



eClassroom

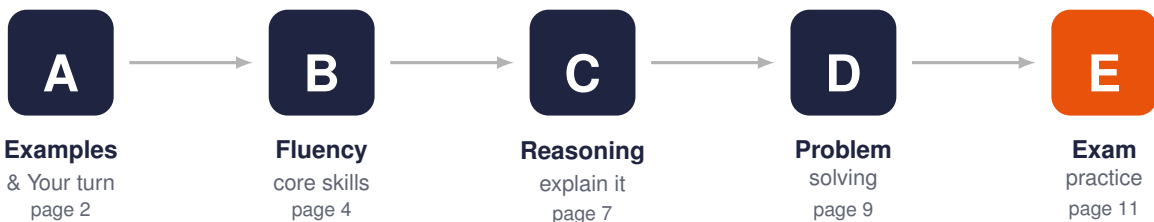
GCSE MATHEMATICS • DATA & STATISTICS

Charts & Diagrams

Worksheet

Pearson Edexcel GCSE (1MA1) & International GCSE (4MA1) • Calculator allowed

Free Charts and Diagrams worksheet for GCSE and iGCSE Maths, with full worked solutions



Tap a section to jump straight to it

By the end of this worksheet you can: read and draw bar charts, pictograms and vertical line charts • work out pie chart angles, draw pie charts and read them • draw and use ordered stem-and-leaf diagrams • spot misleading charts
• *Higher:* compare pie charts, back-to-back stem-and-leaf diagrams, frequency polygons and composite bar charts.

Which questions are for me?

FOUNDATION Everyone starts here. These skills appear on both tiers.

HIGHER The same charts where Higher papers use them: comparing pie charts with different totals, back-to-back diagrams, frequency polygons and pie-chart algebra. Grades 6 to 9.

Every section has both, clearly labelled. Questions get harder as you go, and every skill in Sections A to D is needed in Section E.

Track your progress

Section	B	C	D	E
Foundation marks	23	10	13	15
Higher marks	16	14	17	15
My score				

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A

Worked examples & Your turn

Read each example carefully. Cover it up, then answer the question beside it using the same method.

FOUNDATION

Everyone starts here

Worked example A1

36 students travel by bus (12), walk (9) or car (15).
Work out the pie chart angles.

$360^\circ \div 36 = 10^\circ$ per student: multiply each number by 10

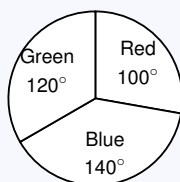
120°, 90°, 150°

Your turn A1

45 people chose red (15), blue (20) or green (10).
Work out the pie chart angles.

Worked example A2

The pie chart shows the favourite colours of 72 people. How many chose red?

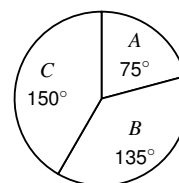


Red is $\frac{100}{360}$ of 72

20

Your turn A2

The pie chart shows the choices of 120 people.
How many chose A?



Worked example A3

Find the median, the range and the mode.

11 values: the median is the 6th

1	2 5 8
2	0 3 3 7
3	1 4 6 9

Key: 1 | 2 means 12

23; 27; 23

Your turn A3

Find the median, the range and the mode.

4	1 6
5	0 2 2 5 8
6	3 7 9

Key: 4 | 1 means 41

Worked example A4

The angles of a pie chart are x , $2x$ and $3x$. Find each angle.

The angles add up to 360° : $6x = 360$

60°, 120°, 180°

Your turn A4

The angles of a pie chart are $x + 20$, $2x$ and $3x - 20$. Find each angle.



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HIGHER

Higher strategies: comparing charts and frequency polygons

Worked example A5: pie charts with different totals

Class P (30 students) and class Q (36 students) each drew a pie chart. Music is 120° for P and 110° for Q . Which class has more students choosing music?

Angles show fractions: $\frac{120}{360} \times 30 = 10$, $\frac{110}{360} \times 36 = 11$

Q , with 11

Your turn A5

Shop X (180 customers) and shop Y (240 customers) each drew a pie chart. Paying by card is 200° for X and 162° for Y . Which shop has more customers paying by card?

Worked example A6: a frequency polygon

Draw a frequency polygon for $0 < t \leq 10$:

4, $10 < t \leq 20$: 9,
 $20 < t \leq 30$: 6,
 $30 < t \leq 40$: 3



Plot at the midpoints 5, 15, 25, 35; join with straight lines.

(5, 4), (15, 9), (25, 6), (35, 3)

Your turn A6

Write down the points you would plot for a frequency polygon of $20 < m \leq 30$: 2, $30 < m \leq 40$: 7, $40 < m \leq 50$: 10, $50 < m \leq 60$: 5

Worked example A7: back-to-back stem-and-leaf

Compare the boys' and girls' times using the medians.

