Pie Charts
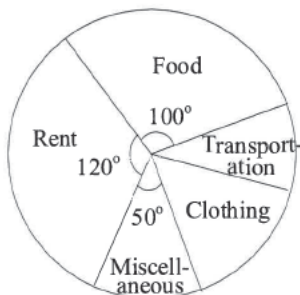
1. The pie chart below shows how Mr. Chan spent $1,800 in April.

   If he spent x on transportation and $2x$ on clothing, what is the value of x?

   A. 450
   B. 300
   C. 150
   D. 60
   E. 30

   [1977-CE-MATHS 2-38]

2. The following table shows how Joan spends her time in a day:
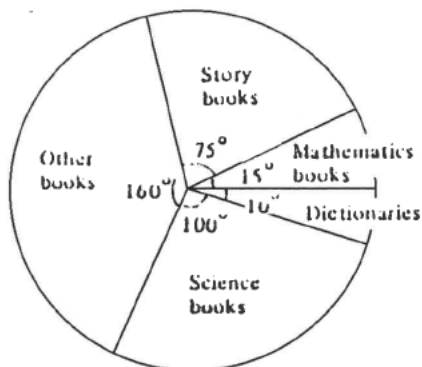
sleep	9 hours
study	6 hours
recreation	5 hours
household work	1 hour
other activities	3 hours

   If these data are shown in a pie chart, what is the size of the angle of the sector for recreation?

   A. $\dfrac{5^\circ}{24}$
   B. 5°
   C. 50°
   D. 75°
   E. 90°
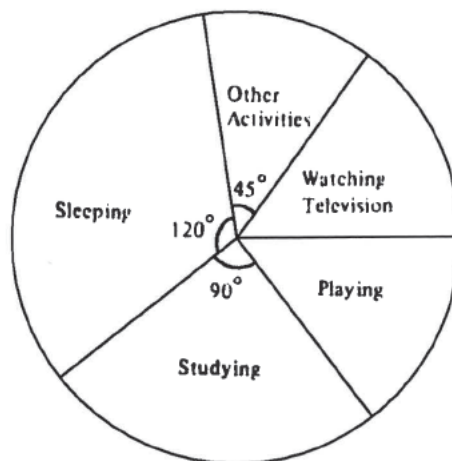
   [SP-CE-MATHS 2-54]

3.

   In a school library, there are 2880 books. The pie chart above shows their distribution by type. How many story books are there

approximately in the library?

   A. 75
   B. 300
   C. 600
   D. 1200
   E. 2160

   [1979-CE-MATHS 2-3]

4.

   The pie chart shows how a boy spends the 24 hours of a day. If the boy spends 4 hours playing, how much time does he spend watching television?

   A. 1 hour
   B. 2 hours
   C. 3 hours
   D. 4 hours
   E. 5 hours

   [1983-CE-MATHS 2-30]

5. In the figure, the pie chart shows the monthly expenditure of a family. If the family spends $4 800 monthly on rent, what is the monthly expenditure on entertainment?
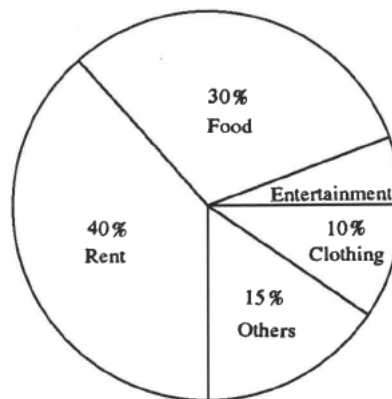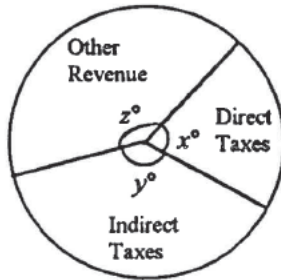

   Monthly Expenditure of a Family

   A. $240
   B. $600
   C. $720
   D. $1 800
   E. $12 000

   [1994-CE-MATHS 2-30]

6. In the pie chart, if $x : y : z = 75 : 106 : 119$, find x.

Total Government Revenue by Sources in a certain year
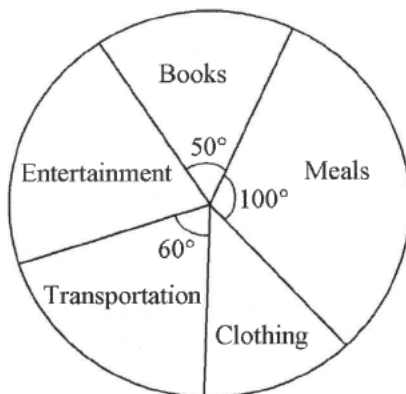
A. 25
B. 45
C. 75
D. 90
E. 120

[1997-CE-MATHS 2-23]

7. The pie chart below shows the expenditure of a family in January 2002. The percentage of the expenditure on Rent was

A. 12.5% .
B. 22.5% .
C. 25% .
D. 45% .

[2002-CE-MATHS 2-33]

8. The pie chart below shows the expenditure of a student in March 2004. If the student spent $520 on meals, then the student's total expenditure on entertainment and clothing was
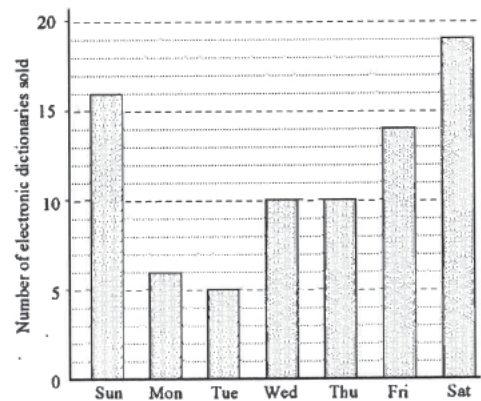

A. $780 .
B. $1 092 .
C. $1 352 .
D. $1 872 .

[2004-CE-MATHS 2-35]

Bar Charts

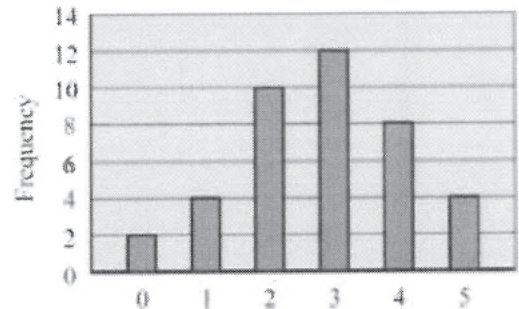9. The bar chart below shows the number of electronic dictionaries sold in a shop last week:

Of those electronic dictionaries sold last week, what percentage were sold on Sunday?

A. 16%
B. 18%
C. 20%
D. 22.5%
E. 25%

[1996-CE-MATHS 2-32]

10. The bar chart below shows the distribution of scores in a test. Find the percentage of scores which are less than 3.
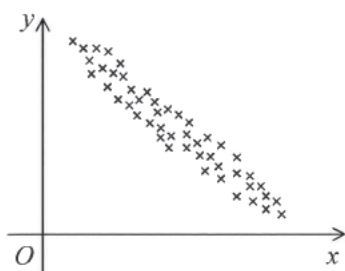

A. 35%
B. 40%
C. 50%
D. 65%
E. 70%

[2001-CE-MATHS 2-5]

Scatter Diagrams

11. The scatter diagram below shows the relation between x and y. Which of the following may represent the relation between x and y?

   A. y varies directly as x^2.
   B. y decreases when x increases.
   C. x increases when y increases.
   D. x remains unchanged when y increases.

   [2006-CE-MATHS 2-36]

12. If y increases when x increases, which of the following scatter diagrams may represent the relation between x and y?

   A.

   B.

   C.

   D.
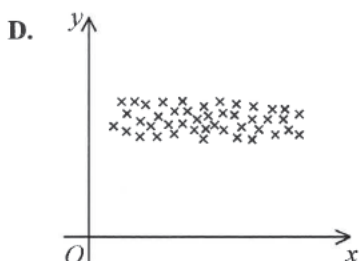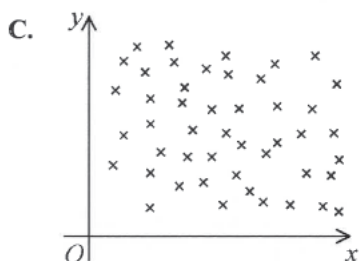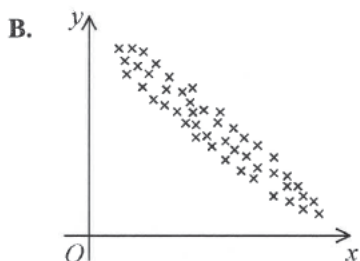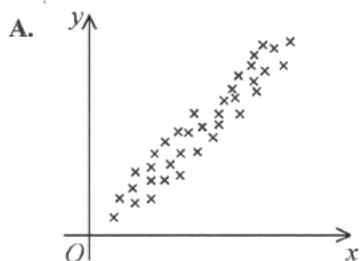
   [2008-CE-MATHS 2-36]

Frequency Curves

13.
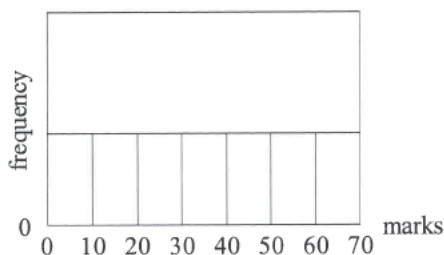
The figure above is the histogram of a distribution. Which of the following could be cumulative frequency curve of this distribution?

