Chapter 13: Connecting the Dots...

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Exercise 13.1 — Representative Values — Mean (Page 101)

Q1 Shreyas counts the number of times he can bounce a ball on a bat before it falls. Data for 8 attempts: 6, 2, 9, 5, 4, 6, 3, 5. Calculate the average number of bounces.

SOLUTION

Sum of all values = 6 + 2 + 9 + 5 + 4 + 6 + 3 + 5 = 40
Number of attempts = 8

Mean = Sum ÷ Number of values = 40 ÷ 8 = 5

Answer: The average number of bounces Shreyas makes is 5.

Q2 Two friends train for a 100 m race. Running times (in seconds) over the past week: Nikhil — 17, 18, 17, 16, 19, 17, 18; Sunil — 20, 18, 18, 17, 16, 16, 17. Who on average ran quicker?

SOLUTION

Lower running time means faster speed.

Nikhil's total = 17 + 18 + 17 + 16 + 19 + 17 + 18 = 122
Nikhil's mean time = 122 ÷ 7 ≈ 17.43 seconds

Sunil's total = 20 + 18 + 18 + 17 + 16 + 16 + 17 = 122
Sunil's mean time = 122 ÷ 7 ≈ 17.43 seconds

Both have the same total (122) and the same number of attempts (7), so their average times are equal.

Answer: Both Nikhil and Sunil ran equally quickly on average — their mean time is 122/7 ≈ 17.43 seconds each.

Q3 The enrolment in a school during six consecutive years was: 1555, 1670, 1750, 2013, 2040, 2126. Find the mean enrolment during this period.

SOLUTION

Sum = 1555 + 1670 + 1750 + 2013 + 2040 + 2126 = 11154

Number of years = 6

Mean enrolment = 11154 ÷ 6 = 1859

Answer: The mean enrolment is 1859 students per year.

Exercise 13.2 — Outliers and Medians (Page 112)

Q1 Find the median of onion prices in Yahapur and Wahapur.
Yahapur (/kg): Jan 25, Feb 24, Mar 26, Apr 28, May 30, Jun 35, Jul 39, Aug 43, Sep 49, Oct 56, Nov 59, Dec 44.
Wahapur (/kg): Jan 19, Feb 17, Mar 23, Apr 30, May 38, Jun 35, Jul 42, Aug 39, Sep 53, Oct 60, Nov 52, Dec 42.

SOLUTION

For median with 12 values, take the average of the 6th and 7th values in sorted order.

Yahapur sorted: 24, 25, 26, 28, 30, 35, 39, 43, 44, 49, 56, 59
6th value = 35, 7th value = 39
Median (Yahapur) = (35 + 39) ÷ 2 = 74 ÷ 2 = 37

Wahapur sorted: 17, 19, 23, 30, 35, 38, 39, 42, 42, 52, 53, 60
6th value = 38, 7th value = 39
Median (Wahapur) = (38 + 39) ÷ 2 = 77 ÷ 2 = 38.5

Answer: Median price in Yahapur = 37/kg; Median price in Wahapur = 38.5/kg.

Q2 Sanskruti asked her class how many domestic animals and pets each student had at home. Some students were absent (shown as —). Data: 0, 1, 0, 4, 8, 0, 0, 2, 1, 1, 5, 3, 4, 0, 0, —, 10, 25, 2, —, 2, 4. Find the mean and median. How would you describe this data?

SOLUTION

The dashes (—) represent absent students — these are not zero, so we exclude them.
Data values (20 students present): 0, 1, 0, 4, 8, 0, 0, 2, 1, 1, 5, 3, 4, 0, 0, 10, 25, 2, 2, 4

Sum = 0+1+0+4+8+0+0+2+1+1+5+3+4+0+0+10+25+2+2+4 = 72
Mean = 72 ÷ 20 = 3.6

Sorted: 0, 0, 0, 0, 0, 0, 1, 1, 1, 2, 2, 2, 3, 4, 4, 4, 5, 8, 10, 25
n = 20 (even), median = average of 10th and 11th values
10th value = 2, 11th value = 2
Median = (2 + 2) ÷ 2 = 2

The value 25 is an outlier. Mean (3.6) > Median (2) because the outlier pulls the

mean up.
Most students have 0–2 pets, but a few have many more.

