

Q1:

(a) $2 \times 2 + (5-3) - 3^2 \times 4$ BODMAS
 $2 \times 2 + 2 - 3^2 \times 4$
 $4 + 2 - 36 = 6 - 36 = \underline{-30}$

(b) $(3 \times 2)(-2^2) + 5 - 3 \times 6$ BODMAS
 $6(4) + 5 - 18$
 $24 + 5 - 18 = \underline{11}$

Q2: N = Natural numbers
 Z = whole numbers

Q = Integers
 R = Rational numbers

Q3 (a) Irrational Numbers that cannot be written in the form $\frac{a}{b}$ and never terminate nor repeat $\sqrt{2}$
 (b) Rational $\frac{a}{b}$ Numbers in the form $\frac{a}{b}$ where a and b are whole no's
 (c) Natural $1, 2, 3, \dots$ These are Counting numbers
 (d) Integer Negative and positive whole numbers eg. $-1, 1, 2, -2, \dots$

Q4 (a) 101101

(b) $\begin{matrix} 1 & 1 & 1 & 1 \\ 2 & 2 & 1 & 0 \end{matrix} = 1 \times 2^3 + 1 \times 2^2 + 1 \times 2^1 + 1 \times 2^0 = 8 + 4 + 2 + 1 = 15_{10}$

(c) $\begin{matrix} * & * & * & * & * \\ 2 & 2 & 2 & 2 & 2 \\ 1 & 1 & 0 & 0 & 1 \end{matrix} = 11001_2$

(d) $7 \times 16^3 + 14 \times 16^2 + 3 \times 16^1 + 7 \times 16^0 = 32308$

(e) $\begin{matrix} 3 & 2 & 0 & 1 \\ A & 6 & 7 & 9 \end{matrix} = A679_{16}$

SECTION 2

Q1 (a) $3^{5/2} = 3^{2.5} = 3^2$

(b) $2^{-3} = \frac{1}{2^3}$

Q2: $3^{1/2} = \sqrt{3}$ surd

(b) $\sqrt[3]{72}$ = surd

Q3: (a) $3^4 = 81$ $\log_3 81 = 4$

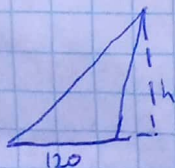
(b) $\log_4 64 = x$ $\Rightarrow 4^x = 64$
 $4^3 = 4^x$ $x = 3$

(c) $\log 4 + \log 3 - \log 6 = \log \left(\frac{4 \times 3}{6} \right) = \log 2$

Section 3

Q1 (a) $\pi(r^2 - b^2) = 45\pi$ (b) $\pi(18) - \pi(12) = 6\pi = 18.849 \text{ m}$

Q2



$\frac{1}{2}bh = LW \Rightarrow \frac{1}{2} \times 120 \times h = 50 \times 18$
 $60h = 900$
 $h = 15 \text{ m}$

Q3: $V = \frac{4}{3}\pi r^2 h =$

$\frac{H}{h} = \frac{R}{r} = \frac{9}{6} = \frac{3}{2}$

$R = \frac{6 \times 6}{9} = 4$

$V = \frac{4}{3}\pi(4^2) \times 6 = 100.53 \text{ cm}^3$

Q1: (a) ~~Volume of ball~~ $V = \pi r^2 h = \pi \times 0.245^2 \times 0.35 = 0.066 \text{ m}^3$
~~(b) $V = \frac{4}{3} \pi r^3 = \frac{4}{3} \pi (0.245)^3 = 0.0275 \text{ m}^3$~~

(b) Volume of sphere $= \frac{4}{3} \pi r^3$
 $r^3 = \frac{3}{4} \pi V = \frac{3}{4} \pi (0.066)$
 $r = 0.245 \text{ m} = 245 \text{ mm}$

(c) $(2.1 \times 1.5 \times 0.35) \times 0.066 = 1.0365 \text{ m}^3$

Section 4

Q1:

(a) $A = \{\text{walk, cycle}\}$ (c) $A \cup B = \{0\}$

(b) $U = \{\text{car, walk, cycle, taxi, train, bus, tram}\}$

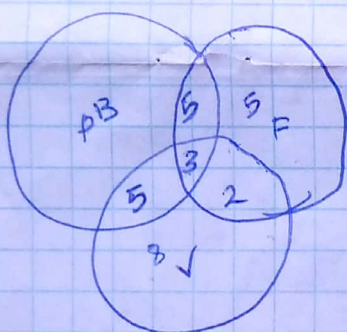
(d) $A \cap B = \{\text{taxi}\}$ (e) $B' = \{\text{walk, cycle, car}\}$

Q2:

