nexamind EDUCATION

Name _____ Date _____

6.1 Conducting an investigation — worked answers

Plan a statistical investigation: write a question and a prediction, decide what data to collect, and record it in a tally chart or frequency table. · 108 questions

A · Fluency — Classify the data, and read the tables.

1 What type of data is **favourite colour**?

- ☐ categorical
- ☐ discrete
- ☐ continuous

Answer: categorical
Categorical — it is a word or a label, not a number.

2 What type of data is **eye colour**?

- ☐ categorical
- ☐ discrete
- ☐ continuous

Answer: categorical
Categorical — it is a word or a label, not a number.

3 What type of data is **country of birth**?

- ☐ categorical
- ☐ discrete
- ☐ continuous

Answer: categorical
Categorical — it is a word or a label, not a number.

4 What type of data is **type of pet**?

- ☐ categorical
- ☐ discrete
- ☐ continuous

Answer: categorical
Categorical — it is a word or a label, not a number.

5 What type of data is **method of travel to school**?

- ☐ categorical
- ☐ discrete
- ☐ continuous

Answer: categorical
Categorical — it is a word or a label, not a number.

6 What type of data is **favourite sport**?

- ☐ categorical
- ☐ discrete
- ☐ continuous

Answer: categorical
Categorical — it is a word or a label, not a number.

7 What type of data is **hair colour**?

- ☐ categorical
- ☐ discrete
- ☐ continuous

Answer: categorical
Categorical — it is a word or a label, not a number.

8 What type of data is **the language spoken at home**?

- ☐ categorical
- ☐ discrete
- ☐ continuous

Answer: categorical
Categorical — it is a word or a label, not a number.

9 What type of data is **type of music**?

- ☐ categorical
- ☐ discrete
- ☐ continuous

Answer: categorical
Categorical — it is a word or a label, not a number.

10 What type of data is **brand of phone**?

- ☐ categorical
- ☐ discrete
- ☐ continuous

Answer: categorical
Categorical — it is a word or a label, not a number.

11 What type of data is **favourite subject**?

- ☐ categorical
- ☐ discrete
- ☐ continuous

Answer: categorical
Categorical — it is a word or a label, not a number.

12 What type of data is **the day of the week you were born**?

- ☐ categorical
- ☐ discrete
- ☐ continuous

Answer: categorical
Categorical — it is a word or a label, not a number.

13 What type of data is **type of housing**?

- ☐ categorical
- ☐ discrete
- ☐ continuous

Answer: categorical
Categorical — it is a word or a label, not a number.

14 What type of data is **nationality**?

- ☐ categorical
- ☐ discrete
- ☐ continuous

Answer: categorical
Categorical — it is a word or a label, not a number.

15 What type of data is **the number of brothers and sisters**?

- ☐ categorical
- ☐ discrete
- ☐ continuous

Answer: discrete
Discrete — it is a number you count, so only whole values are possible.

16 What type of data is **the number of pets**?

- ☐ categorical
- ☐ discrete
- ☐ continuous

Answer: discrete
Discrete — it is a number you count, so only whole values are possible.

17 What type of data is **the number of goals scored**?

- ☐ categorical
- ☐ discrete
- ☐ continuous

Answer: discrete
Discrete — it is a number you count, so only whole values are possible.

18 What type of data is **the number of books read this month**?

- ☐ categorical
- ☐ discrete
- ☐ continuous

Answer: discrete
Discrete — it is a number you count, so only whole values are possible.

19 What type of data is **shoe size**?

- ☐ categorical
- ☐ discrete
- ☐ continuous

Answer: discrete
Discrete — it is a number you count, so only whole values are possible.

20 What type of data is **the number of people in a car**?

- ☐ categorical
- ☐ discrete
- ☐ continuous

Answer: discrete

Discrete — it is a number you count, so only whole values are possible.

21 What type of data is **the number of texts sent**?

- ☐ categorical
- ☐ discrete
- ☐ continuous

Answer: discrete

Discrete — it is a number you count, so only whole values are possible.