Answer: Mean = 3.6, Median = 2. The data has an outlier (25) that raises the mean above the median. Most students have 0–2 pets.

Q3 Rintu's date-palm tree farm heights (in feet): 50, 45, 43, 52, 61, 63, 46, 55, 60, 55, 59, 56, 56, 49, 54, 65, 66, 51, 44, 58, 60, 54, 52, 57, 61, 62, 60, 60, 67. Find the mean and median. How many trees are shorter than the average height?

SOLUTION

n = 29 trees
Sum = 50+45+43+52+61+63+46+55+60+55+59+56+56+49+54+65+66+51+44+58+60+54+52+57+61+62+60+60+67
Sum = 1621
Mean = 1621 ÷ 29 ≈ 55.90 feet

Sorted (29 values): 43,44,45,46,49,50,51,52,52,54,54,55,55,56,56,57,58,59,60,60,60,60,61,61,62,63,65,66,67
n = 29 (odd), median = 15th value = 56 feet

Trees shorter than mean (55.90 ft): count values < 55.90
Values < 55.90: 43,44,45,46,49,50,51,52,52,54,54,55,55 = 13 trees

Answer: Mean height ≈ 55.90 feet; Median = 56 feet. 13 trees are shorter than the average height.

Q4 Daily water usage from a tap (in litres): 5.6, 8, 3.09, 12.9, 6.5, 12.1, 11.3, 20.5, 7.4.
(a) Can the mean or median daily usage lie between 25 and 30? Justify.
(b) Can the mean or median be less than the minimum or greater than the maximum value in data?

SOLUTION

(a) Sum of values = 5.6 + 8 + 3.09 + 12.9 + 6.5 + 12.1 + 11.3 + 20.5 + 7.4 = 87.39
Mean = 87.39 ÷ 9 ≈ 9.71 litres

Sorted: 3.09, 5.6, 6.5, 7.4, 8, 11.3, 12.1, 12.9, 20.5

Median (5th value) = 8 litres

Neither 9.71 nor 8 lies between 25 and 30.
The mean is a fair-share value — it cannot exceed the maximum (20.5) since no single day used 25–30 litres.
The median is always one of the data values (or between two of them), so it cannot be outside the data range.

(b) No. The mean is always between the minimum and maximum values of the data.
The median is also always within the range [minimum, maximum] of the data.
A single outlier can move the mean closer to an extreme, but it can never exceed the maximum or fall below the minimum.

Answer: (a) No. Mean ≈ 9.71 L and Median = 8 L — both are well below 25. (b) No — both mean and median always lie within the range [min, max] of the data.

Q5 Weights of a few newborn babies (in kg):
Boys: 3.5, 4.1, 2.6, 3.2, 3.4, 3.8
Girls: 4.0, 3.1, 3.4, 3.7, 2.5, 3.4
Analyse and compare this data.

SOLUTION

Boys (n = 6):
Sum = 3.5 + 4.1 + 2.6 + 3.2 + 3.4 + 3.8 = 20.6
Mean = 20.6 ÷ 6 ≈ 3.43 kg
Sorted: 2.6, 3.2, 3.4, 3.5, 3.8, 4.1
Median = (3.4 + 3.5) ÷ 2 = 3.45 kg
Range = 4.1 − 2.6 = 1.5 kg

Girls (n = 6):
Sum = 4.0 + 3.1 + 3.4 + 3.7 + 2.5 + 3.4 = 20.1
Mean = 20.1 ÷ 6 = 3.35 kg
Sorted: 2.5, 3.1, 3.4, 3.4, 3.7, 4.0
Median = (3.4 + 3.4) ÷ 2 = 3.4 kg
Range = 4.0 − 2.5 = 1.5 kg

Both groups have the same range (1.5 kg), showing similar spread.
Boys have a slightly higher mean (3.43 > 3.35) and higher median (3.45 > 3.40).
Boys are on average slightly heavier than girls in this sample.

Answer: Boys: mean ≈ 3.43 kg, median = 3.45 kg. Girls: mean = 3.35 kg, median = 3.40 kg. Both groups have the same range (1.5 kg). Boys are slightly heavier on average.

