Cumulative Frequency - Worksheet

Skill

Group A - Drawing cumulative frequency graphs

Draw cumulative frequency graphs for the following:

1)

Time (min)	Frequency
$0 < t \leq 5$	5
$5 < t \leq 10$	15
$10 < t \leq 15$	20
$15 < t \leq 20$	35
$20 < t \leq 25$	20
$25 < t \leq 30$	5

2)

Distance (km)	Frequency
$0 < d \leq 1$	4
$1 < d \leq 2$	10
$2 < d \leq 4$	20
$4 < d \leq 6$	14
$6 < d \leq 10$	9
$10 < d \leq 15$	3

3)

Weight (g)	Frequency
$300 < w \leq 350$	3
$350 < w \leq 400$	9
$400 < w \leq 450$	18
$450 < w \leq 500$	32
$500 < w \leq 550$	12
$550 < w \leq 600$	6

4)

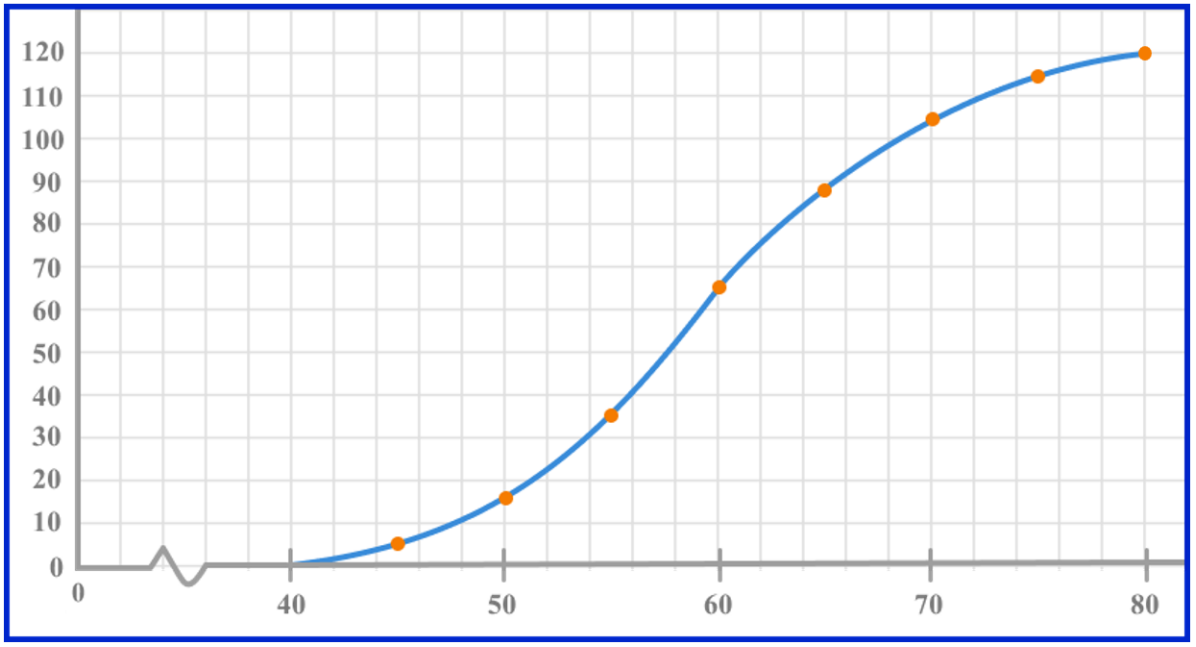
Height (m)	Frequency
$1.3 < h \leq 1.4$	10
$1.4 < h \leq 1.5$	16
$1.5 < h \leq 1.6$	24
$1.6 < h \leq 1.7$	20
$1.7 < h \leq 1.8$	8
$1.8 < h \leq 1.9$	2

Cumulative Frequency - Worksheet

Group B - Estimating the median and quartiles

Determine the median and quartiles of each cumulative frequency graph:

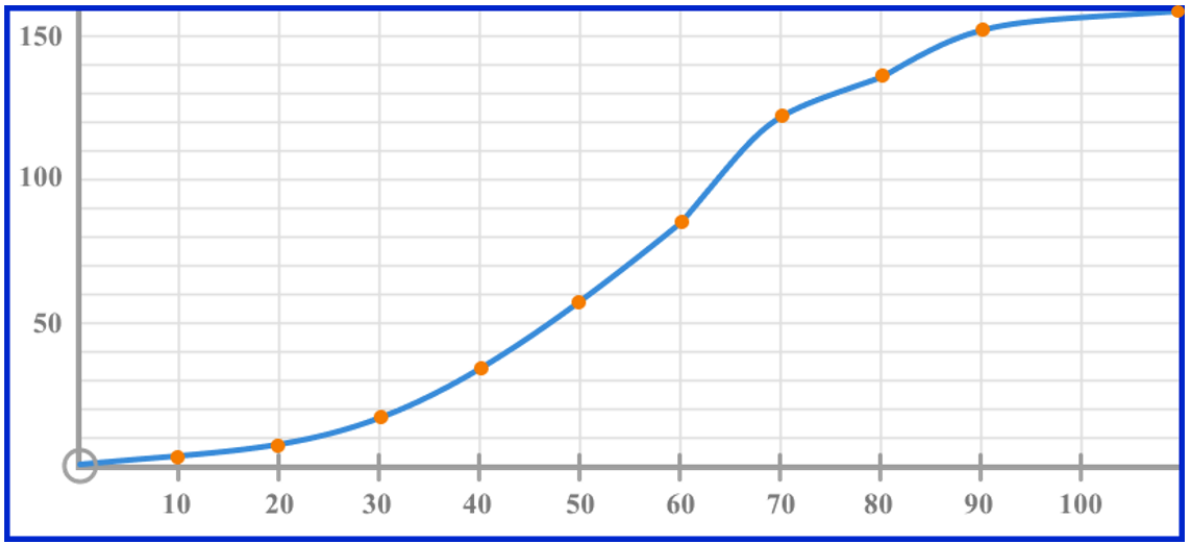
1)



a) Estimate the median

b) Estimate the lower quartile

2)