   A.   c.f.

   B.   c.f.

   C.   c.f.

   D.   c.f.

   E.   c.f.
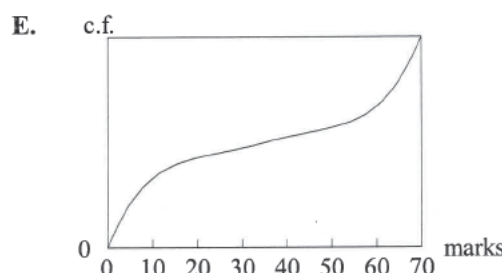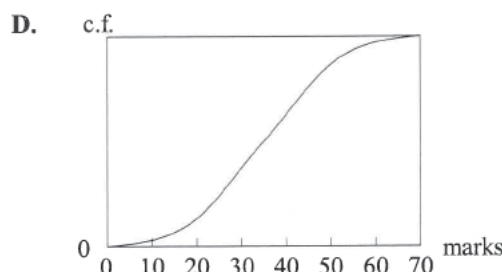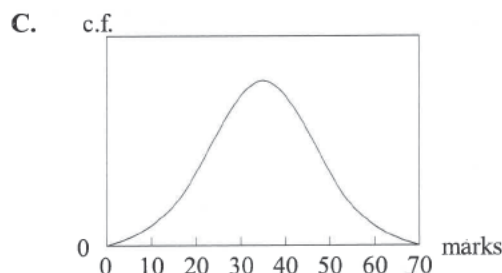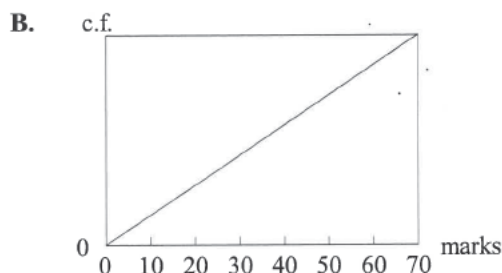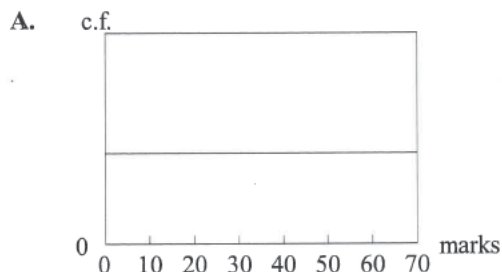
   [1978-CE-MATHS 2-50]

14. The figure shows the frequency curve of a certain distribution.
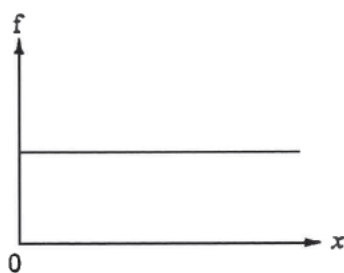
Which of the following can be the distribution's cumulative frequency curve?

A. c.f.

B. c.f.

C. c.f.

D. c.f.

E. c.f.

[1986-CE-MATHS 2-28]

15. The figure shows the cumulative frequency polygon of the heights of 100 persons. If one persons is selected at random from the group, find the probability that his height is less than 170 cm but not less than 150 cm.
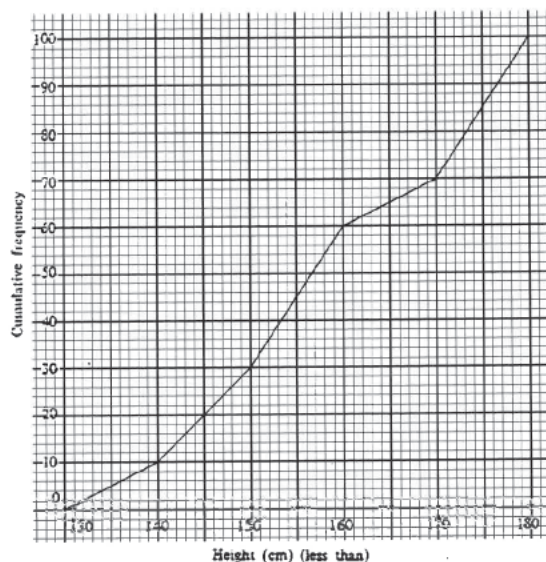
A. $\dfrac{1}{5}$

B. $\dfrac{2}{5}$

C. $\dfrac{3}{5}$

D. $\dfrac{1}{2}$

E. $\dfrac{7}{10}$

[1988-CE-MATHS 2-32]

HKDSE Problems

16. The scatter diagram below shows the relation between x and y. Which of the following may represent the relation between x and y?
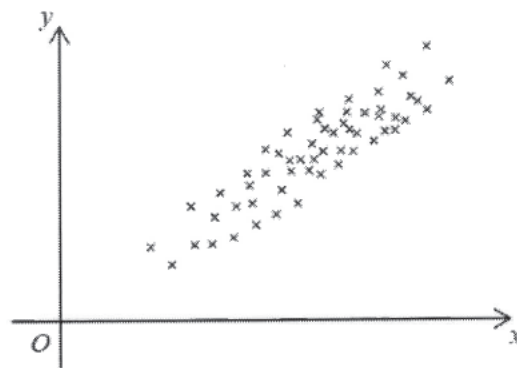
A. y increases when x increases.
B. y decreases when x increases.
C. y varies inversely as x^2.
D. y varies directly as x^{-3}.

[2013-DSE-MATHS 2-28]

Provided by dse.life

17. The pie chart below shows the expenditure of John in a certain week. John spends $240 on clothing that week. Find his expenditure on transportation that week.
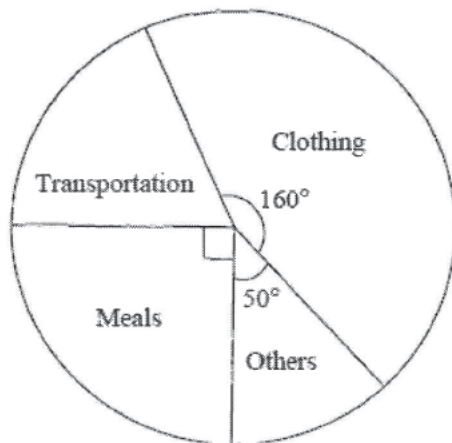
A. $40
B. $60
C. $90
D. $135

[2014-DSE-MATHS 2-29]

Measures of Central Tendency

1. A manufacturer produced 900 transistors in the first week, x in the second week, $3x$ in the third week and 600 in the fourth week. If the mean for the four weeks was 825 transistors, then x is

   A. 206.
   B. 375.
   C. 450.
   D. 750.
   E. 825.

   [1972-CE-MATHS B1-5]

2. The average of x, y is a; that of y, z is b; and that of z, x is c. The average of x, y, z is

   A. $\dfrac{a+b+c}{6}$.
   B. $\dfrac{a+b+c}{3}$.
   C. $\dfrac{a+b+c}{2}$.
   D. $\dfrac{2(a+b+c)}{3}$.
   E. $\dfrac{3(a+b+c)}{2}$.

   [1977-CE-MATHS 2-11]

3. If the average of x, y and z is 4, the average of $x-1$, $y-5$ and $z+3$ is

   A. -1.
   B. 1.
   C. 3.
   D. 5.
   E. 9.

   [SP-CE-MATHS 2-7]

4. The following are the weights in kg of 9 boys:

38	22	40
36	26	30
36	20	40

   What is the median of the distribution?

   A. 26
   B. 30
   C. 35
   D. 36
   E. 38

   [SP-CE-MATHS 2-51]

5. A class consists of 9 children. The following are their scores in a test:

   80 70 80 50 30 55 65 70 40

   What is the median of the distribution of scores?

   A. 50
   B. 55
   C. 60
   D. 65
   E. 70

   [1978-CE-MATHS 2-46]

6. The average of x and y is a, the average of y and z is b, and the average of x and z is c. What is the average of x, y and z?

   A. $\dfrac{1}{6}(a+b+c)$
   B. $\dfrac{1}{3}(a+b+c)$
   C. $\dfrac{1}{2}(a+b+c)$
   D. $\dfrac{2}{3}(a+b+c)$
   E. $\dfrac{3}{2}(a+b+c)$

   [1982-CE-MATHS 2-38]

7.

Class mid-value	Frequency
$m-8$	3
$m-4$	1
m	2
$m+4$	6

   The mean of the above distribution is

   A. $m-\dfrac{1}{3}$.
   B. $m-\dfrac{1}{2}$.
   C. $m-2$.
   D. $m-4$.
   E. m.

   [1985-CE-MATHS 2-30]

8. If the median of the 5 **different** integers 2, 7, 10, x, $2x-3$ is 7, then $x=$

   A. 3.
   B. 4.
   C. 5.
   D. 6.
   E. 8.

   [1987-CE-MATHS 2-29]

9. The maximum load a lift can carry is 600 kg. 11 men with a mean weight of 49 kg are already in the lift. If one more man is to enter the lift, his weight must not exceed

A. 49 kg.
B. 50 kg.
C. 51 kg.
D. 59 kg.
E. 61 kg.

[1988-CE-MATHS 2-29]

10. The mean length of 30 rods is 80 cm. If one of these rods of length 68 cm is taken out and replaced by another rod of length 89 cm, then the new mean length is

A. 79.3 cm.
B. 79.7 cm.
C. 80 cm.
D. 80.3 cm.
E. 80.7 cm.

[1988-CE-MATHS 2-30]

11. Ten years ago, the mean age of a band of 11 musicians was 30. One of them is now leaving the band at the age of 40. What is the present mean age of the remaining 10 musicians?

