

30 Inequalities

Solve these inequalities in the form $x \geq$ a number, $x \leq$ a number, $x >$ a number or $x <$ a number.

- | | | |
|--|---|--|
| 1) $x + 1 > 4$ | 2) $x + 2 < 5$ | 3) $7 < 2 + x$ |
| 4) $x + 2 < 8$ | 5) $x - 3 > 7$ | 6) $3 > x - 7$ |
| 7) $3x \geq 12$ | 8) $5x \geq -25$ | 9) $25 \geq 5x$ |
| 10) $2x + 1 \geq 7$ | 11) $3x - 6 < 6$ | 12) $3 < 6x + 39$ |
| 13) $6x - 26 \leq 10$ | 14) $5x + 5 \geq 40$ | 15) $3x + 7 < 40$ |
| 16) $6 > x - 3$ | 17) $12 < x + 20$ | 18) $15 > x + 7$ |
| 19) $14 + 3x \leq 38$ | 20) $18 + 2x < 60$ | 21) $15 + 3x \leq 45$ |
| 22) $x + 4 > 3x - 8$ | 23) $x - 3 > 2x + 11$ | 24) $x - 7 < 3x - 1$ |
| 25) $4x + 3 \geq 3x - 7$ | 26) $5x - 6 \leq 2x + 9$ | 27) $3x + 9 \geq 5x + 2$ |
| 28) $7x - 12 < 3x - 2$ | 29) $5x - 15 > 3x + 2$ | 30) $4x + 15 < 3x + 22$ |
| 31) $\frac{1}{2}x - 7 \leq 4$ | 32) $\frac{1}{3}x - 3 \leq 2$ | 33) $\frac{1}{8}x + 7 \leq 2$ |
| 34) $\frac{1}{4}x + 15 > 12$ | 35) $\frac{1}{5}x - 6 > 10$ | 36) $\frac{1}{6}x + 3 > 10$ |
| 37) $7 - \frac{1}{3}x \leq \frac{2}{3}x - 3$ | 38) $9 - \frac{4}{5}x > \frac{1}{5}x + 4$ | 39) $12 - \frac{3}{8}x > \frac{5}{8}x + 7$ |
| 40) $3(x + 2) > 12$ | 41) $2(x + 8) > 12$ | 42) $2(2x + 7) > 10$ |
| 43) $2(2x + 4) \leq -6$ | 44) $2(3x + 2) \leq 16$ | 45) $2(4x + 4) \leq 32$ |
| 46) $3x - 5 > 2(x + 1)$ | 47) $4x + 3 > 3(x + 4)$ | 48) $9x - 3 > 3(2x + 5)$ |
| 49) $4(x + 2) \leq 2x + 20$ | 50) $5(x - 7) \geq 3x + 15$ | 51) $6(x - 7) \leq 3x + 18$ |

54 Circumference of a Circle.

In each of the following questions use $\pi = 3.142$ or use the π button on your calculator.

Exercise 1

Calculate the circumference of each of the following circles

- | | | |
|---------------------|--------------------|--------------------|
| 1) Radius 4cm | 2) Radius 6cm | 3) Radius 10cm |
| 4) Radius 18 metres | 5) Radius 8 metres | 6) Radius 7 metres |
| 7) Diameter 12cm | 8) Diameter 16cm | 9) Diameter 24cm |
| 10) Diameter 2.3m | 11) Diameter 17m | 12) Diameter 23m |

Exercise 2

Calculate the diameters of circles with the following circumferences (correct to 4 significant figures)

- | | | |
|-------------|------------|--------------|
| 1) 20cms | 2) 105 cms | 3) 2.3metres |
| 4) 15metres | 5) 256cms | 6) 176metres |