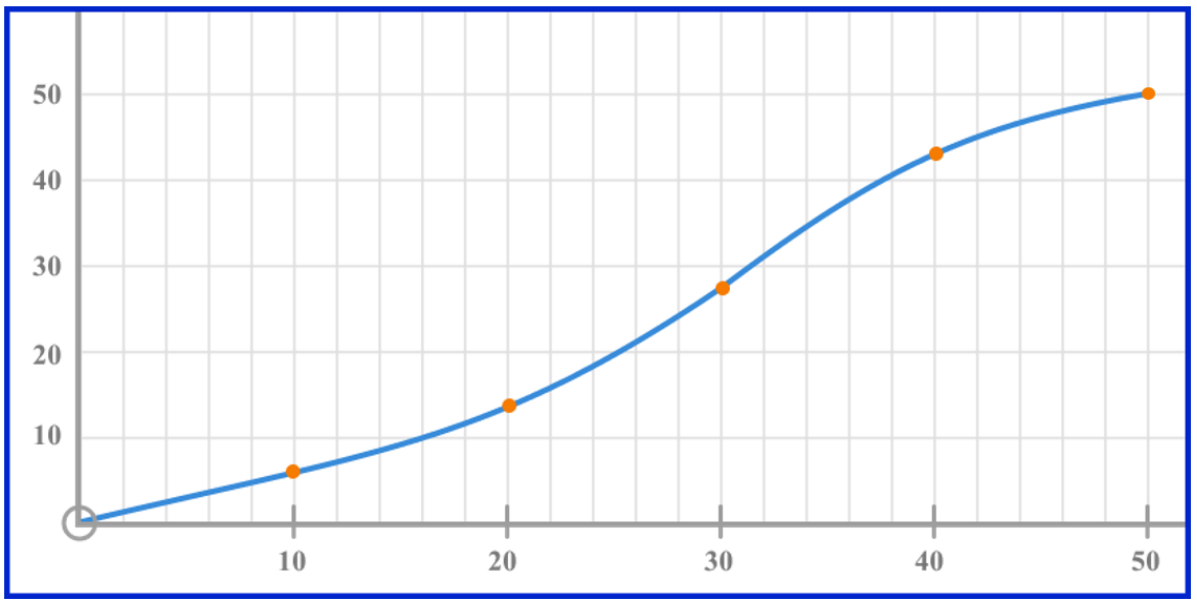


a) Estimate the median

b) Estimate the upper quartile

Cumulative Frequency - Worksheet

3)



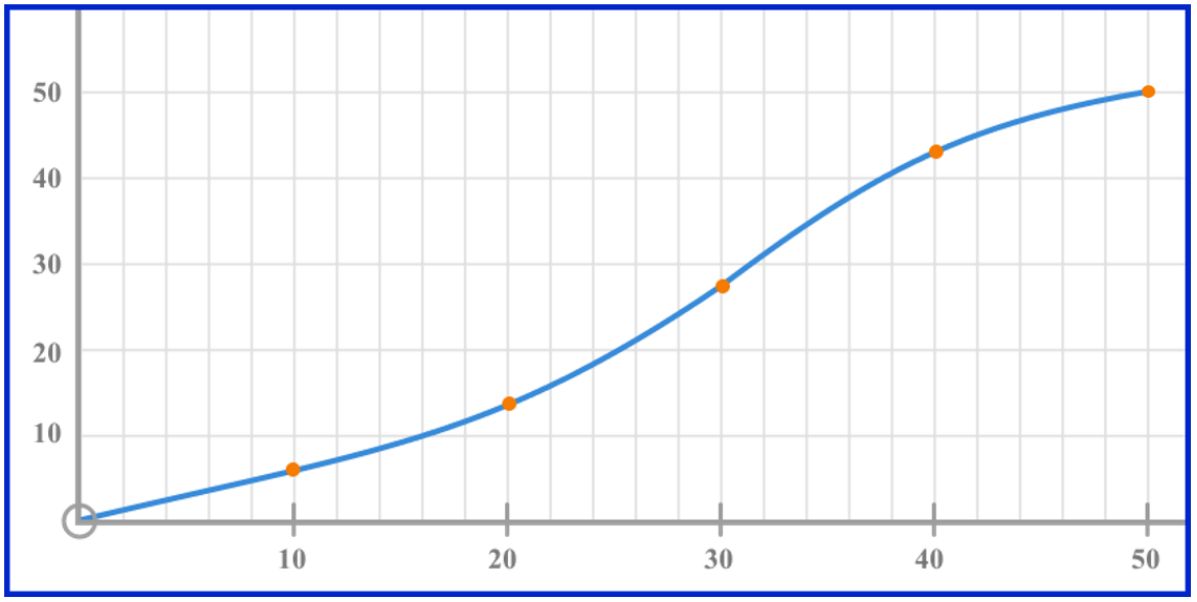
a) Estimate the median

b) Estimate the lower quartile

Group C - Estimating from a cumulative frequency graph

Determine the required value(s) from each cumulative frequency graph:

1)

