Motion (F)

1. An object travelled 800 m in 40 seconds.

Use the equation: distance travelled (m) = speed (m/s) × time (s)

What is the speed of the object?

A 0.05 m/s
B 20 m/s
C 840 m/s
D 32 000 m/s

Your answer ☐ **[1]**

2. Which is a scalar?

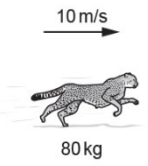
A Acceleration
B Displacement
C Force
D Speed

Your answer ☐ **[1]**

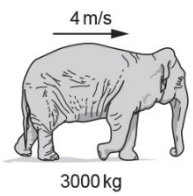
3. Which of the following has the **most** kinetic energy?

A

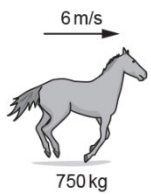
B



C



D



Your answer ☐ **[1]**

4. Which distances are the **same**?

A 1×10^{-3} m and 1 μm
B 1×10^{-6} m and 1 mm
C 1×10^{-9} m and 1 nm
D 1×10^{-12} m and 1 Gm

Your answer ☐ **[1]**

5. A lorry has a mass of 3500 kg. It travels at a speed of 30 m/s.

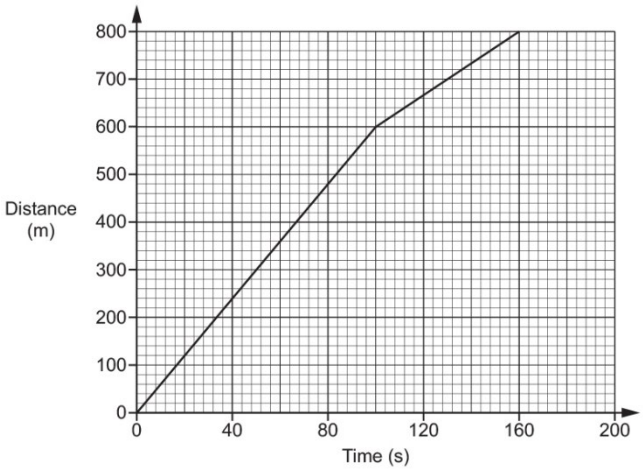
Use the equation: Kinetic Energy = 0.5 × Mass × Speed^2

Calculate the kinetic energy of this lorry.

A 10 500 J
B 52 500 J
C 1 575 000 J
D 3 150 000 J

Your answer ☐ **[1]**

6. Look at the distance-time graph for a journey to school.



What is the average speed for the journey?

Use the equation: average speed = distance travelled ÷ time

A 0.2 m/s
B 5.0 m/s
C 6.0 m/s
D 50 m/s

Your answer ☐ **[1]**

7. A car travels at 72 km / h.

How fast is this in metres per second (m / s)?

A 1.2 m/s
B 20 m/s
C 120 m/s
D 1200 m/s

Your answer ☐ **[1]**

8. A teacher measures the speed of water waves in a ripple tank.

What apparatus should she use?

A Ammeter and stopwatch

B Newton-meter and ruler

C Ruler and protractor

D Ruler and stopwatch

Your answer ☐ **[1]**

9. The kinetic energy of motorbike **X** is 10 kJ.

Motorbike **Y** has the same speed but double the mass.

What is the kinetic energy of motorbike **Y**?

Use the equation: kinetic energy = 0.5 × mass × $(\text{speed})^2$

A 5 kJ
B 10 kJ
C 20 kJ
D 40 kJ

Your answer ☐ **[1]**

10. A cyclist travels 750 m in 50 seconds.

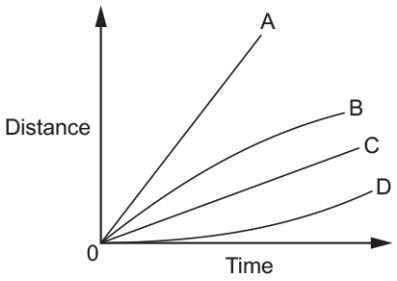
Calculate the speed of the cyclist.

Use the equation: speed = distance / time

A 0.015 m / s
B 15 m / s
C 37.5 m / s
D 375 m / s

Your answer ☐ **[1]**

11. Look at the distance-time graph.



Which line shows the largest average speed?

