

Percentages

- Q1.** For each of the investments below, calculate
- (i) the amount due at the end of the term
 - (ii) the total interest

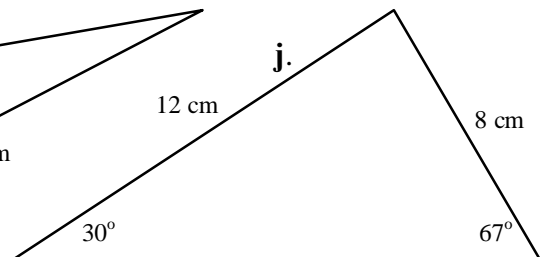
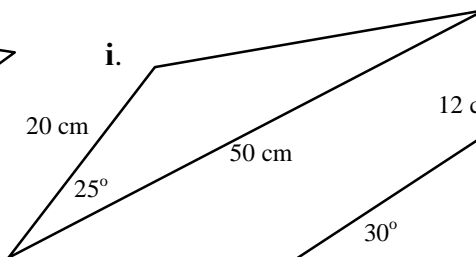
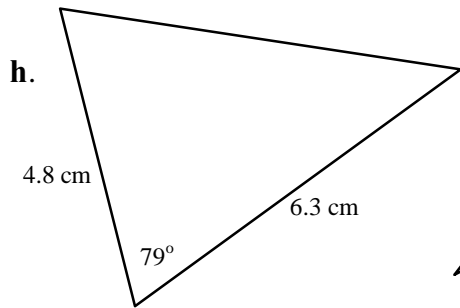
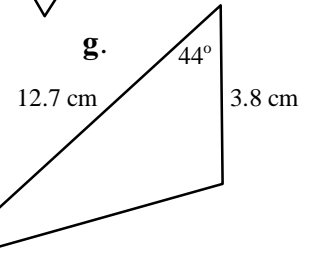
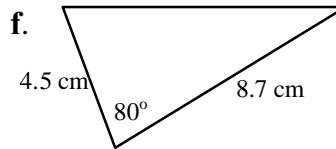
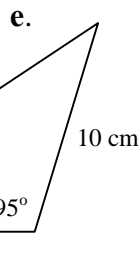
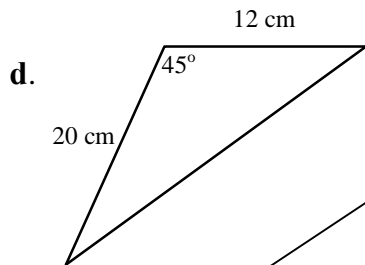
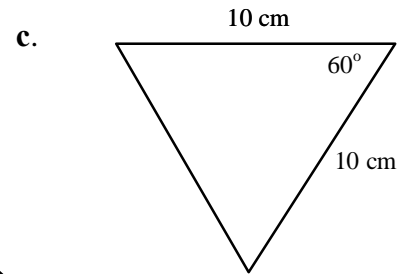
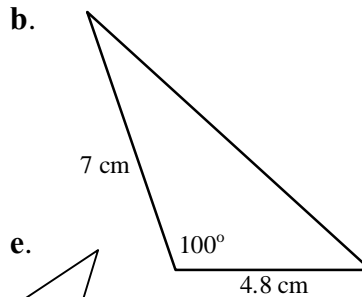
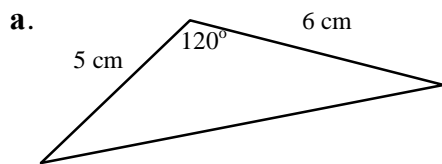
	Bank/ Building Society	Amount Invested (£)	Rate of interest (per year)	Number of Years
a	Hamilton Bank	2000	8 %	2
b	Allied Friendly	5000	6 %	3
c	Northern Hill	4800	7 %	2
d	Highland Bank	3500	7.5 %	3
e	Church National	1600	5.5 %	4
f	Southern Rock	1750	11 %	3
g	London Savings Bank	20 000	6%	3
h	Bath & Eastern	18 000	8.5%	2
i	Royal Bank of Britain	50 000	9%	3
j	Bingford & Bradley	400	4.8%	2

