in a horizontal circle with varying radii and spin rates. The circle radius (R) and spin rate (in rev/min) for Case A and Case B are shown. How does the linear velocity of the two buckets compare to one another?

Case A



R = 150 cm
80 rev/min

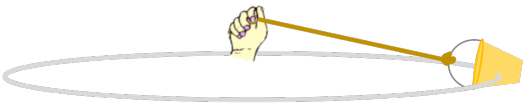
Case B

R = 75 cm
40 rev/min

The linear velocity in Case A is _____ the linear velocity in Case B.
the same as two times greater than four times greater than
two times less than four times less than

Questions 40
In the World Peace Lab, a bucket filled with peas is whirled in a horizontal circle with varying radii and spin rates. The circle radius (R) and spin rate (in rev/min) for Case A and Case B are shown. How does the linear velocity of the two buckets compare to one another?

Case A



R = 120 cm
50 rev/min

Case B

R = 60 cm
25 rev/min

The linear velocity in Case A is _____ the linear velocity in Case B.
the same as two times greater than four times greater than
two times less than four times less than

Activity 3: Do the Math
Question Group 11
Questions 41
The outermost tip of a fan blade revolves in a 1.4-meter diameter circle, making 20 complete revolutions in 30 seconds. Which expression must be used to determine the angular velocity of the tip of the fan blade in radians per second?
20 • 2 • π / 30
20 • 2 • π • 1.4 / 30
20 • π • 1.4 / 30
π • 1.4 / 30
20 • π / 30

Questions 42
The outermost tip of a fan blade revolves in a 1.6-meter diameter circle, making 15 complete revolutions in 20 seconds. Which expression must be used to determine the angular velocity of the tip of the fan blade in radians per second?
15 • 2 • π / 20
15 • 2 • π • 1.6 / 20
15 • π • 1.6 / 20
π • 1.6 / 20
15 • π / 20

Questions 43
The outermost tip of a fan blade revolves in a 1.2-meter diameter circle, making 40 complete revolutions in 60 seconds. Which expression must be used to determine the angular velocity of the tip of the fan blade in radians per second?
40 • 2 • π / 60
40 • 2 • π • 1.2 / 60
40 • π • 1.2 / 60
π • 1.2 / 60
40 • π / 60

Question Group 12
Questions 44

The blades of a windmill rotate in a circle, making 20 revolutions per minute. The outer tip of each blade is 4.0 meters from the circle's center. Which expression must be used to determine the linear velocity of the blade's outer tip in meter per second?
20 • 2 • π • 4.0 / 60
20 • 4.0 / 60
4.0 • 20 • π / 60
2 • π • 4.0 / 60
20 • 2 • π / 60

Questions 45
The blades of a windmill rotate in a circle, making 15 revolutions per minute. The outer tip of each blade is 5.0 meters from the circle's center. Which expression must be used to determine the linear velocity of the blade's outer tip in meter per second?
15 • 2 • π • 5.0 / 60
15 • 5.0 / 60
5.0 • 15 • π / 60
2 • π • 5.0 / 60
15 • 2 • π / 60

Questions 46
The blades of a windmill rotate in a circle, making 10 revolutions per minute. The outer tip of each blade is 6.0 meters from the circle's center. Which expression must be used to determine the linear velocity of the blade's outer tip in meter per second?
10 • 2 • π • 6.0 / 60
10 • 6.0 / 60
6.0 • 10 • π / 60
2 • π • 6.0 / 60
10 • 2 • π / 60

Question Group 13
Questions 47
A flywheel having a radius of 20 cm has a spin rate of 12 revolutions per second. Which expression must be used to determine the angular velocity of the flywheel in radians per second?
12 • 2 • π
12 • 2 • π • 20
12 • 2 • π • 20 / 100
12 • 20
12 • 20 / 2 / π

Questions 48
A flywheel having a radius of 15 cm has a spin rate of 10 revolutions per second. Which expression must be used to determine the angular velocity of the flywheel in radians per second?
10 • 2 • π
10 • 2 • π • 15
10 • 2 • π • 15 / 100
10 • 15
10 • 15 / 2 / π

Questions 49
A flywheel having a radius of 24 cm has a spin rate of 8 revolutions per second. Which expression must be used to determine the angular velocity of the flywheel in radians per second?
8 • 2 • π
8 • 2 • π • 24
8 • 2 • π • 24 / 100
8 • 24
8 • 24 / 2 / π

Question Group 14
Questions 50
A turntable has an angular velocity of 2.5 radians/second. A lady bug is positioned 0.20 m from the turntable's center (and nobody knows why). Which expression must be used to determine the linear velocity of the lady bug in meter/second?
2.5 • 0.20
2.5 • 2 • π • 0.20
2.5 • 2 • π / 0.20
2 • π / 0.20
2.5 • 2 • π • 0.20 / 360

Questions 51
A turntable has an angular velocity of 3.0 radians/second. A lady bug is positioned 0.16 m from the turntable's center (and nobody knows why). Which expression must be used to determine the linear velocity of the lady bug in meter/second?
3.0 • 0.16
3.0 • 2 • π • 0.16
3.0 • 2 • π / 0.16
2 • π / 0.16
3.0 • 2 • π • 0.16 / 360

Questions 52

A turntable has an angular velocity of 4.0 radians/second. A lady bug is positioned 0.12 m from the turntable's center (and nobody knows why). Which expression must be used to determine the linear velocity of the lady bug in meter/second?

4.0 • 0.12
4.0 • 2 • π • 0.12
4.0 • 2 • π / 0.12
2 • π / 0.12
4.0 • 2 • π • 0.12 / 360