Q6 The dot plots of heights (cm) of another section of Grade 5 students are given with: Whole class — Mean = 141.21, Median = 142.5; Boys — Mean = 142.05, Median = 143; Girls — Mean = 140.14, Median = 140. Compare with the first section (Whole class mean = 144.4, Boys mean = 142.94, Girls mean = 146.9). Share your observations.

SOLUTION

Comparing the two sections:

Section 1 (from 'How Tall is Your Class?'): Whole class mean = 144.4 cm, median = 145 cm
Section 2 (this question): Whole class mean = 141.21 cm, median = 142.5 cm

Section 2 students are shorter on average — whole class mean is 3.19 cm lower.

In Section 1, girls (mean 146.9) are taller than boys (mean 142.94).
In Section 2, boys (mean 142.05) are taller than girls (mean 140.14) — the pattern reverses.

In Section 2, mean < median for both the whole class and boys, indicating a slight pull from lower values.
For girls in Section 2, mean ≈ median (140.14 vs 140), suggesting a fairly balanced distribution.

Both sections show overall mean < median for the full class, indicating that a few shorter students bring the mean slightly below the median.

Answer: Section 2 students are shorter on average (mean 141.21 cm vs 144.4 cm). In Section 2, boys are taller than girls — the reverse of Section 1. Both sections show mean slightly below median for the whole class.

Q7 Weights of sumo wrestlers: 295.2 kg, 250.7 kg, 234.1 kg, 221.0 kg, 200.9 kg. Weights of ballet dancers: 40.3 kg, 37.6 kg, 38.8 kg, 45.5 kg, 44.1 kg, 48.2 kg. Approximately how many times heavier is a sumo wrestler compared to a ballet dancer?

SOLUTION

Mean weight of sumo wrestlers:
Sum = 295.2 + 250.7 + 234.1 + 221.0 + 200.9 = 1201.9
Mean = 1201.9 ÷ 5 = 240.38 kg

Mean weight of ballet dancers:
Sum = 40.3 + 37.6 + 38.8 + 45.5 + 44.1 + 48.2 = 254.5
Mean = 254.5 ÷ 6 ≈ 42.42 kg

Ratio = 240.38 ÷ 42.42 ≈ 5.67

So a sumo wrestler is approximately 5 to 6 times heavier than a ballet dancer.

Answer: A sumo wrestler (mean ≈ 240.4 kg) is approximately 5 to 6 times heavier than a ballet dancer (mean ≈ 42.4 kg).

Exercise 13.3 — Visualising Data — Clustered Bar Graphs (Page 122)

Q1 An infographic shows maximum speeds of animals in air, on land, and in water (scale: 1 unit = 16 kph). Speeds visible: Peregrine falcon 322 kph (air), Spine-tailed swift 170 kph (air), Free-tailed bat 96 kph (air), Green darner dragonfly 64 kph (air), Flying fish 56 kph (air); Cheetah 103 kph (land), Pronghorn antelope 88 kph (land), Ostrich 64 kph (land), Human 37 kph (land), Australian tiger beetle 8 kph (land); Sailfish 109 kph (water), Dolphin 40 kph (water), California sea lion 40 kph (water), Gentoo penguin 35 kph (water), Humpback whale 26 kph (water).
(a) What is the scale used?
(b) What is interesting in the infographic?
(c) Identify a pair of creatures where one's speed is about twice the other.
(d) Can we say a sailfish is about 4 times faster than a humpback whale? Is the sailfish the fastest aquatic animal in the world?

SOLUTION

(a) Scale: 1 unit = 16 kph (kilometre per hour).

(b) Interesting observations:
The peregrine falcon (322 kph) is faster than all land and water animals combined.
Among land animals, the cheetah (103 kph) is the fastest — faster than some flying animals like the dragonfly (64 kph).
The sailfish (109 kph) is faster in water than the cheetah is on land.
The Australian tiger beetle, despite being tiny, reaches 8 kph — about 120 body lengths per second.

(c) Pairs where one is about twice the other:
Cheetah (103 kph) ≈ 2 × ostrich (64 kph): 103/64 ≈ 1.6 — approximately.
Spine-tailed swift (170 kph) ≈ 2 × free-tailed bat (96 kph): 170/96 ≈ 1.8 — approximately.
Sailfish (109 kph) ≈ 2 × California sea lion or dolphin (40 kph): 109/40 ≈ 2.7 — close to 3×.
Best example: human (37 kph) ≈ 2 × penguin (35 kph) — not quite; or cheetah ≈ 2 × flying fish (56): 103/56 ≈ 1.8.