- Q2.** At the beginning of the year, Mr. Bradford borrows £5000 from the bank. The rate of compound interest is 8%. He agrees to pay back £108 per month. Calculate how much he still owes at the end of the second year.
- Q3.** The Smiths buy a house for £60,000. If it appreciates in value at the rate of 9% per year, how much will it be worth in 5 years time ?
- Q4.** Amanda wins some money and decides to spend £200 on some jewelry. If it appreciates at the rate of 2% per year, how much will the jewelry be worth 3 years from now ?
- Q5.** In 1990 the world population was estimated to be 5300 million, and was increasing at the rate of 1.7% per annum. What will the population be in the year 2000 ? (answer to 2 significant figures)
- Q6.** Peter buys a car for £3000. If it depreciates at the rate of 20% per annum, how much will he be able to sell it for in 3 years time ?
- Q7.** Brian buys a new car costing £12600. It depreciates in value by 30% in the first year and by 20% each year after that. How much will he be able to trade it in for in 3 years time ?
- Q8.** Each year a factory's machinery depreciates by 25% of its value at the beginning of the year. The initial value of the machinery was £360 000.
- a. What was the value of the machinery after 1 year ?
 - b. The machinery was to be scrapped at the end of the year when its value fell below half its original value. After how many years should the machinery be scrapped ?

- Q9.** In a 30% sale a jacket costs £52.50. How much did it cost before the discount?
- Q10.** After V.A.T (at 20%) a new car costs £13 800. How much did it cost before V.A.T was added?

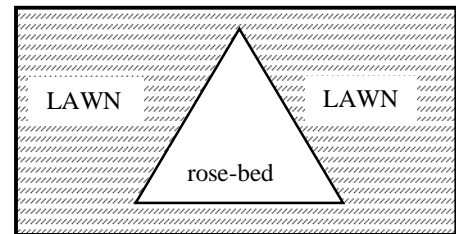
Trigonometry ~ Area of a Triangle

Q1. Find the area of the following triangles :

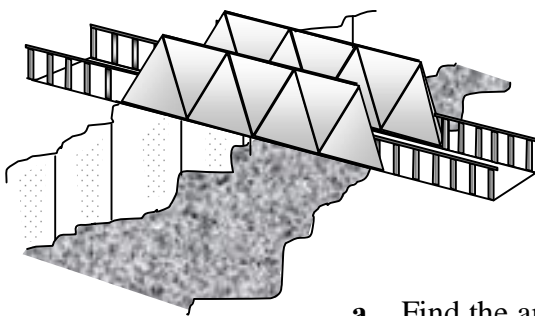


Q2. Mr. Fields is planting a rose-bed in his garden. It is to be in the shape of an equilateral triangle of side 2m.

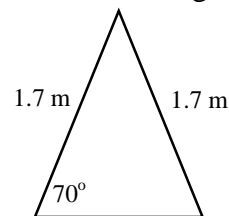
What area of lawn will he need to remove to plant his rose-bed ?



Q3.