Exercise 3

- 1) A car wheel has a diameter of 50cm. How far will the car travel if the wheel turns 5 times?
- 2) If the same car wheel turns 500 times, find the distance travelled correct to the nearest metre.
- 3) A hose pipe is stored by winding it around a drum of diameter 70cms. If it makes 12 turns, how long is the hose correct to the nearest metre?
- 4) A car has a wheel diameter of 55cms. How many revolutions does it make while travelling a distance of 1 kilometre? (give your answer correct to the nearest whole number)
- 5) A length of cotton measuring 2 metres is wound around a cotton reel of diameter 3cms. How many turns does it make? (correct to the nearest turn)
- 6) A bicycle wheel has a diameter of 65cms. How many turns will it make while travelling a distance of 2km?
- 7) Another bicycle travels 2km and its wheels each turn 1157 times. Calculate the diameter of its wheels, correct to the nearest cm.
- 8) A pulley wheel, of diameter 1.3 metres, raises a lift in a hotel from the ground floor to the 9th floor. In doing so it makes 9 complete turns. What is the distance, correct to the nearest centimetre, between each floor?.
- 9) An artificial lake is in the shape of a circle of diameter 200 metres and has a path running around it. It is planned to hold a 10 kilometre race around the lake. How far apart, to the nearest metre, must the start and finish be?

65 Mean, Median, Mode and Range

Exercise 1

In each of the following, put the data into a frequency table and write down the mode and range.

- 2, 3, 3, 3, 4, 2, 6, 1, 5, 1, 1, 4, 4, 3, 5, 2, 3
2, 1, 1, 1, 3, 1, 5, 4, 5, 1, 2, 2, 2, 3, 4, 7, 6
- 1, 4, 7, 4, 3, 8, 0, 0, 1, 8, 2, 9, 2, 6, 0, 8
2, 0, 6, 2, 8, 1, 9, 0, 3, 7, 1, 0, 7, 5, 1, 9
8, 3, 2, 6, 2, 6, 0, 2, 5, 2, 8, 7, 3, 0, 1, 2
- 13, 14, 17, 14, 15, 14, 17, 14, 13
16, 15, 13, 16, 17, 15, 13, 16, 17
17, 16, 14, 15, 13, 17, 14, 16, 16
15, 15, 15, 14, 14, 15, 15, 15, 13
15, 16, 13, 15, 14, 16, 14, 17, 15

Exercise 2.

Find the median and range of each of the following sets of data.

- 8, 7, 4, 10, 1, 5, 6, 6, 5, 4, 3, 4, 8, 7, 10, 4, 9, 5, 3, 2, 7
- 9, 9, 7, 6, 7, 4, 3, 2, 3, 7, 7, 6, 5, 7, 5, 8
- 70, 72, 30, 74, 80, 83, 36, 50, 38, 85
92, 50, 70, 68, 17, 48, 77, 72, 60, 74
14, 75, 83, 65, 33, 52, 46, 34, 32, 37

Exercise 3.

Calculate the mean of each of the following sets of data, giving your answer correct to four significant figures wherever necessary.

- 4cm, 7cm, 8cm, 5cm, 4cm, 3cm, 2cm, 9cm, 8cm, 6cm
- 21 grams, 40 grams, 8 grams, 73 grams, 68 grams
- 6 metres, 4m, 3m, 8m, 5m, 6m, 4m, 7m, 2m, 5m
- 13, 16, 20, 24, 27, 29, 33
- 221, 352, 234, 421, 301, 383
- 2.6, 1.9, 2.7, 2.1, 3.2, 3.0
- $43\frac{1}{2}$, $47\frac{1}{2}$, $39\frac{1}{2}$, $34\frac{1}{2}$
- 179, 111, 152, 233, 244, 221
- 141, 126, 117, 64, 72, 65, 85, 120, 141, 132
- 41, 85, 72, 17, 41, 16, 54, 55, 10

Exercise 4.

In each of the following give the answer correct to four significant figures wherever necessary.

- The mean of six numbers is 25.5 and the mean of a further seven numbers is 23. What is the mean of all thirteen numbers combined?
- The mean weight of six people is 83kg. If three more people, weighing 93kg, 107kg and 78kg join them, what is their new mean weight?
- The mean weight of six people in a lift is 90kg. If the maximum total weight allowable in the lift is 1 tonne, approximately how many more people will be allowed in?

69 Mean 4 - Frequency distributions with class intervals

By first finding the mid value of each class interval, calculate an approximate mean for each of the tables of values shown below. State also the modal class in each case.

1. This table shows the heights of a sample of pupils in a school.

Height of child(cm)	Frequency
$120 < h \leq 130$	2
$130 < h \leq 140$	5
$140 < h \leq 150$	23
$150 < h \leq 160$	55
$160 < h \leq 170$	27
$170 < h \leq 180$	14

Give your answer correct to the nearest millimetre.

