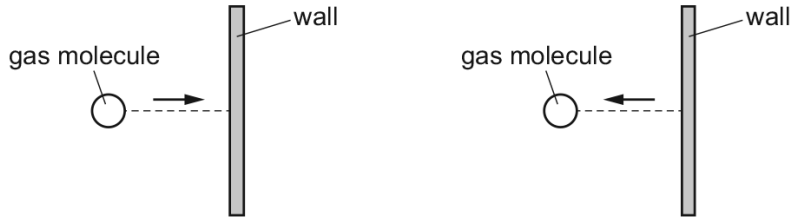
1.6 Momentum

01. 0625_m21_qp_22 Q: 9

A gas molecule strikes the wall of a container. The molecule rebounds with the same speed.



before hitting the wall after hitting the wall

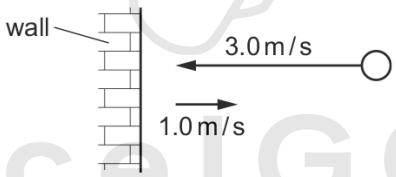
What happens to the kinetic energy and what happens to the momentum of the molecule?

	kinetic energy	momentum
A	changes	changes
B	changes	stays the same
C	stays the same	changes
D	stays the same	stays the same

---

02. 0625_s21_qp_21 Q: 8

A ball has a mass of 2.0 kg. The ball approaches a wall at a speed of 3.0 m/s and rebounds at a speed of 1.0 m/s.



What is the impulse on the wall?

A 4.0 N **B** 4.0 Ns **C** 8.0 N **D** 8.0 Ns

---

03. 0625_s21_qp_22 Q: 8

A tennis ball has a mass of 57 g.

A tennis player hits the tennis ball with a tennis racket. The tennis ball has a velocity of 25 m/s when it hits the racket.

The velocity of the tennis ball when it leaves the player's racket is 15 m/s in the opposite direction from its approaching direction.

The average force exerted by the tennis racket on the ball is 35 N.

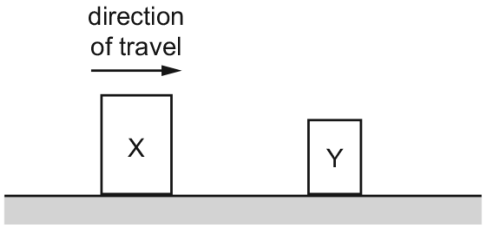
For how long is the tennis ball in contact with the tennis racket?

A 0.015 s **B** 0.016 s **C** 0.065 s **D** 0.65 s

---

04. 0625_s21_qp_23 Q: 8

Object X moves to the right along a frictionless surface towards a stationary object Y, as shown.



They make a noise as they collide and then both objects move to the right.

Which equation is correct?

A change in momentum of X = change in momentum of Y

B impulse of force acting on X = impulse of force acting on Y

C kinetic energy of X before collision = (kinetic energy of X + kinetic energy of Y) after collision

D momentum of X before collision = (momentum of X + momentum of Y) after collision

---

05. 0625_w21_qp_21 Q: 7

What is the relationship between the impulse acting on an object and the change in momentum of the object?

A impulse = change in momentum

B impulse = change in momentum $\times$ time

C $\text{impulse} = \dfrac{\text{change in momentum}}{\text{time}}$

D $\text{impulse} = \dfrac{\text{change in momentum}}{\text{mass}}$

---

06. 0625_w21_qp_22 Q: 7

A rocket is launched upwards from the surface of the Moon.

Hot gases are ejected downwards over a very short period of time.

Which statement is **not** correct?

A The rocket experiences a downward force.

B The rocket experiences an upward force.

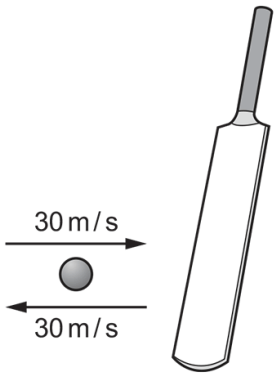
C The total momentum of the hot gases is equal to the momentum of the rocket.

D The total momentum of the hot gases and rocket when the hot gases have been ejected is zero.

---

07. 0625_w21_qp_23 Q: 7

A cricket ball has a mass of 0.16 kg. The ball travels at 30 m/s. The ball is hit by a bat with a force of 10 800 N. After being hit, the ball moves off at 30 m/s in the opposite direction.