A. 40
B. 39
C. 37
D. 30
E. 29

[1990-CE-MATHS 2-25]

12. The table shows the mean marks of two classes of students in a mathematics test.

	Number of students	Mean mark
Class A	38	72
Class B	42	54

A student in Class A has scored 91 marks. It is found that his score was wrongly recorded as 19 in the calculation of the mean mark for Class A in the above table. Find the correct mean mark of the 80 students in the two classes.

A. 61.65
B. 62.55
C. 63
D. 63.45
E. 63.9

[1992-CE-MATHS 2-32]

13. Under which of the following condition **must** the mean of n consecutive positive integers also be an integer?

A. n is any positive integer
B. n is any positive odd integer
C. n is any positive even integer
D. n is any multiple of 3
E. n is the square of any positive integer

[1992-CE-MATHS 2-39]

14. A group of n numbers has mean m. If the numbers 1, 2 and 6 are removed from the group, the mean of the remaining $n - 3$ numbers remains unchanged. Find m.

A. 1
B. 2
C. 3
D. 6
E. $n - 3$

[1993-CE-MATHS 2-32]

15. The mean of a set of 9 numbers is 12. If the mean of the first 5 numbers is 8, the mean of the other four numbers is
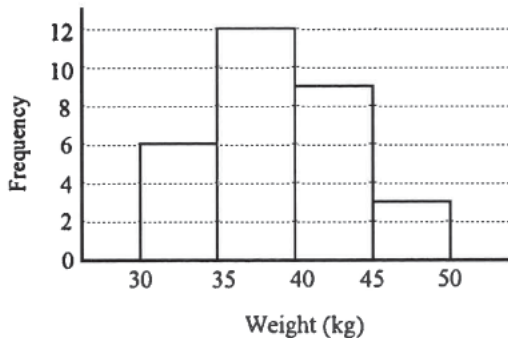
A. 4.
B. 10.
C. 16.
D. 17.
E. 25.

[1995-CE-MATHS 2-33]

16. Which of the following **cannot** be read directly from a cumulative frequency curve?

(1) Mean
(2) Median
(3) Mode

A. (1) only
B. (2) only
C. (1) and (2) only
D. (1) and (3) only
E. (2) and (3) only

[1996-CE-MATHS 2-33]

17. The histogram below shows the distribution of the weights of 30 students. Find the mean weight of these students.

Weight (kg)

A. 36.5 kg
B. 38.5 kg
C. 39 kg
D. 39.5 kg
E. 41.5 kg

[1997-CE-MATHS 2-24]

18. Find the median and mode of the ten numbers

   6, 8, 3, 3, 5, 5, 5, 7, 7, 11.

A. median = 5, mode = 5
B. median = 5, mode = 5.5
C. median = 5.5, mode = 5
D. median = 5.5, mode = 6
E. median = 6, mode = 5

[1999-CE-MATHS 2-33]

19. If the mean of the ten numbers 8, 6, 6, 6, 7, 4, 10, 9, 9, x is 7, find the median of the ten numbers.

A. 5.5
B. 6
C. 6.5
D. 7
E. 7.5

[2001-CE-MATHS 2-21]

20. For the five numbers x, $x - 1$, $x - 2$, x, $x + 8$, which of the following must be true?

   (1) The median is $x - 2$.
   (2) The mean is $x + 1$.
   (3) The mode is 2.

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

[2002-CE-MATHS 2-34]

21. The median of the five numbers 15, $x - 1$, $x - 3$, $x - 4$, and $x + 17$ is 8. Find the mean of the five numbers.

A. 8
B. 12
C. 13.6
D. 14.4

[2003-CE-MATHS 2-33]

22. The mean weight of 36 boys and 32 girls is 46 kg. If the mean weight of the boys is 52 kg, then the mean weight of the girls is

A. 39.25 kg.
B. 40 kg.
C. 40.67 kg.
D. 49 kg.

[2004-CE-MATHS 2-32]

23. If the mean of the five numbers 15, $x + 4$, $x + 1$, $2x - 7$ and $x - 3$ is 6, then the mode of the five numbers is

A. 1.
B. 4.
C. 5.
D. 15.

[2005-CE-MATHS 2-34]

24. If the mode of the seven numbers 8, 7, 1, 3, 7, a and b is 8, then the median of the seven numbers is

A. 3.
B. 6.
C. 7.
D. 8.

[2007-CE-MATHS 2-34]

25. The mean height of 54 boys and 36 girls is 162 cm. If the mean height of the girls is 153 cm, then the mean height of the boys is

A. 147 cm.
B. 157.5 cm.
C. 168 cm.
D. 175.5 cm.

[2009-CE-MATHS 2-35]

26. The weight of seven boys are 70 kg, 55 kg, 53 kg, 56 kg, 64 kg, 54 kg and x kg. If the mean weight of the boys is 58 kg, then the median of their weight is

A. 54 kg.
B. 55 kg.
C. 56 kg.
D. 57 kg.

[2011-CE-MATHS 2-34]

HKDSE Problems

27. Consider the following data:

    19 10 12 12 13 13 14 15 16 m n

    If both the mean and the median of the above data are 14, which of the following are true?

    (1) $m \geq 14$
    (2) $n \leq 16$
    (3) $m + n = 30$

    A. (1) and (2) only
    B. (1) and (3) only
    C. (2) and (3) only
    D. (1), (2) and (3)

    [2012-DSE-MATHS 2-30]

28. If the mean and the mode of the nine numbers 14, 6, 4, 5, 7, 5, x, y and z are 8 and 14 respectively, then the median of these nine numbers is

    A. 5 .
    B. 6 .
    C. 7 .
    D. 8 .

    [2013-DSE-MATHS 2-27]

29. Consider the following integers:

    2 2 3 3 3 3 3 5 5 6 8 8 9 10 m

    Let p, q and r be the mean, the median and the mode of the above integers respectively. If $3 \leq m \leq 5$, which of the following must be true?

    (1) $p > q$
    (2) $p > r$
    (3) $q > r$

    A. (1) only
    B. (2) only
    C. (1) and (3) only
    D. (2) and (3) only

    [2015-DSE-MATHS 2-30]

30. Consider the following data:

    32 68 79 86 88 98 98 a b c

    If the mean and the mode of the above data are 77 and 68 respectively, then the median of the above data is

    A. 76 .
    B. 82 .
    C. 85 .
    D. 93 .

    [2016-DSE-MATHS 2-30]

31. The mean of the numbers of pages of 10 magazines is 132. If the mean of the number of pages of 6 of these 10 magazines is 108, then the mean of the numbers of pages of the remaining 4 magazines is

    A. 148
    B. 156
    C. 168
    D. 176

    [2018-DSE-MATHS 2-29]

32. The table below shows the distribution of the numbers of merits obtained by some students in a year. Which of the following is true?

Number of merits obtained	6	7	8	9	10
Number of students	32	36	28	18	2

    A. The mode of the distribution is 36.
    B. The median of the distribution is 8.
    C. The lower quartile of the distribution is 6.
    D. The upper quartile of the distribution is 10.

    [2020-DSE-MATHS 2-30]

33. Consider the following integers:
    3, 3, 8, 8, 8, 10, 12, m, n
    Let x, y and z be the median, the mean and the mode of the above integers respectively. If the range of the above integers is 9, which of the following must be true?

    I. $x = 8$
    II. $y = 8$
    III. $z = 8$

    A. I only
    B. II only
    C. I and III only
    D. II and III only

    [2020-DSE-MATHS 2-30]

Measures of Dispersion

1. The standard deviation of the five numbers $a - 2d$, $a - d$, a, $a + d$, $a + 2d$, is

   A. 0.
   B. d.
   C. $\sqrt{2}d$.
   D. $\sqrt{5}d$.
   E. $\sqrt{10}d$.

   [1984-CE-MATHS 2-32]

2. Referring to the data 1, 1, 1, 1, 1, 2, 2, 2, 3, which of the following is/are true?

   (1) median < mean
   (2) range = 3
   (3) mode = 3

   A. (1) only
   B. (2) only
   C. (3) only
   D. (1) and (2) only
   E. (1), (2) and (3)

   [1989-CE-MATHS 2-25]

3. If the mean of the numbers 3, 3, 3, 3, 4, 4, 5, 5, 6, x is also x, which of the following is/ are true?

   (1) Mean = Median
   (2) Mode = Range
   (3) Median = Mode

   A. (1) and (2) only
   B. (1) and (3) only
   C. (2) and (3) only
   D. None of them
   E. All of them

   [1990-CE-MATHS 2-24]

4. The standard deviation of the four numbers $m - 7$, $m - 1$, $m + 1$ and $m + 7$ is

   A. 2.5.
   B. 4.
   C. 5.
   D. 10.

   [2002-CE-MATHS 2-54]

5. The standard deviation of the five numbers $10a + 1$, $10a + 3$, $10a + 5$, $10a + 7$ and $10a + 9$ is

   A. 8.
   B. $\dfrac{12}{5}$.
   C. $\sqrt{10}$.
   D. $2\sqrt{2}$.

   [2006-CE-MATHS 2-54]

6. Let a, b, c and d be the mean, the median, the mode and the range of the group of numbers $\{x, x, x, x, x, x, x + 1, x + 1, x + 2, x + 3\}$ respectively. Which of the following must be true?

