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Question 1

Mean of grouped data:

Range	f	X	fX
0-10	5	5	25
10-20	8	15	120
20-30	12	25	300
30-40	20	35	700
40-50	10	45	450
50-60	5	55	275

Formula for mean of grouped data:

$$\frac{\Sigma fX}{\Sigma f}$$

$$= \frac{25+120+300+700+450+275}{5+8+12+20+10+5}$$

Mean = 31.167

Question 2

Median of grouped data:

Range	f	cf
1000-2000	3	3
2000-3000	7	10
3000-4000	15	25
4000-5000	25	50
5000-6000	10	60

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Formula for median in grouped data:

$$L + \frac{h}{f}\left(\frac{n}{2} - c\right)$$

Median class:

$N = 60$ $\frac{N}{2} = 30$

Median class is 4000 – 5000

$L = 4000$ $n = 60$

$h = 1000$ $c = 25$

$f = 25$

Median = 4200

Question 3

Mode of grouped data:

Range	f
0 – 10	4
10 – 20	6
20 – 30	15
30 – 40	20
40 – 50	10
50 – 60	5

Modal class 30 – 40

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Formula for mode for grouped data:

$$L + \frac{f_m - f_1}{(f_m - f_1) + (f_m - f_2)} h$$

$L = 30$ | Mode = 33.33

$h = 10$

$f_m = 20$

$f_1 = 15$

$f_2 = 10$

Question 4:

Standard deviation and variance

Class limits	f	Mid (x)	f.x	x^2	fx^2
5 - 8.9	8	6.95	55.6	48.3	386.42
9 - 12.9	20	10.95	219	119.9	2398.05
13 - 16.9	29	14.95	433.55	223.5	6481.57
17 - 20.9	45	18.95	852.75	359.1	16159.61
21 - 24.9	32	22.95	734.4	526.7	16854.48
25 - 28.9	19	26.95	512.05	726.3	13799.75
29 - 32.9	7	30.95	216.65	957.9	6705.32
	$\Sigma f = 160$		$\Sigma fx = 3024$		$\Sigma fx^2 = 62685.$

$$\bar{x} = \frac{\Sigma fx}{\Sigma f} = 18.9$$

$$\sigma^2 = \frac{\Sigma fx^2}{\Sigma fx} - \left(\frac{\Sigma fx}{\Sigma f}\right)^2$$

$$= \frac{62685.2}{160} - (18.9)^2$$

$\sigma^2 = 34.75$

variance = 34.75

St. dev = $\sqrt{34.75}$

= 5.88

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Question 5

Quartiles, Deciles, Percentiles

Q 24 observations

1.11, 1.13, 1.17, 1.21, 1.23, 1.24, 1.25, 1.25, 1.27, 1.27,
1.28, 1.29, 1.30, 1.31, 1.31, 1.32, 1.33, 1.34, 1.35, 1.36
1.36, 1.37, 1.38, 1.39

Upper quartile:

$\frac{3}{4} \times 24 = 18^{th}$ value

Ans = 1.34

3rd decile:

$\frac{3}{10} \times 24 \approx 8^{th}$ value

Ans = 1.25

57th percentile:

$\frac{57}{100} \times 24 \approx 14^{th}$ value

Ans = 1.31

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Question 6:
Probability:

Q A box contains 5 red, 7 green and 8 blue marbl 2 marbles are drawn without replacement. What is the probability that the 2nd marble is blue given that first marble is red.

Total marbles = 20

$P(R) = \frac{5}{20} = \frac{1}{4}$

$P(B|R) = \frac{8}{19}$

Question 7:
Probability

Q A die is rolled twice. What is the probability of getting a sum of 7?

Possible outcomes = (1,6) (2,5) (3,4) (4,3) (5,2) (6,1)

Total outcomes = 6 x 6

Probability = $\frac{1}{6}$

Question 8:
Binomial Distribution

Q A die is rolled 5 times and 5 or 6 is considered success. Find the probability of:

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a) No succers

Formula:

$$P(X=x) = \binom{n}{p} p^{x} q^{1-x}$$

$$P(X=0) = \binom{5}{0} \frac{1}{3}^{0} \cdot \left(\frac{2}{3}\right)^{4-0}$$

$$= \frac{16}{81}$$

b) At least 2 succers

$$P(X \geq 2) = 1 - P(X=0) + P(X=1)$$

$$= 1 - \frac{16}{81} - \binom{5}{1} \frac{1}{3} \cdot \left(\frac{2}{3}\right)^{4}$$

$$= 0.5391$$

Question 9

Binomial Distribution

Q If on avg rain falls on 12 days in every 30, find the probability that the rain will fall on only 3 days of the week.

$$P(X=3) = \binom{7}{3} \cdot \left(\frac{2}{5}\right)^{3} \cdot \left(\frac{3}{5}\right)^{7-3}$$

$$= 0.2903$$

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Question 10
Poisson Distribution

Q For the case of thin copper ~~wire~~ wire, suppose there ~~are 2.3~~ is a mean of 2.3 flaws per millimeter. Determine the probability of:

a) At most 2 flaws per mm

Formula:

$$P(X=x) = \frac{e^{-\mu} \cdot \mu^x}{x!}$$

For $x=0$

$$\frac{e^{-2.3} \cdot 2.3^0}{0!} = 0.1$$

For $x=1$

$$\frac{e^{-2.3} \cdot 2.3}{1} = 0.23$$

For $x=2$

$$\frac{e^{-2.3} \cdot 2.3^2}{2!} = 0.265$$

$$P(X \leq 2) = 0.1 + 0.23 + 0.265 = 0.5961$$

b) exactly 2 flaws ~~per~~ in 2 mm

$$P(X=2) = \frac{4.6^2 e^{-4.6}}{2!} = 0.2421$$

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Question 11
Uniform Distribution

Q The arrival time of an engineer is uniformly distributed in the interval between 8 am to 9 am. Find the probability that the engineer will arrive in the next minute given that she has not arrived by 8:30

A = Event that the engineer arrives in the next min
B = Event that she has not arrived by 8:30

$$P(B) = \frac{30}{60} = 0.5$$

$$P(A \cap B) = \frac{1}{60}$$

$$P(A|B) = \frac{\frac{1}{60}}{0.5} = \frac{1}{30}$$

Question 12:
Normal Distribution:

Q The weights in an orchard are normally distributed with a mean of 150 grams and st dev of 20g. What is the prob that the a randomly selected apple weighs between 130 to 170g?

$$Z_1 = \frac{130 - 150}{20} = -1$$

using normal distribution table
$P(-1 \leq Z \leq 1) = 0.6826$

$$Z_2 = \frac{170 - 150}{20} = 1$$

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Question 13

Q In a city, the length of daily commute times for workers is normally distributed with a mean of 35 mins and st dev of 8 mins. What is the prob that the commute time of a randomly selected worker is more than 50 mins

$$z = \frac{50 - 35}{8} = 1.875$$

Using table:

$P(z > 1.875) = 0.0301$