Boys		Girls
8 5	1	2 7 9
9 6 4 1	2	0 2 5
3	3	0

Key: 5|1 = 15 (boys),

1|2 = 12 (girls)

Read each side outward from the stem; the median is the 4th of 7

boys 24, girls 20

Your turn A7

Find the median for each group.

A		B
7 2	4	5 8
9 6 3 0	5	1 4 4
1	6	2 6

Key: 2|4 = 42 (A), 4|5 = 45 (B)



B**Fluency**

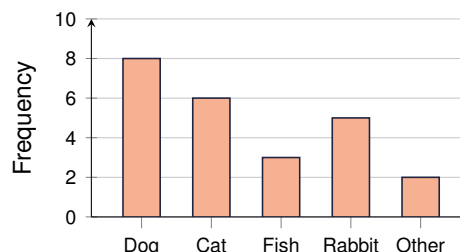
Each question is a designed sequence. From one part to the next, ask yourself: what changed, and what did it do to the answer?

FOUNDATION

Everyone starts here

- B1** The bar chart shows the pets owned by some students.

- (a) How many own a dog?
 (b) How many students are there?
 (c) How many more own a dog than a fish?
 (d) What fraction own a cat?



[4 marks]

- B2** A pie chart shows the choices of 60 people.

- (a) How many degrees for each person?
 (b) What angle is 15 people?
 (c) How many people is an angle of 150° ?
 (d) What angle is 35% of the people?

[4 marks]

- B3** In a pictogram, ● represents 4 books. How many books do these represent?

(a) ● ● ●

(b) ● ● ●

(c) ● ●

(d) Draw the symbols for 9 books.

[4 marks]

- B4** The stem-and-leaf diagram shows 15 marks.

- (a) Write down the smallest mark.
 (b) Find the median.
 (c) Find the range.
 (d) Write down the mode.

2	1 3 3 8
3	0 2 4 4 4 7
4	1 5 6
5	0 2

Key: 2 | 1 means 21

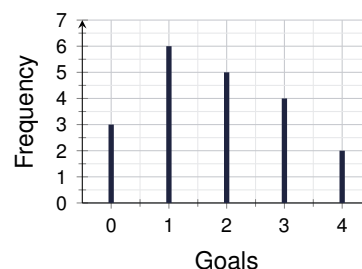
[4 marks]



FOUNDATION *continued: line charts and choosing a chart*

B5 The vertical line chart shows the goals scored in some matches.

- (a) Write down the mode.
 (b) How many matches were there?
 (c) Work out the mean number of goals.



[3 marks]

B6 Which type of chart or diagram would you use for each set of data? Give a reason.

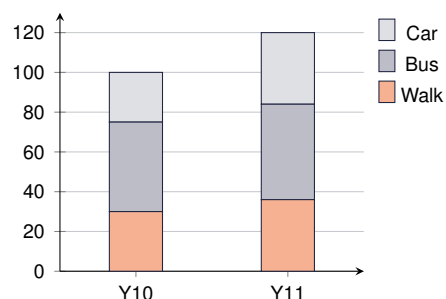
- (a) The favourite colours of 30 students. (b) How a family spends its monthly budget, as parts of the whole.
 (c) The heights of 50 students, in grouped classes. (d) The marks of 20 students, keeping every mark.

[4 marks]

HIGHER *Higher tier only*

B7 The composite bar chart shows how students in Years 10 and 11 travel to school.

- (a) How many Year 10 students go by bus?
 (b) How many Year 11 students go by car?
 (c) How many students walk altogether?
 (d) What percentage of Year 11 walk?



[4 marks]

B8 The table shows the times some people took.

Time t (min)	$0 < t \leq 4$	$4 < t \leq 8$	$8 < t \leq 12$	$12 < t \leq 16$	$16 < t \leq 20$
Frequency	3	7	9	5	1

- (a) Write down the midpoints. (b) Write down the points to plot for a frequency polygon.
 (c) Write down the modal class. (d) Which class contains the median?

[4 marks]



HIGHER*continued: comparing pie charts and back-to-back diagrams*

B9 90 boys and 120 girls chose their favourite sport. In the boys' pie chart football is 160° ; in the girls' pie chart football is 90°

- (a) How many boys chose football? (b) How many girls chose football?
 (c) What fraction of the girls chose football? (d) What fraction of all 210 students chose football?

[4 marks]

B10 The diagram shows the scores of two groups, A and B .

- (a) Find the median of A .
 (b) Find the median of B .
 (c) Find the range of A .
 (d) Find the range of B .

