UNIVERSITY OF MALTA JUNIOR COLLEGE

DEPARTMENT OF MATHEMATICS

APPLIED MATHS INTERMEDIATE LEVEL

End-of-Year Exam – ANSWER SHEET – JUNE 2017

1. (a) $\overrightarrow{DB} = -\frac{1}{2}\mathbf{q},\ \overrightarrow{DA} = -\frac{1}{2}(2\mathbf{p}+\mathbf{q}),\ \overrightarrow{BG} = \frac{1}{3}(\mathbf{q}-\mathbf{p}),\ \overrightarrow{GE} = \frac{1}{6}(\mathbf{q}-\mathbf{p})$
   (c) *G* is the **centroid** of triangle *ABC*

2. (b) $Q = \frac{66\sqrt{5}}{5}$

3. (b) $\lambda = \tan^{-1}\frac{1}{3} = 18.4°,\ \mu = \frac{1}{3}$ (c) $\frac{W\sqrt{10}}{10}$ at 18.4° to the horizontal

4. (b) 36.87°, 6N

5. (a) $P = mg(\mu\cos\alpha + \sin\alpha),\ Q = mg(\mu\cos\alpha - \sin\alpha)$

6. (b) 2800N (c) 1.5m s^{-2}

7. (a) $3mg$ (b) $\frac{3}{2}mg$ (c) 48°, $\frac{\sqrt{5}}{2}mg$

8. (a) 5625N (b) 37.93° to the horizontal

9. (a) 16.4N at 37.6° to *AB*, 5.5m from *A* along *AB* produced
   (b) single force has same magnitude and direction

10. (a) 1.35m from *A*, 7.5N, $\frac{15\sqrt{3}}{2}$ N
    (b) 11.25N, 3.75N