   (1) $a > b$
   (2) $b > c$
   (3) $c > d$

   A. (1) only
   B. (2) only
   C. (1) and (3) only
   D. (2) and (3) only

   [2010-CE-MATHS 2-34]

7. The bar chart shows the distribution of scores obtained by a group of students in a test. Find the standard deviation of the scores correct to the nearest integer.
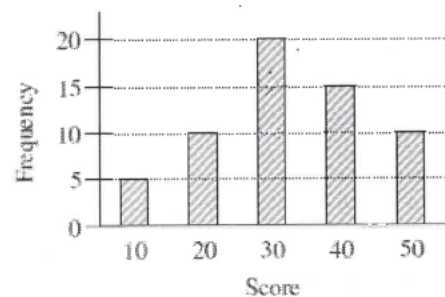
   A. 12
   B. 14
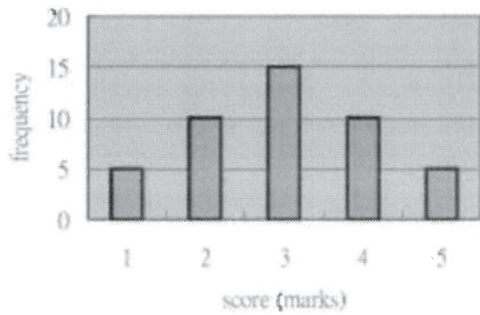   C. 23
   D. 33

   [2010-CE-MATHS 2-35]

Mean Deviation (Out of Current Syllabus)

8. Find the mean deviation of the five numbers $x - 2$, $x - 1$, x, $x + 1$ and $x + 2$.

   A. x.
   B. 0.
   C. $\dfrac{6}{5}$.
   D. $\sqrt{2}$.
   E. $\dfrac{\sqrt{30}}{5}$.

   [1998-CE-MATHS 2-51]

9. The bar chart below shows the distribution of scores of a test. Find the mean deviation of the scores of the test.

score (marks)

A. 0 mark

B. $\dfrac{8}{9}$ mark

C. $\dfrac{2\sqrt{2}}{3}$ mark

D. $\dfrac{2\sqrt{3}}{3}$ marks

E. $\dfrac{6}{5}$ marks

[2000-CE-MATHS 2-47]

10. Find the mean deviation of the five numbers 0 , 3 , 4 , 6 and 7.

A. 0

B. $\dfrac{3}{2}$

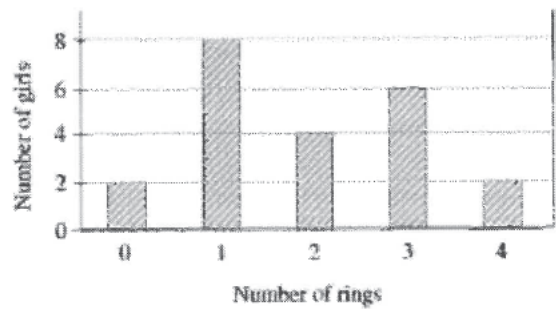C. $\dfrac{\sqrt{10}}{2}$

D. 2

E. $\sqrt{6}$

[2001-CE-MATHS 2-41]

11. The mean deviation of the four numbers $x-8$, $x-2$, $x+3$ and $x+7$ is

A. x .

B. 0 .

C. 5 .

D. 5.6 .

[2004-CE-MATHS 2-54]

HKDSE Problems

12. The bar chart below shows the distribution of the numbers of rings owned by the girls in a group. Find the standard deviation of the distribution correct to 2 decimal places.

Number of rings

A. 1.04
B. 1.16
C. 1.19
D. 2.09

[2012-DSE-MATHS 2-29]

13. Consider the following positive integers:

2   3   4   6   7   9   10 m n

Let a, b and c be the mode, the median and the range of the above positive integers respectively. If the mean of the above positive integers is 5, which of the following must be true?

(1) $a = 2$
(2) $b = 4$
(3) $c = 8$

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

[2017-DSE-MATHS 2-30]

14. There are 49 terms in an arithmetic sequence. If the variance of the first 7 terms of the sequence is 9, then the variance of the last 7 terms of the sequence is

A. 9
B. 18
C. 49
D. 81

[2018-DSE-MATHS 2-45]

15. The bar chart below shows the distribution of the numbers of pens owned by some students. Find the inter-quartile range of the distribution.
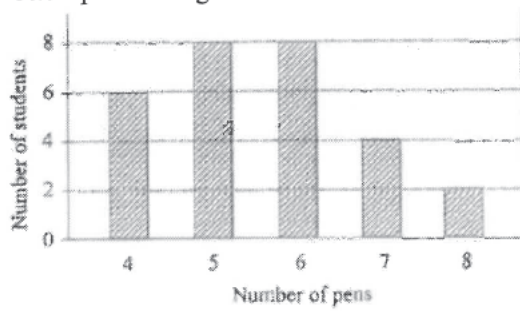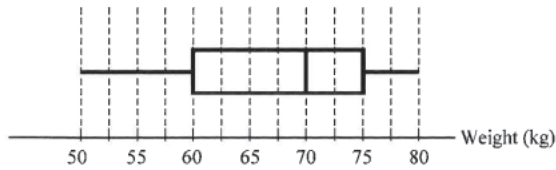

A. 1
B. 2
C. 4
D. 6

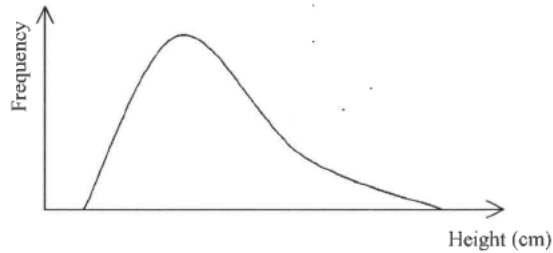[2020-DSE-MATHS 2-29]

Box-and-Whisker Diagram

1. The box-and-whisker diagram below shows the distribution of the weights (in kg) of some students. Find the inter-quartile range of their weights.

Weight (kg)

A. 5 kg
B. 10 kg
C. 15 kg
D. 30 kg

[2006-CE-MATHS 2-35]

2. The frequency curve below shows the distribution of the heights (in cm) of the students in a school.

Height (cm)

Which of the following box-and-whisker diagrams may represent the distribution of their heights?

A.
B.
C.
D.

[2008-CE-MATHS 2-35]

3. The box-and-whisker diagram below shows the distribution of temperatures (in °C) of water in an experiment under various settings. Which of the following are true?
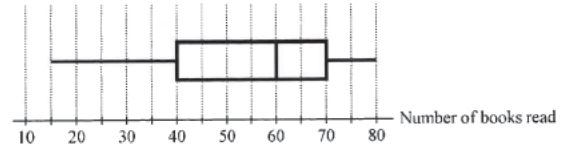

Temperature (°C)
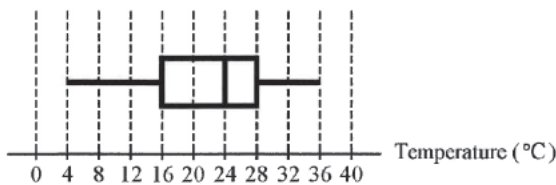
(1) The range is 40 °C.
(2) The median is 24 °C.
(3) The interquartile range is 12 °C.

A. (1) and (2) only

B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2009-CE-MATHS 2-36]

4. The box-and-whisker diagram below shows the distribution of the numbers of books read by some students in a year. Find the inter-quartile range of the numbers of books read.

Number of books read

A. 30
B. 40
C. 55
D. 65

[2010-CE-MATHS 2-36]

5. Which of the following can be obtained from any box-and-whisker diagram?

(1) Mean
(2) Mode
(3) Range
(4) Upper quartile

A. (1) and (2) only
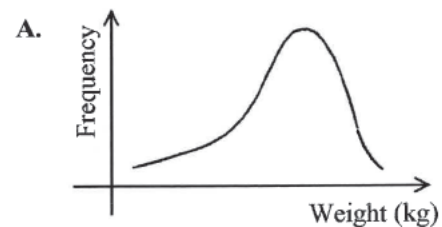B. (1) and (3) only
C. (2) and (4) only
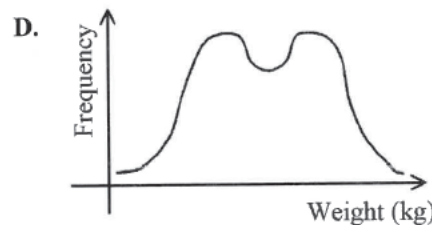D. (3) and (4) only

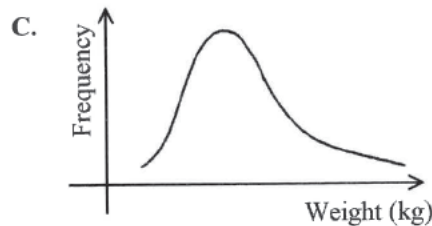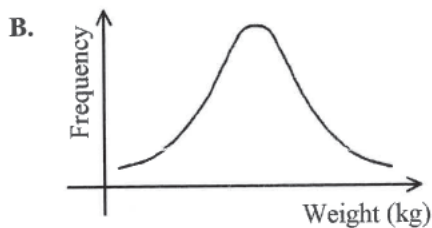[2011-CE-MATHS 2-35]

Stem-and-Leaf Diagram

6. The stem-and-leaf diagram below shows the distribution of the weights (in kg) of some students.

Stem (tens)	Leaf (units)
3	6
4	2 4 5 7 8 9
5	2 3 4 5 5 6 7 8
6	1 2 3 6 7
7	0 5 8
8	4 7
9	3

Which of the following frequency curves may represent the distribution of their weights?

