

EXAM STYLE PRACTICE  
STATISTICS

STATISTICS + MECHANICS  
PAPER (AV)

1. a)  $1 - 0.35 = 0.65$

so  $y = 0.15$

b)  $P(B) = 0.35$

$P(H) = 0.45$

$P(B) \times P(H) = 0.1575$

$\neq P(B \cap H) (0.15)$

so not independent.

2. a) continuous - measured variable can take any value.

b)  $\bar{x} = \frac{140.1}{10}$   
 $= 14.01$

s.d. =  $\sqrt{\frac{\sum x^2}{10} - 140.1^2}$   
 $= 1.36 \text{ (3sf)}$

c) increase, value  $>$  mean.

d) could select random days and from other locations in UK.

3. a)  $0.1 + 0.2 + 0.15 + p + 0.1 + 0.25 = 1$

$p = 1 - 0.8$   
 $= 0.2$

b)  $P(2 \leq X \leq 5) = 0.2 + 0.15 + 0.2 + 0.1$   
 $= 0.65$

c)  $P(\text{odd}) = 0.1 + 0.15 + 0.1 = 0.35$

$x$	1	2	3	4	5	6
$P(X=x)$	0.1	0.2	0.15	0.2	0.1	0.2

$X \sim B(10, 0.35)$

(i)  $P(X=2) = 0.1757$       (ii)  $P(X > 6) = 1 - P(X \leq 6)$

1 2 3 4 5 6 | 7 8 9 10  $\rightarrow = 0.0260$

VSM:

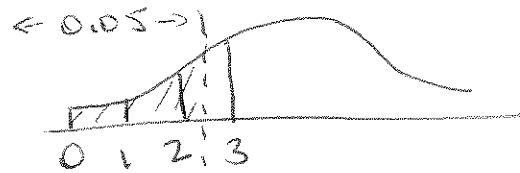
4. a) Test statistic  $X$  is the random variable representing the number of flaws

$$X \sim B(20, 0.3).$$

b)  $H_0: p = 0.3$   
 $H_1: p < 0.3$  (fewer flaws).

$$P(X \leq 2) = 0.0354$$

$$P(X \leq 3) = 0.1070$$



Critical region  $x = 0, 1, 2$ . CR ←

c) Actual significance 3.5%  
 (where  $x \leq 2$ )

d)  $x = 1$  lies in the CR  
 so there is evidence to support the claim  
 the process has improved.

5.  $e = 20 + 3.1h$

a) value 3.1 is increase in energy in Joules released for each degree rise in temp  $^{\circ}C$

b) Not sensible - extrapolation is long way from the range of experimental data.

c) Can predict  $e$  given  $h$  as  $h$  is the independent variable and  $e$  is the dependent variable not vice versa.

6.  $P(4.6 < h < 6.1)$

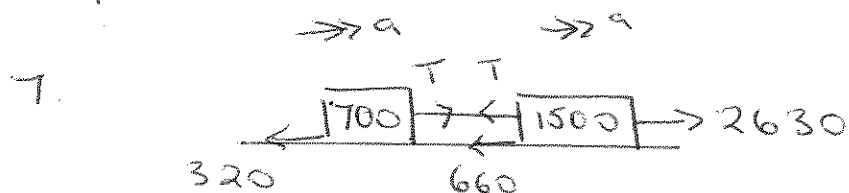
$$\text{No. of squares} = \frac{102}{117}$$

$$= 0.8717.$$

← area between 4.6 and 6.1

← total area.

## MECHANICS



a)  $[F = ma]$  for each trailer

$$2630 - 320 - 660 = (1500 + 700)a$$

$$a = 0.75 \text{ ms}^{-2}$$

b)  $[F = ma]$  for trailer

$$T - 320 = 700 \times 0.75$$

$$T = 845 \text{ N}$$

c) same acceleration throughout

8. a)  $\underline{F}_1 = 3\underline{i} - 6\underline{j}$

$$\underline{F}_2 = 4\underline{i} + 5\underline{j}$$

$$\underline{F}_3 = 2\underline{i} - 2\underline{j}$$

✓ (check)

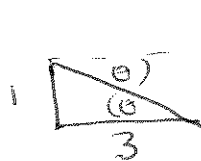
Resultant  $\underline{R} = 9\underline{i} - 3\underline{j}$

$$[\underline{F} = m\underline{a}]$$

$$9\underline{i} - 3\underline{j} = 3\underline{a}$$

$$\underline{a} = 3\underline{i} - \underline{j}$$

b)



$\rightarrow \underline{i}$  direction

$$\tan \theta = \frac{1}{3}$$

$\theta = 18.4^\circ$  below  $\underline{i}$  direction

c)  $|\underline{a}| = \sqrt{3^2 + 1^2}$   
 $= \sqrt{10} \text{ ms}^{-2}$