(d) Sailfish vs humpback whale: 109 ÷ 26 ≈ 4.2 times faster.
So yes, a sailfish is approximately 4 times faster than a humpback whale based on the data shown.
However, we cannot say the sailfish is the fastest aquatic animal in the world

based only on this infographic — this shows only a selection of animals, and there may be faster aquatic animals not listed here.

Answer: (a) Scale: 1 unit = 16 kph. (c) Spine-tailed swift (170) ≈ 2 × free-tailed bat (96); or cheetah (103) ≈ 2 × flying fish (56). (d) Sailfish is ≈ 4.2× faster than humpback whale — approximately yes. But we cannot conclude it is the world's fastest aquatic animal from this limited data.

Q2 Preyashi asked students about preferred superpowers: aquatic (w), aerial (a), spaceborne (s), or none (n).
Grade 5: w, a, a, a, w, n, s, a, n, w, a, a, a, a, a, w, w, s, a, a, n, w, a, a, n
Grade 9: n, w, s, a, s, w, s, s, a, a, w, s, s, a, s, a, n, w, s, s, a, w, a, w, a
Draw a double-bar graph comparing both grades. Choose an appropriate scale.

SOLUTION

Count each option for each grade:

Grade 5 (n = 25):
Aquatic (w) = 6, Aerial (a) = 13, Spaceborne (s) = 2, None (n) = 4

Grade 9 (n = 25):
Aquatic (w) = 6, Aerial (a) = 8, Spaceborne (s) = 9, None (n) = 2

Appropriate scale: 1 unit = 2 students (so bars reach up to 7 units for Grade 5 aerial).

Key observations from the double-bar graph:
Aerial power is the top choice in Grade 5 (13 students = 52%), but only 3rd in Grade 9 (8 students = 32%).
Spaceborne is most popular in Grade 9 (9 students = 36%) but least popular in Grade 5 (2 students = 8%).
The aquatic preference is exactly the same in both grades (6 each = 24%).
Fewer Grade 9 students chose 'none' compared to Grade 5.

Answer: Grade 5 counts — Aquatic: 6, Aerial: 13, Spaceborne: 2, None: 4. Grade 9 counts — Aquatic: 6, Aerial: 8, Spaceborne: 9, None: 2. Scale: 1 unit = 2 students. Aerial dominates Grade 5; Spaceborne dominates Grade 9.

Q3 Temperature variation in Jodhpur over two days (°C):
Time: 12 am, 3 am, 6 am, 9 am, 12 pm, 3 pm, 6 pm, 9 pm
Day 1: 20, 18, 16, 20, 26, 34, 30, 24
Day 2: 37, 34, 30, 33, 37, 43, 42, 39
Draw a double-bar graph using scale 1 unit = 4°C. Can you guess which two months these days might belong to?

SOLUTION

Scale: 1 unit = 4°C. Y-axis from 0 to 44°C (11 units). X-axis shows 8 time points.

Day 1 bar heights (in units): 5, 4.5, 4, 5, 6.5, 8.5, 7.5, 6
Day 2 bar heights (in units): 9.25, 8.5, 7.5, 8.25, 9.25, 10.75, 10.5, 9.75

Key observations:
Day 1: temperatures range from 16°C to 34°C — a moderate day.
Day 2: temperatures range from 30°C to 43°C — a very hot day.
Both days show the same pattern: coolest around 6 am, hottest around 3 pm.

Guessing the months:
Day 1 (16–34°C) is consistent with a winter or spring month like February or March.
Day 2 (30–43°C) is consistent with a peak summer month like May or June.
Jodhpur (Rajasthan) is a desert region — such extreme summer temperatures are typical.

Answer: Draw bars for each time slot, with Day 1 and Day 2 side by side. Day 1 (16–34°C) likely belongs to a winter/spring month (Feb–Mar); Day 2 (30–43°C) likely belongs to a peak summer month (May–Jun) in Jodhpur.