(a) $A \cup B = \{1, 2, 3, 5, 7, 9\}$ (c) $Y - X = \{b, i, o, u\}$

(b) $A \cap B = \{3, 5, 7\}$

Q3: Piano P = 16 11 F = Flute 3 PFV
 Violin V = 16 5 PF 5 F 8 V



$P = 16 - 3 = 13$

$F = nF - [n(P \cap F) - n(P \cap F \cap V)]$
 $= 11 - (5 - 3) = 9$

$V = nV - n(P \cap V) = 8$
 $= 8$

$P = nP - (nP \cap F - n(P \cap F \cap V)) = 16 - 3 = 13$
 Piano only = 13

Section 5

Q1: (a)

P	Q	P ∩ Q
0	0	0
0	1	0
1	0	0
1	1	1

AND

(b)

P	Q	P ∩ Q
0	1	0
1	0	0

NOT

(c)

P	Q	P ∩ Q
0	0	0
0	1	1
1	0	1
1	1	1

OR

(d)

P	Q	P ⊕ Q
0	0	0
0	1	1
1	0	1
1	1	0

XOR EXOR

Q12: a) $P, Q, P \cdot Q, (P \cdot Q)', P', Q', P+Q, (P+Q)'$

0	0	0	1	1	1	1
0	1	0	1	1	0	1
1	0	0	1	0	1	1
1	1	1	0	0	0	0

$(P \cdot Q)' = P' + Q'$

b) $(P+Q)' = P' \cdot Q'$

P	Q	P'	Q'	P'Q'	P+Q	(P+Q)'
0	0	1	1	1	0	1
0	1	1	0	0	1	0
1	0	0	1	0	1	0
1	1	0	0	0	1	0

Q13: SECTION 6

Q1: $4! = 24$

b) $5!$
c) $5!$

SECTION 6

Q2: a) LINEAR = $6! = 720$ $Q1: 4! = 24$

b) $5! = 120$

c) $4! + 4! = 48$

d)

Q3: $3! = 6$

b) $5! = 120$

c) $4! = 24$

Q4: $7! \times 5! \div 4 = 8$

b) 2

SECTION 7

Q1: a) 1

b) 0

c) Tossing a coin, probability of obtaining a tail or head is 0.5. There are only 2 possible outcomes i.e. head or tail.