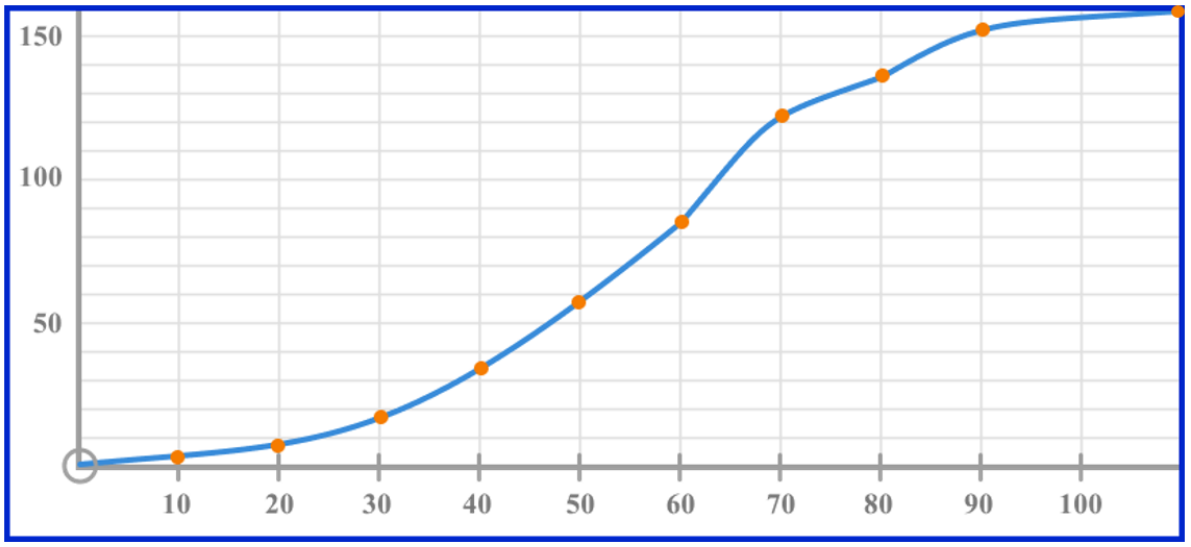


a) How many people scored 30 or less?

b) How many people scored more than 40?

Cumulative Frequency - Worksheet

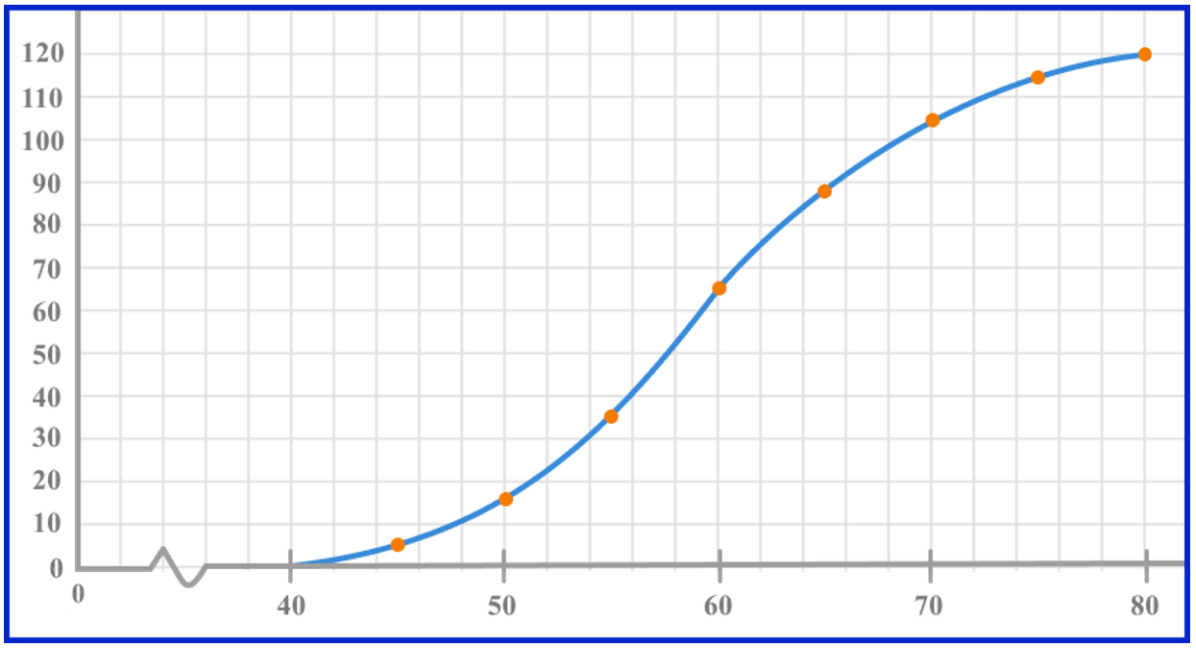
2)



a) How many people scored 40 or less?

b) How many people scored more than 65?

3)



a) How many people scored 50 or more?

b) How many people scored between 60 and 70?

Cumulative Frequency - Worksheet

Applied

1) The table below shows the ages of people watching a football match on a Saturday morning:

Age (years)	Frequency
$0 < y < 10$	6
$10 < y < 20$	19
$20 < y < 30$	25
$30 < y < 40$	30
$40 < y < 50$	22
$50 < y < 60$	10
$60 < y < 70$	8

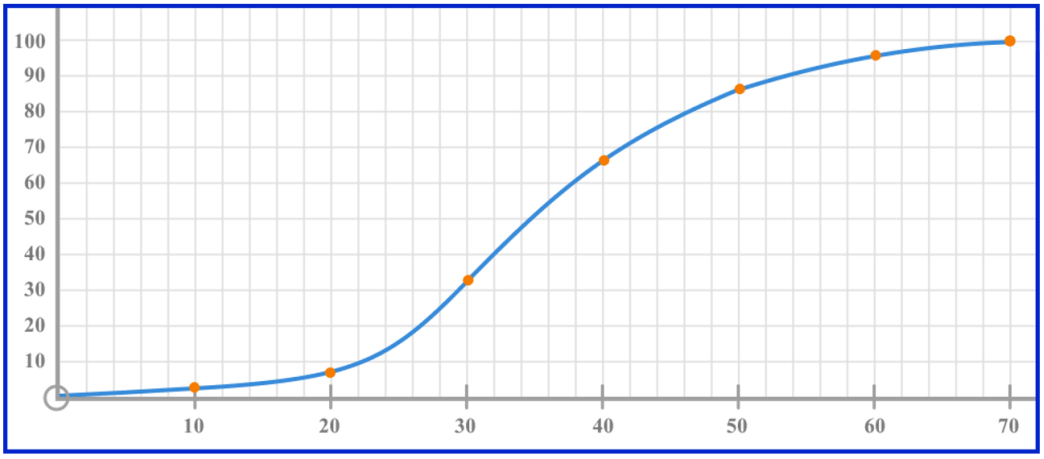
Age (years)	Cumulative Frequency
$0 < y < 10$	
$0 < y < 20$	
$0 < y < 30$	
$0 < y < 40$	
$0 < y < 50$	
$0 < y < 60$	
$0 < y < 70$	

(a) Complete the cumulative frequency column of the second table.

(b) Draw a cumulative frequency graph to represent this distribution.

(c) Estimate the number of attendees 18 or under.