A.

Weight (kg)

B.

C.

D.

[2007-CE-MATHS 2-36]

7. The stem-and-leaf diagram below shows the distribution of the ages of 24 members of a committee.

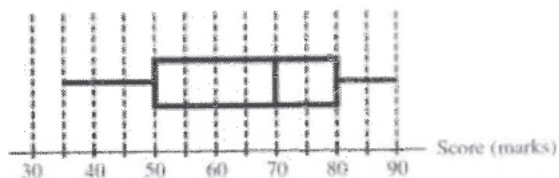| Stem (tens)	Leaf (units)
1	a
2	2 2 3 7 8 8
3	3 3 4 5 5 6 7 9
4	1 1 b 6
5	0 5 8
6	0 1

If the range and the inter-quartile range of the distribution are 42 and 18 respectively, then

A. $a = 8$ and $b = 5$.
B. $a = 8$ and $b = 6$.
C. $a = 9$ and $b = 5$.
D. $a = 9$ and $b = 6$.

[2011-CE-MATHS 2-36]

HKDSE Problems

8. The box-and-whisker diagram below shows the distribution of the scores (in marks) of the students of a class in a test.

If the passing score of the test is 50 marks, then the passing percentage of the class is

A. 25%.
B. 50%.
C. 70%.
D. 75%.

[SP-DSE-MATHS 2-27]

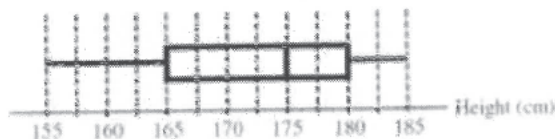9. The stem-and-leaf diagram below shows the distribution of heights (in cm) of 23 staff members in an office.

Stem (tens)	Leaf (units)
15	3 3 4 5 6 7 9
16	1 2 2 3 5 6 6 8
17	1 2 6 7 9
18	2 6 7

Find the median of the distribution.

A. 164 cm
B. 165 cm
C. 165.5 cm
D. 166 cm

[SP-DSE-MATHS 2-28]

10. The box-and-whisker diagram below shows the distribution of the heights (in cm) of some students. Which of the following is / are true?

(1) The height of the tallest student is 180 cm.
(2) The inter-quartile range of the distribution is 15 cm.
(3) Less than half of the students are taller than 170 cm.

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

[PP-DSE-MATHS 2-29]

11. The stem-and-leaf diagram below shows the distribution of the ages of a group of members in a recreational centre.

Stem (tens)	Leaf (units)
5	0 5 6 6 8
6	1 4 5 5 7 8 8 9
7	3 4 4 6 7 9
8	
9	1

A member is randomly selected from the group. Find the probability that the selected member is not under the age of 74.
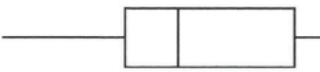
A. 0.2
B. 0.3
C. 0.7

D. 0.8

[2012-DSE-MATHS 2-28]

12. The stem-and-leaf diagram below shows the distribution of the hourly wages (in dollars) of some workers.

Stem (tens)	Leaf (units)
4	0 2 2 2 4 4 4 7
5	0 0 1 2 2 6 8 9
6	3 5 5 7
7	0
8	2 6
9	5

Which of the following box-and-whisker diagrams may represent the distribution of their hourly wages?

A.

B.

C.

D.

[2013-DSE-MATHS 2-29]

13. The stem-and-leaf diagram below shows the distribution of the ages of the passengers in a bus.

| Stem (tens)	Leaf (units)
1	h 4 6
2	3 3 3 4 6 7 7
3	1 2 2 2 6 8
4	0 k

If the range of the above distribution is at least 33, which of the following must be true?

(1) $0 \le h \le 3$
(2) $3 \le k \le 9$
(3) $3 \le k - h \le 5$

A. (1) only
B. (2) only
C. (1) and (3) only
**D.** (2) and (3) only

[2014-DSE-MATHS 2-30]

14. The box-and-whisker diagram below shows the distribution of the numbers of books read by some teachers in a term. Find the inter-quartile range of the distribution.
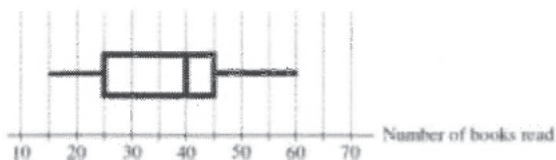
A. 20
B. 35
C. 40
D. 45

[2015-DSE-MATHS 2-29]

15. The box-and-whisker diagram below shows the distribution of the numbers of online hours spent by a class of students in a certain week. Find the lower quartile of the distribution.
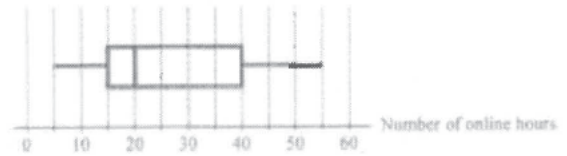
A. 5
B. 15
C. 25
D. 40

[2017-DSE-MATHS 2-29]

16. The stem-and-leaf diagram below shows the distribution of the numbers of books read by 20 students in a year. If the inter-quartile range of the distribution is at most 25, which of the following must be true?

Stem (tens)	Leaf (units)
2	1 2 2 8
3	a a
4	0 2 4 5 5 7 8
5	3
6	b b 9 9
7	0 8

I. $5 \le a \le 9$
II. $0 \le b \le 4$
III. $1 \le a - b \le 6$

A. I and II only
B. I and III only
C. II and III only
D. I, II and III

[2018-DSE-MATHS 2-30]

17. Which of the following can be obtained from any box-and-whisker diagram?

I. Range
II. Standard Deviation
III. Inter-quartile range

A. I and II only
B. I and III only
C. II and III only
D. I, II and III

[2019-DSE-MATHS 2-29]

Operations on Data

1. Given two groups of numbers

   $a + 1, \quad a + 2, \quad a + 3$

   $b + 1, \quad b + 2, \quad b + 3$

   where $a > b$, m_1 and m_2 are respectively the means of the two groups, and s_1 and s_2 are respectively their standard deviations. Which of the following is true?

   A. $m_1 > m_2$ and $s_1 > s_2$.
   B. $m_1 > m_2$ and $s_1 = s_2$.
   C. $m_1 = m_2$ and $s_1 > s_2$.
   D. $m_1 = m_2$ and $s_1 = s_2$.
   E. $m_1 > m_2$ and $s_1 < s_2$.

   [1986-CE-MATHS 2-27]

2. The mean and standard deviation of a distribution of test scores are m and s respectively. If 4 marks are added to each score of the distribution, what are the mean and standard deviation of the new distribution?

	Mean	Standard Deviation
A.	$m + 4$	s
B.	$m + 4$	$s + 2$
C.	$m + 4$	$s + 4$
D.	m	$s + 2$
E.	m	$s + 4$

   [1991-CE-MATHS 2-30]

3. The mean, standard deviation and interquartile range of n numbers are m, s and q respectively. If 3 is added to each of the n numbers, what will be their new mean, standard deviation and interquartile range?

	Mean	Standard Deviation	Interquartile Range
A.	m	s	q
B.	m	$s + 3$	$q + 3$
C.	$m + 3$	s	q
D.	$m + 3$	s	$q + 3$
E.	$m + 3$	$s + 3$	$q + 3$

   [1994-CE-MATHS 2-32]

4. $\{x, x + 2, x + 4, x + 6, x + 8\}$ and $\{x + 1, x + 3, x + 5, x + 7, x + 9\}$ are two groups of numbers. Which of the following is / are true?

   (1) The two groups of numbers have the same range.
   (2) The two groups of numbers have the same standard deviation.
   (3) The two groups of numbers have the same mean.

   A. (1) only
   B. (2) only
   C. (3) only
   D. (1) and (2) only
   E. (1) and (3) only

   [2000-CE-MATHS 2-23]

5. x is the mean of the group of numbers $\{a, b, c, d, e\}$. Which of the following statements about the two groups of numbers $\{a, b, c, d, e\}$ and $\{a, b, c, d, e, x\}$ must be true?

   (1) The two groups of numbers have the same mean.
   (2) The two groups of numbers have the same range.
   (3) The two groups of numbers have the same standard deviation.

   A. (1) only
   B. (3) only
   C. (1) and (2) only
   D. (2) and (3) only

   [2003-CE-MATHS 2-36]

6. $\{x - 6, x - 3, x + 4, x + 5\}$ and $\{x - 8, x - 1, x + 2, x + 9\}$ are two groups of numbers. Which of the following is / are true?

   (1) The two groups of numbers have the same mean.
   (2) The two groups of numbers have the same median.
   (3) The two groups of numbers have the same range.

   A. (1) only
   B. (2) only
   C. (1) and (3) only
   D. (2) and (3) only

   [2006-CE-MATHS 2-34]

7. Let A be a group of numbers $\{\alpha, \beta, \gamma, \delta\}$ and B be another group of numbers $\{\alpha, \beta, \gamma, \delta, \mu\}$, where $\alpha < \beta < \gamma < \delta < \mu$. Which of the following must be true?

