

Registration Number

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INDIAN INSTITUTE OF HANDLOOM TECHNOLOGY

Bargarh/Fulia/Guwahati/Jodhpur/Salem/Varanasi/Champa/Kannur/KHTI-Gadag/SPKM-Venkatagiri

Diploma in Handloom & Textile Technology

APRIL/MAY-2024 SEMESTER EXAMINATION

(Regulation-2021)

Semester : 01

Time:3 Hours

Course Code & Title : **BS101 Mathematics - I**

Maximum Marks: 100

PART-A

(10×2=20 Marks)

Answer all the questions within two to three sentences

1. Find the value of $\sin 32^\circ \cos 28^\circ + \cos 32^\circ \sin 28^\circ$, by using trigonometric formulae.
2. Find the value of $\frac{\tan 20^\circ + \tan 25^\circ}{1 - \tan 20^\circ \tan 25^\circ}$.
3. Evaluate $\lim_{x \rightarrow -2} (2x + 5)$
4. If $y = \frac{1}{2} + x^3$, find $\frac{dy}{dx}$
5. Find the total number of ways strings arranging by using letters in the word "HANDLOOM".
6. Find the value of ${}^{15}C_{13}$.
7. State Baye's theorem.
8. If $P(A) = \frac{1}{2}$, $P(B) = \frac{1}{3}$, $P(A \cap B) = \frac{1}{18}$, Find $P(A \cup B)$.
9. Write formula to find the control limits of np - chart.
10. Find the average of 12,14,7,6,10,10,11,12,5,18,12,4,4,9,21,14,8,9,13,21.

PART-B

((6+10)×5=80 Marks)

Answer all the questions in detail

11. A. Prove that $\frac{\sin 2A}{1 - \cos 2A} = \cot A$ (6)
B. Prove that $\sin 3A = 3\sin A - 4\sin^3 A$. (10)
(OR)
C. Prove that $\frac{1 - \cos 2A + \sin 2A}{1 + \cos 2A + \sin 2A} = \tan A$ (6)
D. Find the value of $\tan 75^\circ$ by using trigonometric formula and hence prove that (10)
 $\tan 75^\circ + \cot 75^\circ = 4$

12. A. Evaluate : $\lim_{x \rightarrow -4} \left(\frac{\frac{1}{4} + \frac{1}{x}}{4+x} \right)$ (6)

B. Find $\frac{dy}{dx}$, If $y = (x^2 + 1)^3(x^2 - 1)^4$ (10)

(OR)

C. If $y = x^2 + 3x^{-4} - e^{5x} + \cos x$ then find $\frac{dy}{dx}$ (6)

D. Differentiate $y = \sqrt{\frac{1+x}{1-x}}$ with respect to x . (10)

13. A. Prove that $10C_2 + (2 \times 10C_3) + 10C_4 = 12C_4$ (6)

B. Find the middle term in the expansion of $(x + y)^7$. (10)

(OR)

C. Find the co-efficient of x^6 in the expansion of $(3 + 2x)^{10}$ (6)

D. A committee of 7 people has to be formed from 8 men and 4 women. How many ways can it be done with following conditions: (i) exactly 3 women, (ii).Atleast 3 women, (iii)Atmost 3 women (10)

14. A. Two dice are rolled together, find the probability of getting sum of faces as 4. (6)

B. A bag contains 4 blue colour yarns and 5 red colour yarns, two yarns are drawn at random : (i).What is the probability that, the first drawn yarn is red and second drawn yarn is blue, (ii). What is the probability that, the first drawn yarn is blue and the second drawn yarn is red, (iii). What is the probability that the first drawn yarn is red and second drawn yarn is also red. (10)

(OR)

C. If $P(A) = \frac{1}{4}$, $P(B) = \frac{1}{2}$ and $P(A \cap B) = \frac{1}{8}$, Find (i). $P(A \cup B)$, (ii). $P(\bar{A} \cap \bar{B})$ (6)

D. In a bolt manufacturing factory there are three machines 'A, B and C' used. 0.25, 0.35 and 0.4 are the probability of bolt manufacture by A,B and C respectively. In their output the probability for defective is 0.05,0.04 and 0.02 respectively. A bolt is drawn from the product and it found to be defective. What is the probability that it was manufactured by machine A. (10)

15. A. In a factory 1000 products are examined 15days. Calculate np -chart control (6)

limits for the data: 9,10,12,8,7,15,10,12,10,8,7,13,14,15,16.

- B. The following are the sample mean and range for 10 samples of size 5. (10)

Construct the control chart for mean and command on the process of control:

| | | | | | | | | | | |
|------------------|----|----|----|----|----|----|----|----|----|----|
| Sample number : | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Mean \bar{X} : | 52 | 50 | 50 | 51 | 47 | 52 | 49 | 54 | 51 | 54 |
| Range R : | 6 | 7 | 6 | 5 | 6 | 9 | 8 | 7 | 7 | 4 |

(OR)

- C. Explain about control chart with type. (6)

- D. 15 types of fabrics are examined for quality control test, The number of defects in each fabric are given below. Draw the appropriate control chart and comment on state of control (10)

| | | | | | | | | | | | | | | | |
|----------------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|
| Fabric | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| No. of defects | 2 | 4 | 3 | 1 | 1 | 2 | 5 | 3 | 6 | 7 | 3 | 1 | 4 | 2 | 1 |