For how long was the ball in contact with the bat?

A 0.0004 s **B** 0.00089 s **C** 0.0044 s **D** 0.015 s

---

08. 0625_p20_qp_20 Q: 1

Which quantity is measured in newton seconds (N s)?

A impulse

B moment

C power

D work done

---

09. 0625_s20_qp_22 Q: 9

An object is moving at +3.0 m/s.

A force acts on the object.

After a time, the object is moving at –4.0 m/s.

The mass of the object is 5.0 kg.

What is the change in momentum of the body?

A –35 kg m/s **B** –5.0 kg m/s **C** +5.0 kg m/s **D** +35 kg m/s

---

10. 0625_s20_qp_23 Q: 9

A ball falls vertically to the floor and rebounds vertically upwards.

Just before it hits the floor, its speed is 4.0 m/s.

As it rebounds, its speed is 3.0 m/s.

The mass of the ball is 0.50 kg.

What is the change in momentum of the ball?

A 0.50 kg m/s downwards

B 0.50 kg m/s upwards

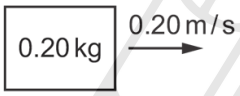
C 3.5 kg m/s downwards

D 3.5 kg m/s upwards

---

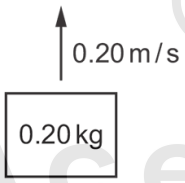
11. 0625_w20_qp_21 Q: 9

An object with a mass of 0.20 kg moves at 0.20 m/s, as shown.



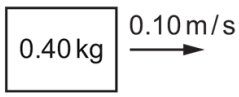
Which other object has a momentum that is identical to the momentum of this object?

A

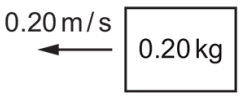


B

C



D



---

12. 0625_w20_qp_22 Q: 9

A footballer kicks a stationary football.

His foot is in contact with the ball for 0.050 s.

The mass of the ball is 0.40 kg.

The speed of projection of the ball is 25 m / s.

What is the average force exerted on the ball by his foot?

A 0.32 N **B** 0.50 N **C** 200 N **D** 1300 N

---

13. 0625_w20_qp_23 Q: 9

A ball of mass m falls vertically and hits a hard surface.

Its speed on hitting the surface is v_1.

It rebounds vertically upwards with speed v_2.

What is the change in momentum of the ball?

A mv_1 **B** mv_2 **C** $m(v_1 + v_2)$ **D** $m(v_2 - v_1)$

---

14. 0625_m19_qp_22 Q: 10

A constant force acts on a body causing the momentum of the body to increase.

Which expression relates the force to the momentum and the time taken?

A force = $\frac{\text{change in momentum}}{\text{time taken}}$

B force = $\frac{\text{momentum}}{\text{time taken}}$

C force = change in momentum × time taken

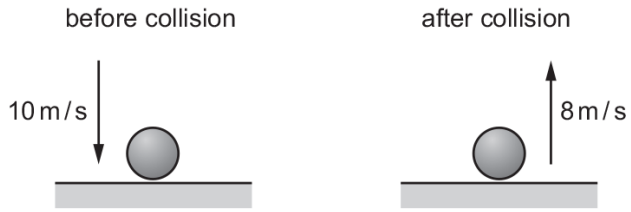
D force = momentum × time taken

---

15. 0625_s19_qp_21 Q: 9

A ball of mass 0.50 kg falls and hits the floor at 10 m/s.

It rebounds at speed 8.0 m/s, as shown.



The collision between the ball and the floor lasts for 0.50 s.

What is the average force acting on the ball during the collision?

A 2.0 N upwards

B 2.0 N downwards

C 18 N upwards

D 18 N downwards

---

16. 0625_s19_qp_21 Q: 10

An object falls from the top of a building that is 25 m high. Air resistance is negligible.

What is the speed of the object when it hits the ground?

A 10 m/s **B** 22 m/s **C** 25 m/s **D** 625 m/s

---

17. 0625_s19_qp_22 Q: 9

An object of mass 4.0 kg is moving with a velocity of 3.0 m/s in a straight line.

What is the momentum of the object?