22 What type of data is **the number of correct answers**?

- ☐ categorical
- ☐ discrete
- ☐ continuous

Answer: discrete

Discrete — it is a number you count, so only whole values are possible.

23 What type of data is **the number of buses per hour**?

- ☐ categorical
- ☐ discrete
- ☐ continuous

Answer: discrete

Discrete — it is a number you count, so only whole values are possible.

24 What type of data is **the number of rooms in a house**?

- ☐ categorical
- ☐ discrete
- ☐ continuous

Answer: discrete

Discrete — it is a number you count, so only whole values are possible.

25 What type of data is **the number of coins in a purse**?

- ☐ categorical
- ☐ discrete
- ☐ continuous

Answer: discrete

Discrete — it is a number you count, so only whole values are possible.

26 What type of data is **the number of siblings**?

- ☐ categorical
- ☐ discrete
- ☐ continuous

Answer: discrete

Discrete — it is a number you count, so only whole values are possible.

27 What type of data is **the number of days absent**?

- ☐ categorical
- ☐ discrete
- ☐ continuous

Answer: discrete

Discrete — it is a number you count, so only whole values are possible.

28 What type of data is **height**?

- ☐ categorical
- ☐ discrete
- ☐ continuous

Answer: continuous

Continuous — it is a number you measure, so any value in a range is possible and it depends on how accurately you measure.

29 What type of data is **mass**?

- ☐ categorical
- ☐ discrete
- ☐ continuous

Answer: continuous

Continuous — it is a number you measure, so any value in a range is possible and it depends on how accurately you measure.

30 What type of data is **the time taken to run 100 m**?

- ☐ categorical
- ☐ discrete
- ☐ continuous

Answer: continuous

Continuous — it is a number you measure, so any value in a range is possible and it depends on how accurately you measure.

31 What type of data is **arm span**?

- ☐ categorical
- ☐ discrete
- ☐ continuous

Answer: continuous

Continuous — it is a number you measure, so any value in a range is possible and it depends on how accurately you measure.

32 What type of data is **the temperature at noon**?

- ☐ categorical
- ☐ discrete
- ☐ continuous

Answer: continuous

Continuous — it is a number you measure, so any value in a range is possible and it depends on how accurately you measure.

33 What type of data is **the length of a leaf**?

- ☐ categorical
- ☐ discrete
- ☐ continuous

Answer: continuous

Continuous — it is a number you measure, so any value in a range is possible and it depends on how accurately you measure.

34 What type of data is **hand span**?

- ☐ categorical
- ☐ discrete
- ☐ continuous

Answer: continuous

Continuous — it is a number you measure, so any value in a range is possible and it depends on how accurately you measure.

35 What type of data is **the volume of water in a bottle**?

- ☐ categorical
- ☐ discrete
- ☐ continuous

Answer: continuous

Continuous — it is a number you measure, so any value in a range is possible and it depends on how accurately you measure.

36 What type of data is **the distance walked in a day**?

- ☐ categorical
- ☐ discrete
- ☐ continuous

Answer: continuous

Continuous — it is a number you measure, so any value in a range is possible and it depends on how accurately you measure.

37 What type of data is **the time spent on homework**?

- ☐ categorical
- ☐ discrete
- ☐ continuous

Answer: continuous

Continuous — it is a number you measure, so any value in a range is possible and it depends on how accurately you measure.

38 What type of data is **the mass of a parcel**?

- ☐ categorical
- ☐ discrete
- ☐ continuous

Answer: continuous

Continuous — it is a number you measure, so any value in a range is possible and it depends on how accurately you measure.

39 What type of data is **the width of a desk**?

- ☐ categorical
- ☐ discrete
- ☐ continuous

Answer: continuous

Continuous — it is a number you measure, so any value in a range is possible and it depends on how accurately you measure.

40 What type of data is **the speed of a car**?

- ☐ categorical
- ☐ discrete
- ☐ continuous

Answer: continuous

Continuous — it is a number you measure, so any value in a range is possible and it depends on how accurately you measure.