Table : Quality Control - Chart Constants

| Sample Size | Chart for average \bar{X} -chart | | | σ -chart — Chart for Standard Deviations | | | | Chart for Ranges — R-chart | | | | | |
|-------------|------------------------------------|-------|-------|---|----------------------------|-------|-------|----------------------------|----------------------------|-------|-------|-------|-------|
| | Factors for Control Limits | | | Factors for Central line | Factors for Control Limits | | | Factors for Central line | Factors for Control Limits | | | | |
| n | A | A_1 | A_2 | C_2 | B_1 | B_2 | B_3 | B_4 | d_2 | D_1 | D_2 | D_3 | D_4 |
| 2 | 2.121 | 3.760 | 1.880 | 0.5642 | 0 | 1.843 | 0 | 3.267 | 1.128 | 0 | 3.686 | 0 | 3.262 |
| 3 | 1.732 | 2.394 | 1.023 | 0.7236 | 0 | 1.858 | 0 | 2.568 | 1.663 | 0 | 4.358 | 0 | 2.575 |
| 4 | 1.500 | 1.880 | 0.729 | 0.7979 | 0 | 1.808 | 0 | 2.266 | 2.059 | 0 | 4.698 | 0 | 2.282 |
| 5 | 0.342 | 1.596 | 0.577 | 7.8407 | 0 | 1.756 | 0 | 2.089 | 2.326 | 0 | 4.918 | 0 | 2.115 |
| 6 | 1.225 | 1.410 | 0.483 | 0.8686 | 0.026 | 0.711 | 0.030 | 1.970 | 2.534 | 0 | 5.078 | 0 | 2.004 |
| 7 | 1.134 | 1.277 | 0.419 | 0.8882 | 0.105 | 1.672 | 0.118 | 1.882 | 2.704 | 0.205 | 5.203 | 0.076 | 1.924 |
| 8 | 1.061 | 1.175 | 0.373 | 0.9027 | 0.167 | 1.638 | 0.185 | 1.815 | 2.847 | 0.387 | 5.307 | 0.136 | 1.864 |
| 9 | 1.000 | 1.094 | 0.337 | 0.9139 | 0.219 | 1.609 | 0.239 | 1.760 | 2.970 | 0.546 | 5.394 | 0.184 | 1.816 |
| 10 | 0.949 | 1.028 | 0.308 | 0.9227 | 0.262 | 1.584 | 0.284 | 1.716 | 3.078 | 0.687 | 5.469 | 0.223 | 1.777 |
| 11 | 0.905 | 0.973 | 0.285 | 0.9300 | 0.299 | 1.561 | 0.321 | 1.679 | 3.173 | 0.812 | 5.534 | 0.256 | 1.744 |
| 12 | 0.866 | 0.925 | 0.266 | 0.9359 | 0.331 | 1.541 | 0.354 | 1.646 | 3.258 | 0.924 | 5.592 | 0.284 | 1.716 |
| 13 | 0.832 | 0.884 | 0.249 | 0.9410 | 0.359 | 1.523 | 0.382 | 1.618 | 3.336 | 1.026 | 5.646 | 0.308 | 1.692 |
| 14 | 0.802 | 0.848 | 0.235 | 0.9453 | 0.384 | 1.507 | 0.406 | 1.594 | 3.407 | 1.121 | 5.693 | 0.329 | 1.671 |
| 15 | 0.775 | 0.816 | 0.223 | 0.9490 | 0.406 | 1.492 | 0.428 | 1.572 | 3.472 | 1.207 | 5.737 | 0.348 | 1.652 |
| 16 | 0.750 | 0.788 | 0.212 | 0.9523 | 0.427 | 1.478 | 0.448 | 1.552 | 3.532 | 1.285 | 5.779 | 0.364 | 1.636 |
| 17 | 0.728 | 0.762 | 0.203 | 0.9551 | 0.445 | 1.465 | 0.466 | 1.534 | 3.588 | 1.359 | 5.817 | 0.379 | 1.621 |
| 18 | 0.707 | 0.738 | 0.194 | 0.9576 | 0.461 | 1.454 | 0.482 | 1.518 | 3.640 | 1.426 | 5.854 | 0.392 | 1.608 |
| 19 | 0.688 | 0.717 | 0.184 | 0.9599 | 0.477 | 1.443 | 0.497 | 1.503 | 3.689 | 1.490 | 5.888 | 0.404 | 1.596 |
| 20 | 0.671 | 0.697 | 0.110 | 0.9619 | 0.491 | 1.433 | 0.510 | 1.490 | 3.735 | 1.544 | 5.922 | 0.418 | 1.586 |

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Diploma in Handloom & Textile Technology

APRIL/MAY-2024 SEMESTER EXAMINATION

(Regulation-2021)

Semester : 01

Time:3 Hours

Course Code & Title : **BS105 Applied Chemistry**

Maximum Marks: 100

PART-A

(10×2=20 Marks)

Answer all the questions within two to three sentences

1. Define Heisenberg uncertainty principle. Write the mathematical expression for it.
2. What is the mole fraction of a solute? What will be its unit?
3. Name some salts that cause hardness of water. What is the unit of hardness?
4. What is Coagulation? Give one example of a coagulant?
5. Define ore and gangue.
6. Write the name and structure of the following polymers. a) PS b) PTFE
7. Differentiate between primary and secondary fuel with examples.
8. What are Octane numbers and Cetane numbers?
9. Define Faraday's law of electrolysis.
10. What are organic inhibitors?

PART-B

((6+10)×5=80 Marks)

Answer all the questions in detail

11. A. Explain the anomalous properties of NH_3 and H_2O due to hydrogen bonding. (6)
B. What are Quantum numbers? Elaborate principal quantum number, azimuthal quantum number & magnetic quantum number with two examples of each? (10)
- (OR)
- C. State any four concentration terms that are used to express the concentration of a solution. Write their units. (6)
- D. What is Rutherford's atomic model? What are the primary observations and limitations of his model? (10)
12. A. Define the process of sedimentation, filtration and sterilization of water. (6)
B. Elaborate the problems caused by the use of hard water in the boiler? (10)

(OR)

- C. Explain the cause of poor lathering of soap in hard water. (6)
- D. Describe the process of water softening technique using Zeolites method. (10)
How it is regenerated?

13. A. What is the degree of polymerization? Differentiate between homopolymers and copolymers. (6)
- B. Explain the preparation properties and uses of the Nylon 6,6 and PVC . (10)

(OR)

- C. What is the difference between flux and slag? Name any two ores of iron and copper. (6)
- D. Illustrate the general principles and processes of extraction of metals from its ores. (10)

14. A. A sample of coal has the following composition by mass C = 70 %, O = 8 %, H = 10 %, N = 3 %, S = 2%, Ash = 7 %. Calculate H.C.V. and L.C.V. using the Dulong's formula. (6)
- B. What can be estimated using proximate analysis of coal and what are its significance? Elaborate. (10)

(OR)

- C. State any three chemical properties of lubricants. (6)
- D. Elucidate any three physical properties of lubricants. What are the functions and characteristics of good lubricants? (10)

15. A. What are the factors affecting the rate of corrosion? (6)
- B. Differentiate between chemical and electrochemical corrosion with examples. (10)

(OR)

- C. What is a redox reaction? Explain the electronic concept of Oxidation and reduction. (6)
- D. What is Lead acid battery? Explain the construction, working and uses of it. (10)

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Diploma in Handloom & Textile Technology

APRIL/MAY-2024 SEMESTER EXAMINATION

(Regulation-2021)

Semester : 01

Time:3 Hours

Course Code & Title : **HS101 Communication Skills in English**

Maximum Marks:100

PART-A

(10×2=20 Marks)

Answer all the questions within two to three sentences

1. Define Communication.
2. What is Soft Skills?
3. What is 'Feedback' in communication process?
4. Explain 'Emotional Intelligence' as a life skill.
5. What is précis writing?
6. Write any one advantage of E-mail writing?
7. Who is the writer of the story Uncle Podger Hangs a Picture?
8. **Identify the following lines and name the poem from which these lines have been taken:-**

The woods are lovely, dark and deep,
But I have promises to keep,
And miles to go before I sleep,
And miles to go before I sleep.