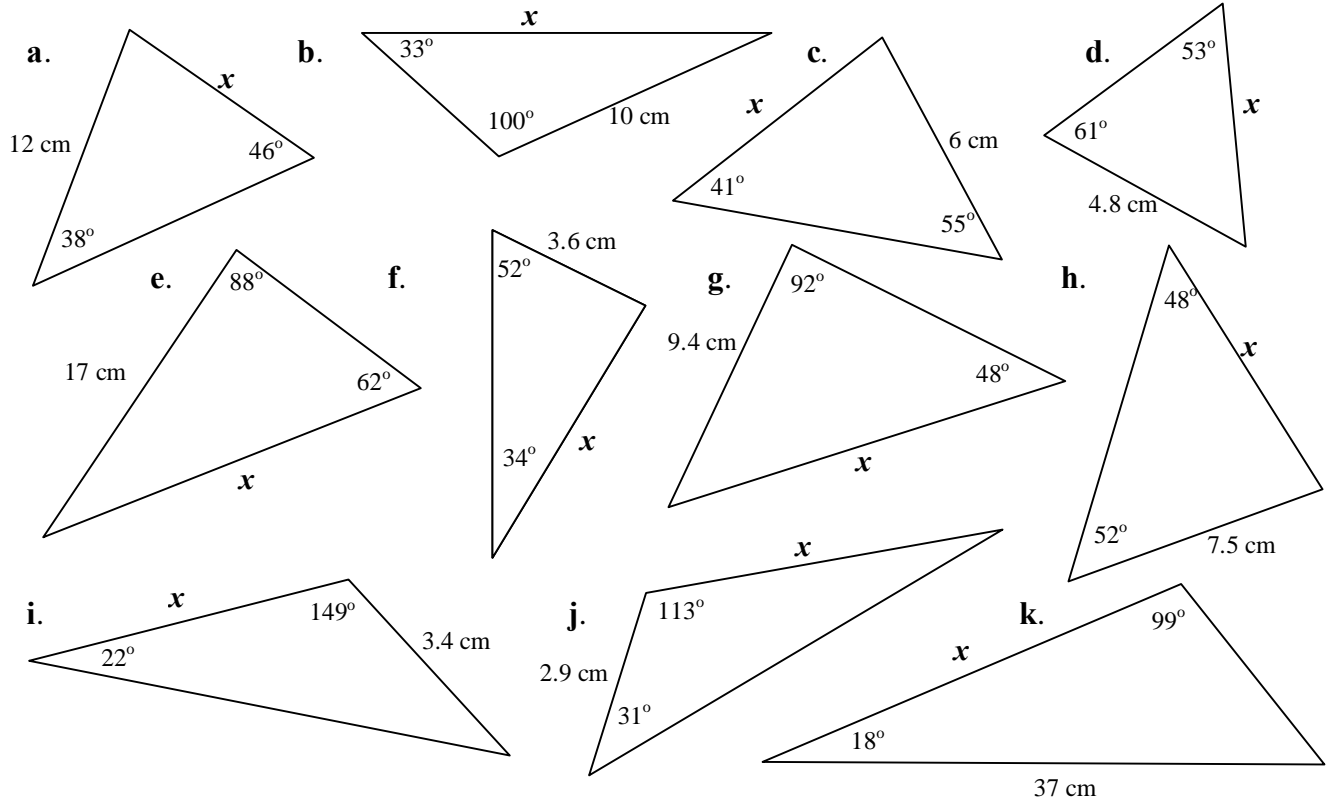
For safety reasons the sides of a footbridge are to be covered with triangular panels. Each panel is an isosceles triangle as shown.



