Answers to exam-style questions

Topic 1

Where appropriate, 1 ✓ = 1 mark

1 B

2 A

3 D

4 B

5 A

6 D

7 C

8 A

9 C

10 A

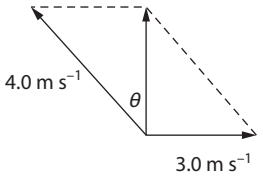
11 Use a smaller heavier ball. ✓
In order to minimise the effect of air resistance. ✓
Let the ball drop from various heights. ✓
In order to draw a graph of height versus time and get the acceleration through the gradient of the graph. ✓
If a stopwatch is to be used measure the time for each height many times and get an average. ✓
In order to get a more accurate value for the time. ✓

12 a It will take $\frac{30}{4.0} = 7.5\text{ s}$ to get across. ✓
And he will move $3.0 \times 7.5 = 22.5 \approx 22\text{ m}$ to the right of P. ✓

b Correct diagram. ✓

$\sin\theta = \frac{3.0}{4.0} = 0.75$ ✓

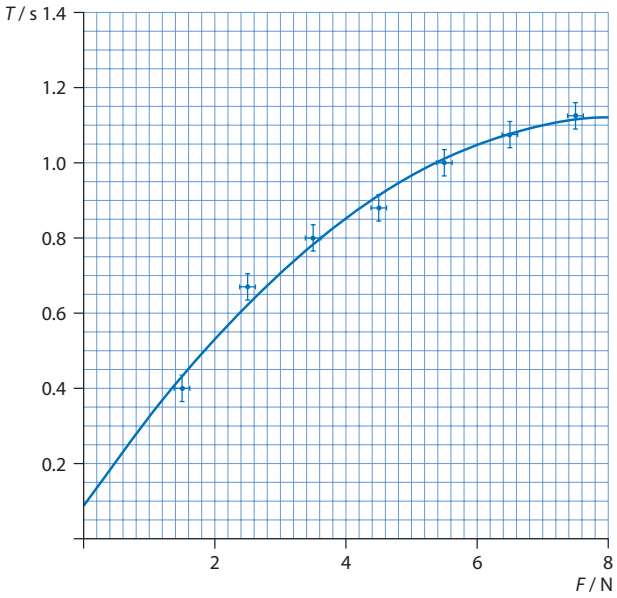
$\theta = \sin^{-1} 0.75 = 48.6°$ ✓



c The woman moves across with a speed of $\sqrt{4.0^2 - 3.0^2} = 2.6458\text{ m s}^{-1}$. ✓

So she will take a time of $\frac{30}{2.6458} = 11.3 \approx 11\text{ s}$, so will be longer than the man. ✓

13 a Smooth curve. ✓
Through all the error bars. ✓



b The vertical intercept is about 0.1 s. ✓

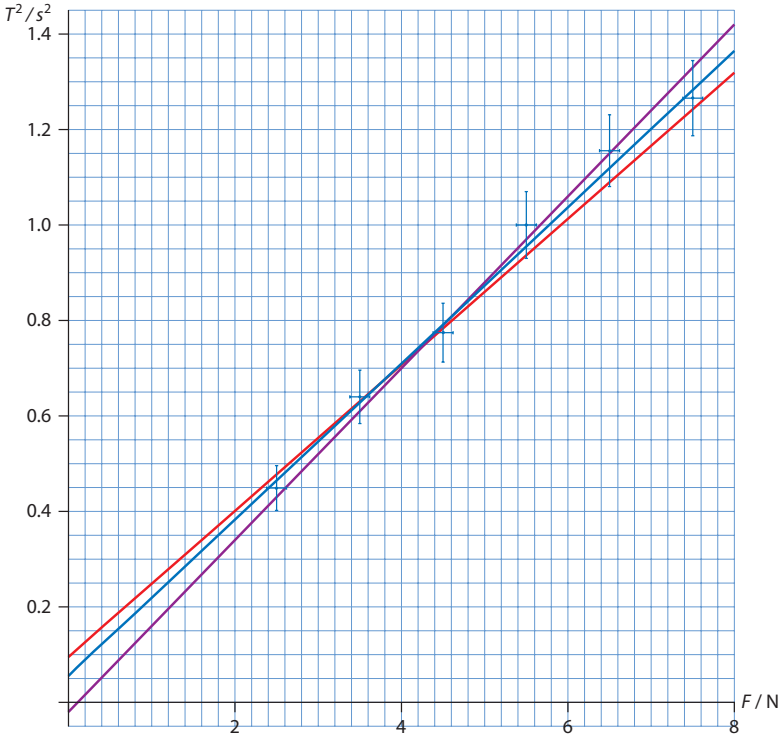
c For T to be proportional to F requires a straight line graph through the origin. ✓
And here neither of these conditions are satisfied. ✓

d The uncertainty in T is about ± 0.035 s . ✓

$$\frac{\Delta T^2}{T^2} = 2\frac{\Delta T}{T} \Rightarrow \Delta T^2 = 2T\Delta T \checkmark$$

Hence $\Delta T^2 = \pm 2 \times 1.0 \times 0.035 = \pm 0.07$ s^2 ✓

e Correct plotting of points. ✓
Correct error bars and lines of maximum and minimum slope. ✓
Line of best-fit is straight and within uncertainties passes through origin. ✓
Hence claim is correct. ✓



f Slope of line of best fit 0.164 $s^2\,N^{-1}$. ✓
Max/min slopes 0.153 $s^2\,N^{-1}$ and 0.180 $s^2\,N^{-1}$ so uncertainty is $0.0135 \approx 0.01$ $s^2\,N^{-1}$. ✓
So (0.164 ± 0.001) $s^2\,N^{-1}$. ✓