A		B
9 4	1	1
8 5 5 2	2	0 3 4 7
6 1	3	2 5 8
0	4	4

Key: $4|1$ means 14 for A ; $1|1$ means 11 for B

[4 marks]

C**Reasoning**

Show your working and explain your thinking. A correct answer without a reason does not score full marks.

FOUNDATION

Everyone starts here

- C1** 36 students chose bus (12), walk (9) or car (15). Tom draws a pie chart with angles 12° , 9° and 15° . Explain Tom's mistake, and give the correct angles. [2 marks]
- C2** Sam draws this stem-and-leaf diagram for some marks.
- | | |
|---|-------|
| 1 | 8 2 5 |
| 2 | 7 0 4 |
- Key: 1 | 8 means 18
- Explain what is wrong with Sam's diagram, and draw it correctly. [2 marks]
- C3** Two schools each drew a pie chart of how students travel. Explain why the pie charts cannot show which school has more students who walk. [3 marks]
- C4** 18 of 45 people chose "yes". Show that the angle for "yes" on a pie chart is 144° [3 marks]



HIGHER*Higher tier only*

- C5** Kai draws a frequency polygon for the classes $0 < t \leq 10$, $10 < t \leq 20$, $20 < t \leq 30$ by plotting his points at 10, 20 and 30
Explain Kai's mistake, and write down the correct t -values for his points. [3 marks]
- C6** Explain when a composite bar chart is better than a dual bar chart, and when a dual bar chart is better. [3 marks]
- C7** A stem-and-leaf diagram has the key $3|4$ means 3.4 Jo reads the value $3|4$ as 34
Explain Jo's mistake, and find the range of the values $2|7$, $3|4$ and $4|1$ [3 marks]
- C8** Every sector of a pie chart represents a whole number of people.
(a) One sector has an angle of 26° . Find the smallest possible number of people.
(b) Another sector has an angle of 75° . Find the smallest possible number of people now.
(c) Explain why the total could not be 500 [5 marks]



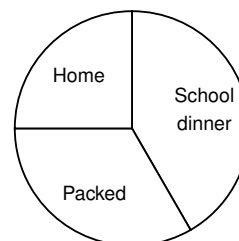
D**Problem solving**

You decide the method. Read the whole question first, and show every step.

FOUNDATION

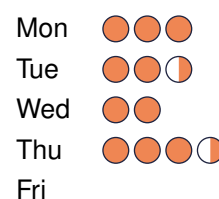
Everyone starts here

- D1** The pie chart shows the lunches of 120 students.
How many more students have a school dinner than go home for lunch?



[3 marks]

- D2** The pictogram shows the cakes sold in a shop. On Friday it sold twice as many as on Wednesday. Complete the pictogram for Friday, and work out the total number of cakes sold.



Key: represents 10 cakes

[4 marks]

- D3** The diagram shows the marks of 21 students. The pass mark is 30
What percentage of the students passed?

1	5 8 9
2	0 3 4 6 6 8
3	0 2 5 5 7 9
4	1 3 4 8
5	2 6

Key: 1 | 5 means 15

[3 marks]

- D4** A pie chart shows the choices of 40 students. Explain why every angle in the pie chart must be a multiple of 9°

[3 marks]



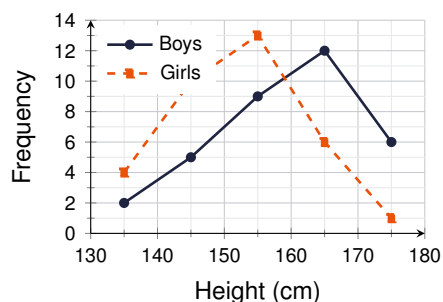
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HIGHER*Higher tier only*

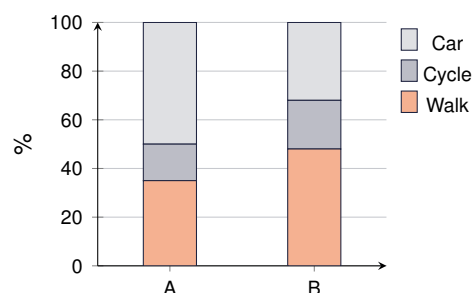
D5 The frequency polygons show the heights of 34 boys and 34 girls.

- (a) Write down the modal class for the boys and for the girls.
 (b) How many boys are taller than 160 cm?
 (c) Compare the heights of the boys and the girls.

**[4 marks]**

D6 The chart shows how students at two schools travel, as percentages. School A has 400 students.

- (a) What percentage of school A cycle?
 (b) How many students at school A cycle?
 (c) School B has 250 students. How many more walk at B than cycle at B?

**[4 marks]**

D7 72 people are shown in a pie chart. The angle for walking is 50° . The angle for bus is 35° more than for walking, and the angle for car is twice the angle for bus. The rest chose "other".