41 How many learners took part altogether?

Pet	Frequency
dog	12
cat	9
fish	5
rabbit	3
none	11
Total	**40**

Answer: 40

Add the frequencies: 12 + 9 + 5 + 3 + 11 = 40.

42 How many learners have a dog?

Pet	Frequency
dog	12
cat	9
fish	5
rabbit	3
none	11
Total	**40**

Answer: 12

Read the row for *dog*: the frequency is 12.

43 Which pet is the most common? Give the word.

Pet	Frequency
dog	12
cat	9
fish	5
rabbit	3
none	11
Total	**40**

Answer: dog
12 is the largest frequency, and it belongs to *dog*.

44 Which pet is the least common? Give the word.

Pet	Frequency
dog	12
cat	9
fish	5
rabbit	3
none	11
Total	**40**

Answer: rabbit
3 is the smallest frequency, and it belongs to *rabbit*.

45 How many more learners have a dog than a cat?

Pet	Frequency
dog	12
cat	9
fish	5
rabbit	3
none	11
Total	**40**

Answer: 3
$12 - 9 = 3$.

46 How many learners have a pet of some kind?

Pet	Frequency
dog	12
cat	9
fish	5
rabbit	3
none	11
Total	**40**

Answer: 29
Everyone except the 11 in the *none* row: 40 − 11 = 29.

47 How many learners are in the survey?

How they travel	Tally	Frequency
walk	𝍸 𝍸 ||||	14
bus	𝍸 𝍸 |	11
car	𝍸 |||	8
bicycle	𝍸 ||	7

Answer: 40
14 + 11 + 8 + 7 = 40.

48 How many learners walk or cycle?

How they travel	Tally	Frequency
walk	𝍸 𝍸 ||||	14
bus	𝍸 𝍸 |	11
car	𝍸 |||	8
bicycle	𝍸 ||	7

Answer: 21
14 + 7 = 21.

49 How many more learners take the bus than come by car?

How they travel	Tally	Frequency
walk	𝍸 𝍸 ||||	14
bus	𝍸 𝍸 |	11
car	𝍸 |||	8
bicycle	𝍸 ||	7

Answer: 3
11 − 8 = 3.

50 How many tally marks are in the row for *bus*?

How they travel	Tally	Frequency
walk	𝍸 𝍸 ||||	14
bus	𝍸 𝍸 |	11
car	𝍸 |||	8
bicycle	𝍸 ||	7

Answer: 11
The tally shows the frequency, so there are 11 marks: two gates of five and one more.

51 How many learners were measured?

Height h (cm)	Frequency
140 ≤ h < 150	4
150 ≤ h < 160	11
160 ≤ h < 170	9
170 ≤ h < 180	6

Answer: 30
4 + 11 + 9 + 6 = 30.

52 How many learners are shorter than 160 cm?

Height h (cm)	Frequency
140 ≤ h < 150	4
150 ≤ h < 160	11
160 ≤ h < 170	9
170 ≤ h < 180	6

Answer: 15
The first two groups: 4 + 11 = 15.

53 How many learners are at least 160 cm tall?

Height h (cm)	Frequency
140 ≤ h < 150	4
150 ≤ h < 160	11
160 ≤ h < 170	9
170 ≤ h < 180	6

Answer: 15
The last two groups: 9 + 6 = 15.

54 How wide is each group, in cm?

Height h (cm)	Frequency
140 ≤ h < 150	4
150 ≤ h < 160	11
160 ≤ h < 170	9
170 ≤ h < 180	6

Answer: 10
Each group runs from one multiple of 10 to the next: 150 − 140 = 10 cm.

55 Which group has the highest frequency? Give the lower limit of the group, in cm.

Height h (cm)	Frequency
140 ≤ h < 150	4
150 ≤ h < 160	11
160 ≤ h < 170	9
170 ≤ h < 180	6

Answer: 150
11 is the largest frequency, in the group 150 ≤ h < 160.

