

# STATISTICS

## HSE (I)

Qn. No.	Answer Key/Value points	Score	Total
1	<p>a) GM = <math>\sqrt{AM \times HM}</math>            = <math>\sqrt{25 \times 23.04}</math>            = <math>\sqrt{576}</math>            = 24</p> <p>b) Mode = 32            Mean = 35            Mode = 3 median - 2 mean            32 = 3 med - 2 × 35            32 + 70 = 3 median            median = <math>\frac{102}{3} = 34</math></p>	<p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p> <p>1</p>	<p>1</p> <p>2</p>
2	<p>CSO (b) Compilation of national accounts            NSSO (c) Conducting socio economic survey            ISI (d) Publishing and statistics department            SANKHYA            Economics (a) Nodal agency of the state            and Statistics            Department</p>	<p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p>	<p>2</p>
3	<p>a) False            b) True            c) True            d) False</p>	<p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p>	<p>2</p>
4	<p>a) Median            b) Mode            c) HM            d) GM</p>	<p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p>	<p>2</p>
5	<p>a) ii) more than 3            b) mean = 20            mode = 23            SD = 2</p> <p>Coefficient of skewness = <math>\frac{mean - mode}{\sigma}</math>            = <math>\frac{20 - 23}{2}</math>            = <math>\frac{-3}{2} = -1.5</math></p>	<p>1</p> <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p>	<p>2</p>

6	$HM = \frac{2}{\frac{1}{x_1} + \frac{1}{x_2}}$ $= \frac{2}{\frac{1}{M} + \frac{1}{N}}$ $= \frac{2MN}{M+N}$	1  $\frac{1}{2}$  $\frac{1}{2}$	  2
7	Absolute measure = 1 point Relative measure = 1 point	1 1	2
8	$\bar{x} = 780, n = 25$ $\sum x = n\bar{x} = 25 \times 780$ $= 19500$ Correct $\sum x = 19500 + 960 - 690$ $= 19770$ Correct $\bar{x} = \frac{19770}{25}$ $= 790.8$	$\frac{1}{2}$  $\frac{1}{2}$  1	    2
9	Sample space mutually exclusive events	1 1	2
10	19, 23, 24, 24, 25, 26, 30  $Q_1 = 23 \quad Q_3 = 26$ Q.D = $\frac{Q_3 - Q_1}{2}$ $= \frac{26 - 23}{2} = \frac{3}{2}$ $= 1.5$	$\frac{1}{2}$  $\frac{1}{2}$  $\frac{1}{2}$  $\frac{1}{2}$	    2
11	Construction of histogram	2	2
12	Weighted mean = $\frac{\sum wx}{\sum w}$ $= \frac{6+8+7+2 \times 6+8+2 \times 9}{8}$ $= \frac{59}{8} = 7.375$	1    1	    2
13	a) Actuarial science b) MOSPI - two points	1 2	3

14	a) Focus Group Discussion b) Direct observation or Any other suitable method c) Mailed questionnaire or Any other suitable method	1 1 1	3
15	a) Percentage bar diagram or Component or sub-divided b) 20% c) % for food = 30%  amount spent for food = $6000 \times \frac{30}{100}$ = 1800	1 1  1	3
16	$l = 40$ $f_0 = 50$ $f_1 = 80$ $f_2 = 55$ $c = 10$  Mode = $l + \frac{(f_1 - f_0)c}{2f_1 - f_0 - f_2}$ = $40 + \frac{(80 - 50) \times 10}{2 \times 80 - 50 - 55}$ = $40 + \frac{300}{55}$ = 45.45	1  1    1/2  1/2	3
17	Mean = 28 class      f          x          fx 0 - 10      12          5          60 10 - 20     18          15         270 20 - 30     27          25         675 30 - 40      x          35         35x 40 - 50     17          45         765 50 - 60      6          55         330 $\frac{6}{80+x}$ $\frac{330}{2100+35x}$  $\bar{x} = \frac{\sum fx}{\sum f}$  $28 = \frac{2100+35x}{80+x}$ $28(80+x) = 2100 + 35x$ $2240 + 28x - 35x = 2100$ 1      3 -7x                           =      2100 - 2240  x                           = $\frac{-140}{-7} = 20$  x                           =      20	1 1/2          1/2  1/2    1/2	3