A 0.75 kg m/s **B** 1.3 kg m/s **C** 12 kg m/s **D** 24 kg m/s

---

18. 0625_s19_qp_23 Q: 9

How is momentum p calculated in terms of the mass m of a body and its velocity v, and what type of quantity is p?

	equation	type of quantity
A	$p = m \times v$	scalar
B	$p = m \times v$	vector
C	$p = \frac{m}{v}$	scalar
D	$p = \frac{m}{v}$	vector

---

19. 0625_w19_qp_21 Q: 9

Two objects X and Y move directly towards each other. The objects have the same mass.

Object X has a velocity of 5.0 m/s to the right. Object Y has a velocity of 3.0 m/s to the left.

Object X and object Y collide and stick together.

What is their velocity after colliding?

A 1.0 m/s to the left

B 1.0 m/s to the right

C 4.0 m/s to the left

D 4.0 m/s to the right

---

20. 0625_w19_qp_22 Q: 9

A ball is at rest on the ground. A boy kicks the ball. The boy's boot is in contact with the ball for 0.040 s.

The average force on the ball is 200 N. The ball leaves the boy's boot with a speed of 20 m/s.

Which row gives the impulse of the boot on the ball and the average acceleration of the ball?

	impulse on ball / N s	average acceleration of ball / m/s^2
A	8	0.8
B	8	500
C	5000	0.8
D	5000	500

---

21. 0625_w19_qp_22 Q: 10

An object P of mass 80 g collides with another object Q of mass 40 g.

After the collision, P and Q stick together and then travel on together.

Before the collision, P is travelling at a speed of 6.0 m/s and Q is at rest.

What is the speed of P and Q after the collision?

A 2.0 m/s **B** 3.0 m/s **C** 4.0 m/s **D** 6.0 m/s

---

22. 0625_w19_qp_23 Q: 9

The momentum of a body is changed by a force acting on it for a period of time.

Which action increases the change in momentum?

A doubling the force and halving the time

B doubling the force for the same time

C halving both the force and time

D halving the force and doubling the time

---

23. 0625_w19_qp_23 Q: 10

A toy train P of mass 0.50 kg is travelling along a straight track with a velocity of 3.0 m/s. It collides with a stationary train Q of mass 1.0 kg. The two trains then stick together.

What is the velocity of the combined trains?

A 1.0 m/s in the same direction as P was travelling originally

B 1.0 m/s in the reverse direction to that in which P was travelling originally

C 1.5 m/s in the same direction as P was travelling originally

D 1.5 m/s in the reverse direction to that in which P was travelling originally

---

24. 0625_m18_qp_22 Q: 7

A stone of mass 0.12 kg is fired from a catapult. The velocity of the stone changes from 0 to 5.0 m/s in 0.60 s.

What is the average resultant force acting on the stone while it is being fired?

A 1.0 N **B** 2.5 N **C** 3.6 N **D** 8.3 N

---

25. 0625_m18_qp_22 Q: 10

A ball of mass 0.16 kg is moving forwards at a speed of 0.50 m/s. A second ball of mass 0.10 kg is stationary. The first ball strikes the second ball. The second ball moves forwards at a speed of 0.50 m/s.

What is the speed of the first ball after the collision?

A 0.0 m/s **B** 0.19 m/s **C** 0.31 m/s **D** 0.50 m/s

---

26. 0625_s18_qp_21 Q: 9

Which expression gives the momentum of an object?

A mass × acceleration

B mass × gravitational field strength

C mass × velocity

D $\frac{1}{2}$ × mass × (velocity)^2

---

27. 0625_s18_qp_22 Q: 9

A car of mass 1000 kg travelling at 8.0 m/s collides with a lorry of mass 3000 kg that is travelling at 2.0 m/s in the same direction. After colliding, the two vehicles stick together.

What is their speed after the collision?

A 2.0 m/s **B** 2.5 m/s **C** 3.5 m/s **D** 5.0 m/s

---

28. 0625_s18_qp_23 Q: 9

A visitor to a fairground throws a soft object of mass 0.12 kg at a coconut of mass 0.48 kg. The soft object stops moving when it hits the coconut. In order to dislodge the coconut, it must be made to move at 0.10 m/s.

What is the minimum speed with which the visitor should throw the soft object in order to dislodge the coconut?

A 0.20 m/s

B 0.40 m/s

C 2.0 m/s

D 4.0 m/s

---

29. 0625_w18_qp_21 Q: 6

A resultant force of 4.0 N acts on an object of mass 0.50 kg for 3.0 seconds.