   (1) The range of A is smaller than that of B.
   (2) The mean of A is smaller than that of B.
   (3) The median of A is smaller than that of B.

   A. (1) and (2) only
   B. (1) and (3) only
   C. (2) and (3) only
   D. (1), (2) and (3)

   [2008-CE-MATHS 2-34]

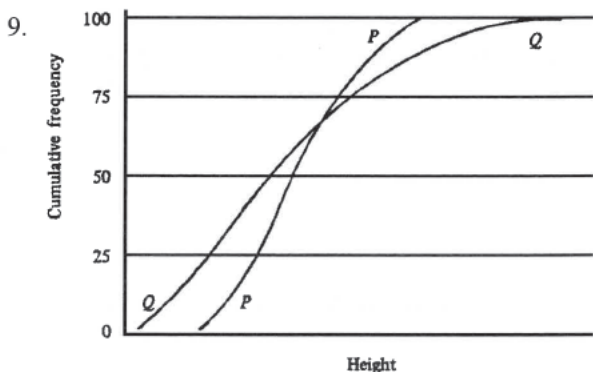## Comparison between Distributions

8.
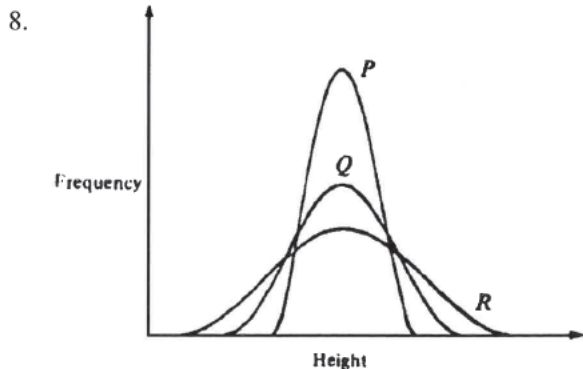
In the figure, P, Q and R are curves showing the frequency distributions of heights of students in three schools, each having the same number of students. Which distribution has the greatest standard deviation and which the smallest?

|	Greatest	Smallest
A.	P	Q
B.	P	R
C.	Q	R
D.	R	P
E.	R	Q

[1983-CE-MATHS 2-32]

9.

In the figure, P and Q are the cumulative frequency curves for the heights of two groups of students, each having 100 students. Which is the following must be true?

(1) range of P < range of Q
(2) median of P < median of Q
(3) the 3rd quartile of P < the 3rd quartile of Q

A. (1) only
B. (2) only
C. (1) and (2) only
D. (1) and (3) only
E. (1), (2) and (3)

[1985-CE-MATHS 2-33]

10.
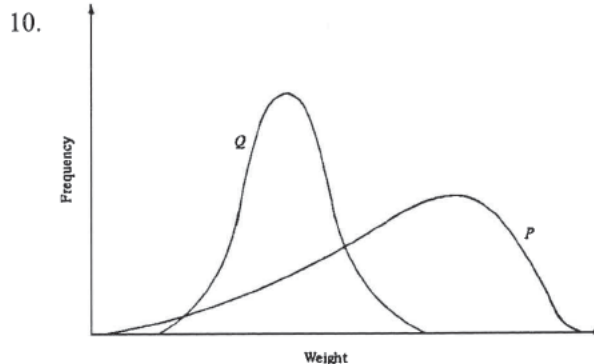
In the figure, P and Q are curves showing the distribution of weights of students in two schools, each having the same number of students. Which is the following must be true?

(1) standard deviation of P > standard deviation of Q
(2) mode of P > mode of Q
(3) median of P > median of Q

A. (1) only
B. (1) and (2) only
C. (1) and (3) only
D. (2) and (3) only
E. (1), (2) and (3)

[1985-CE-MATHS 2-34]

11. The figures show the histograms of three frequency distributions. Arrange their standard deviations in ascending order of magnitude.

(1)

(2)

(3)
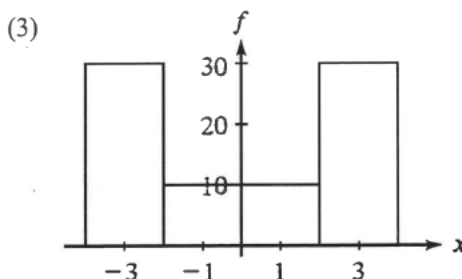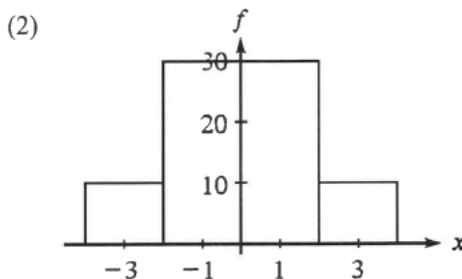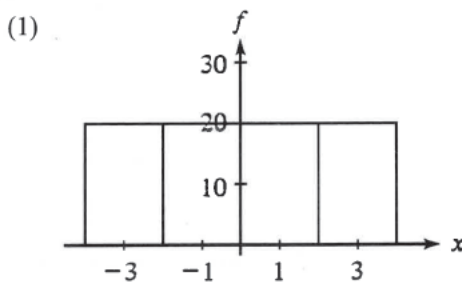
A.   (1), (2), (3)
B.   (1), (3), (2)
C.   (2), (1), (3)
D.   (2), (3), (1)
E.   (3), (2), (1)

[1987-CE-MATHS 2-30]

12. The graph shows the frequency curves of two symmetric distributions P and Q.

Which of the following is/are true?

(1)   The mean of P < the mean of Q.
(2)   The mode of P > the mode of Q.
(3)   The inter-quartile range of P < the inter-quartile range of Q.

A.   (1) only
B.   (1) and (2) only
C.   (1) and (3) only
D.   (2) and (3) only
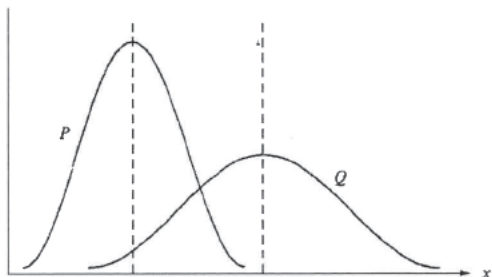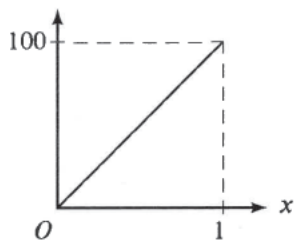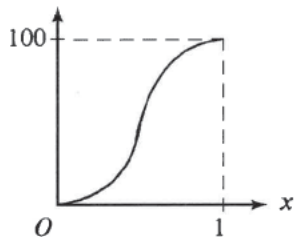E.   (1), (2) and (3)

[1991-CE-MATHS 2-31]

13. (1)   c.f.

(2)   c.f.

(3)   c.f.
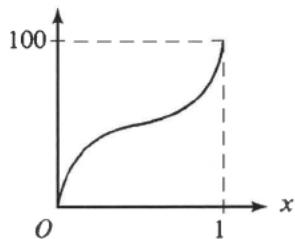
The figure shows the cumulative frequency curves of three distributions. Arrange the three distributions in the order of their standard deviations, from the smallest to the largest.

A.   (1), (2), (3)
B.   (1), (3), (2)
C.   (2), (1), (3)
D.   (2), (3), (1)
E.   (3), (1), (2)

[1992-CE-MATHS 2-34]

14.
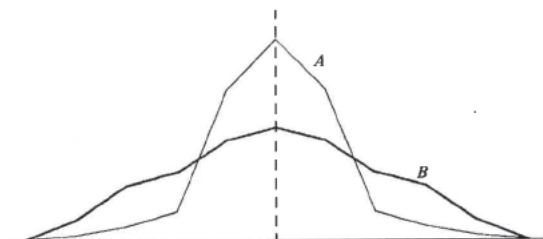
The figure shows the frequency polygons of two symmetric distributions A and B with the same mean. Which of the following is/are true?

(1)   Interquartile range of A < Interquartile range of B
(2)   Standard deviation of A > Standard deviation of B
(3)   Mode of A > Mode of B

A.   (1) only
B.   (2) only
C.   (3) only
D.   (1) and (3) only
E.   (2) and (3) only

[1993-CE-MATHS 2-33]

15. The figure shows the frequency curves of two symmetric distributions A and B.
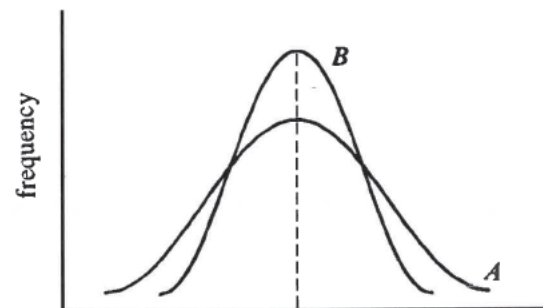
Which of the following is/are true?

(1)   The mean of A = the mean of B.
(2)   The inter-quartile range of A > the inter-quartile range of B.
(3)   The standard deviation of A > the standard deviation of B.