The football club also recorded attendance at a match which took place on a Wednesday night. Here is a graph to represent this distribution:

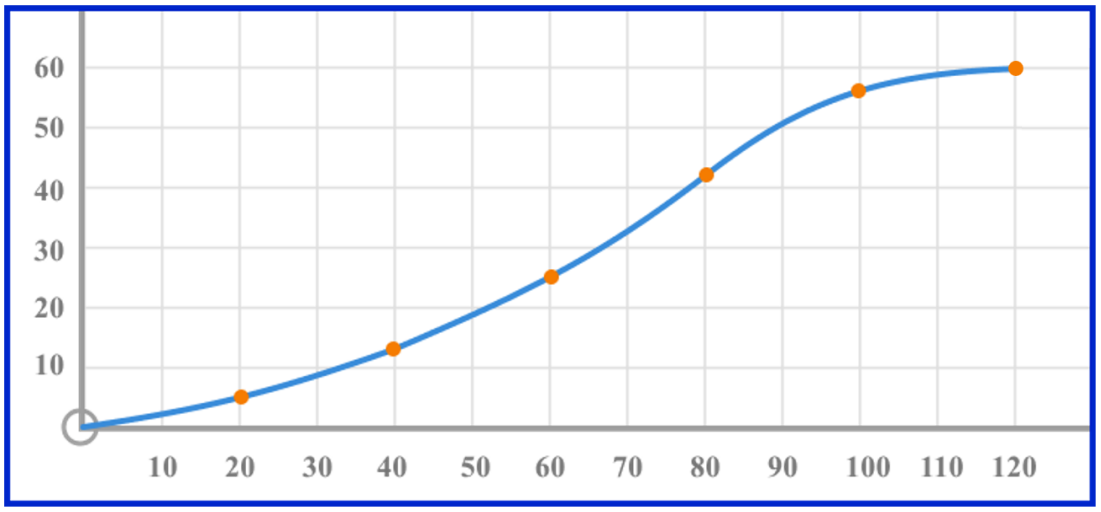


(d) Estimate the number of attendees 18 or under.

(e) Compare the number of attendees 18 or under at each match, and suggest a reason for your results.

Cumulative Frequency - Worksheet

2) This graph shows the commute time of a group of 60 employees.



(a) Estimate the median commute time.

(b) Use the graph to estimate the lower and upper quartiles.

(c) Hence, estimate the interquartile range.

(d) How many employees take more than an hour to travel to work?

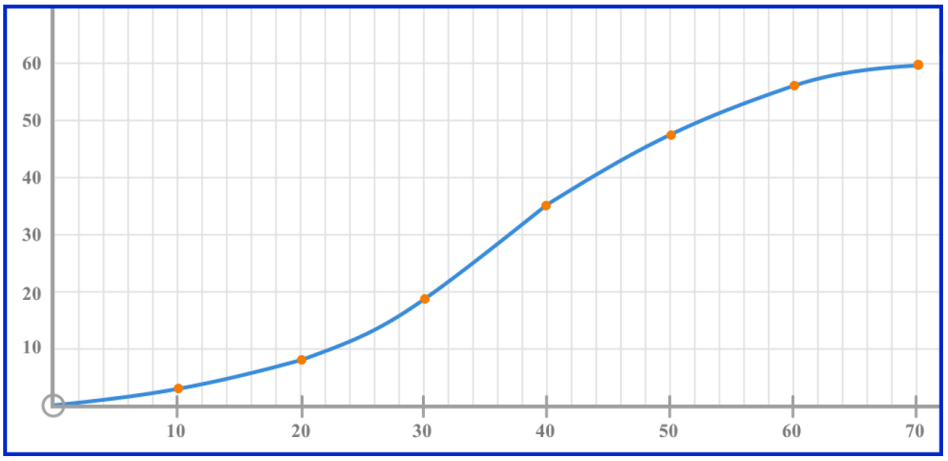
The company manager decides that all employees with a commute distance of 90 minutes or more can work from home more frequently.

(e) What proportion of the employees does this affect?

(f) Use the graph to draw a box plot of the distribution.

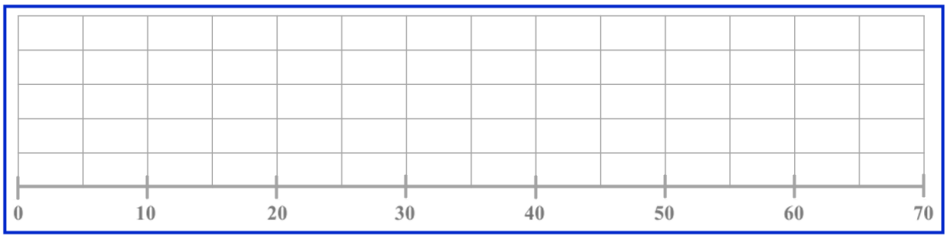
Cumulative Frequency - Exam Questions

1) The heights of 60 plants were recorded. The cumulative frequency graph gives information about the heights recorded, correct to the nearest cm.



The shortest plant was $4cm$.
The tallest plant was $65cm$.

Draw a box plot to represent this distribution.



(3 marks)

---

2) Here is some information about the number of minutes spent in a shop by a group of 100 shoppers:

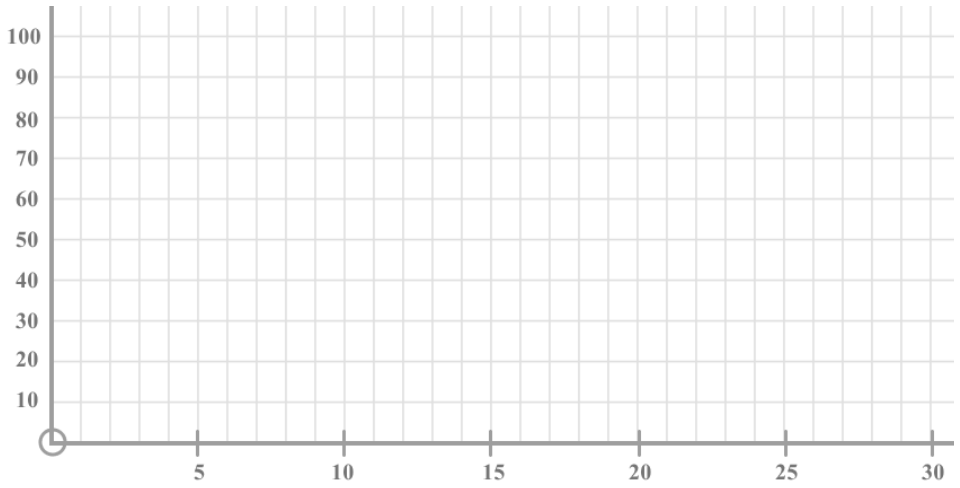
Time (min)	Frequency
$0 < t \leq 2$	5
$2 < t \leq 5$	34
$5 < t \leq 10$	28
$10 < t \leq 15$	16
$15 < t \leq 20$	10
$20 < t \leq 30$	7