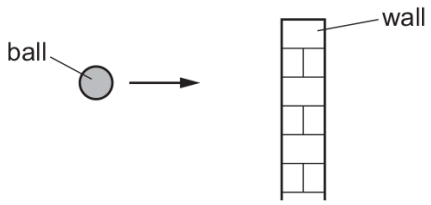
What is the change in velocity caused by this force?

A 4.0 m/s **B** 6.0 m/s **C** 12 m/s **D** 24 m/s

---

30. 0625_w18_qp_21 Q: 8

A moving ball with a momentum of 25 kg m/s collides head-on with a wall.



It rebounds from the wall with the same speed but in the opposite direction. The time of collision is 50 ms.

What is the average force exerted on the wall by the ball during the collision?

A 0.50 N **B** 1.00 N **C** 500 N **D** 1000 N

---

31. 0625_w18_qp_22 Q: 8

An object of mass 3.0 kg, travelling at a speed of 6.0 m/s, collides with an object of mass 2.0 kg, travelling in the opposite direction at a speed of 2.0 m/s.

The objects stick together during the collision.

What is the speed and direction of the combined mass after the collision?

A 4.4 m/s to the left

B 4.4 m/s to the right

C 2.8 m/s to the left

D 2.8 m/s to the right

---

32. 0625_m17_qp_22 Q: 8

A moving body undergoes a change of momentum.

What is a unit for change of momentum?

A Nm **B** N/m **C** Ns **D** N/s

---

33. 0625_s17_qp_21 Q: 9

A bullet of mass 0.10 kg travels horizontally at a speed of 600 m/s. It strikes a stationary wooden block of mass 1.90 kg resting on a frictionless, horizontal surface.

The bullet stays in the block.

What is the speed of the bullet and the block immediately after the impact?

A 30 m/s **B** 32 m/s **C** 60 m/s **D** 134 m/s

---

34. 0625_s17_qp_22 Q: 9

A ball of mass 2.0 kg is travelling at a speed of 12 m/s. It moves towards an object of mass 3.0 kg which is at rest.

The ball hits the object and sticks to it.

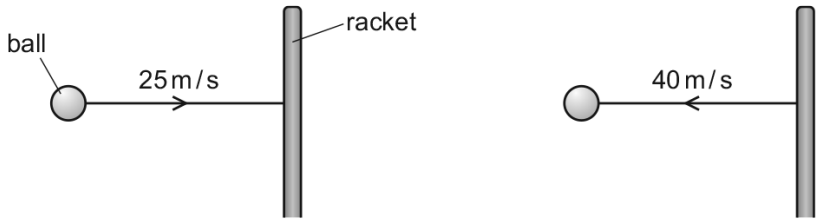
Which row gives the total momentum, and the speed of both objects immediately after the collision?

	total momentum kg m/s	speed m/s
A	0	4.8
B	0	8.0
C	24	4.8
D	24	8.0

---

35. 0625_w17_qp_21 Q: 9

A tennis ball of mass 0.060 kg travels horizontally at a speed of 25 m/s. The ball hits a tennis racket and rebounds horizontally at a speed of 40 m/s.



before hitting racket　　after hitting racket

The ball is in contact with the racket for 50 ms.

What force does the racket exert on the ball?

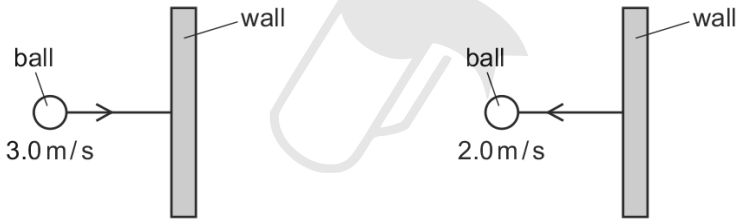
A 0.018 N　　**B** 0.078 N　　**C** 18 N　　**D** 78 N

---

36. 0625_w17_qp_22 Q: 9

A ball has a mass of 0.30 kg. It moves horizontally with a speed of 3.0 m/s in the direction shown.

The ball hits a wall.



before hitting the wall　　after hitting the wall

The ball rebounds from the wall with a horizontal speed of 2.0 m/s.

What is the change in momentum of the ball?