18	Questionnaire 6 questions	3	3																																			
19	<table border="1"> <thead> <tr> <th></th> <th colspan="3">Plus one</th> <th colspan="3">Plus two</th> </tr> <tr> <th></th> <th>M</th> <th>F</th> <th>T</th> <th>M</th> <th>F</th> <th>T</th> </tr> </thead> <tbody> <tr> <td>Science</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Commerce</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Humanities</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>		Plus one			Plus two				M	F	T	M	F	T	Science							Commerce							Humanities							3	3
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20	<p>Factory A</p> $CV = \frac{\sigma}{x} \times 100$ $= \frac{10}{810} \times 100$ $= 1.235$ <p>Factory B</p> $CV = \frac{12}{960} \times 100$ $= 1.25$ <p>CV (factory A) &lt; CV (factory B) ∴ Factory A has greater consistency</p>	$\frac{1}{2}$  1  1  $\frac{1}{2}$	3																																			
21	<table> <thead> <tr> <th>x</th> <th>f</th> <th> x - mode </th> <th>f x - mode </th> </tr> </thead> <tbody> <tr> <td>0</td> <td>2</td> <td>2</td> <td>4</td> </tr> <tr> <td>1</td> <td>6</td> <td>1</td> <td>6</td> </tr> <tr> <td>2</td> <td>12</td> <td>0</td> <td>0</td> </tr> <tr> <td>3</td> <td>5</td> <td>1</td> <td>5</td> </tr> <tr> <td>4</td> <td><u>3</u></td> <td>2</td> <td><u>6</u></td> </tr> <tr> <td></td> <td><b>28</b></td> <td></td> <td><b>21</b></td> </tr> </tbody> </table> <p>Mode = 2</p> <p>Mean deviation about mode = <math>\frac{\sum f x - \text{mode} }{\sum f}</math></p> $= \frac{21}{28}$ $= 0.75$	x	f	x - mode	f x - mode	0	2	2	4	1	6	1	6	2	12	0	0	3	5	1	5	4	<u>3</u>	2	<u>6</u>		<b>28</b>		<b>21</b>	$1\frac{1}{2}$  $\frac{1}{2}$  1	3							
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22	$\begin{aligned} Q_1 + Q_3 &= 100 \\ \text{Median} &= 48 \\ S &= 0.2 \\ S &= \frac{Q_3 + Q_1 - 2\text{median}}{Q_3 - Q_1} \\ 0.2 &= \frac{100 - 2 \times 48}{Q_3 - Q_1} \\ Q_3 - Q_1 &= \frac{100 - 96}{0.2} \\ Q_3 - Q_1 &= 20 \\ Q_3 + Q_1 &= 100 \\ 2Q_3 &= 120 \\ Q_3 &= 60 \\ Q_1 &= 40 \end{aligned}$	$\frac{1}{2}$      $\frac{1}{2}$      $\frac{1}{2}$  $\frac{1}{2}$    1	                 3
23	<p>a. (iii) 1</p> <p>b. P (selection 1 black ball) = <math>\frac{3}{16}</math> = 0.1875</p> <p>P (selection non blue ball) = <math>\frac{10}{16}</math> = 0.625</p>	1      1   1	       3
24	Proper curves Locating mean, median and mode	$1\frac{1}{2}$ $1\frac{1}{2}$	3

25	<table border="1" style="margin-bottom: 10px;"> <thead> <tr> <th>Class</th> <th>Tally</th> <th>f</th> <th>cf</th> </tr> </thead> <tbody> <tr> <td>10 - 20</td> <td>  </td> <td>2</td> <td>2</td> </tr> <tr> <td>20 - 30</td> <td>    </td> <td>5</td> <td>7</td> </tr> <tr> <td>30 - 40</td> <td>       </td> <td>7</td> <td>14</td> </tr> <tr style="border: 2px solid black;"> <td>40 - 50</td> <td>        </td> <td>8</td> <td>22</td> </tr> <tr> <td>50 - 60</td> <td>        </td> <td>8</td> <td>30</td> </tr> <tr> <td>60 - 70</td> <td>        </td> <td>8</td> <td>38</td> </tr> <tr> <td>70 - 80</td> <td>  </td> <td>2</td> <td>40</td> </tr> <tr> <td colspan="2"></td> <td style="text-align: center;">40</td> <td></td> </tr> </tbody> </table> <p>Median = <math>l + \frac{\left(\frac{N}{2} - m\right) \times c}{f}</math></p> <p>N = 40, <math>\frac{N}{2} = 20</math>, l = 40, m = 14, c = 10, f = 8</p> <p>Median = <math>40 + \frac{\left(\frac{40}{2} - 14\right) \times 10}{8}</math> = 47.5</p> <p>OR Calculation of median using raw data</p>	Class	Tally	f	cf	10 - 20		2	2	20 - 30		5	7	30 - 40		7	14	40 - 50		8	22	50 - 60		8	30	60 - 70		8	38	70 - 80		2	40			40		2	5
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26	<p>a. 19</p> <p>b. Drawing ogive</p> <p>c. Select answer from the ogive</p>	1 3 1	5																																				
27	<p>a. median</p> <p>b.</p> <table border="1" style="margin-bottom: 10px;"> <thead> <tr> <th>x</th> <th>f</th> <th>fx</th> <th>fx<sup>2</sup></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>7</td> <td>7</td> <td>7</td> </tr> <tr> <td>2</td> <td>4</td> <td>8</td> <td>16</td> </tr> <tr> <td>3</td> <td>6</td> <td>18</td> <td>54</td> </tr> <tr> <td>4</td> <td>2</td> <td>8</td> <td>32</td> </tr> <tr> <td>5</td> <td>1</td> <td>5</td> <td>25</td> </tr> <tr> <td></td> <td>20</td> <td>46</td> <td>134</td> </tr> </tbody> </table> <p>sd <math>\sigma = \sqrt{\frac{\sum fx^2}{N} - \left(\frac{\sum fx}{N}\right)^2}</math></p> <p>= <math>\sqrt{\frac{134}{20} - \left(\frac{46}{20}\right)^2}</math></p> <p>= <math>\sqrt{6.7 - 5.29}</math></p> <p>= <math>\sqrt{1.41}</math></p> <p>= 1.19</p>	x	f	fx	fx <sup>2</sup>	1	7	7	7	2	4	8	16	3	6	18	54	4	2	8	32	5	1	5	25		20	46	134	1  2  1  $\frac{1}{2}$  $\frac{1}{2}$	5								
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