Time (min)	CF
$0 < t \leq 2$	
$0 < t \leq 5$	
$0 < t \leq 10$	
$0 < t \leq 15$	
$0 < t \leq 20$	
$0 < t \leq 30$	

(a) Complete the cumulative frequency table above. **(1)**

Cumulative Frequency - Exam Questions

(b) On the grid, draw the cumulative frequency graph for this information.



(2)

(c) Use your graph to estimate the percentage of shoppers who took longer than 12 minutes.

.....

(3)

(6 marks)

---

3) Here is some information about the price of 50 used cars sold by a dealership in a year.

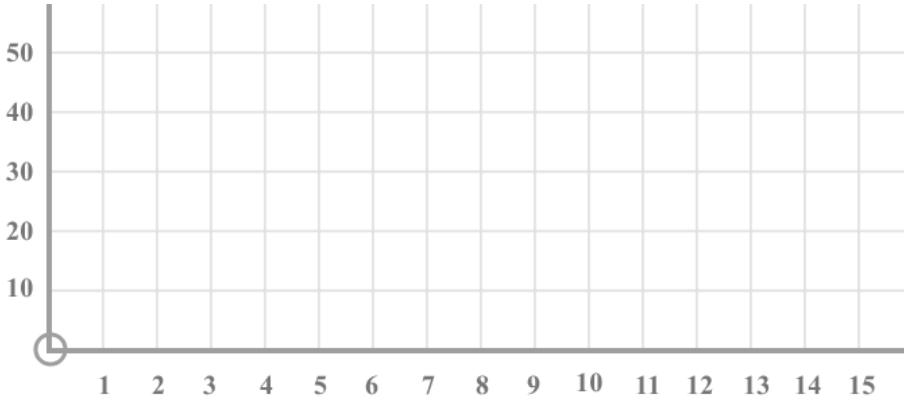
Price (£K)	Frequency
$0 < p \leq 3$	3
$3 < p \leq 6$	15
$6 < p \leq 9$	10
$9 < p \leq 12$	18
$12 < p \leq 15$	4

Price (£K)	CF
$p \leq 3$	
$p \leq 6$	
$p \leq 9$	
$p \leq 12$	
$p \leq 15$	

(a) Complete the cumulative frequency table: **(1)**

Cumulative Frequency - Exam Questions

(b) On the grid, draw the cumulative frequency graph for this information.



(2)

(c) Use your graph to estimate the percentage of cars that cost more than £10000.

.....

(3)

(d) The car dealership also sells new cars. The median car price for the same year was £20000 and the interquartile range was £5500. Compare the prices of the new and used cars.

Statement 1:

Statement 2:

.....

(3)

(9 marks)

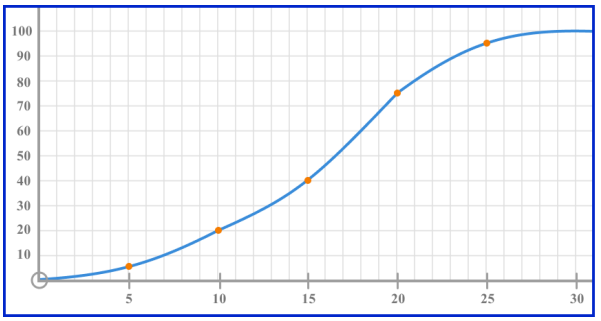
Cumulative Frequency - Answers

	Question	Answer
	Skill Questions	
Group A	Draw cumulative frequency graphs for the following:	

1)

Time (min)	Frequency
$0 < t \leq 5$	5
$5 < t \leq 10$	15
$10 < t \leq 15$	20
$15 < t \leq 20$	35
$20 < t \leq 25$	20
$25 < t \leq 30$	5

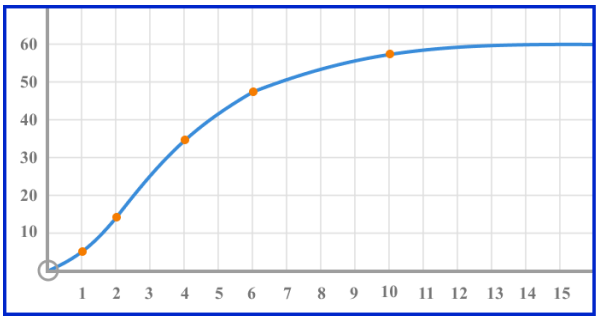
1)



2)

Distance (km)	Frequency
$0 < d \leq 1$	4
$1 < d \leq 2$	10
$2 < d \leq 4$	20
$4 < d \leq 6$	14
$6 < d \leq 10$	9
$10 < d \leq 15$	3

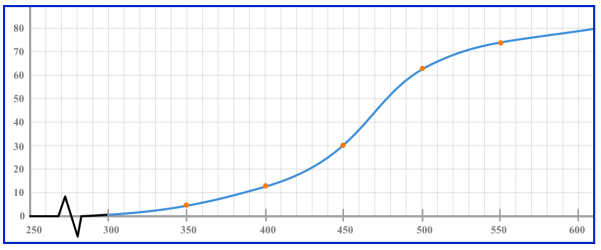
2)



3)

Weight (g)	Frequency
$300 < w \leq 350$	3
$350 < w \leq 400$	9
$400 < w \leq 450$	18
$450 < w \leq 500$	32
$500 < w \leq 550$	12
$550 < w \leq 600$	6