A 0.30 kg m/s　　**B** 1.0 kg m/s　　**C** 1.5 kg m/s　　**D** 5.0 kg m/s

---

37. 0625_w17_qp_23 Q: 9

An object has a mass of 60 kg.

It decelerates from 50 m/s to 20 m/s when a resultant force of 300 N acts on it.

For how long does the force act?

A 0.071 s　　**B** 0.17 s　　**C** 6.0 s　　**D** 14 s

---

38. 0625_p16_qp_20 Q: 1

Which quantity is measured in newton seconds (Ns)?

A impulse

B moment

C power

D work done

---

39. 0625_s16_qp_21 Q: 7

An object of mass 50 kg accelerates from a velocity of 2.0 m/s to a velocity of 10 m/s in the same direction.

What is the impulse provided to cause this acceleration?

A 250 Ns **B** 400 Ns **C** 850 Ns **D** 2500 Ns

---

40. 0625_w16_qp_21 Q: 6

An object travels in a circular path at constant speed.

Which statement about the object is correct?

A It has changing kinetic energy.

B It has changing momentum.

C It has constant velocity.

D It is not accelerating.

---

41. 0625_w16_qp_22 Q: 8

A girl of mass 50 kg runs at 6.0 m/s.

What is her momentum?

A 300 J **B** 300 kg m/s **C** 900 J **D** 900 kg m/s

---

42. 0625_w16_qp_22 Q: 9

Which list contains only vector quantities?

A acceleration, energy, force, mass

B acceleration, force, momentum, velocity

C distance, energy, mass, speed

D distance, momentum, power, speed

---

43. 0625_w16_qp_23 Q: 6

An object travels in a circular path at constant speed.

Which statement about the object is correct?

A It has changing kinetic energy.

B It has changing momentum.

C It has constant velocity.

D It is not accelerating.

---

44. 0625_w16_qp_23 Q: 8

A vehicle of mass 900 kg is travelling with a velocity of 20 m/s.

What is the momentum of the vehicle?

A 45 kg m/s **B** 450 kg m/s **C** 18 000 kg m/s **D** 180 000 kg m/s

---

45. 0625_w16_qp_23 Q: 9

Which list contains only scalar quantities?

A acceleration, energy, force, mass

B acceleration, force, momentum, velocity

C distance, energy, mass, speed

D distance, momentum, speed, velocity

SN	Paper	Q. No.	Answer
01	0625_m21_qp_22	9	C
02	0625_s21_qp_21	8	D
03	0625_s21_qp_22	8	C
04	0625_s21_qp_23	8	D
05	0625_w21_qp_21	7	A
06	0625_w21_qp_22	7	C
07	0625_w21_qp_23	7	B
08	0625_p20_qp_20	1	A
09	0625_s20_qp_22	9	A
10	0625_s20_qp_23	9	D
11	0625_w20_qp_21	9	C
12	0625_w20_qp_22	9	C
13	0625_w20_qp_23	9	C
14	0625_m19_qp_22	10	A
15	0625_s19_qp_21	9	B
16	0625_s19_qp_21	10	A
17	0625_s19_qp_22	9	C
18	0625_s19_qp_23	9	B
19	0625_w19_qp_21	9	B
20	0625_w19_qp_22	9	B
21	0625_w19_qp_22	10	C
22	0625_w19_qp_23	9	B
23	0625_w19_qp_23	10	A
24	0625_m18_qp_22	7	A
25	0625_m18_qp_22	10	B
26	0625_s18_qp_21	9	C
27	0625_s18_qp_22	9	C
28	0625_s18_qp_23	9	B
29	0625_w18_qp_21	6	D
30	0625_w18_qp_21	8	D
31	0625_w18_qp_22	8	D
32	0625_m17_qp_22	8	C
33	0625_s17_qp_21	9	A
34	0625_s17_qp_22	9	C
35	0625_w17_qp_21	9	D
36	0625_w17_qp_22	9	C
37	0625_w17_qp_23	9	C
38	0625_p16_qp_20	1	A
39	0625_s16_qp_21	7	B
40	0625_w16_qp_21	6	B
41	0625_w16_qp_22	8	B
42	0625_w16_qp_22	9	B
43	0625_w16_qp_23	6	B
44	0625_w16_qp_23	8	C
45	0625_w16_qp_23	9	C