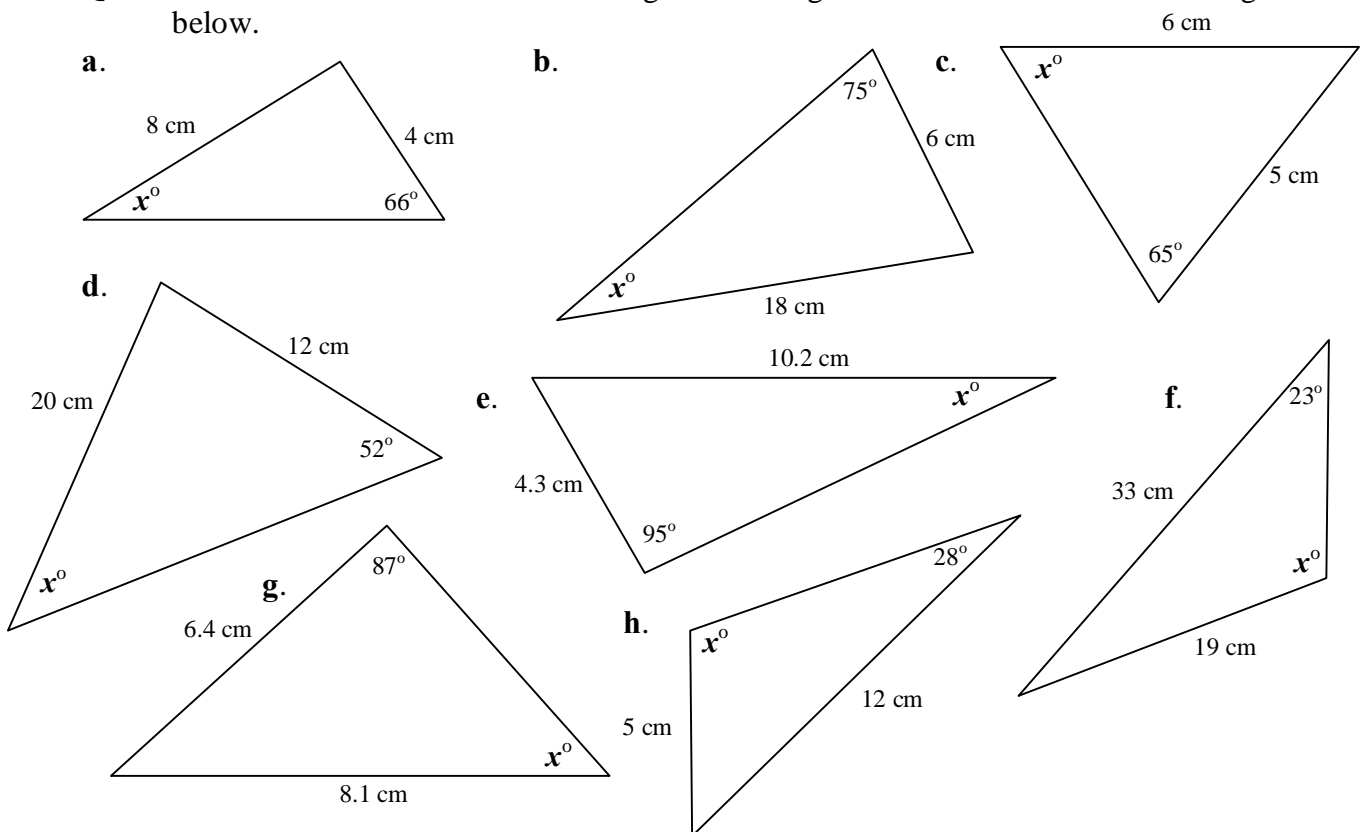
- Find the area of each panel.
- If there are 7 panels on each side of the bridge, find the total area of material required to cover the bridge.

Trigonometry ~ Sine Rule

Q1. Use the sine rule to calculate the length of the side marked x in each of the triangles below.

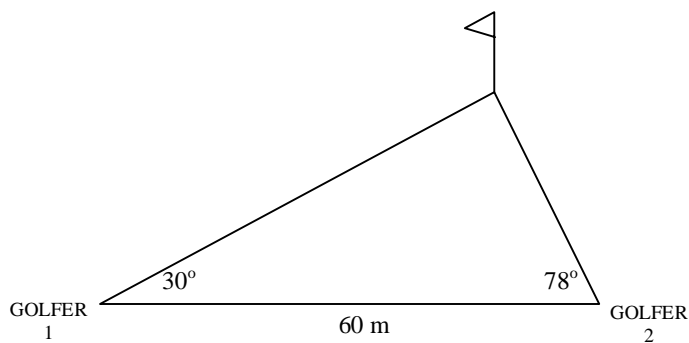


Q2. Use the sine rule to calculate the length of the angle marked x° in each of the triangles below.