9. **Fill in the blanks with appropriate verb forms:**
 - a) The shop_____ (opens/open) at 9 o'clock in the morning.
 - b) There _____ (was/were) too many people in the room.
10. **Fill in the blanks with suitable prepositions:**
 - a) The cat is sitting_____ the table. (below/under)
 - b) He resigned _____ his post last week. (from/of)

PART-B

(6+10)×5=80 Marks)

Answer all the questions in detail

11. **A.** Explain types of communication. (6)
- B.** Describe the art of effective communication. (10)

(OR)

- C. Explain barriers to effective communication. (6)
- D. Explain 7Cs for effective communication. (10)
12. A. Write a short note on the following life skills: (6)
- a) Emotional Intelligence
 - b) Self Awareness
- B. Explain the importance of Soft Skills. (10)
- (OR)**
- C. How soft skill is different from hard skill? Explain. (6)
- D. Explain the importance of 'Time Management' and Leadership' as an important life skill. (10)
13. A. **I watched the flame feeding on my mother.** (6)
- I watched the holy man perform his rites to tame the poison with an incantation. After twenty hours it lost its sting.**
- i. Write the name of the poem from which the above lines have been taken.
 - ii. Who is 'I' in the above passage?
 - iii. After how many hours did the bite lost its sting?
- B. **Read the passage given below and answer the questions that follow:-** (10)
- R.K. Narayan is one of the most widely read and appreciated Indian writers of the 20th century. His creation of the fictitious town of Malgudi and the adorable prankster Swami has earned him many accolades. His stories hold up a mirror to his readers. R.K. Narayan was born on 10 October, 1906 in Madras (now Chennai). His father was a school teacher and his initial years were spent with his grandmother. He studied Tamil and English during the early years of his schooling and later moved to Mysore (now Mysuru) with his parents. He graduated from Maharaja College of Mysore.
- As a writer R.K.Narayan started his literary career with the publication of short stories in the newspaper, The Hindu. His first novel was *Swami and Friends* which won the approval and patronage of another celebrated author, Graham Greene, who got it published. A succession of novels and stories followed in the wake of the success of Narayan's first novel. The most important R.K. Narayan's novels are *The Bachelor of Arts*, *The Financial Expert*, *The Guide*, which was made into a blockbuster Hindi movie, *The Man-Eater of Malgudi* and *The Talkative Man*. The most famous collection of his stories include *Malgudi days*, *An Astrologer's Day and other stories*, *Under the Banyan Tree and other stories* and *Grandmother's Tale* and

selected Stories. R.K.Narayan received the Sahitya Akademi Award in 1958, the Padma Bhushan in 1964 and the Padma Vibhushan in 2000. He passed away on 13 May, 2001.

- i. When and where R.K. Narayan was born?
- ii. From where R.K.Narayan did his schooling?
- iii. Which was R.K.Narayan's first novel?
- iv. Name the awards that were given to Narayan for his literary achievements.
- v. When did R.K.Narayan died?

(OR)

C. **Where words come from the depth of truth;** (6)

Where tireless striving stretches its arm towards perfection;

Where the clear stream of reasons has not lost its way

Into the dreary sand of dead habit.

- i. Who is the poet of the above mentioned lines?
- ii. What does the line 'Where words come from the depth of truth' mean?
- iii. What has the poet compared reason and dead habit with?

D. **Read the passage given below and answer the questions that follow:-** (10)

One dollar and eighty-seven cents. That was all. And sixty cents of it was in pennies. Pennies saved one and two at a time by bulldozing the grocer and the vegetable man and the butcher until one's cheeks burned with the silent imputation of parsimony that such close dealing implied. Three times Della counted it. One dollar and eighty-seven cents. And the next day would be Christmas.

There was clearly nothing left to do but flop down on the shabby little couch and howl. So Della did it. Which instigates the moral reflection that life is made up of sobs, sniffles, and smiles, with sniffles predominating?

- i. Write the name of the story from which the above passage has been taken.
- ii. Write the name of the writer of the passage.
- iii. Why Della was sad?
- iv. Write the meaning of the word 'sniffles'.
- v. Identify the proper noun in the above passage.

- 14. A. Read the passage given below and summarize it by giving appropriate title:-** (6)

Man first appeared on earth half a million years ago. Then he was little more than an animal. Even so, early man had certain advantages over animals. He had a large brain; he had an upright body with quick-moving hands. He invented a language to communicate with his fellow men. This ability to speak was of supreme value because it allowed men to share ideas and plan together: speech enabled ideas to be passed on from generation to generation. These special advantages put men far ahead of all other living creatures. Since those far-off times, when he first made his appearance, man has achieved a great deal.

- B. Write a letter to the Director of your Institute requesting permission to go on an Industrial visit.** (10)

(OR)

- C. Write an email to your sister congratulating her on getting a new job.** (6)
D. Write a letter to your brother advising him to work hard at his studies so that he may get a first class. (10)

- 15. A. Pick out Nouns in the following sentences:** (6)

- a) Cows are grazing.
- b) Army marched forward.
- c) He went to Kanpur

- B. Change the following sentences into their negative forms:** (10)

- a) She speaks English.
- b) I saw a dog in the street.
- c) Mohan plays cricket.
- d) Radha sings well.
- e) She has written an article.

(OR)

- C. Pick out Pronouns in the following sentences:** (6)

- a) They are good boys.
- b) Trees shed their leaves in autumn.
- c) She has completed her work.