Q4 A clustered bar graph shows electric vehicles (EV) registered per year (2022–2024) in several states. Gujarat and Delhi data (in thousands): Gujarat — 2022: 69, 2023: 89, 2024: 78; Delhi — 2022: 62, 2023: 74, 2024: 81.
(a) Mark the bars for Gujarat and Delhi on the graph.
(b) Describe the scale and patterns.
(c) How would you describe changes for various states between 2022 and 2024?
(d) Approximately how many more registrations did Assam get in 2023 vs 2022?
(e) How many times more did West Bengal registrations increase from 2022 to 2024?
(f) Is this statement correct — 'There were very few new registrations in Uttarakhand in 2023 and 2024, as the increase in bar lengths is minimal'?

SOLUTION

(a) Mark Gujarat bars at heights 69000, 89000, 78000 and Delhi bars at 62000, 74000, 81000 for 2022, 2023, 2024 respectively.

(b) Scale: 1 unit = 25000 vehicles. Y-axis goes from 0 to 100000.
Each state has 3 adjacent bars (blue = 2022, red = 2023, yellow = 2024).
States are ordered along the x-axis.

(c) Changes 2022→2024:
Gujarat: 69000 → 78000 (+9000) — increased overall, but dipped in 2024 after a 2023 peak.
Delhi: 62000 → 81000 (+19000) — steady increase each year.
Assam: shows a large increase from 2022 to 2023 and 2024.
Andhra Pradesh and Odisha: significant growth over the 3 years.
Uttarakhand: very small absolute numbers but shows growth.

(d) Reading Assam's bars: 2022 ≈ 40000, 2023 ≈ 60000.
Difference ≈ 60000 − 40000 = 20000 more registrations in 2023.

(e) Reading West Bengal's bars: 2022 ≈ 10000, 2024 ≈ 43000.
Ratio ≈ 43000 ÷ 10000 ≈ 4.3, so registrations grew about 4 times from 2022 to 2024.

(f) The statement is INCORRECT.
The bar lengths for Uttarakhand are small in absolute terms (~15000–20000 range), but the bars DO show growth from year to year.
A minimal increase in bar length means a small absolute increase, NOT that there were very few new registrations — those new registrations still number in the thousands.

Answer: (d) Assam: ≈ 20,000 more in 2023 vs 2022 (from about 40,000 to 60,000). (e) West Bengal: about 4 times more in 2024 vs 2022 (from about 10,000 to 43,000). (f) The statement is incorrect — the bars show growth; a minimal bar increase means a small absolute increase, not very few registrations.

Exercise 13.4 — Data Detective (Page 129)

Q1 The dot plots below show the distribution of the number of pockets on clothing for a group of boys and a group of girls. Based on the dot plots, which of the following statements are true?
(a) The data varies more for the boys than for the girls.
(b) The median number of pockets for the boys is more than that for the girls.
(c) The mean number of pockets for the girls is more than that for the boys.
(d) The maximum number of pockets for boys is greater than that for the girls.

SOLUTION

Reading the dot plots (each dot = one child):
Boys (12 dots): one dot at 3, four dots at 4, five dots at 5, two dots at 6
Boys data: 3, 4, 4, 4, 4, 5, 5, 5, 5, 5, 6, 6
Girls (13 dots): one dot at 0, one dot at 2, four dots at 3, five dots at 4, one dot at 5, one dot at 6
Girls data: 0, 2, 3, 3, 3, 3, 4, 4, 4, 4, 4, 5, 6

Boys: mean = 56 ÷ 12 ≈ 4.67; median (average of 6th & 7th of 12 sorted values = 5 and 5) = 5
Boys range = 6 − 3 = 3; Boys maximum = 6

Girls: mean = 45 ÷ 13 ≈ 3.46; median (7th of 13 sorted values) = 4
Girls range = 6 − 0 = 6; Girls maximum = 6

(a) Boys range = 3, Girls range = 6. The girls' data varies more (it stretches from 0 to 6, with an outlier at 0). → FALSE
(b) Median boys = 5, Median girls = 4. Boys' median is greater. → TRUE
(c) Mean girls ≈ 3.46, Mean boys ≈ 4.67. Boys' mean is higher, not girls'. → FALSE
(d) Maximum boys = 6, Maximum girls = 6. They are equal, so boys' maximum is not greater. → FALSE

Answer: Only statement (b) is true. Boys' median (5) is more than girls' median (4). (a) is false — girls' data varies more (range 6 vs 3). (c) is false — the boys' mean (≈4.67) is higher than the girls' (≈3.46). (d) is false — both maximums are 6 (equal).