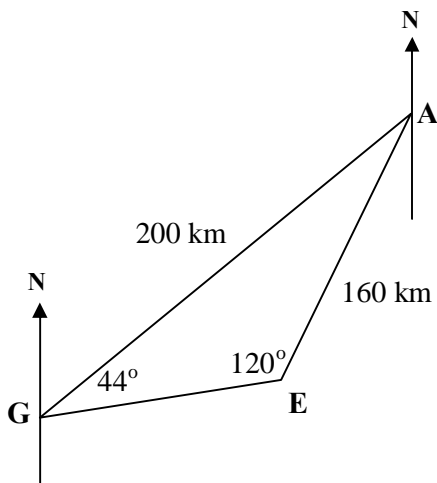


- Q3.** Two golfers are aiming for the green. The golfers are 60 m apart and the angles are as shown in the diagram.

What distance will each golfer have to hit the ball in order to reach the pin.



- Q4.**

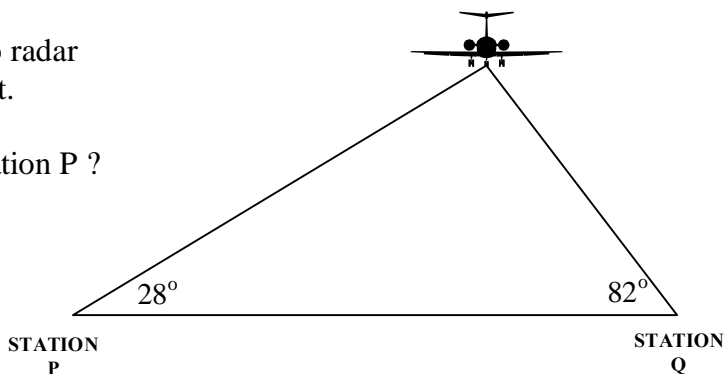


The diagram shows the path of an aircraft from Glasgow to Aberdeen to Edinburgh.

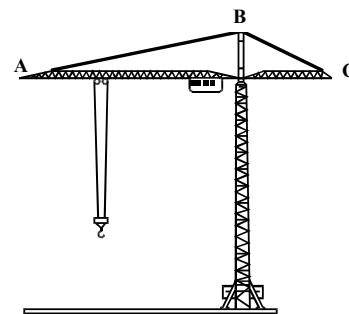
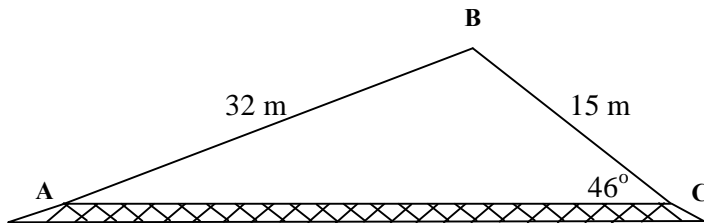
- Write down the size of $\angle GAE$
- Calculate the distance GE.

- Q5.** An aircraft is picked up by two radar stations, P and Q, 120 km apart.

How far is the aircraft from station P ?