D. Change the following sentences into passive voice:

(10)

- a) She wrote a letter.
- b) Jacob always plays the guitar.
- c) They are eating bananas.
- d) The teacher called the student.
- e) Astha was learning French.

BS102 – Applied Mathematics - II

Values of $F_{0.05}$

| ν_2 = Degrees of freedom for denominator | ν_1 = Degrees of freedom for numerator | | | | | | | | | | | | | | | | | | |
|--|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 12 | 15 | 20 | 25 | 30 | 40 | 60 | 120 | ∞ |
| 1 | 161 | 200 | 216 | 225 | 230 | 234 | 237 | 239 | 241 | 242 | 244 | 246 | 248 | 249 | 250 | 251 | 252 | 253 | 254 |
| 2 | 18.51 | 19.00 | 19.16 | 19.25 | 19.30 | 19.33 | 19.35 | 19.37 | 19.38 | 19.40 | 19.41 | 19.43 | 19.45 | 19.46 | 19.47 | 19.48 | 19.49 | 19.50 | 19.50 |
| 3 | 10.13 | 9.55 | 9.28 | 9.12 | 9.01 | 8.94 | 8.89 | 8.85 | 8.81 | 8.79 | 8.74 | 8.70 | 8.66 | 8.63 | 8.62 | 8.59 | 8.57 | 8.55 | 8.53 |
| 4 | 7.71 | 6.94 | 6.59 | 6.39 | 6.26 | 6.16 | 6.09 | 6.04 | 6.00 | 5.96 | 5.91 | 5.86 | 5.80 | 5.77 | 5.75 | 5.72 | 5.69 | 5.66 | 5.63 |
| 5 | 6.61 | 5.79 | 5.41 | 5.19 | 5.05 | 4.95 | 4.88 | 4.82 | 4.77 | 4.74 | 4.68 | 4.62 | 4.56 | 4.52 | 4.50 | 4.46 | 4.43 | 4.40 | 4.37 |
| 6 | 5.99 | 5.14 | 4.76 | 4.53 | 4.39 | 4.28 | 4.21 | 4.15 | 4.10 | 4.06 | 4.00 | 3.94 | 3.87 | 3.83 | 3.81 | 3.77 | 3.74 | 3.70 | 3.67 |
| 7 | 5.59 | 4.74 | 4.35 | 4.12 | 3.97 | 3.87 | 3.79 | 3.73 | 3.68 | 3.64 | 3.57 | 3.51 | 3.44 | 3.40 | 3.38 | 3.34 | 3.30 | 3.27 | 3.23 |
| 8 | 5.32 | 4.46 | 4.07 | 3.84 | 3.69 | 3.58 | 3.50 | 3.44 | 3.39 | 3.35 | 3.28 | 3.22 | 3.15 | 3.11 | 3.08 | 3.04 | 3.01 | 2.97 | 2.93 |
| 9 | 5.12 | 4.26 | 3.86 | 3.63 | 3.48 | 3.37 | 3.29 | 3.23 | 3.18 | 3.14 | 3.07 | 3.01 | 2.94 | 2.89 | 2.86 | 2.83 | 2.79 | 2.75 | 2.71 |
| 10 | 4.96 | 4.10 | 3.71 | 3.48 | 3.33 | 3.22 | 3.14 | 3.07 | 3.02 | 2.98 | 2.91 | 2.85 | 2.77 | 2.73 | 2.70 | 2.66 | 2.62 | 2.58 | 2.54 |
| 11 | 4.84 | 3.98 | 3.59 | 3.36 | 3.20 | 3.09 | 3.01 | 2.95 | 2.90 | 2.85 | 2.79 | 2.72 | 2.65 | 2.60 | 2.57 | 2.53 | 2.49 | 2.45 | 2.40 |
| 12 | 4.75 | 3.89 | 3.49 | 3.26 | 3.11 | 3.00 | 2.91 | 2.85 | 2.80 | 2.75 | 2.69 | 2.62 | 2.54 | 2.50 | 2.47 | 2.38 | 2.38 | 2.34 | 2.30 |
| 13 | 4.67 | 3.81 | 3.41 | 3.18 | 3.03 | 2.92 | 2.83 | 2.77 | 2.71 | 2.67 | 2.60 | 2.53 | 2.46 | 2.39 | 2.34 | 2.31 | 2.27 | 2.22 | 2.18 |