Q2 Points scored by players across four games:
A: 14, 16, 10, 10; B: 0, 8, 6, 4; C: 8, 11, Did not play, 13
(a) Find the average points per game by A.
(b) To find mean for C, divide by 3 or 4? What about B?
(c) Who is the best performer?

SOLUTION

(a) Player A played all 4 games.
Total = 14 + 16 + 10 + 10 = 50
Mean for A = 50 ÷ 4 = 12.5 points per game

(b) Player C did NOT play Game 3 — it is not a score of 0, it means C was absent.
We count only the games C actually played: 3 games.
Total for C = 8 + 11 + 13 = 32
Mean for C = 32 ÷ 3 ≈ 10.67 points per game

Player B scored 0 in Game 1 — B DID play but scored nothing.
We count all 4 games for B.
Total for B = 0 + 8 + 6 + 4 = 18
Mean for B = 18 ÷ 4 = 4.5 points per game

(c) Comparing averages: A = 12.5, C ≈ 10.67, B = 4.5
Player A has the highest average.

Answer: (a) A's mean = 12.5 points/game. (b) Divide C's total by 3 (played 3 games); divide B's total by 4 (played all 4, scoring 0 in one). (c) A is the best performer with a mean of 12.5 points per game.

Q3 Group 1 General Knowledge quiz marks (out of 100): 85, 76, 90, 85, 39, 48, 56, 95, 81, 75. Group 2: 68, 59, 73, 86, 47, 79, 90, 93, 86. Compare both groups using mean and median.

SOLUTION

Group 1 (n = 10):
Sum = 85+76+90+85+39+48+56+95+81+75 = 730
Mean = 730 ÷ 10 = 73
Sorted: 39, 48, 56, 75, 76, 81, 85, 85, 90, 95
Median = (76 + 81) ÷ 2 = 78.5

Group 2 (n = 9):

Sum = 68+59+73+86+47+79+90+93+86 = 681
Mean = 681 ÷ 9 ≈ 75.67
Sorted: 47, 59, 68, 73, 79, 86, 86, 90, 93
Median (5th value) = 79

Comparison:
Group 2 has a higher mean (75.67 > 73) and higher median (79 > 78.5).
Group 1 has a very low score (39) pulling its mean down — 39 is an outlier.
Group 1's mean (73) < median (78.5) confirms the low outlier's effect.
Group 2's scores are more consistent — no extreme outliers.
Overall, Group 2 performed slightly better.

Answer: Group 1: mean = 73, median = 78.5. Group 2: mean ≈ 75.67, median = 79. Group 2 performed slightly better on both measures. Group 1 has an outlier (39) that lowers its mean below its median.

Q4 Colony survey data on favourite sport:
Sport | Cricket | Basketball | Swimming | Hockey | Athletics
Watching | 1240 | 470 | 510 | 430 | 250
Participating | 620 | 320 | 320 | 250 | 105
Choose an appropriate scale and draw a double-bar graph. Write observations.

SOLUTION

Scale: 1 unit = 200 people (y-axis from 0 to 1400, i.e., 7 units).
Two bars per sport — one for Watching, one for Participating.

Observations:
Cricket has the highest numbers for both watching (1240) and participating (620).
Athletics has the lowest watching (250) and the lowest participating (105).
For every sport, the number of watchers exceeds the number of participants.
The Watching:Participating ratio is roughly 2:1 for most sports.
Cricket watching (1240) is more than double basketball watching (470).
Swimming and Basketball have equal participation numbers (320 each).

Answer: Scale: 1 unit = 200 people. Key observation: Cricket dominates both watching (1240) and participating (620). For every sport, watchers outnumber participants by roughly 2:1.

Q5 A group of 17 students has heights (in cm): 106, 110, 123, 125, 117, 120, 112, 115, 110, 120, 115, 102, 115, 115, 109, 115, 101. The sports teacher wants to divide them into two equal groups — one with heights below a certain value, the other with heights above it. Suggest a way.