How many people chose each option?

[4 marks]

D8 In group B, one leaf is missing and is shown as x .

- (a) The two groups have the same median. Find x .
 (b) Show that the two groups can never have the same mean, whatever digit x is.

A	B
7 3	1 1 6 9
8 4 0	2 x 6 9
5 1	3 3
	4 0

Key: 3 | 1 means 13 for A; 1 | 1 means 11 for B

[5 marks]

E**Exam practice**

Exam-style questions. Write your answers in the spaces. Aim for about one minute per mark.

FOUNDATION

Foundation and Higher crossover

E1 The bar chart shows the favourite sports of some students.

(a) How many chose football?

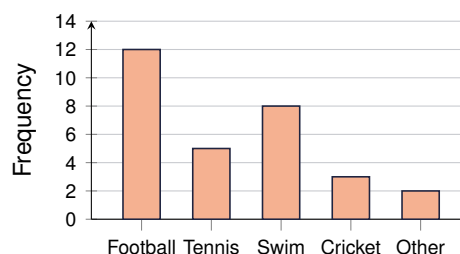
(1)

(b) How many students are there?

(1)

(c) What fraction chose tennis?

(1)



(Total for Question E1 is 3 marks)

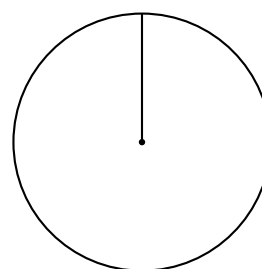
E2 60 people chose tea (25), coffee (20) or juice (15).

(a) Work out the angle for each drink.

(3)

(b) Draw the pie chart.

(1)



(Total for Question E2 is 4 marks)

E3 Here are 11 times, in seconds. 34 27 41 29 35 38 22 45 31 36 27

(a) Draw an ordered stem-and-leaf diagram. Include a key.

(2)

(b) Find the median time.

(1)

(Total for Question E3 is 3 marks)



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E4 The pictogram shows the cars washed on two days.

(a) How many cars were washed on Monday?

(1)

(b) 18 cars were washed on Tuesday. Complete the pictogram.

(2)

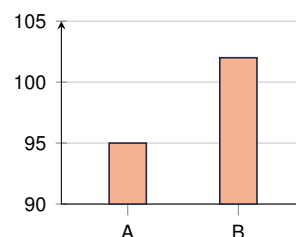
Mon 
Tue

Key:  represents 8 cars

(Total for Question E4 is 3 marks)

E5 The bar chart shows the sales of two phones. The advert says "Phone B sells three times as many as phone A".

Give two reasons why the chart is misleading.



(Total for Question E5 is 2 marks)

HIGHER

Higher tier only

E6 The table shows the times some people waited.

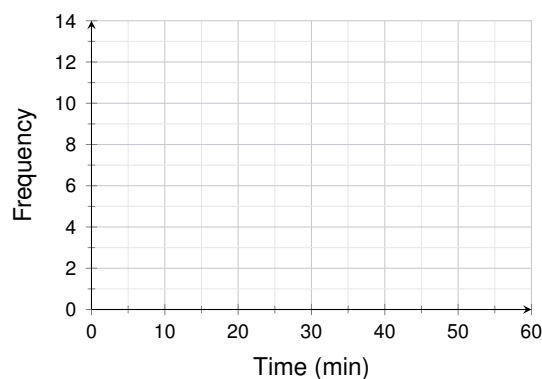
Time t (min)	$10 < t \leq 20$	$20 < t \leq 30$	$30 < t \leq 40$	$40 < t \leq 50$
Frequency	3	8	12	5

(a) Draw a frequency polygon for this information.

(2)

(b) Write down the modal class.

(1)



(Total for Question E6 is 3 marks)



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- E7** School *A* has 300 students and school *B* has 500 students. In each school's pie chart of how students travel, the angle for walking is 72° for *A* and 54° for *B*.

Rob says, "More students walk at school *A*, because its angle is bigger." Is Rob right? Show your working.

(Total for Question E7 is 3 marks)

- E8** The back-to-back diagram shows the scores of two teams.

Compare the scores of the two teams, using the medians and the ranges.

Team A		Team B
8 5	3	1
7 4 1	4	0 3 8 9
6 2 2	5	5
0	6	2 4 7

Key: 5|3 means 35 for *A*; 3|1 means 31 for *B*

(Total for Question E8 is 4 marks)

- E9** The angles of a pie chart are $2x$, $3x - 10$, $x + 40$ and 90°

(a) Find x .

.....
(2)

(b) The sector with the angle $3x - 10$ represents 33 people. Work out the number of people each of the other sectors represents.

.....
(3)

(Total for Question E9 is 5 marks)

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