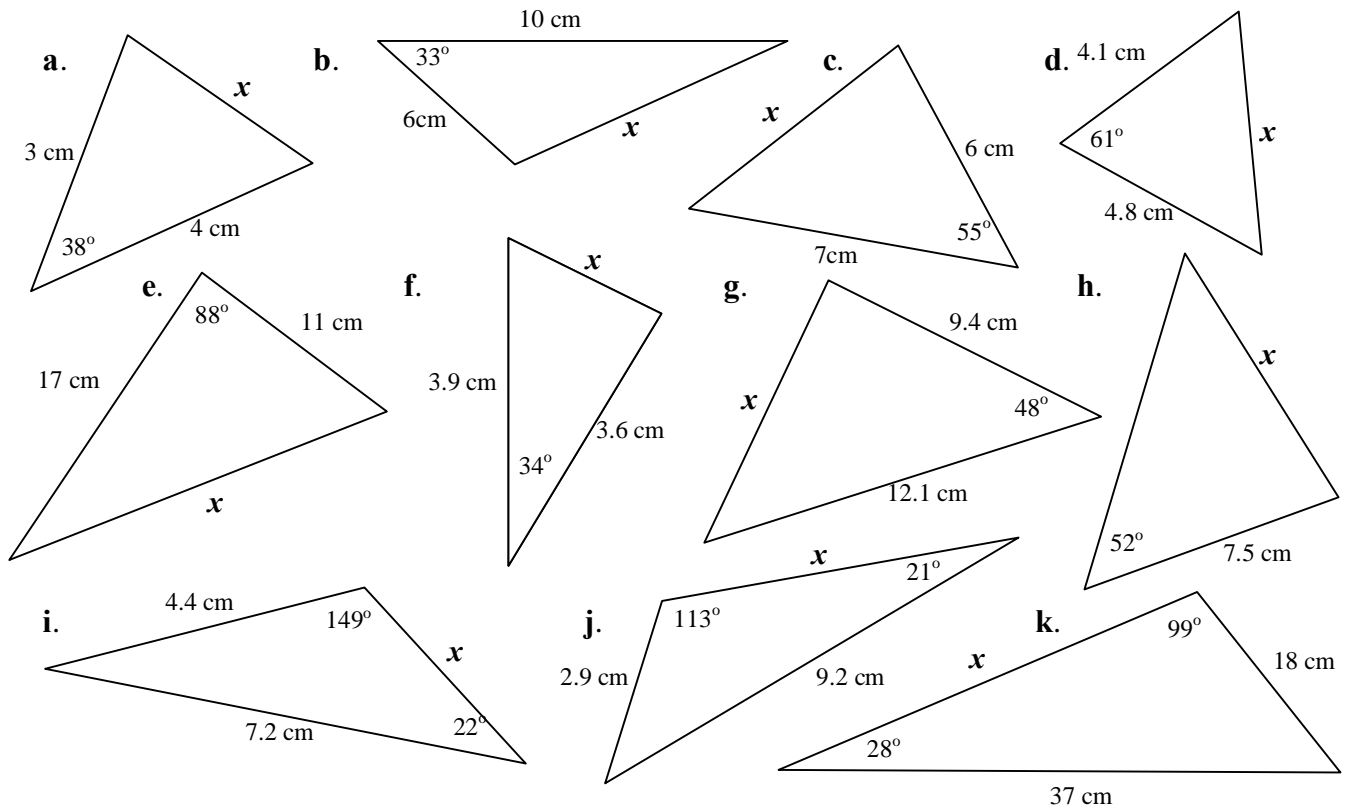
- Q6.** A large crane is being used in the construction of a block of flats. The crossbeam is supported by two metal stays.



