

**Have solutions for this test in your revision book**

- The forces  $\begin{pmatrix} 3 \\ -4 \end{pmatrix}$ ,  $\begin{pmatrix} 5 \\ 12 \end{pmatrix}$  and  $\begin{pmatrix} 7 \\ 24 \end{pmatrix} N$ , act on a particle of mass  $3.5kg$ . Calculate the ;
  - Resultant force on the particle.
  - Magnitude of the acceleration of the particle.
- Locate each of the three roots of the equation  $x^4 = 4 + 4x$  in the interval  $-2 \leq x \leq 3$ .
- A particle is projected from the origin and has an initial velocity of  $(7i + 5j) ms^{-1}$ . Given that the particle passes through the point P, position vector  $(xi - 30j) m$ , find the time taken for this to occur and the value of  $x$ . (Take  $g = 10 ms^{-2}$ )

- The table below shows the order in which ten candidates were ranked in two tests

Test 1	A	F	D	C	H	J	K	B	E	L
Test 2	D	F	C	A	J	K	H	B	L	E

Calculate the rank correlation coefficient between tests 1 and 2. Hence comment on your result at a 5% level.

- The probabilities that a man and his wife come back home early are  $\frac{2}{3}$  and  $\frac{3}{4}$  respectively, and

the probability that the wife is back early if the man is early is  $\frac{7}{8}$ , find the probability that they

are both ;

- Early
- Late.

- A uniform rod  $AB$  of mass  $m$  hangs vertically with end  $A$  freely hinged to a fixed point. The rod is pulled a side by a horizontal force  $F$ , applied at  $B$ , until it makes an angle of  $30^\circ$  with the downward vertical, show that  $F = \frac{mg}{2\sqrt{3}}$ .

- Study the table below ;

$x$	$k$	$2k$	$3k$
$g(x)$	0.16	0.48	0.64

Using linear extrapolation/interpolation find

- $f(1.5k)$
- The value of  $a$  such that  $f(ak) = 0.5$ .

- A fruit machine consists of 3 windows, each of which shows pictures of fruits; lemons or oranges or mangoes or apples. The probability that a window shows a particular fruit is as follows;  $P(\text{lemons}) = 0.4$ ,  $P(\text{oranges}) = 0.1$ ,  $P(\text{mangoes}) = 0.2$ ,  $P(\text{apples}) = 0.3$ . The windows operate independently. Anyone wanting to play the fruit machine pays  $shs.10000$ . The winning combination and amount are as follows;
  - Orange in 3 windows  $shs.10000$
  - Orange in 2 windows and mangoes in 1 window  $shs.80000$ .
  - Mangoes in 3 windows  $shs.50000$ .
  - Lemons in 3 windows  $shs.40000$ .

Find the expected gain/loss per turn.

9. (a) If two events  $A$  and  $B$  are independent and  $3P(A \cup B) = 5P(B) = 4P(A)$ . Find

(i)  $P(A)$

(ii)  $P(A^1 \cap B^1)$

(b) Bag  $P$  contains 3 green and 5 blue balls. Bag  $Q$  contains 2 green and 4 blue balls. Bag  $P$  is twice as likely to be picked as bag  $Q$ . A bag is selected at random and two balls are drawn from it one at a time without replacement. Find the probability that they are ;

(i) Both green.

(ii) Both green from bag  $Q$ .

10. The table below shows the prices of items ( *in shs* ) and prices of items during the years 2019 and 2020.

<i>items</i>	2019 Prices	2020 price indices with 2019 as the base year
X	3000	150
Y	5000	120
Z	4000	125
W	3500	85

(a) Calculate the price for each item in 2020.

(b) Taking 2019 as the base year and using the weights 3, 2, 5 and 4 for items X, Y, Z and W respectively. Calculate the ;

(i) Weighted average price index for 2020.

(ii) Weighted aggregate price index for 2020.

11. (a) Derive the Newton Raphson Formula for finding the natural logarithm of the reciprocal of a number  $N$ .

(c) Hence find  $\ln\left(\frac{2}{3}\right)$  correct to 3 decimal places using  $x_0 = -0.35$ .

12. A student used the trapezium rule with 6 strips to estimate  $\int_0^{0.5} (\cos x - x^2) dx$  correct to 3 decimal places.

Determine;

(a) The value the student obtained.

(b) The actual value of the integral.

(c) How the student can reduce the error.

13. A random variable  $X$  has a probability density function given by ;

$$f(x) = \begin{cases} \frac{1}{4}x & ; 0 \leq x \leq a \\ \frac{1}{4}(4-x) & ; a \leq x \leq b \\ 0 & ; \text{otherwise} \end{cases}$$

(a) Determine the value of  $a$  and  $b$ .

(b) Find  $P\left(\frac{x \leq 3}{x > 1.5}\right)$ .

END