2. This table shows the weights, in grammes, of 5kg bags of potatoes.

Weight of bag	Frequency
$5000 < w \leq 5010$	76
$5010 < w \leq 5020$	54
$5020 < w \leq 5030$	48
$5030 < w \leq 5040$	12
$5040 < w \leq 5050$	7
$5050 < w \leq 5060$	3

Give your answer correct to the nearest gramme.

3. This table shows the weekly wage for employees in a factory.

Wage	Frequency
$40 < £ \leq 80$	7
$80 < £ \leq 120$	16
$120 < £ \leq 160$	23
$160 < £ \leq 200$	27
$200 < £ \leq 240$	31
$240 < £ \leq 280$	43
$280 < £ \leq 320$	45
$320 < £ \leq 360$	12

Give your answer correct to the nearest penny.

4. The life, in hours, of batteries tested by a manufacturer.

Life (hours)	Frequency
$10 < h \leq 15$	2
$15 < h \leq 20$	9
$20 < h \leq 25$	27
$25 < h \leq 30$	43
$30 < h \leq 35$	33
$35 < h \leq 40$	19
$40 < h \leq 45$	6

Give your answer correct to the nearest minute.

5. This table shows the heights of tomato plants ranging from 39 cms to 46 cms.

Height of plant	Frequency
$39 < h \leq 40$	4
$40 < h \leq 41$	10
$41 < h \leq 42$	14
$42 < h \leq 43$	17
$43 < h \leq 44$	10
$44 < h \leq 45$	5
$45 < h \leq 46$	2

Give your answer correct to the nearest millimetre.

72 Cumulative Frequency 2

- 1) Nina carries out a survey of the speeds of vehicles passing a certain point on a motorway. Her results are shown in the table below.

Speed (mph)	Frequency	Cumulative frequency
$20 < \text{speed} \leq 30$	3	
$30 < \text{speed} \leq 40$	26	
$40 < \text{speed} \leq 50$	41	
$50 < \text{speed} \leq 60$	48	
$60 < \text{speed} \leq 70$	37	
$70 < \text{speed} \leq 80$	26	
$80 < \text{speed} \leq 90$	5	

- Copy and complete the table for the cumulative frequency.
 - Draw the cumulative frequency graph.
 - From the graph estimate (i) the median speed (ii) the approximate number of cars whose speed is below 75mph
- 2) Batteries are tested by using them in an electric toy and recording the length of time the toy operates before the battery fails. The results of 50 batteries are shown below

Time (t hours)	$9 < t \leq 11$	$11 < t \leq 13$	$13 < t \leq 15$	$15 < t \leq 17$	$17 < t \leq 19$
Frequency	4	10	19	14	3

- From the data draw a cumulative frequency graph.
 - From the graph, estimate (i) the median life of a battery (ii) the interquartile range.
- If the battery company guarantee that their batteries last longer than 12 hours, approximately what percentage of their batteries don't meet this criteria?
- 3) The table below shows the runs scored by batsmen in a cricket team.

Runs scored	1 - 20	21 - 40	41 - 60	61 - 80	81 - 100
Frequency	10	22	36	14	2

- a) Complete this cumulative frequency table

Runs	20	40	60		
Cumulative frequency	10	32			

- Draw the cumulative frequency graph
- From the graph estimate (i) the median number of runs scored (ii) the number of times more than 70 was scored

82 Simultaneous Equations

- | | | | |
|------------------------------------|-------------------------------------|--------------------------------------|-------------------------------------|
| 1) $2x + 2y = 10$
$x + 2y = 6$ | 2) $3x + y = 18$
$2x + y = 13$ | 3) $4x + 2y = 2$
$2x + 2y = 0$ | 4) $5x + 3y = 18$
$5x + y = 16$ |
| 5) $x + y = 1$
$x - y = 5$ | 6) $3x + 4y = 29$
$x - 4y = -17$ | 7) $3x - 2y = 10$
$-3x + y = -11$ | 8) $3x + 4y = 18$
$3x - 4y = -6$ |
| 9) $4x + 3y = 11$
$2x + y = 7$ | 10) $5x + 2y = 33$
$2x + y = 14$ | 11) $6x + 2y = 10$
$4x + y = 7$ | 12) $3x - 2y = 13$
$x - y = 5$ |
| 13) $2x + 3y = 28$
$3x - y = 9$ | 14) $2x + 3y = 15$
$5x - y = 46$ | 15) $4x + 3y = 13$
$6x - 2y = 13$ | 16) $5x + 3y = 14$
$2x + 2y = 4$ |