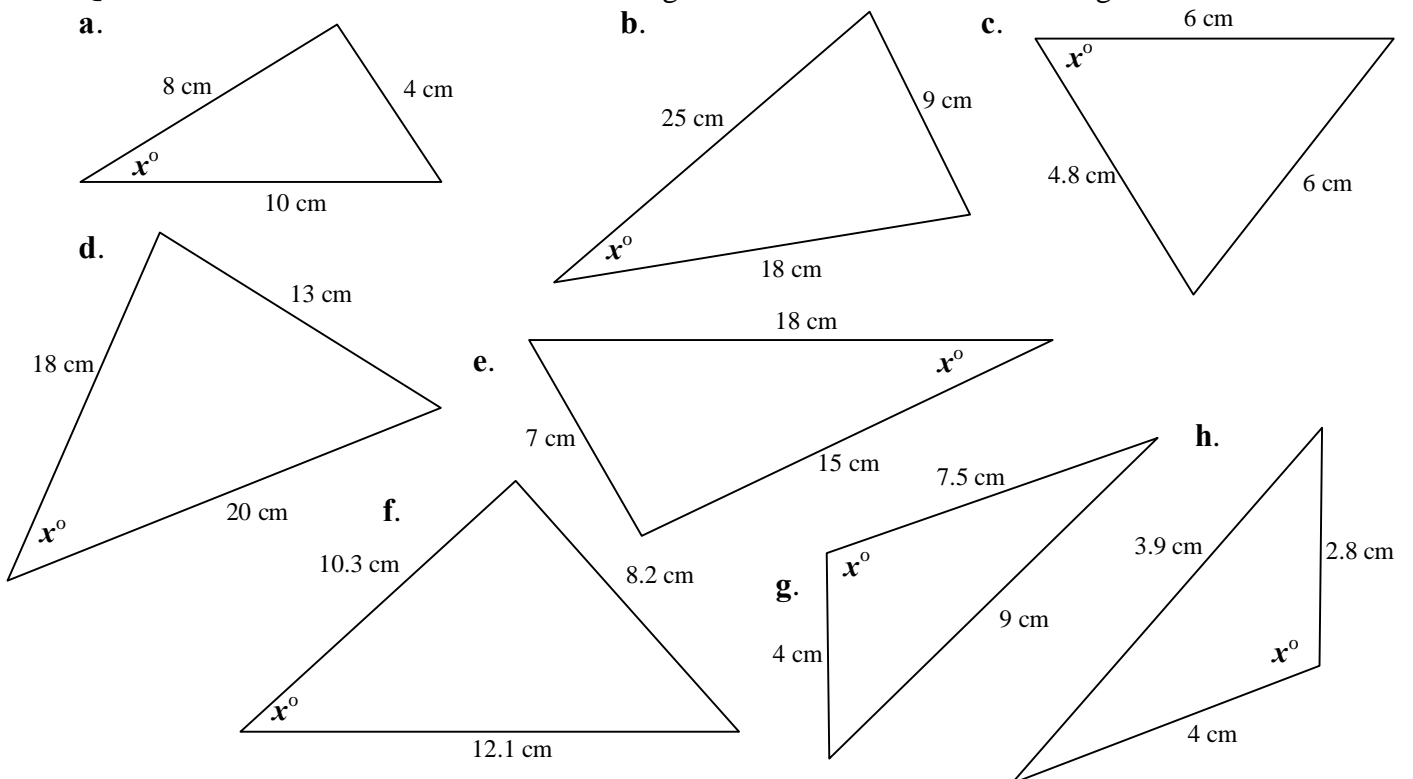
The length of AB is 32 m and the length of BC is 15 m. $\angle BCA$ is 46° . Calculate the size of $\angle BAC$ and the length of the crossbeam AC.

Trigonometry ~ Cosine Rule

Q1. Use the cosine rule to calculate the length of the side marked x in each of the triangles below.

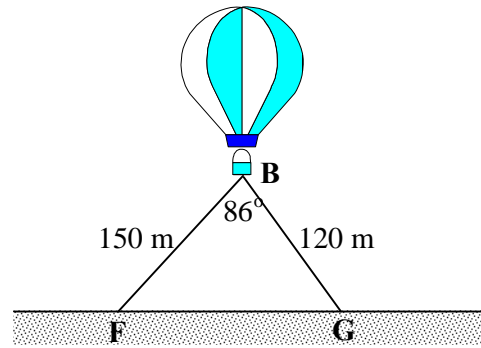


Q2. Use the cosine rule to calculate the angle marked x° in each of the triangles below.

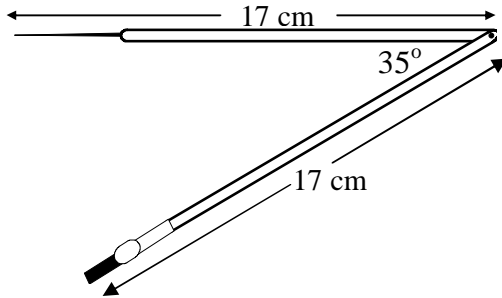


Q3. A hot air balloon B is fixed to the ground at F and G by 2 ropes 120m and 150 m long.