56 How many Year 7 learners were asked?

Year group	Walk	Bus	Car
Year 7	14	11	5
Year 8	9	16	7

Answer: 30
14 + 11 + 5 = 30.

57 How many Year 8 learners were asked?

Year group	Walk	Bus	Car
Year 7	14	11	5
Year 8	9	16	7

Answer: 32
9 + 16 + 7 = 32.

58 How many learners take the bus altogether?

Year group	Walk	Bus	Car
Year 7	14	11	5
Year 8	9	16	7

Answer: 27
11 + 16 = 27.

59 How many learners were asked in total?

Year group	Walk	Bus	Car
Year 7	14	11	5
Year 8	9	16	7

Answer: 62
30 + 32 = 62.

60 How many more Year 8 learners take the bus than Year 7?

Year group	Walk	Bus	Car
Year 7	14	11	5
Year 8	9	16	7

Answer: 5
16 − 11 = 5.

61 Which year group has more learners walking? Give the year group number.

Year group	Walk	Bus	Car
Year 7	14	11	5
Year 8	9	16	7

Answer: 7
14 is more than 9, so Year 7.

62 How many learners are in this survey?

Time t (minutes)	Frequency
$0 \le t < 10$	3
$10 \le t < 20$	8
$20 \le t < 30$	12
$30 \le t < 40$	7
$40 \le t < 50$	2

Answer: 32
3 + 8 + 12 + 7 + 2 = 32.

63 How many learners spent less than 20 minutes?

Time t (minutes)	Frequency
$0 \le t < 10$	3
$10 \le t < 20$	8
$20 \le t < 30$	12
$30 \le t < 40$	7
$40 \le t < 50$	2

Answer: 11
3 + 8 = 11.

64 How many learners spent 30 minutes or more?

Time t (minutes)	Frequency
0 ≤ t < 10	3
10 ≤ t < 20	8
20 ≤ t < 30	12
30 ≤ t < 40	7
40 ≤ t < 50	2

Answer: 9
7 + 2 = 9.

65 Which group has the highest frequency? Give the lower limit, in minutes.

Time t (minutes)	Frequency
0 ≤ t < 10	3
10 ≤ t < 20	8
20 ≤ t < 30	12
30 ≤ t < 40	7
40 ≤ t < 50	2

Answer: 20
12 is the largest frequency, in the group 20 ≤ t < 30.

66 How many groups are there?

Time t (minutes)	Frequency
0 ≤ t < 10	3
10 ≤ t < 20	8
20 ≤ t < 30	12
30 ≤ t < 40	7
40 ≤ t < 50	2

Answer: 5
Count the rows: 5 class intervals.

67 How wide is each group, in minutes?

Time t (minutes)	Frequency
0 ≤ t < 10	3
10 ≤ t < 20	8
20 ≤ t < 30	12
30 ≤ t < 40	7
40 ≤ t < 50	2

Answer: 10
10 − 0 = 10 minutes.

68 How many learners chose a sport?

Sport	Tally	Frequency
football	𝍸 𝍸 𝍸 ||	17
swimming	𝍸 |||	8
athletics	𝍸 |	6
tennis	||||	4

Answer: 35
17 + 8 + 6 + 4 = 35.

69 Which sport is most popular? Give the word.

Sport	Tally	Frequency
football	𝍸 𝍸 𝍸 ||	17
swimming	𝍸 |||	8
athletics	𝍸 |	6
tennis	||||	4

Answer: football
17 is the largest frequency.

70 How many more chose football than tennis?

Sport	Tally	Frequency
football	𝍸 𝍸 𝍸 ||	17
swimming	𝍸 |||	8
athletics	𝍸 |	6
tennis	||||	4

Answer: 13
17 − 4 = 13.

71 How many chose a sport other than football?

Sport	Tally	Frequency
football	𝍸 𝍸 𝍸 ||	17
swimming	𝍸 |||	8
athletics	𝍸 |	6
tennis	||||	4

Answer: 18
35 − 17 = 18.