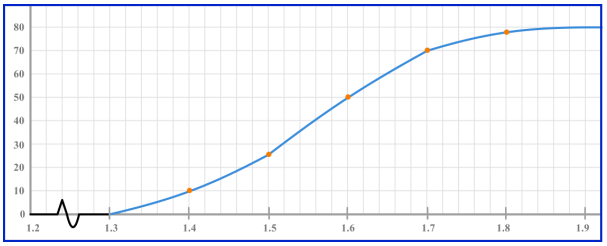
3)



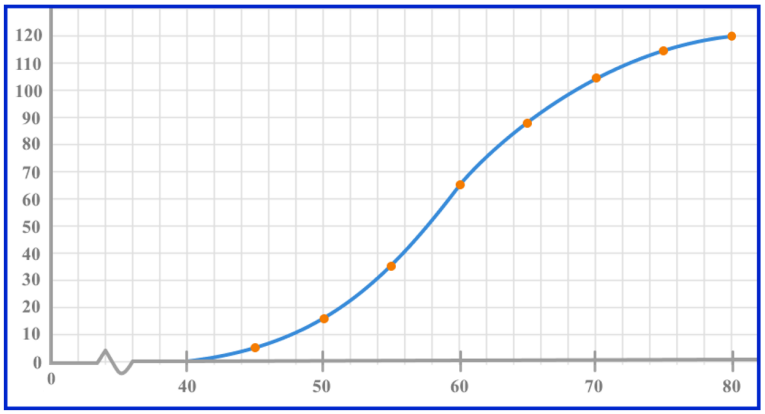
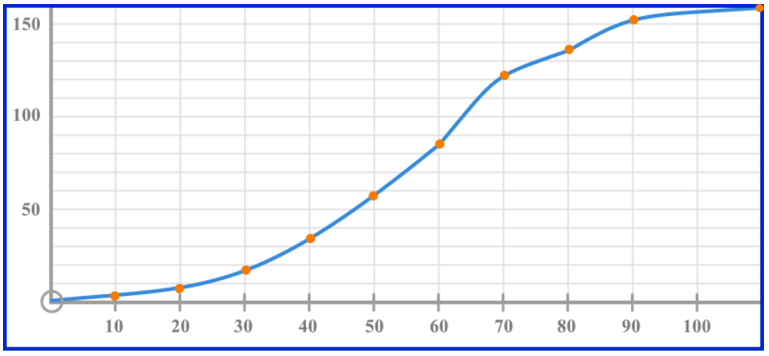
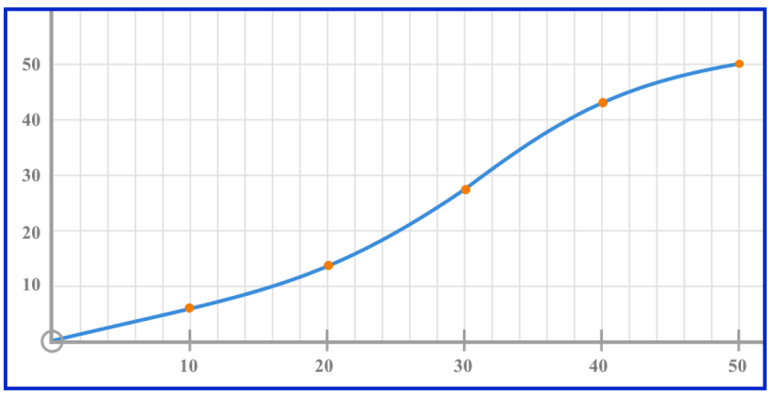
4)

Height (m)	Frequency
$1.3 < h \leq 1.4$	10
$1.4 < h \leq 1.5$	16
$1.5 < h \leq 1.6$	24
$1.6 < h \leq 1.7$	20
$1.7 < h \leq 1.8$	8
$1.8 < h \leq 1.9$	2

4)

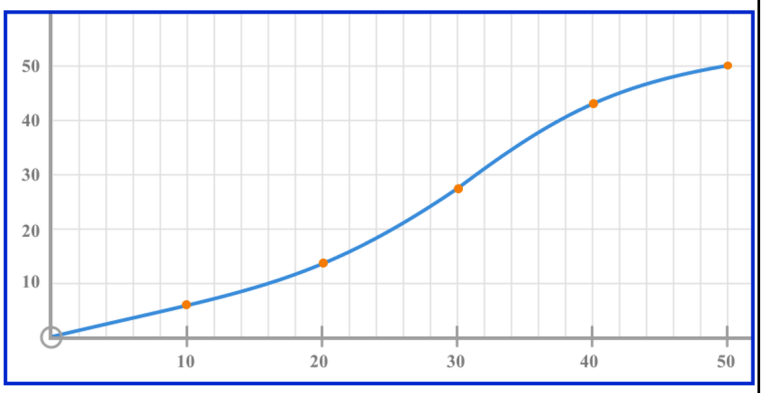
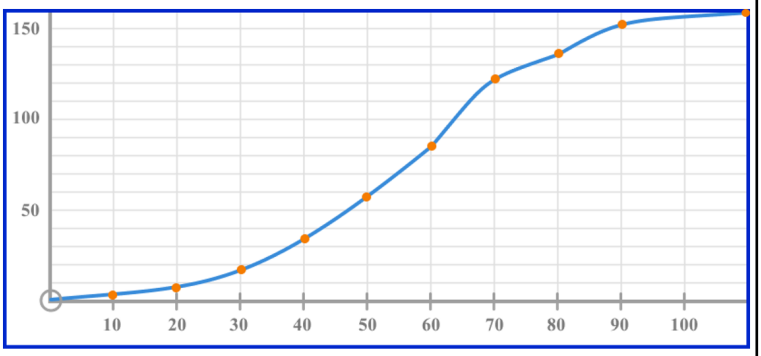
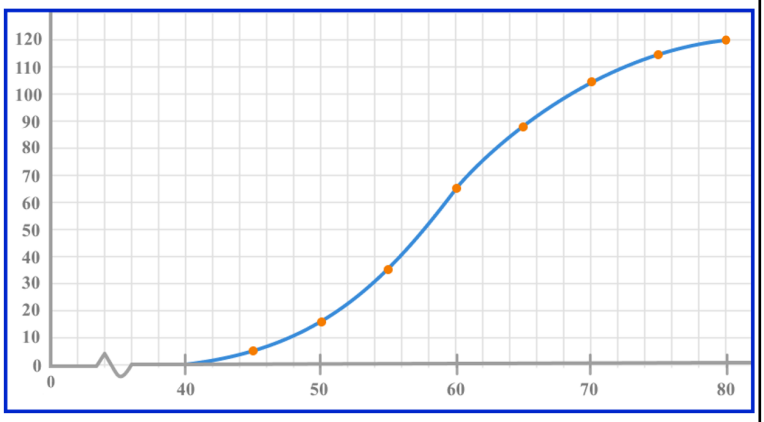