| 14 | 4.60 | 3.74 | 3.34 | 3.11 | 2.96 | 2.85 | 2.76 | 2.70 | 2.65 | 2.60 | 2.53 | 2.46 | 2.39 | 2.34 | 2.31 | 2.27 | 2.22 | 2.18 | 2.13 |
| 15 | 4.54 | 3.68 | 3.29 | 3.06 | 2.90 | 2.79 | 2.71 | 2.64 | 2.59 | 2.54 | 2.48 | 2.40 | 2.33 | 2.28 | 2.25 | 2.20 | 2.16 | 2.11 | 2.07 |
| 16 | 4.49 | 3.63 | 3.24 | 3.01 | 2.85 | 2.74 | 2.66 | 2.59 | 2.54 | 2.49 | 2.42 | 2.35 | 2.28 | 2.23 | 2.19 | 2.15 | 2.11 | 2.06 | 2.01 |
| 17 | 4.45 | 3.59 | 3.20 | 2.96 | 2.81 | 2.70 | 2.61 | 2.55 | 2.49 | 2.45 | 2.38 | 2.31 | 2.23 | 2.18 | 2.15 | 2.10 | 2.06 | 2.01 | 1.96 |
| 18 | 4.41 | 3.55 | 3.16 | 2.93 | 2.77 | 2.66 | 2.58 | 2.51 | 2.46 | 2.41 | 2.34 | 2.27 | 2.19 | 2.14 | 2.11 | 2.06 | 2.02 | 1.97 | 1.92 |
| 19 | 4.38 | 3.52 | 3.13 | 2.90 | 2.74 | 2.63 | 2.54 | 2.48 | 2.42 | 2.38 | 2.31 | 2.23 | 2.16 | 2.11 | 2.07 | 2.03 | 1.98 | 1.93 | 1.88 |
| 20 | 4.35 | 3.49 | 3.10 | 2.87 | 2.71 | 2.60 | 2.51 | 2.45 | 2.39 | 2.35 | 2.28 | 2.20 | 2.12 | 2.07 | 2.04 | 1.99 | 1.95 | 1.90 | 1.84 |
| 21 | 4.32 | 3.47 | 3.07 | 2.84 | 2.68 | 2.57 | 2.49 | 2.42 | 2.37 | 2.32 | 2.25 | 2.18 | 2.10 | 2.05 | 2.01 | 1.96 | 1.92 | 1.87 | 1.81 |
| 22 | 4.30 | 3.44 | 3.05 | 2.82 | 2.66 | 2.55 | 2.46 | 2.40 | 2.34 | 2.30 | 2.23 | 2.15 | 2.07 | 2.02 | 1.98 | 1.94 | 1.89 | 1.84 | 1.78 |
| 23 | 4.28 | 3.42 | 3.03 | 2.80 | 2.64 | 2.53 | 2.44 | 2.37 | 2.32 | 2.27 | 2.20 | 2.13 | 2.05 | 2.00 | 1.96 | 1.91 | 1.86 | 1.81 | 1.76 |
| 24 | 4.26 | 3.40 | 3.01 | 2.78 | 2.62 | 2.51 | 2.42 | 2.36 | 2.30 | 2.25 | 2.18 | 2.11 | 2.03 | 1.97 | 1.94 | 1.89 | 1.84 | 1.79 | 1.73 |
| 25 | 4.24 | 3.39 | 2.99 | 2.76 | 2.60 | 2.49 | 2.40 | 2.34 | 2.28 | 2.24 | 2.16 | 2.09 | 2.01 | 1.96 | 1.92 | 1.87 | 1.82 | 1.77 | 1.71 |
| 30 | 4.17 | 3.32 | 2.92 | 2.69 | 2.53 | 2.42 | 2.33 | 2.27 | 2.21 | 2.16 | 2.09 | 2.01 | 1.93 | 1.88 | 1.84 | 1.79 | 1.74 | 1.68 | 1.62 |
| 40 | 4.08 | 3.23 | 2.84 | 2.61 | 2.45 | 2.34 | 2.25 | 2.18 | 2.12 | 2.08 | 2.00 | 1.92 | 1.84 | 1.78 | 1.74 | 1.69 | 1.64 | 1.58 | 1.51 |
| 60 | 4.00 | 3.15 | 2.76 | 2.53 | 2.37 | 2.25 | 2.17 | 2.10 | 2.04 | 1.99 | 1.92 | 1.84 | 1.75 | 1.69 | 1.65 | 1.59 | 1.53 | 1.47 | 1.39 |
| 120 | 3.92 | 3.07 | 2.68 | 2.45 | 2.29 | 2.18 | 2.09 | 2.02 | 1.96 | 1.91 | 1.83 | 1.75 | 1.66 | 1.60 | 1.55 | 1.50 | 1.43 | 1.35 | 1.25 |
| ∞ | 3.84 | 3.00 | 2.60 | 2.37 | 2.21 | 2.10 | 2.01 | 1.94 | 1.88 | 1.83 | 1.75 | 1.67 | 1.57 | 1.51 | 1.46 | 1.39 | 1.32 | 1.22 | 1.00 |

