Work Energy Power MS

1. A

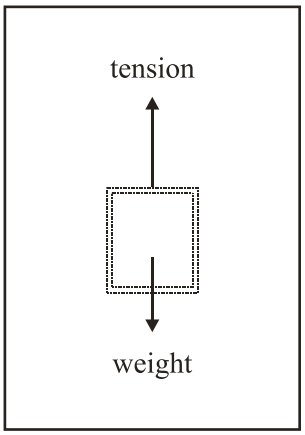
2. C

3. D

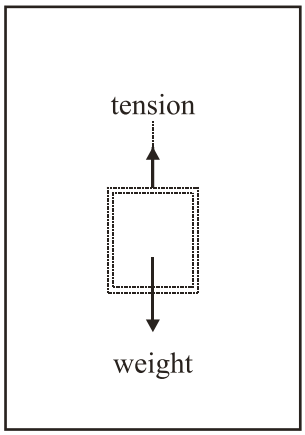
4. (a) statement that gravitational mass and inertial mass have the same numerical value;
understanding of what gravitational mass means;
e.g. "a quantity that determines the gravitational force on the object"
understanding of what inertial mass means;
e.g. "a quantity that determines the acceleration of the object" 3 max

(b) *Mark part (i) and (ii) together.*
weight arrow the same in both diagrams;
magnitude of tension (size of arrow) **equal to** weight in (i);
magnitude of tension (size of arrow) **less than** weight in (ii); 3 max

(i) 0.50 to 11.50 s

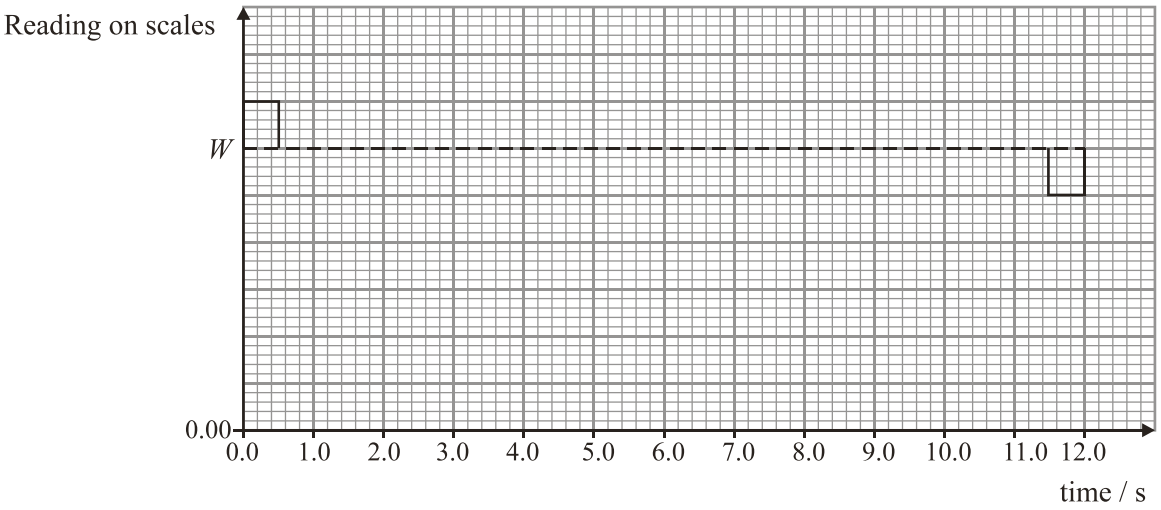


(ii) 11.50 to 12.00 s



3 max

(c) a constant value **greater** than W from 0.00 to 0.50 s;
a constant value **equal** to W from 0.50 to 11.50 s;
a constant value **less** than W from 11.50 to 12.00 s;



3 max

(d) ***[1]*** *for each appropriate and valid point. Essentially* ***[2]*** *for journey up and* ***[2]*** *for journey down. Some explanation or justification is required for full marks e.g.*
the law of conservation of energy does apply to round trip;
energy is all dissipated into heat and sound;
on the way up, most electrical energy converted into g.P.E., initially some electrical energy is converted into K.E;
on the way down electrical energy does work "breaking" lift some (not all) g.P.E. is converted into K.E.; 4 max

Reject answers that imply that P.E. converts into K.E. as lift falls.

[13]

5. D

[1]

6. (a) mass × velocity; 1

(b) (i) momentum before = 800 × 5 = 4 000 N s;
momentum after = 2 000v;
conservation of momentum gives v = 2.0 m s^{-1}; 3

(ii) KE before = 400 × 25 = 10 000 J KE after = 1 000 × 4 = 4 000 J;
loss in KE = 6 000 J; 2

(c) transformed/changed into;
heat (internal energy) (and sound); 2

Do not accept "deformation of trucks".

[8]

7. (a) ***Note****: for part (i) and (ii) the answers in brackets are those arrived at if 19.3 is used as the value for the height.*

(i) height raised = 30 sin 40 = 19 m;
ain in PE = mgh = 700 × 19 = 1.3 × 10^4 J (1.4 × 10^4 J); 2

(ii) 48 × 1.3 × 10^4 J = 6.2 × 10^5 J (6.7 × 10^5 J); 1

(iii) the people stand still / don't walk up the escalator
their average weight is 700 N / ignore any gain in KE of the people; 1 max

(b) power required = $\frac{(6.2 \times 10^5)}{60}$ = 10 kW (11kW);

$Eff = \frac{P_{out}}{P_{in}}$, $P_{in} = \frac{P_{out}}{Eff}$;

P_{in} = 14 kW (16 kW); 3

[7]

8. B

[1]

9. B

[1]