MARKS

6

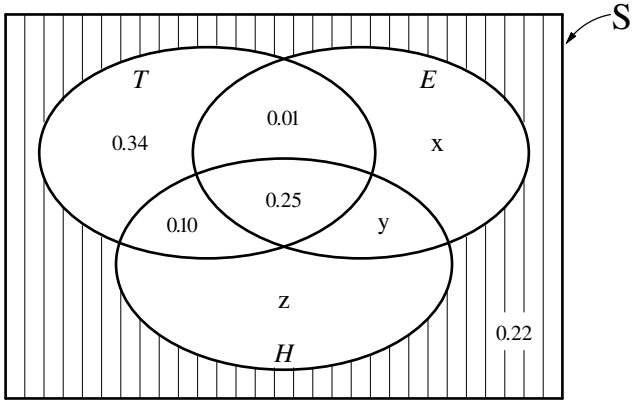
(5, 1)

5. Suppose that 70% of all cars on the road have incorrect tire pressures, 30% have defective exhaust systems, and 40% have poorly aimed headlights. Suppose also that 25% have all three faults, 35% have the faults with both tires and headlights, 26% with both tires and exhaust syatem, and 22% have none of the faults. Find the probability a car selected equiprobably ('at random') on the road has:

(a) a defective exhaust system and poorly aimed headlights;

(b) a defective exhaust system and poorly aimed headlights but **correct** tire pressures.

(a) A **Venn diagram** is a convenient way to appraoch this question;
we mark the percentages (representing probabilities) on an appropriate Venn diagram.



T denotes *incorrect tire pressures*,
E denotes *defective exhaust system*,
H denotes *poorly aimed headlights*.

For *E*: $x + y + 0.25 + 0.01 = 0.30$;
for *H*: $y + z + 0.10 + 0.25 = 0.40$;
overall: $x + y + z + 0.70 + 0.22 = 1$.

From the three equations:

$x + y = 0.04$
$y + z = 0.05$
$x + y + z = 0.08$

} so that: $x = 0.03$, $y = 0.01$, $z = 0.04$.

Poorly aimed headlights **and** a defective exhaust system is $0.25 + y = 0.26 = 26\%$.

$\boxed{0.26 = 26\%}$ (a)
Probability

(b) A defective exhaust system **and** poorly aimed headlights but *correct* tire pressures is $y = 0.01 = 1\%$.

$\boxed{0.01 = 1\%}$ (b)
Probability