STEP 2008, Paper 2 - Notes (2 pages; 2/6/18)

See separate documents for Sol'ns.

1	2	3	4	5	6	7	8
Sol'n	N	Sol'n	Sol'n	Sol'n	Sol'n	Sol'n	N

9	10	11		12	13
N	Sol'n	N		N	N

Q2 Hint: For the 2nd part, consider the factors of 8181.

Q8 Hint

Although there may be neat methods using eg scalar products, it is often possible to just employ the Sine or Cosine rules.

Notes

λ can be determined by use of the Sine rule (as an alternative to the official sol'ns), and the last part can be done by the Cosine rule.

Q9 Rather than having to learn the trajectory eq'n (as the official sol'ns suggest), it isn't too much work (by STEP standards) to use a vector notation for distance and solve for t and $tan\alpha$:

$$\binom{20}{0} = \binom{0}{h} + \binom{40cos\alpha}{40sin\alpha}t - \frac{1}{2}\binom{1}{10}t^2$$

to give $t = \frac{1}{2cos\alpha}$ and $tan\alpha = 8 \pm \sqrt{63 + \frac{4h}{5}}$

Q11 Hint

By N3L, the wedge and the particle exert equal and opposite forces on each other.

Taking everything relative to the ground, the particle has two components of acceleration: a & A (the acceleration of the wedge).

Notes

By N3L, the wedge and the particle exert equal and opposite forces on each other.

Considering the horiz. components, if A is the acceleration of the wedge,

then $m(a\cos\theta - A) = kmA$

$\Rightarrow A(k+1) = a\cos\theta \Rightarrow A = \frac{a\cos\theta}{k+1}$

For the last part of (i), it is also possible to resolve along & perp. to the slope.

Q12 Hint

For the 1st part, E(A+B)=E(A)+E(B)

For the 2nd part, consider a case by case approach.

Q13 Hint

As usual, try a case by case approach.