Your answer ☐ **[1]**

12. A girl runs twice around a 400 m circular track. What is the final displacement of the girl from her starting point?

A 0 m
B 200 m
C 400 m
D 800 m

Your answer ☐ **[1]**

13. * Four students run in different races.

Student	Race distance (m)	Time (s)
A	50	6
B	100	15
C	100	14
D	200	31

Use the information in the table to **describe** and **compare** the motion of the four students.

Use the data in your answer.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ **[6]**

14. A presenter on a car TV programme says:

"The car maker has reduced the mass of this car and it now has better acceleration."

i. Explain why the presenter is correct.

_____

_____

_____ **[2]**

ii. A car accelerates from 5 m/s to 25 m/s in 4 seconds.

Calculate the acceleration of the car.

Use the equation: Acceleration = Change in speed ÷ Time taken

Answer = ... m/s^2 **[3]**

15 (a). A student watches a ball game on the school field.

The student sees the ball being hit with a bat but he hears the sound a short time after. This is because the speed of light is greater than the speed of sound.

He decides to do an experiment to measure the speed of sound waves in air.

Describe which measurements he needs to measure this speed.

_____

_____

_____ **[2]**

(b). Which equation is used to calculate speed?

_____ **[1]**

(c). Describe one way he could get valid results for this experiment.

_____

_____ **[1]**

16. This question is about force, mass and acceleration.

A car starts from rest and accelerates at 3 m/s^2.

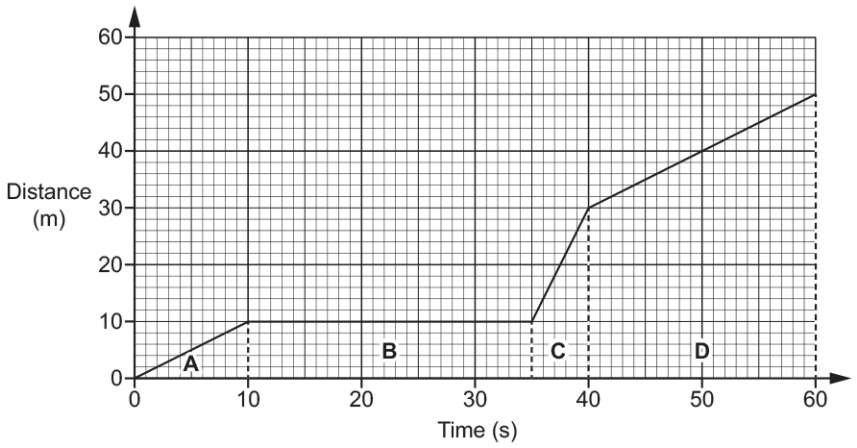
Use the equation: Acceleration = Change in velocity ÷ Time taken

Calculate the **velocity** of the car after 4 s.

Answer = _____ m/s **[2]**

17(a). A student investigates motion graphs.

Look at a distance-time graph for the movement of a dog in a park.



i. How far did the dog move in the park?

Distance = ... m **[1]**

ii. How long was the dog in the park?

Time = ... s **[1]**

iii. Name a piece of apparatus the student could use to accurately measure the distance the dog moved.

_____ **[1]**

(b). The distance-time graph has four sections: **A**, **B**, **C** and **D**.

i. Which section of the graph shows the **greatest** speed?

Tick (✓) **one** box.

A ☐

B ☐

C ☐

D ☐

Explain your answer.

_____

_____

_____ **[2]**

ii. Which section of the graph shows **zero** speed?

Tick (✓) **one** box.

A ☐

B ☐

C ☐

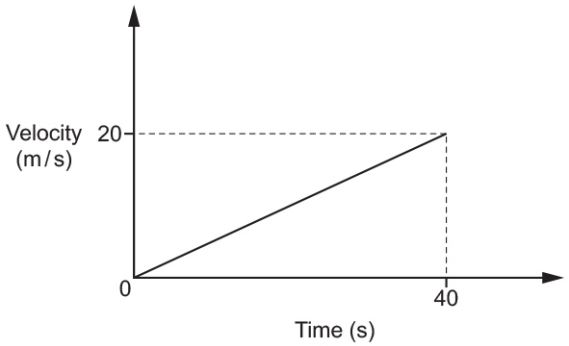
D ☐

Explain your answer.