Cumulative Frequency - Answers

Group B	Determine the median and quartiles of each cumulative frequency graph:	
	1) 	
	a) The median	**a)** 59
	b) The lower quartile	**b)** 54
	2) 	
	a) The median	**a)** 57
	b) The lower quartile	**b)** 67
	3) 	
	a) The median	**a)** 28

	b) The lower quartile	**b)** 20

Cumulative Frequency - Answers

Group C	Determine the median and quartiles of each cumulative frequency graph:	
	1) 	
	a) How many people scored 30 or less?	**a)** 27
	b) How many people scored more than 40?	**b)** 8
	2) 	
	a) How many people scored 40 or less?	**a)** 33
	b) How many people scored more than 65?	**b)** 56
	3) 	
	a) How many people scored 50 or more?	**a)** 105

	b) How many people scored between 60 and 70?	**b)** 40

Cumulative Frequency - Answers

	Question	Answer
	Applied Questions	
1)	The table below shows the ages of people watching a football match on a Saturday morning: **a)** Complete the cumulative frequency column of the second table.	**a)**

Age (years)	Frequency
$0 < y < 10$	6
$10 < y < 20$	19
$20 < y < 30$	25
$30 < y < 40$	30
$40 < y < 50$	22
$50 < y < 60$	10
$60 < y < 70$	8

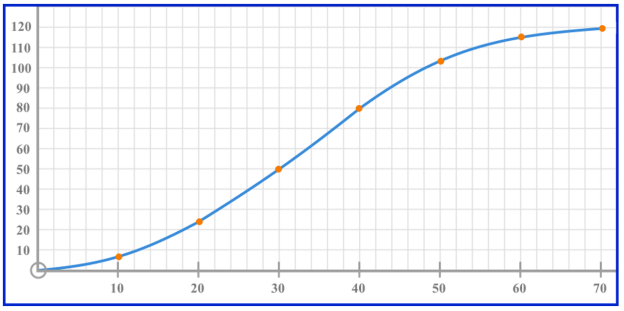
Age (years)	Cumulative Frequency
$0 < y < 10$	
$0 < y < 20$	
$0 < y < 30$	
$0 < y < 40$	
$0 < y < 50$	
$0 < y < 60$	
$0 < y < 70$	

Age (years)	Cumulative Frequency
$0 < y < 10$	6
$0 < y < 20$	25
$0 < y < 30$	50
$0 < y < 40$	80
$0 < y < 50$	102
$0 < y < 60$	112
$0 < y < 70$	120

Cumulative Frequency - Answers

b) Draw a cumulative frequency graph to represent this distribution.

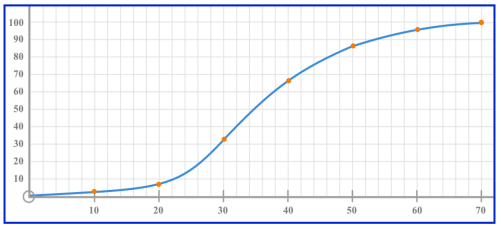
b)



c) Estimate the number of attendees 18 or under.

c) 21

The football club also recorded attendance at a match which took place on a Wednesday night. Here is a graph to represent this distribution:



d) Estimate the number of attendees 18 or under.

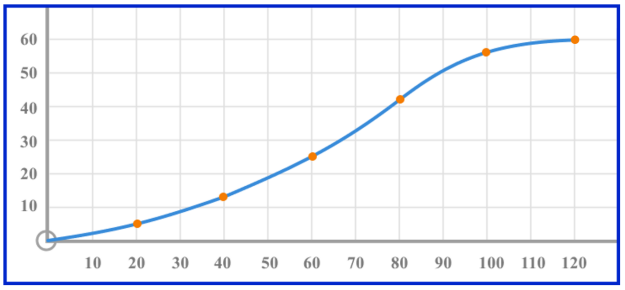
d) 4

e) Compare the proportion of attendees under 18 at each match, and suggest a reason for your results.

e) At Saturday's match, about 17% of attendees were 18 or under. At Wednesday's match, 4% of attendees were 18 or under. This could be because fewer young children can attend matches on a school night.

Cumulative Frequency - Answers

2) This graph shows the commute time of a group of 60 employees.



a) Estimate the median distance.

a) Median = 66

b) Use the graph to estimate the lower and upper quartiles.

b) $LQ = 45$
$UQ = 85$

c) Hence, estimate the interquartile range.

c) $IQR = 85 - 45 = 40$

d) How many employees take more than an hour to travel to work?

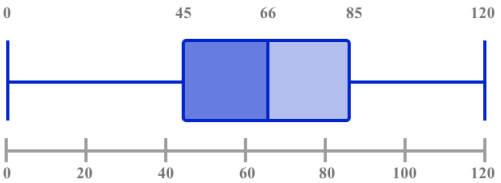
d) 35

e) The company manager decides that all employees with a commute distance of 90 minutes or more can work from home more frequently. What proportion of the employees does this affect?