Q2: Blue = 3

White = 4

Red = 5

a) red = $\frac{5}{12}$

b) blue + white = $\frac{3+4}{12} = \frac{7}{12}$

c) Not red = $1 - P(\text{red})$

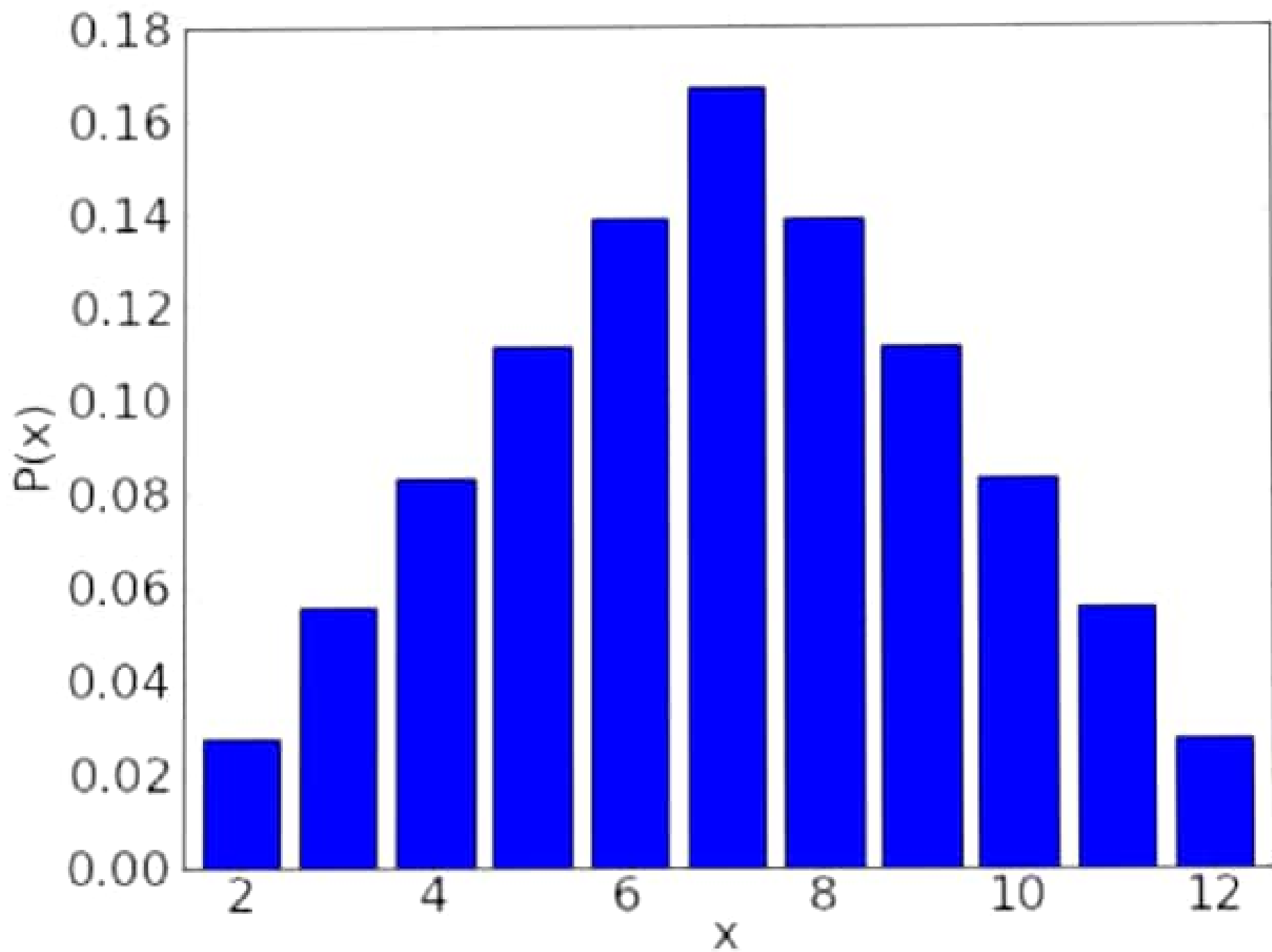
$= 1 - \frac{5}{12} = \frac{7}{12}$

Q3: $\frac{1}{6} \times \frac{1}{52} = \frac{1}{312}$

Q4: a) $\frac{1}{2}$ and $\frac{1}{6}$ number of possibilities = 36

$P(x) = \begin{cases} \frac{1}{36} & \text{if } x \in \{2, 12\} \\ \frac{2}{36} = \frac{1}{18} & \text{if } x \in \{3, 11\} \\ \frac{3}{36} = \frac{1}{12} & \text{if } x \in \{4, 10\} \\ \frac{4}{36} = \frac{1}{9} & \text{if } x \in \{5, 9\} \\ \frac{5}{36} & \text{if } x \in \{6, 8\} \\ \frac{6}{36} = \frac{1}{6} & \text{if } x = 7 \\ 0 & \text{otherwise} \end{cases}$

Most common score = 7



Section 8

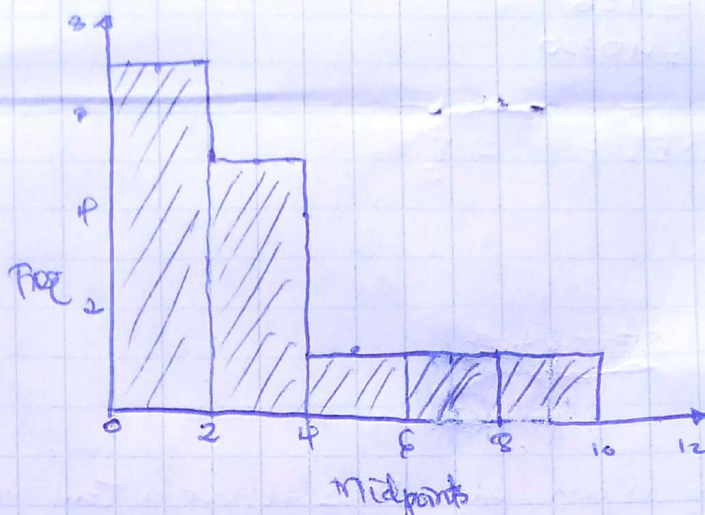
Ph 1; (a) Discrete numbers between consecutive intervals are non divisible i.e. decimals

(b) Data distribution is non-uniform this shows the sampling process might have been biased

(c) ~~Table~~

C-B	f	C.M	C.f
0-2	7	1	7
2-4	5	3	12
4-6	1	5	13
6-8	1	7	14
8-10	1	9	15

$n = 15$



(d) Distribution is skewed : Distribution is more on the left than the right

(e) $R = 0-10$ mins

(f) Modal group = 0-2 min

(g) Median =

$$K = \frac{n}{2} + 1 = \frac{15}{2} + 1 = 8$$

$$\text{Median} = 8 - 12 + \left(\frac{17.5 - 7}{5} \right) 2 = 2.5 + 0.2 = 2.7$$

$$\text{Mean} = \frac{\sum fx}{n} = \frac{3 \times 7 + 3 \times 5 + 5 + 7 + 9}{15} = \frac{43}{15} = 2.867$$

$$SD = \sqrt{\frac{\sum fx^2}{n} - \left(\frac{\sum fx}{n} \right)^2} = \sqrt{\frac{207}{15} - (2.867)^2} = 2.362$$