Values of $F_{0.01}$

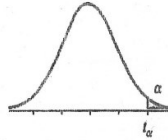
| ν_2 = Degrees of freedom for denominator | ν_1 = Degrees of freedom for numerator | | | | | | | | | | | | | | | | | | |
|--|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 12 | 15 | 20 | 25 | 30 | 40 | 60 | 120 | ∞ |
| 1 | 4.052 | 5.000 | 5.403 | 5.625 | 5.764 | 5.859 | 5.928 | 5.982 | 6.023 | 6.056 | 6.106 | 6.157 | 6.209 | 6.240 | 6.261 | 6.287 | 6.313 | 6.339 | 6.366 |
| 2 | 98.50 | 99.00 | 99.17 | 99.25 | 99.30 | 99.33 | 99.36 | 99.37 | 99.39 | 99.40 | 99.42 | 99.43 | 99.45 | 99.46 | 99.57 | 99.47 | 99.48 | 99.49 | 99.50 |
| 3 | 34.12 | 30.82 | 29.46 | 27.71 | 28.24 | 27.91 | 27.67 | 27.49 | 27.35 | 27.23 | 27.05 | 26.87 | 26.69 | 26.58 | 26.50 | 26.41 | 26.32 | 26.22 | 26.13 |
| 4 | 21.20 | 18.00 | 16.69 | 15.98 | 15.52 | 15.21 | 14.98 | 14.80 | 14.66 | 14.55 | 14.37 | 14.20 | 14.02 | 13.91 | 13.84 | 13.75 | 13.65 | 13.56 | 13.46 |
| 5 | 16.26 | 13.27 | 12.06 | 11.39 | 10.97 | 10.67 | 10.46 | 10.29 | 10.16 | 10.05 | 9.89 | 9.72 | 9.55 | 9.45 | 9.38 | 9.29 | 9.20 | 9.11 | 9.02 |
| 6 | 13.75 | 10.92 | 9.78 | 9.15 | 8.75 | 8.47 | 8.26 | 8.10 | 7.98 | 7.87 | 7.72 | 7.56 | 7.40 | 7.30 | 7.23 | 7.14 | 7.06 | 6.97 | 6.88 |
| 7 | 12.25 | 9.55 | 8.45 | 7.85 | 7.46 | 7.19 | 6.99 | 6.84 | 6.72 | 6.62 | 6.47 | 6.31 | 6.16 | 6.06 | 5.99 | 5.91 | 5.82 | 5.74 | 5.65 |
| 8 | 11.26 | 8.65 | 7.59 | 7.01 | 6.63 | 6.37 | 6.18 | 6.03 | 5.91 | 5.81 | 5.67 | 5.52 | 5.36 | 5.26 | 5.20 | 5.12 | 5.03 | 4.95 | 4.86 |
| 9 | 10.56 | 8.02 | 6.99 | 6.42 | 6.06 | 5.80 | 5.61 | 5.47 | 5.35 | 5.26 | 5.11 | 4.96 | 4.81 | 4.71 | 4.65 | 4.57 | 4.48 | 4.40 | 4.31 |
| 10 | 10.04 | 7.56 | 6.55 | 5.99 | 5.64 | 5.39 | 5.20 | 5.06 | 4.94 | 4.85 | 4.71 | 4.56 | 4.41 | 4.31 | 4.25 | 4.17 | 4.08 | 4.00 | 3.91 |
| 11 | 9.65 | 7.21 | 6.22 | 5.67 | 5.32 | 5.07 | 4.89 | 4.74 | 4.63 | 4.54 | 4.40 | 4.25 | 4.10 | 4.01 | 3.94 | 3.86 | 3.78 | 3.69 | 3.60 |
| 12 | 9.33 | 6.93 | 5.95 | 5.41 | 5.06 | 4.82 | 4.64 | 4.50 | 4.39 | 4.30 | 4.16 | 4.01 | 3.86 | 3.76 | 3.70 | 3.62 | 3.54 | 3.45 | 3.36 |
| 13 | 9.07 | 6.70 | 5.74 | 5.21 | 4.86 | 4.62 | 4.44 | 4.30 | 4.19 | 4.10 | 3.96 | 3.82 | 3.66 | 3.57 | 3.51 | 3.43 | 3.34 | 3.25 | 3.17 |
| 14 | 8.86 | 6.51 | 5.56 | 5.04 | 4.69 | 4.46 | 4.28 | 4.14 | 4.03 | 3.94 | 3.80 | 3.66 | 3.51 | 3.41 | 3.35 | 3.27 | 3.18 | 3.09 | 3.00 |
| 15 | 8.68 | 6.36 | 5.42 | 4.89 | 4.56 | 4.32 | 4.14 | 4.00 | 3.89 | 3.80 | 3.67 | 3.52 | 3.37 | 3.28 | 3.21 | 3.13 | 3.05 | 2.96 | 2.87 |
| 16 | 8.53 | 6.23 | 5.29 | 4.77 | 4.44 | 4.20 | 4.03 | 3.89 | 3.78 | 3.69 | 3.55 | 3.41 | 3.26 | 3.16 | 3.10 | 3.02 | 2.93 | 2.84 | 2.75 |
| 17 | 8.40 | 6.11 | 5.18 | 4.67 | 4.34 | 4.10 | 3.93 | 3.79 | 3.68 | 3.59 | 3.46 | 3.31 | 3.16 | 3.07 | 3.00 | 2.92 | 2.83 | 2.75 | 2.65 |
| 18 | 8.29 | 6.01 | 5.09 | 4.58 | 4.25 | 4.01 | 3.84 | 3.71 | 3.60 | 3.51 | 3.37 | 3.23 | 3.08 | 2.98 | 2.92 | 2.84 | 2.75 | 2.66 | 2.57 |
| 19 | 8.18 | 5.93 | 5.01 | 4.50 | 4.17 | 3.94 | 3.77 | 3.63 | 3.52 | 3.43 | 3.30 | 3.15 | 3.00 | 2.91 | 2.84 | 2.76 | 2.67 | 2.58 | 2.49 |
| 20 | 8.10 | 5.85 | 4.94 | 4.43 | 4.10 | 3.87 | 3.70 | 3.56 | 3.46 | 3.37 | 3.23 | 3.09 | 2.94 | 2.84 | 2.78 | 2.69 | 2.61 | 2.52 | 2.42 |
| 21 | 8.02 | 5.78 | 4.87 | 4.37 | 4.04 | 3.81 | 3.64 | 3.51 | 3.40 | 3.31 | 3.17 | 3.03 | 2.88 | 2.79 | 2.72 | 2.64 | 2.55 | 2.46 | 2.36 |
| 22 | 7.95 | 5.72 | 4.82 | 4.31 | 3.99 | 3.76 | 3.59 | 3.45 | 3.35 | 3.26 | 3.12 | 2.98 | 2.83 | 2.73 | 2.67 | 2.58 | 2.50 | 2.40 | 2.31 |
| 23 | 7.88 | 5.66 | 4.76 | 4.26 | 3.94 | 3.71 | 3.54 | 3.41 | 3.30 | 3.21 | 3.07 | 2.93 | 2.78 | 2.69 | 2.62 | 2.54 | 2.45 | 2.35 | 2.26 |
| 24 | 7.82 | 5.61 | 4.72 | 4.22 | 3.90 | 3.67 | 3.50 | 3.36 | 3.26 | 3.17 | 3.03 | 2.89 | 2.74 | 2.64 | 2.58 | 2.49 | 2.40 | 2.31 | 2.21 |
| 25 | 7.77 | 5.57 | 4.68 | 4.18 | 3.85 | 3.63 | 3.46 | 3.32 | 3.22 | 3.13 | 2.99 | 2.85 | 2.70 | 2.60 | 2.54 | 2.45 | 2.36 | 2.27 | 2.17 |
| 30 | 7.56 | 5.39 | 4.51 | 4.02 | 3.70 | 3.47 | 3.30 | 3.17 | 3.07 | 2.98 | 2.84 | 2.70 | 2.55 | 2.45 | 2.39 | 2.30 | 2.21 | 2.11 | 2.01 |
| 40 | 7.31 | 5.18 | 4.31 | 3.83 | 3.51 | 3.29 | 3.12 | 2.99 | 2.89 | 2.80 | 2.66 | 2.52 | 2.37 | 2.27 | 2.20 | 2.11 | 2.02 | 1.92 | 1.80 |
| 60 | 7.08 | 4.98 | 4.13 | 3.65 | 3.34 | 3.12 | 2.95 | 2.82 | 2.72 | 2.63 | 2.50 | 2.35 | 2.20 | 2.10 | 2.03 | 1.94 | 1.84 | 1.73 | 1.60 |
| 120 | 6.85 | 4.79 | 3.95 | 3.48 | 3.17 | 2.96 | 2.79 | 2.66 | 2.56 | 2.47 | 2.34 | 2.19 | 2.03 | 1.93 | 1.86 | 1.76 | 1.66 | 1.53 | 1.38 |
| ∞ | 6.63 | 4.61 | 3.78 | 3.32 | 3.02 | 2.80 | 2.64 | 2.51 | 2.41 | 2.32 | 2.18 | 2.04 | 1.88 | 1.77 | 1.70 | 1.59 | 1.47 | 1.32 | 1.00 |