SOLUTION

Sort the heights:
101, 102, 106, 109, 110, 110, 112, 115, 115, 115, 115, 115, 117, 120, 120, 123, 125

n = 17 (odd). The median is the 9th value = 115 cm.

Count around the median height 115 cm:
Below 115 cm: 101, 102, 106, 109, 110, 110, 112 → 7 students
Exactly 115 cm: 115, 115, 115, 115, 115 → 5 students
Above 115 cm: 117, 120, 120, 123, 125 → 5 students

Use the median (115 cm) as the dividing height. The 7 students below 115 cm go in the 'shorter' group and the 5 students above 115 cm go in the 'taller' group.
That leaves the 5 students who are exactly 115 cm. Split them so the two groups end up equal — put 1 of them with the shorter group (making 8) and the remaining 4 with the taller group... but 17 is odd, so a perfectly equal split is impossible.
Best possible: put 2 of the 115-cm students with the taller group and 3 with the shorter group → shorter group = 7 + 3 = 10... instead, to get the closest to equal (8 and 9): put the shorter 7 plus 1 of the 115-cm students in one group (8 students) and the other 4 of the 115-cm students plus the taller 5 in the other group (9 students).

Since 17 is an odd number, the two groups cannot be exactly equal — the nearest split is 8 and 9, using the median 115 cm as the cut-off and dividing the five students who are exactly 115 cm between the two groups.

Answer: Sort the data — the median height is 115 cm (the 9th of 17 values). Use 115 cm as the dividing line: 7 students are below 115 cm, 5 are exactly 115 cm, and 5 are above. Because 17 is odd the groups can't be exactly equal, so split the five students at 115 cm to make the closest split of 8 and 9 (median as the natural divider).

Q6 Describe the mean and median heights of your class. Visualise heights on a dot plot.

SOLUTION

This is an activity question — answers will vary by class.

Steps:

1. Collect the height of every student in your class.
2. Place each height as a dot on a number line (dot plot) at the correct position, stacking dots if multiple students share the same height.
3. Calculate the mean: add all heights, divide by the number of students.
4. Calculate the median: sort the heights, find the middle value (or average of the two middle values if n is even).
5. Mark both mean and median on the dot plot.
6. Describe the spread: note the minimum, maximum, and whether the data is clustered or spread out.
7. Compare mean and median — if they are close, the data is fairly balanced; if mean < median, taller students are fewer.

Answer: Activity-based. Collect class heights, compute mean (sum ÷ count) and median (middle value in sorted list), mark both on a dot plot, and describe the distribution.

Q7 Two 7th grade sections each have 15 boys and 15 girls. In one section, the mean height is 154.2 cm. From this, what must be true about the mean height of students in the other section?

(a) Mean of the other section is 154.2 cm.
(b) Mean of the other section is less than 154.2 cm.
(c) Mean of the other section is more than 154.2 cm.
(d) The mean of the other section cannot be determined.

SOLUTION

Knowing the mean height of one section gives us no information about the other section.

The two sections are independent groups — the heights in one section do not constrain the heights in the other.

The other section's mean could be higher, lower, or exactly the same as 154.2 cm.

We need the actual height data from the other section to calculate its mean.

Answer: (d) The mean height of students in the other section cannot be determined.

Q8 An infographic 'Cities with Most Skyscrapers (buildings taller than 150 m)' shows: Hong Kong 553, Shenzhen 367, New York ≈290, Dubai 251, Guangzhou 188, Shanghai 183, Tokyo ≈170, Kuala Lumpur 154, Chongqing 144, Jakarta 112, Bangkok 110, Singapore 95, Mumbai 86, Seoul 82, Toronto 81, Melbourne 69, Miami 58, Istanbul 48, Moscow 46, London ≈35.
(a) Write estimated values for New York, Tokyo, and London.
(b) Verify: (i) Only 12 cities have more skyscrapers than Mumbai. (ii) Only 7 cities have fewer skyscrapers than Mumbai. (iii) The tallest building in the world is in Hong Kong.

SOLUTION

(a) Reading from the bar chart:
New York: bar is 3rd longest, between Shenzhen (367) and Dubai (251) → approximately 290 skyscrapers.
Tokyo: bar is just longer than Kuala Lumpur (154), between Shanghai (183) and Kuala Lumpur (154) → approximately 170 skyscrapers.
London: bar is the shortest, just below Moscow (46) → approximately 35 skyscrapers.