---

[2]

(c). The student draws a velocity-time graph for a boat accelerating.



Acceleration is the gradient of a velocity-time graph.

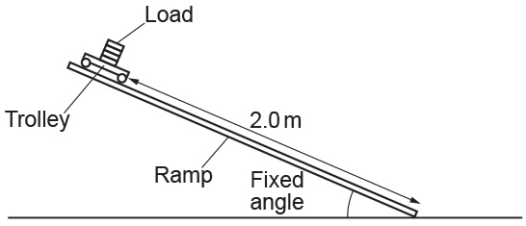
Calculate the acceleration of the boat.

Use the equation: acceleration = change in velocity ÷ time

Acceleration = ... m/s^2 **[2]**

18(a). A student investigates the average speed at which a trolley with different loads travels down a ramp.

Look at the diagram of her experiment.



She releases the trolley from a distance of 2.0 m from the bottom of the ramp.

The student uses a stop-clock to measure the time it takes to reach the bottom of the ramp.

She calculates the average speed. Look at her results.

Load (N)	Time taken (s)	Average speed (m / s)
20	2.3	0.87
40	2.4	0.83
60	2.3	0.87
80	2.4	0.83

* Describe the trend shown by the results, identify problems with the experiment and describe any improvements that you would make to the experiment.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ **[6]**

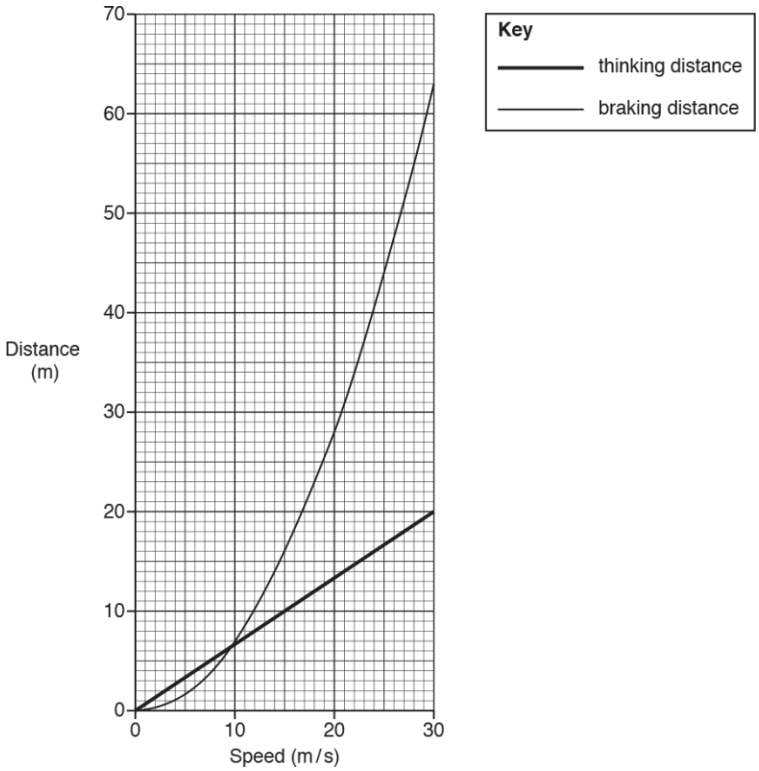
(b). For one experiment the trolley starts from rest and reaches a final speed of 2 m / s.

The ramp length is 2.0 m.

Calculate the acceleration of the trolley.

Acceleration = ... m / s^2 **[4]**

19. The graph shows thinking and braking distances for a car at different speeds.



i. State **one** factor that could **increase** thinking distance.

_____ **[1]**

ii. Calculate the **stopping distance** at 15 m / s.

Use the graph to help you.

Stopping distance = ... m **[2]**

20. A toy car travels around a race track. After one lap it is back at the start position.

Explain why the velocity of the toy car is different from its speed as it travels around the track.

---

[2]

END OF QUESTION PAPER