t-Table

| <i>v</i> | Probability | | | | |
|----------|-------------|-------|--------|--------|--------|
| | 0.9 | 0.1 | 0.05 | 0.02 | 0.01 |
| 1 | 0.158 | 6.314 | 12.706 | 31.821 | 63.657 |
| 2 | 0.142 | 2.920 | 4.303 | 6.965 | 9.925 |
| 3 | 0.137 | 2.353 | 3.182 | 4.541 | 5.841 |
| 4 | 0.134 | 2.132 | 2.776 | 3.747 | 4.604 |
| 5 | 0.132 | 2.015 | 2.571 | 3.365 | 4.032 |
| 6 | 0.131 | 1.943 | 2.447 | 3.143 | 3.707 |
| 7 | 0.130 | 1.895 | 2.365 | 2.998 | 3.496 |
| 8 | 0.130 | 1.860 | 2.306 | 2.896 | 3.355 |
| 9 | 0.129 | 1.833 | 2.262 | 2.821 | 3.250 |
| 10 | 0.129 | 1.812 | 2.228 | 2.764 | 3.169 |
| 11 | 0.129 | 1.796 | 2.201 | 2.718 | 3.106 |
| 12 | 0.128 | 1.782 | 2.179 | 2.681 | 3.055 |
| 13 | 0.128 | 1.771 | 2.160 | 2.650 | 3.012 |
| 14 | 0.128 | 1.761 | 2.145 | 2.624 | 2.977 |
| 15 | 0.128 | 1.753 | 2.131 | 2.602 | 2.947 |
| 16 | 0.128 | 1.746 | 2.120 | 2.583 | 2.921 |
| 17 | 0.128 | 1.740 | 2.110 | 2.567 | 2.898 |
| 18 | 0.127 | 1.734 | 2.101 | 2.552 | 2.878 |
| 19 | 0.127 | 1.729 | 2.093 | 2.539 | 2.861 |
| 20 | 0.127 | 1.725 | 2.086 | 2.528 | 2.845 |
| 21 | 0.127 | 1.721 | 2.080 | 2.518 | 2.831 |
| 22 | 0.127 | 1.717 | 2.074 | 2.508 | 2.819 |
| 23 | 0.127 | 1.714 | 2.069 | 2.500 | 2.807 |
| 24 | 0.127 | 1.711 | 2.064 | 2.492 | 2.797 |
| 25 | 0.127 | 1.708 | 2.060 | 2.485 | 2.787 |
| 30 | 0.127 | 1.697 | 2.042 | 2.457 | 2.750 |
| 40 | 0.126 | 1.684 | 2.021 | 2.423 | 2.704 |
| 60 | 0.126 | 1.671 | 2.000 | 2.390 | 2.660 |
| 120 | 0.126 | 1.658 | 1.980 | 2.358 | 2.617 |
| ∞ | 0.126 | 1.645 | 1.960 | 2.326 | 2.576 |

STATISTICAL TABLES

Values of t_{α}



| v | $\alpha = 0.10$ | $\alpha = 0.05$ | $\alpha = 0.025$ | $\alpha = 0.01$ | $\alpha = 0.00833$ | $\alpha = 0.00625$ | $\alpha = 0.005$ | v |
|------|-----------------|-----------------|------------------|-----------------|--------------------|--------------------|------------------|------|
| 1 | 3.078 | 6.314 | 12.706 | 31.821 | 38.204 | 50.923 | 63.657 | 1 |
| 2 | 1.886 | 2.920 | 4.303 | 6.965 | 7.650 | 8.860 | 9.925 | 2 |
| 3 | 1.638 | 2.353 | 3.182 | 4.541 | 4.857 | 5.392 | 5.841 | 3 |
| 4 | 1.533 | 2.132 | 2.776 | 3.747 | 3.961 | 4.315 | 4.604 | 4 |
| 5 | 1.476 | 2.015 | 2.571 | 3.365 | 3.534 | 3.810 | 4.032 | 5 |
| 6 | 1.440 | 1.943 | 2.447 | 3.143 | 3.288 | 3.521 | 3.707 | 6 |
| 7 | 1.415 | 1.895 | 2.365 | 2.998 | 3.128 | 3.335 | 3.499 | 7 |
| 8 | 1.397 | 1.860 | 2.306 | 2.896 | 3.016 | 3.206 | 3.355 | 8 |
| 9 | 1.383 | 1.833 | 2.262 | 2.821 | 2.934 | 3.111 | 3.250 | 9 |
| 10 | 1.372 | 1.812 | 2.228 | 2.764 | 2.870 | 3.038 | 3.169 | 10 |
| 11 | 1.363 | 1.796 | 2.201 | 2.718 | 2.820 | 2.961 | 3.106 | 11 |
| 12 | 1.356 | 1.782 | 2.179 | 2.681 | 2.780 | 2.934 | 3.055 | 12 |
| 13 | 1.350 | 1.771 | 2.160 | 2.650 | 2.746 | 2.896 | 3.012 | 13 |
| 14 | 1.345 | 1.761 | 2.145 | 2.624 | 2.718 | 2.864 | 2.977 | 14 |
| 15 | 1.341 | 1.753 | 2.131 | 2.602 | 2.694 | 2.837 | 2.947 | 15 |
| 16 | 1.337 | 1.746 | 2.120 | 2.583 | 2.673 | 2.813 | 2.921 | 16 |
| 17 | 1.333 | 1.740 | 2.110 | 2.567 | 2.655 | 2.793 | 2.898 | 17 |
| 18 | 1.330 | 1.734 | 2.101 | 2.552 | 2.639 | 2.775 | 2.878 | 18 |
| 19 | 1.328 | 1.729 | 2.093 | 2.539 | 2.625 | 2.759 | 2.861 | 19 |
| 20 | 1.325 | 1.725 | 2.086 | 2.528 | 2.613 | 2.744 | 2.845 | 20 |
| 21 | 1.323 | 1.721 | 2.080 | 2.518 | 2.602 | 2.732 | 2.831 | 21 |
| 22 | 1.321 | 1.717 | 2.074 | 2.508 | 2.591 | 2.720 | 2.819 | 22 |
| 23 | 1.319 | 1.714 | 2.069 | 2.500 | 2.582 | 2.710 | 2.807 | 23 |
| 24 | 1.318 | 1.711 | 2.064 | 2.492 | 2.574 | 2.700 | 2.797 | 24 |
| 25 | 1.316 | 1.708 | 2.060 | 2.485 | 2.566 | 2.692 | 2.787 | 25 |
| 26 | 1.315 | 1.706 | 2.056 | 2.479 | 2.559 | 2.684 | 2.779 | 26 |
| 27 | 1.314 | 1.703 | 2.052 | 2.473 | 2.553 | 2.676 | 2.771 | 27 |
| 28 | 1.313 | 1.701 | 2.048 | 2.467 | 2.547 | 2.669 | 2.763 | 28 |
| 29 | 1.311 | 1.699 | 2.045 | 2.462 | 2.541 | 2.663 | 2.756 | 29 |
| inf. | 1.282 | 1.645 | 1.960 | 2.326 | 2.394 | 2.498 | 2.576 | inf. |