- 17) A family of 2 adults and 2 children go to the cinema. Their tickets cost a total of £14.00. Another family of 1 adult and 4 children go to the same cinema and their bill is £13.60.
- a) Letting x represent the cost of an adult's ticket and y the cost of a child's ticket, write down two equations connecting x and y . b) Solve for x and y .
- c) What are the prices of an adult's and a child's ticket?
- 18) The sum of two numbers is 39 and their difference is 9.
- a) Letting x and y be the two numbers write down two equations.
- b) Solve the equations.
- 19) A rectangle has a perimeter of 42cm. Another rectangle has a length double that of the first and a width one third of that of the first. The perimeter of the second is 57cm. Letting x and y represent the dimensions of the first rectangle, write down two equations containing x and y . Solve the equations and write down the dimensions of the second rectangle.
- 20) 4 oranges and 3 apples weigh 720 grams. 3 oranges and 4 apples weigh 750 grams. Let x and y represent their weights. Write down two equations containing x and y . Calculate the weights of each piece of fruit.
- 21) Three mugs and two plates cost £7.20, but four mugs and one plate cost £7.90. Let x represent the cost of a mug and y the cost of a plate. Write down two equations involving x and y . Solve these equations and calculate the cost of seven mugs and 6 plates.
- 22) Sandra withdrew £400 from the bank. She was given £20 and £10 notes, a total of 23 notes altogether. Let x represent the number of £20 notes and y the number of £10 notes. Write down two equations and solve them.
- 23) A quiz game has two types of question, hard (h) and easy (e). Team A answers 7 hard questions and 13 easy questions. Team B answers 13 hard questions and 3 easy questions. If they both score 74 points, find how many points were given for each of the two types of question.
- 24) A man stays at a hotel. He has bed and breakfast (b) for three nights and two dinners (d). A second man has four nights bed and breakfast and three dinners. If the first man's bill is £90 and the second man's bill is £124, calculate the cost of a dinner.
- 25) Four large buckets and two small buckets hold 58 litres. Three large buckets and five small buckets hold 68 litres. How much does each bucket hold?

71. Mean

1. The table below shows the wages paid to a number of people working in a factory. Complete the table and calculate the mean wage.

Wages, £	Frequency	Mid value	Frequency × Mid value
$60 \leq \text{£} < 100$	4		
$100 \leq \text{£} < 140$	19		
$140 \leq \text{£} < 170$	24		
$170 \leq \text{£} < 200$	11		
$200 \leq \text{£} < 220$	6		

2. The table below shows the heights of a number of rose trees at a garden centre. Copy and complete the table of results. Calculate the approximate mean height of the roses.

Height of plant, h , centimetres	Frequency		
$50 \leq h < 70$	5		
$70 \leq h < 90$	14		
$90 \leq h < 100$	16		
$100 \leq h < 110$	24		
$110 \leq h < 120$	21		
$120 \leq h < 140$	23		
$140 \leq h < 160$	17		

3. The table below shows the speeds of 60 vehicles passing a certain point on a motorway.

27.6	58.5	80.5	64.8	54.8	46.6	77.9	84.1	54.9	59.6
64.1	45.8	43.6	30.6	73.9	28.5	43.1	43.9	39.5	49.6
40.4	76.0	24.7	48.6	45.8	75.6	22.5	58.9	45.5	60.8
37.4	42.8	54.8	35.9	45.2	32.6	83.5	43.9	39.4	42.4
51.6	47.9	33.7	57.8	33.6	57.2	54.9	64.5	61.0	73.6
32.1	67.9	57.8	75.7	23.6	52.0	38.6	54.2	27.3	55.8

Make a frequency table from the values and hence calculate the approximate mean speed of the traffic, in miles per hour.