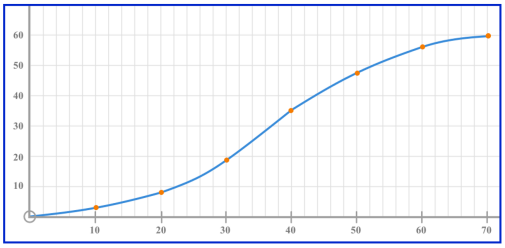
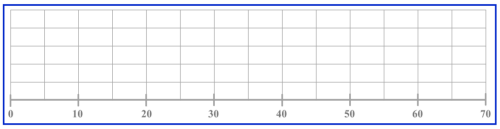
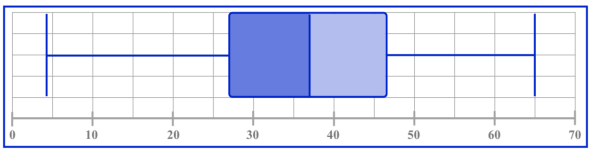
e) $\frac{9}{60} = \frac{3}{20}$ or 15%

f) Use the graph to draw a box plot of the distribution.

f)



Cumulative Frequency - Mark Scheme

	Question	Answer	
	Exam Questions		
1)	The heights of 60 plants were recorded. The cumulative frequency graph gives information about the heights recorded, correct to the nearest cm.  The shortest plant was $4cm$. The tallest plant was $65cm$. Draw a box plot to represent this distribution. 	Ends of whiskers at 4 and 65 with a box **seen** Median at 37 (± 1) Ends of box at 27 (± 1) and 47 (± 1) 	**(1)** **(1)** **(1)**
2)	Here is some information about the number of minutes spent in a shop by a group of 100 shoppers: **Time (min)** / **Frequency** $0 < t \leq 2$: 5 $2 < t \leq 5$: 34 $5 < t \leq 10$: 28 $10 < t \leq 15$: 16 $15 < t \leq 20$: 10 $20 < t \leq 30$: 7 **Time (min)** / **CF** $0 < t \leq 2$ $0 < t \leq 5$ $0 < t \leq 10$ $0 < t \leq 15$ $0 < t \leq 20$ $0 < t \leq 30$		

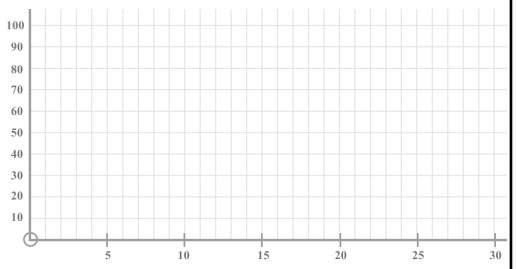
(a) Complete the cumulative frequency table above

(a)

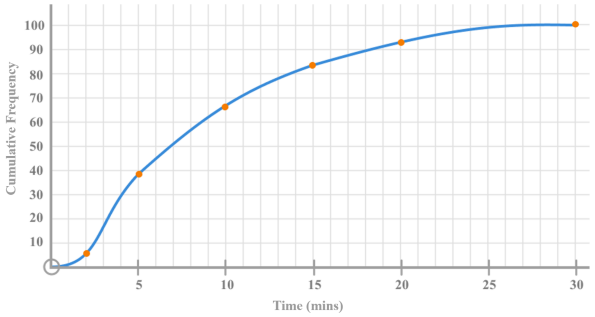
Time (min)	CF
$0 < t \leq 2$	5
$0 < t \leq 5$	39
$0 < t \leq 10$	67
$0 < t \leq 15$	83
$0 < t \leq 20$	93
$0 < t \leq 30$	100

All values correct **(1)**

(b) On the grid, draw the cumulative frequency graph for this information.



(b)



4 or 5 points plotted correctly **(1)**

Completely correct graph **(1)**

(c) Use your graph to estimate the percentage of shoppers who took longer than 12 minutes.

(c) Method to read off the graph at 12 on the x-axis - approx 73 on cf axis **(1)**

$100 - \textit{their } 73$ **(1)**

27% ***ft*** **(1)**

3) Here is some information about the price of 50 used cars sold by a dealership in a year.

Price (£K)	Frequency
$0 < p \leq 3$	3
$3 < p \leq 6$	15
$6 < p \leq 9$	10
$9 < p \leq 12$	18
$12 < p \leq 15$	4

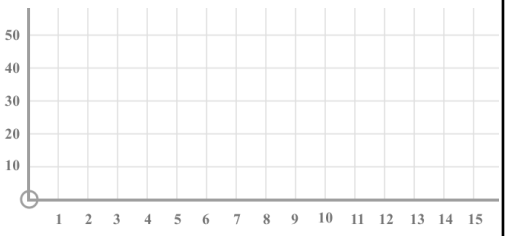
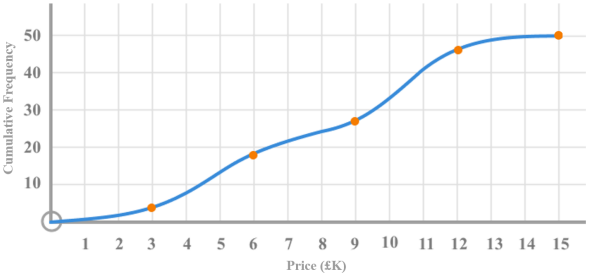
(a) Complete the cumulative frequency table:

Price (£K)	CF
$0 < p \leq 3$	
$3 < p \leq 6$	
$6 < p \leq 9$	
$9 < p \leq 12$	
$12 < p \leq 15$	

(a)

Price (£K)	Frequency
$0 < p \leq 3$	3
$3 < p \leq 6$	18
$6 < p \leq 9$	28
$9 < p \leq 12$	46
$12 < p \leq 15$	50

All values correct **(1)**

(b)	On the grid, draw the cumulative frequency graph for this information.  	**(b)**  4 or 5 points plotted correctly Completely correct graph	 **(1)** **(1)**
(c)	Use your graph to estimate the percentage of cars that cost more than £10000.	**(c)** Method to read off the graph at 10 on the x-axis - approx 34 on cf axis $50 - 34 = 16$ $\frac{16}{50} = 32\%$	**(1)** **(1)** **(1)**
(d)	The car dealership also sells new cars. The median car price for the same year was £20000 and the interquartile range was £5500. Compare the prices of the new and used cars.	**(d)** $LQ = 4.9\ (\pm 0.1)$ and $UQ = 10.5\ (\pm 0.1)$ with IQR £5600 The median for used cars is £8500. The median price for new cars is higher than the median price for used cars / on average, new cars cost more than used cars **oe** The IQR for new and used cars is similar / there is a similar spread of data **oe**	**(1)** **(1)** **(1)**