B · Reasoning — Planning, question design and why the rules exist.

72 Which of these is a good statistical question?

- ☐ What is my favourite colour?
- ☐ Which colour is most popular in my class?
- ☐ Is blue a nice colour?
- ☐ How many colours are there?

Answer: Which colour is most popular in my class?

A statistical question is one you answer by collecting data that **varies** from person to person. The others have a single fixed answer or are a matter of opinion.

73 What should you do first when planning a statistical investigation?

- ☐ Collect the data
- ☐ Write the statistical question and a prediction
- ☐ Draw the chart
- ☐ Write the conclusion

Answer: Write the statistical question and a prediction

Deciding what you are trying to find out tells you what data you need — collecting first usually means collecting the wrong thing.

74 Why is a prediction useful before you collect data?

- ☐ It saves collecting data
- ☐ It makes the answer come out right
- ☐ It gives you something to test the data against
- ☐ It is required by the teacher

Answer: It gives you something to test the data against

The point of the investigation is to see whether the data supports your prediction or not. Being wrong is a perfectly good result.

75 Data you collect yourself is called …

- ☐ primary data
- ☐ secondary data
- ☐ continuous data
- ☐ raw data

Answer: primary data

Primary data is first-hand. Secondary data is data somebody else collected, such as figures from a website or a census.

76 Data taken from a website or a published report is called …

- ☐ primary data
- ☐ secondary data
- ☐ categorical data
- ☐ biased data

Answer: secondary data

It is second-hand: you did not collect it yourself.

77 What is a tally chart for?

- ☐ Making the data look tidy
- ☐ Counting reliably as the data comes in
- ☐ Calculating the mean
- ☐ Drawing a pie chart

Answer: Counting reliably as the data comes in

The five-bar gate lets you keep count without losing your place, and the totals become the frequency column.

78 When should you group data into class intervals?

- ☐ Always
- ☐ When there are many different values, especially continuous data
- ☐ Only for categorical data
- ☐ Never — it loses information

Answer: When there are many different values, especially continuous data
Grouping makes a pattern visible. It does lose some detail, which is the trade-off you accept.

79 Why must class intervals not overlap?

- ☐ It looks untidy
- ☐ Some values would belong to two groups at once
- ☐ It makes the total wrong on purpose
- ☐ There is no reason

Answer: Some values would belong to two groups at once
Groups such as 140–150 and 150–160 leave you nowhere to put 150. Writing $140 \leq h < 150$ fixes it.

80 A question asks “Don't you agree that football is the best sport?” What is wrong with it?

- ☐ Nothing
- ☐ It is a leading question that pushes people towards one answer
- ☐ It is too short
- ☐ It asks for continuous data

Answer: It is a leading question that pushes people towards one answer
A fair question is neutral: “Which sport do you most enjoy watching?”

81 A questionnaire offers the choices 0–5, 5–10, 10–15. What is wrong?

- ☐ Nothing
- ☐ The groups overlap, so 5 and 10 fit in two boxes
- ☐ The groups are too wide
- ☐ There are too few choices

Answer: The groups overlap, so 5 and 10 fit in two boxes
Response boxes must not overlap and must cover every possible answer.

82 A questionnaire asks for age with the boxes “under 12” and “over 12”. What is wrong?

- ☐ Nothing
- ☐ Someone who is exactly 12 has no box to tick
- ☐ The boxes overlap
- ☐ Age is categorical data

Answer: Someone who is exactly 12 has no box to tick
The options must be **exhaustive** as well as non-overlapping.

83 Is shoe size discrete data?

- ☐ Yes
- ☐ No

Answer: Yes
Shoe sizes come in fixed steps and you count them, so they are discrete — even though feet themselves vary continuously.

84 Is the time taken to run 100 m continuous data?

- ☐ Yes
- ☐ No

Answer: Yes
Time is measured, not counted, so any value in a range is possible.

85 Is a person's favourite subject numerical data?

☐ Yes

☐ No

Answer: No

It is a word, so it is categorical.