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A. (1) only
B. (1) and (2) only
C. (1) and (3) only
D. (2) and (3) only
E. (1), (2) and (3)

[1995-CE-MATHS 2-34]

16. In the figure, C_A and C_B are the cumulative frequency curves of two distributions of weights A and B respectively. Which of the following is/are true?

Weights (kg)

(1) median of A > median of B
(2) range of A > range of B
(3) inter-quartile range of A > inter-quartile range of B

A. (1) only
B. (1) and (2) only
C. (1) and (3) only
D. (2) and (3) only
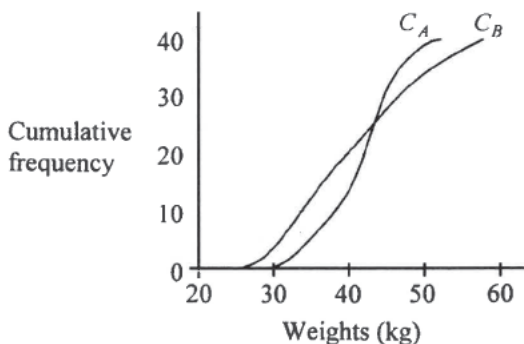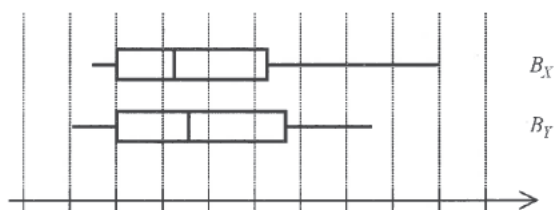E. (1), (2) and (3)

[1998-CE-MATHS 2-34]

17.

In the figure, B_X and B_Y are the box-and-whisker diagrams for the distributions X and Y respectively. Let μ_1, q_1 and r_1 be the mean, the interquartile range and the range of X respectively while μ_2, q_2 and r_2 be the mean, the interquartile range and the range of Y respectively. Which of the following must be true?

(1) $\mu_1 < \mu_2$
(2) $q_1 < q_2$
(3) $r_1 < r_2$

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

[2007-CE-MATHS 2-35]

18. The bar chart below shows the numbers of cars sold for brand A, brand B and brand C in a certain month.
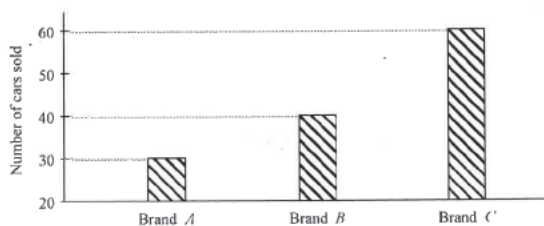
A sales representative makes the following claims:

(1) In that month, the number of cars sold for brand C is two times that for brand B.
(2) In that month, the total number of cars sold for brand A and brand B is less than the number of cars sold for brand C.
(3) In that month, the number of cars sold for brand A is 50% less than that for brand C.

Which of the above claims are **false**?

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2008-CE-MATHS 2-54]

19. The broken line graphs below show the annual revenue (in million dollars) of Company X and Company Y in 2008 and 2009.

Provided by dse.life
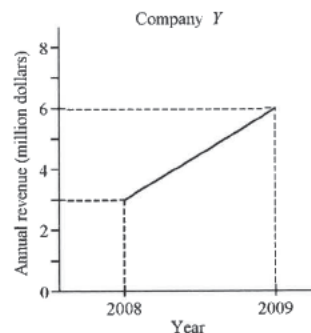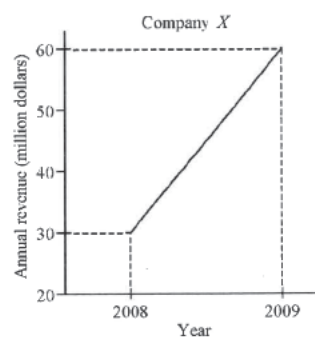
Which of the following statements about the percentage increases of the annual revenue of the two companies from 2008 to 2009 is true?

A. The percentage increases of the annual revenue of company X and company Y are the same.

B. The percentage increase of the annual revenue of company X is twice that of company Y.

C. The percentage increase of the annual revenue of company X is five times that of company Y.

D. The percentage increase of the annual revenue of company X is ten times that of company Y.

[2009-CE-MATHS 2-54]

20. The pie charts below show the expenditures of Albert and Betty in a certain month.
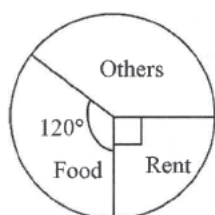
The expenditure of Albert
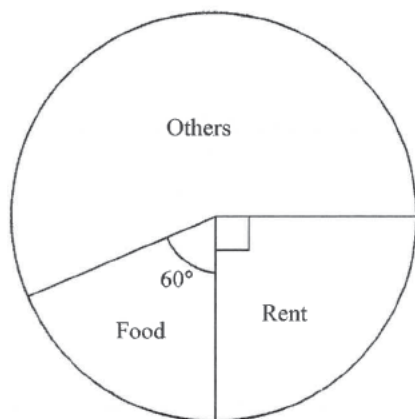
The expenditure of Betty

Which of the following must be true?

A. In that month, the expenditure of Albert is less than that of Betty.

B. In that month, the percentage of rent in the expenditure of Albert is the same as that of Betty.

C. In that month, the expenditure on rent of Albert is the same as that of Betty.

D. In that month, the expenditure on food of Albert is twice that of Betty.

[2010-CE-MATHS 2-54]

21. There are three groups of students in a tutorial class. The following table shows the mean mark of each of the three groups of students in a Mathematics test.

Group	Mean mark
Group A	60 marks
Group B	70 marks
Group C	80 marks

Which of the following must be true?

(1) In the test, the mean mark of all students in the tutorial class is 70 marks.

(2) In the test, the mean mark of all students of Group A and Group B is lower than the mean mark of all students of Group B and Group C.

(3) In the test, the student who gets the highest mark is in Group C.

A. (1) only

B. (2) only

C. (1) and (3) only

D. (2) and (3) only

[2011-CE-MATHS 2-54]

HKDSE Problems

22. $\{a-7,\ a-1,\ a,\ a+2,\ a+4,\ a+8\}$ and $\{a-9,\ a-2,\ a-1,\ a+3,\ a+4,\ a+6\}$ are two groups of numbers. Which of the following is / are true?

(1) The two groups of numbers have the same mean.

(2) The two groups of numbers have the same median.

(3) The two groups of numbers have the same range.

A. (1) only

B. (2) only

C. (1) and (3) only

D. (2) and (3) only

[SP-DSE-MATHS 2-29]

23. A set of numbers has a mode of 32, an inter-quartile range of 27 and a variance of 25. If 3 is added to each number of the set and each resulting number is then doubled to form a new set of numbers, find the mode, the inter-quartile range and the variance of the new set of numbers.

	Mode	Inter-quartile range	Variance
A.	64	60	50
B.	70	60	100
C.	70	54	50
D.	70	54	100

[SP-DSE-MATHS 2-45]

24. The figure below shows the cumulative frequency polygons of the test score distributions X and Y. Let m_1, r_1 and s_1 be

the median, the range and the standard deviation of X respectively while m_2, r_2 and s_2 be the median, the range and the standard deviation of Y respectively. Which of the following are true?
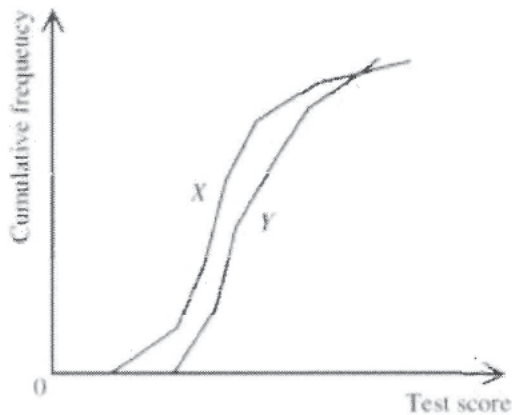
(1) $m_1 > m_2$
(2) $r_1 > r_2$
(3) $s_1 > s_2$

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[PP-DSE-MATHS 2-30]

25. The mean, the variance and the inter-quartile range of a set of numbers are 40, 9 and 18 respectively. If 5 is added to each number of the set and each resulting number is then tripled to form a new set of numbers, find the mean, the variance and the inter-quartile range of the new set of numbers.

	Mean	Variance	Inter-quartile range
A.	120	27	69
B.	120	81	69
C.	135	27	54
D.	135	81	54

[PP-DSE-MATHS 2-44]

26. Let A be a group of numbers $\{\alpha, \beta, \gamma, \delta\}$ and B be another group of numbers $\{\alpha + 2, \beta + 2, \mu + 2, \gamma + 2, \delta + 2\}$, where $\alpha < \beta < \mu < \gamma < \delta$. Which of the following must be true?

(1) The median of A is smaller than that of B.
(2) The range of A and the range of B are the same.
(3) The standard deviation of A is greater than that of B.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[PP-DSE-MATHS 2-45]

27. Let m_1, r_1 and v_1 be the mean, the range and the variance of a group of numbers $\{x_1, x_2, x_3, \dots, x_{100}\}$ respectively. If m_2, r_2 and v_2 are the mean, the range and the variance of the group of numbers $\{x_1, x_2, x_3, \dots, x_{100}, m_1\}$ respectively, which of the following must be true?