STATISTICAL TABLES

Values of χ^2_{α}

| v | $\alpha = 0.995$ | $\alpha = 0.99$ | $\alpha = 0.975$ | $\alpha = 0.95$ | $\alpha = 0.05$ | $\alpha = 0.025$ | $\alpha = 0.01$ | $\alpha = 0.005$ | v |
|-----|------------------|-----------------|------------------|-----------------|-----------------|------------------|-----------------|------------------|-----|
| 1 | 0.0000393 | 0.000157 | 0.000982 | 0.00393 | 3.841 | 5.024 | 6.635 | 7.879 | 1 |
| 2 | 0.0100 | 0.0201 | 0.0506 | 0.103 | 5.991 | 7.378 | 9.210 | 10.597 | 2 |
| 3 | 0.0717 | 0.115 | 0.216 | 0.352 | 7.815 | 9.348 | 11.345 | 12.838 | 3 |
| 4 | 0.207 | 0.297 | 0.484 | 0.711 | 9.488 | 11.143 | 13.277 | 14.860 | 4 |
| 5 | 0.412 | 0.554 | 0.831 | 1.145 | 11.070 | 12.832 | 15.086 | 16.750 | 5 |
| 6 | 0.676 | 0.872 | 1.237 | 1.635 | 12.592 | 14.449 | 16.812 | 18.548 | 6 |
| 7 | 0.989 | 1.239 | 1.690 | 2.167 | 14.067 | 16.013 | 18.475 | 20.278 | 7 |
| 8 | 1.344 | 1.646 | 2.180 | 2.733 | 15.507 | 17.535 | 20.090 | 21.955 | 8 |
| 9 | 1.735 | 2.088 | 2.700 | 3.325 | 16.919 | 19.023 | 21.666 | 23.589 | 9 |
| 10 | 2.156 | 2.558 | 3.247 | 3.940 | 18.307 | 20.483 | 23.209 | 25.188 | 10 |
| 11 | 2.603 | 3.053 | 3.816 | 4.575 | 19.675 | 21.920 | 24.725 | 26.757 | 11 |
| 12 | 3.074 | 3.571 | 4.404 | 5.226 | 21.026 | 23.337 | 26.217 | 28.300 | 12 |
| 13 | 3.565 | 4.107 | 5.009 | 5.892 | 22.362 | 24.736 | 27.688 | 29.819 | 13 |
| 14 | 4.075 | 4.660 | 5.629 | 6.571 | 23.685 | 26.119 | 29.141 | 31.319 | 14 |
| 15 | 4.601 | 5.229 | 6.262 | 7.261 | 24.996 | 27.488 | 30.578 | 32.801 | 15 |
| 16 | 5.142 | 5.812 | 6.908 | 7.962 | 26.296 | 28.845 | 32.000 | 34.267 | 16 |
| 17 | 5.697 | 6.408 | 7.564 | 8.672 | 27.587 | 30.191 | 33.409 | 35.718 | 17 |
| 18 | 6.265 | 7.015 | 8.231 | 9.390 | 28.869 | 31.526 | 34.805 | 37.156 | 18 |
| 19 | 6.844 | 7.633 | 8.907 | 10.117 | 30.144 | 32.852 | 36.191 | 38.582 | 19 |
| 20 | 7.434 | 8.260 | 9.591 | 10.851 | 31.410 | 34.170 | 37.566 | 39.997 | 20 |
| 21 | 8.034 | 8.897 | 10.283 | 11.591 | 32.671 | 35.479 | 38.932 | 41.401 | 21 |
| 22 | 8.643 | 9.542 | 10.982 | 12.338 | 33.924 | 36.781 | 40.289 | 42.796 | 22 |
| 23 | 9.260 | 10.196 | 11.689 | 13.091 | 35.172 | 38.076 | 41.638 | 44.181 | 23 |
| 24 | 9.886 | 10.856 | 12.401 | 13.848 | 36.415 | 39.364 | 42.980 | 45.558 | 24 |
| 25 | 10.520 | 11.524 | 13.120 | 14.611 | 37.652 | 40.646 | 44.314 | 46.928 | 25 |
| 26 | 11.160 | 12.198 | 13.844 | 15.379 | 38.885 | 41.923 | 45.642 | 48.290 | 26 |
| 27 | 11.808 | 12.879 | 14.573 | 16.151 | 40.113 | 43.194 | 46.963 | 49.645 | 27 |
| 28 | 12.461 | 13.565 | 15.308 | 16.928 | 41.337 | 44.461 | 48.278 | 50.993 | 28 |
| 29 | 13.121 | 14.256 | 16.047 | 17.708 | 42.557 | 45.772 | 49.588 | 52.336 | 29 |
| 30 | 13.787 | 14.953 | 16.791 | 18.493 | 43.773 | 46.979 | 50.892 | 53.672 | 30 |
| 40 | 20.706 | 22.164 | 24.433 | 26.509 | 55.758 | 59.342 | 63.691 | 66.766 | 40 |
| 50 | 27.991 | 29.707 | 32.357 | 34.764 | 67.505 | 71.420 | 76.154 | 79.490 | 50 |
| 60 | 35.535 | 37.485 | 40.482 | 43.118 | 79.082 | 83.298 | 88.379 | 91.952 | 60 |
| 70 | 43.275 | 45.442 | 48.758 | 51.739 | 90.531 | 95.023 | 100.425 | 104.215 | 70 |
| 80 | 51.172 | 53.540 | 57.153 | 60.391 | 101.879 | 106.629 | 112.329 | 116.321 | 80 |
| 90 | 59.196 | 61.754 | 65.646 | 69.126 | 113.145 | 118.136 | 124.116 | 128.299 | 90 |
| 100 | 67.328 | 70.065 | 74.222 | 77.929 | 124.342 | 129.561 | 135.807 | 140.169 | 100 |

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