86 Which type of data is best shown in a bar chart with a gap between the bars?

☐ continuous

☐ categorical

☐ neither

☐ both equally

Answer: categorical

The gaps show that the categories are separate. Continuous data is drawn with the bars touching, because the scale is unbroken.

C · Challenge — Missing frequencies, grouping and percentages.

87 A tally chart has 4 complete gates of five and 3 extra marks. What is the frequency?

Answer: 23

$4 \times 5 + 3 = 23$.

88 A survey of 60 learners records 18 who walk. How many do not walk?

Answer: 42

$60 - 18 = 42$.

89 A frequency table has four rows with frequencies 12, 9, 5 and an unknown value. The total is 40. What is the missing frequency?

Answer: 14

$40 - (12 + 9 + 5) = 40 - 26 = 14$.

90 Data is grouped as $0 \le t < 5$, $5 \le t < 10$, and so on, up to $25 \le t < 30$. How many groups are there?

Answer: 6

$30 \div 5 = 6$ groups.

91 Heights from 142 cm to 178 cm are to be put into groups 10 cm wide, starting at 140. How many groups are needed?

Answer: 4

140–150, 150–160, 160–170, 170–180 — that is 4 groups.

92 In a survey of 200 people, 35% chose tea. How many people is that?

Answer: 70

35% of 200 = $0.35 \times 200 = 70$.

93 A class of 30 is surveyed and 12 have a bicycle. What percentage is that?

Answer: 40

$12 \div 30 = 0.4 = 40\%$.

94 You want to find the typical time learners spend on homework. Is that data categorical, discrete or continuous?

Answer: continuous

Time is measured, so it is continuous.

95 You want to find how many pets each learner owns. Is that data categorical, discrete or continuous?

Answer: discrete
You count whole pets, so it is discrete.

96 You predict that most learners in your class walk to school. The data shows only 30% walk. What should you do?

- ☐ Change the data
- ☐ Collect more data until the prediction is right
- ☐ Report that the prediction was not supported
- ☐ Do not mention the prediction

Answer: Report that the prediction was not supported
A prediction that turns out to be wrong is a real finding. Changing the data or collecting until you get the answer you want is not statistics.

D · Word problems — Surveys in real settings.

97 A shop records 45 customers on Monday, 62 on Tuesday and 58 on Wednesday. How many customers in the three days?

Answer: 165
45 + 62 + 58 = 165.

98 In a class of 28, everyone has either a cat or a dog. 17 have a dog. How many have a cat?

Answer: 11
28 − 17 = 11.

99 A teacher counts 5 gates of five and 2 extra tally marks. How many is that?

Answer: 27
5 × 5 + 2 = 27.

100 A survey collects data from 3 classes of 32 learners. How many learners in total?

Answer: 96
3 × 32 = 96.

101 A café records drinks sold: 24 tea, 31 coffee, 15 juice. How many drinks altogether?

Answer: 70
24 + 31 + 15 = 70.

102 Using the café figures above, how many more coffees than juices were sold?

Answer: 16
31 − 15 = 16.

103 A bus company counts passengers each hour for 8 hours and records 47, 52, 38, 61, 55, 43, 39, 45. How many passengers altogether?

Answer: 380
47 + 52 + 38 + 61 + 55 + 43 + 39 + 45 = 380.

104 Of 150 people surveyed, 90 said yes. What percentage said yes?

Answer: 60
90 ÷ 150 = 0.6 = 60%.

105 A library records books borrowed in a week: 120 fiction, 85 non-fiction. How many books were borrowed?

Answer: 205
120 + 85 = 205.

106 A researcher wants to know which languages learners speak at home. What type of data is that?

Answer: categorical
Languages are labels, not numbers.

107 A nurse records the mass of each baby in kilograms. What type of data is that?

Answer: continuous
Mass is measured, so any value in a range is possible.

108 A coach records the number of goals each player scored. What type of data is that?

Answer: discrete
Goals are counted in whole numbers.