(1) $m_1 = m_2$
(2) $r_1 = r_2$
(3) $v_1 = v_2$

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

[2012-DSE-MATHS 2-45]

28. The pie charts below show the distributions of the profits of stationery shop X and stationery shop Y from the sales of stationery in a certain month. Which of the following must be true?

Distribution of the profits of stationery shop X
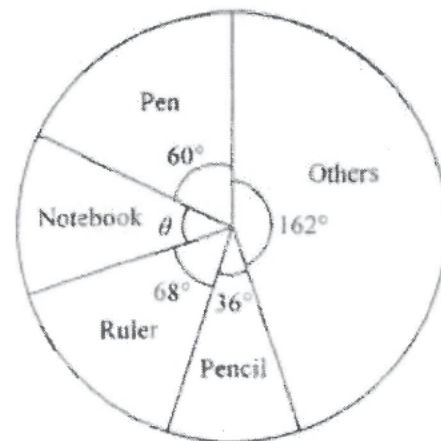
Distribution of the profits of stationery shop Y
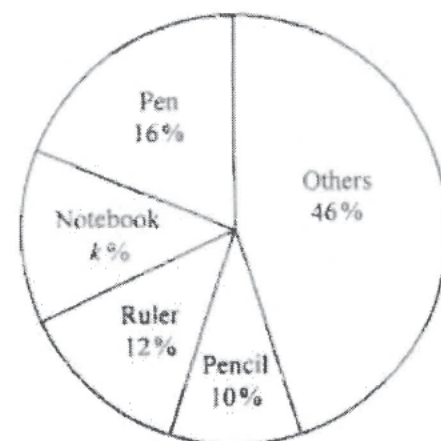
A. In that month, the profit from the sales of pencils of stationery shop X is the same as that of stationery shop Y.

B. In that month, the total profit from the sales of pens and notebooks of stationery shop X is less than the total profit from the sales of rulers and pencils of the shop.

C. $k = 14$

D. $\theta = 36°$

[2013-DSE-MATHS 2-30]

29. If the variance of the five numbers x_1, x_2, x_3, x_4 and x_5 is 13, then the variance of the five numbers $3x_1 + 4$, $3x_2 + 4$, $3x_3 + 4$, $3x_4 + 4$ and $3x_5 + 4$ is

A. 39 .

B. 43 .

C. 117 .

D. 121 .

[2013-DSE-MATHS 2-45]

30. The mean height of 25 teachers and 140 students is 150 cm. If the mean height of the students is 145 cm, then the mean height of the teachers is

A. 151 cm .

B. 155 cm .

C. 176 cm .

D. 178 cm .

[2014-DSE-MATHS 2-28]

31. If the variance of the four numbers a, b, c and d is 9, then the variance of the four numbers $14 - a$, $14 - b$, $14 - c$ and $14 - d$ is

A. 5 .

B. 9 .

C. 23 .

D. 121 .

[2014-DSE-MATHS 2-45]

32. Let x_1, y_1 and z_1 be the mean, the median and the variance of a group of numbers $\{a_1, a_2, a_3, ..., a_{50}\}$ respectively while x_2, y_2 and z_2 be the mean, the median and the variance of the group of numbers $\{a_1, a_2, a_3, ..., a_{49}\}$ respectively. If $x_1 = a_{50}$, which of the following must be true?

(1) $x_1 = x_2$

(2) $y_1 \geq y_2$

(3) $z_1 \leq z_2$

A. (1) and (2) only

B. (1) and (3) only

C. (2) and (3) only

D. (1), (2) and (3)

[2015-DSE-MATHS 2-45]

33. The variance of a set of numbers is 49. Each number of the set is multiplied by 4 and then 9 is added to each resulting number to form a new set of numbers. Find the variance of the new set of numbers.

A. 196

B. 205

C. 784

D. 793

[2016-DSE-MATHS 2-45]

34. Let m_1, r_1 and v_1 be the mode, the inter-quartile range and the variance of a group of numbers $\{x_1, x_2, x_3, x_4, x_5, x_6, x_7\}$ respectively while m_2, r_2 and v_2 be the mode, the inter-quartile range and the variance of the group of numbers $\{8x_1, 8x_2, 8x_3, 8x_4, 8x_5, 8x_6, 8x_7\}$ respectively. Which of the following must be true?

(1) $m_2 = 8m_1$

(2) $r_2 = 8r_1$

(3) $v_2 = 8v_1$

A. (1) and (2) only

B. (1) and (3) only

C. (2) and (3) only

D. (1), (2) and (3)

[2017-DSE-MATHS 2-45]

35. The mean, the range and the variance of a set of numbers are m, r and v respectively. Each number of the set is multiplied by 6 and then 5 is added to each resulting number to form a new set of numbers. Which of the following is/are true?

I.   The mean of the new set of numbers is $6m+5$

II. The range of the new set of numbers is $6r+5$

III. The variance of the new set of numbers is $6v + 5$

A. I only

B. II only

C. I and III only

D. II and III only

[2019-DSE-MATHS 2-45]

36. The variance of the six numbers $20a + 3$, $20a + 5, 20a + 9, 20a + 11, 20a + 15$ and $20a + 17$ is

A. 5

B. 10

C. 25

D. $20a + 25$

[2020-DSE-MATHS 2-45]

Standard Score

1. A student scored 50 marks in a test and the corresponding standard score is –0.5. If the mean of the test scores is 60 marks, find the standard deviation of the scores.

   A. $\sqrt{20}$ marks

   B. 5 marks

   C. 9.5 marks

   D. 10 marks

   E. 20 marks

   [1999-CE-MATHS 2-34]

2. The mean mark of a mathematics test was 63 marks. Peter got 75 marks in the test and his standard score was 0.75. If Mary got 83 marks in the same test, then her standard score would be

   A. 0.83 .

   B. 1.25 .

   C. 2.22 .

   D. 5 .

   [2003-CE-MATHS 2-32]

3. David got 70 marks in a test and his standard score was –0.625. If the standard deviation of the test marks was 8 marks, then the mean mark of the test was

   A. 62 marks.

   B. 65 marks.

   C. 75 marks.

   D. 78 marks.

   [2004-CE-MATHS 2-36]

HKDSE Problems

4. In an examination, Peter gets 55 marks and his standard score is –3 while Mary gets 95 marks and her standard score is 2. Find the mean of the examination scores.

   A. 8 marks

   B. 64 marks

   C. 75 marks

   D. 79 marks

   [2014-DSE-MATHS 2-44]

5. The stem-and-leaf diagram below shows the distribution of the scores (in marks) of a group of students in a test. Ada gets the highest score in the test.

Stem (tens)	Leaf (units)
4	5 6 7 8
5	5 5 6 8
6	3 5 5 6 9 9
7	0 0 1
8	0 2 5

   Which of the following is/are true?

   (1) The upper quartile of the distribution is 55 marks.
   (2) The standard score of Ada in the test is lower than 2.
   (3) The standard deviation of the distribution is greater than 12 marks.

   A. (1) only

   B. (2) only

   C. (1) and (3) only

   D. (2) and (3) only

   [2016-DSE-MATHS 2-44]

6. The standard score of Tom in a Mathematics examination is –2. If the score of Tom in the Mathematics examination is 33 marks and the mean of the scores of the Mathematics examination is 45 marks, then the standard deviation of the scores of the Mathematics examination is

   A. 3 marks.

   B. 6 marks.

   C. 12 marks.

   D. 36 marks.

   [2017-DSE-MATHS 2-44]

7. In a test, the mean of the test scores is 68 marks. Peter gets 46 marks in the test and his standard score is –2.2. If Susan gets 52 marks in the test, then her standard score is

   A. –2.5

   B. –1.6

   C. –0.6

   D. 1.6

   [2018-DSE-MATHS 2-44]

8. In an examination, the standard deviation of the examination score is 8 marks. The examination score of Mary is 69 marks and her standard score is 0.5. If the standard score of John in the examination is -1.5, then his examination score is

    A. 45 marks
    B. 53 marks
    C. 65 marks
    D. 77 marks

    [2019-DSE-MATHS 2-44]

9. In a test, the difference of the test scores and the difference of the standard scores of two students are 30 marks and 6 respectively. In the test, the standard deviation of the test scores is

    A. 5 marks
    B. 24 marks
    C. 25 marks
    D. 36 marks

    [2020-DSE-MATHS 2-23]

Sampling Techniques

1. The manager of a popular restaurant designs a questionnaire to collect the opinions from customers about the food provided by the restaurant. The manager has four relatives who are customers of the restaurant and only these four relatives are selected as a sample to fill in the questionnaire. Which of the following are disadvantages of this sampling method?

   (1) The sample size is too small.
   (2) The customers are not randomly selected.
   (3) Not all the customers are selected.

   A. (1) and (2) only
   B. (1) and (3) only
   C. (2) and (3) only
   D. (1), (2) and (3)

   [2011-CE-MATHS 2-53]

HKDSE Problems

2. The students' union of a school of 950 students wants to investigate the opinions of students in the school on the services provided by the tuck shop. A questionnaire is designed by the students' union and only the chairperson and vice-chairperson of the students' union are selected as a sample to fill in the questionnaire. Which of the following are the disadvantages of this sampling method?

   (1) The sample size is very small.
   (2) Not all students in the school are selected.
   (3) Not all students in the school have an equal chance of being selected.

   A. (1) and (2) only
   B. (1) and (3) only
   C. (2) and (3) only
   D. (1), (2) and (3)

   [SP-DSE-MATHS 2-30]