(b)(i) Cities with MORE than Mumbai (86):
Hong Kong (553), Shenzhen (367), New York (~290), Dubai (251), Guangzhou (188), Shanghai (183), Tokyo (~170), Kuala Lumpur (154), Chongqing (144), Jakarta (112), Bangkok (110), Singapore (95) — that is 12 cities.
Statement (i) is TRUE.

(b)(ii) Cities with FEWER than Mumbai (86):
Seoul (82), Toronto (81), Melbourne (69), Miami (58), Istanbul (48), Moscow (46), London (~35) — that is 7 cities.
Statement (ii) is TRUE.

(b)(iii) Hong Kong has the MOST skyscrapers (553), but that does not mean it has the TALLEST building.
The world's tallest building is the Burj Khalifa in Dubai, not in Hong Kong.
Statement (iii) is FALSE.

Answer: (a) New York ≈ 290, Tokyo ≈ 170, London ≈ 35. (b)(i) TRUE — 12 cities have more than Mumbai. (ii) TRUE — 7 cities have fewer. (iii) FALSE — the world's tallest building is the Burj Khalifa in Dubai, not Hong Kong.

Q9 Estimate and then measure five objects (length of a pen, eraser, palm, geometry box, math notebook) in cm. Draw a double-bar graph (Estimate vs Measure). Find the average difference between estimated and measured values.

SOLUTION

This is an activity — students fill in their own estimates and measurements.

Steps:

1. For each object, write your estimate in the Estimate column before measuring.
2. Measure carefully and record in the Measure column.
3. Positive Difference = |Estimate − Measure| (always take the absolute value).
4. Draw a double-bar graph: one bar per object for estimate, one for measure. Use scale 1 unit = 2 cm (or suitable scale).
5. Average difference = Sum of positive differences ÷ 5.

Example calculation (sample values):

If differences are 1.5, 0.5, 2, 1, 1 cm:

Average difference = (1.5 + 0.5 + 2 + 1 + 1) ÷ 5 = 6 ÷ 5 = 1.2 cm

Answer: Activity-based. Measure all 5 objects, compute each positive difference (|estimate − measure|), draw the double-bar graph, then calculate average difference = sum of differences ÷ 5.

Q10 Aditi's 'Easy' Sudoku solving times (in seconds): 410, 400, 370, 340, 360, 400, 320, 330, 310 (Week 1) and 320, 290, 380, 280, 270, 230, 220, 240 (Week 2).
(a) Construct a dot plot for both weeks.
(b) Describe the mean, median, and observations.

SOLUTION

(a) Dot plot: place Week 1 data (triangles) and Week 2 data (circles) on a common number line from 200 to 420.

Week 1 dots at: 310, 320, 330, 340, 360, 370, 400, 400, 410

Week 2 dots at: 220, 230, 240, 270, 280, 290, 320, 380

(b) Week 1 (n = 9):

Sum = 410+400+370+340+360+400+320+330+310 = 3240

Mean = 3240 ÷ 9 = 360 seconds
Sorted: 310, 320, 330, 340, 360, 370, 400, 400, 410
Median (5th value) = 360 seconds

Week 2 (n = 8):
Sum = 320+290+380+280+270+230+220+240 = 2230
Mean = 2230 ÷ 8 = 278.75 seconds
Sorted: 220, 230, 240, 270, 280, 290, 320, 380
Median = (270 + 280) ÷ 2 = 275 seconds

Observations:
Aditi improved significantly from Week 1 to Week 2.
Mean dropped from 360 s to 278.75 s — about 81 seconds faster on average.
Median dropped from 360 s to 275 s — confirming genuine improvement, not just an outlier effect.
Week 1 data is tightly clustered around 310–410 s.
Week 2 data spreads from 220 to 380 s — greater variability — but the central tendency is much lower.
The fastest time in Week 2 (220 s) is well below any time in Week 1 (minimum 310 s).

Answer: (b) Week 1: mean = 360 s, median = 360 s. Week 2: mean = 278.75 s, median = 275 s. Aditi improved significantly — her average solving time dropped by about 81 seconds from Week 1 to Week 2.