If $\angle FBG$ is 86° , how far apart are F and G.



Q4.



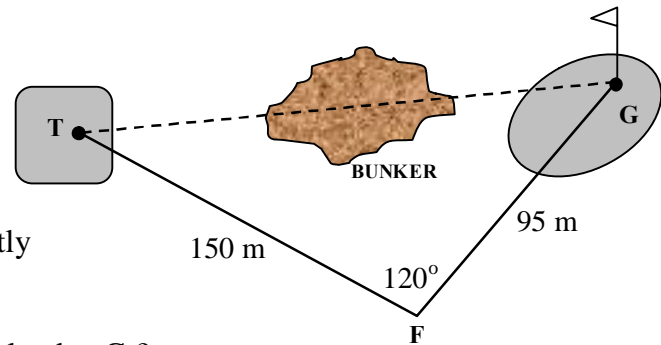
A set of compasses is shown where the angle between the arms is set at 35°

Calculate the diameter of the circle which could be drawn with the arms in this position.

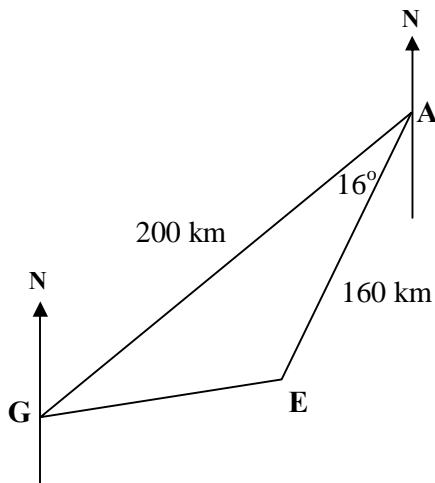
Q5. During a golf match, Ian discovers that he has forgotten his sand wedge, so to avoid the bunker he plays a shot from T to F and then from F to G.

His opponent Fred decides to play directly from T to G.

How far will Fred need to hit his shot to land at G ?



Q6.



The diagram shows the path of an aircraft from Glasgow to Aberdeen, a distance of 200 km and then from Aberdeen to Edinburgh, a distance of 160 km.

Calculate the distance from Glasgow to Edinburgh.

Graphs, Charts and Tables ~ Box Plots

Q1. For each data set, write down the minimum, maximum, median, upper and lower quartiles and draw a box plot.

- a. 19 27 12 30 8 31 25
- b. 4 7 10 2 6 4 14 8 15
- c. 4.0 2.9 5.3 1.8 4.0 4.7 2.8 1.8 5.2 4.0 5.1
- d. 18 11 12 11 16 20 10 15 13 14 15
- e. 51 58 53 51 52 55 53 50 54 53 52
- f. 249 265 254 267 270 279 252 268 258
- g. 82 90 97 85 105 86 96 104 108 94 96
- h. 40 43 41 41 40 50 40 44 80 40 41 40
- i. 0.1 0.8 0.3 0.2 0.2 0.5 0.3 0.1 0.4 0.3 0.2
- j. 29 25 13 39 29 26 18 18 33 31 19 30 26

Q2. Here are two sets of marks for a French test.

Class 5A	98	94	92	78	88	78	82	98	68	66
	100	96	84	86	84	94	86	92	82	100

Class 5B	73	95	80	72	85	90	91	88	91	93
	83	76	93	75	88	94	88	91	91	75

Draw a box plot for each class and compare the results.

Q3. A company that manufactures shoelaces spot checks the length (in cm) of the laces. Here are the results for two different production lines.

Line A	26.8	27.2	26.5	27.0	27.3	27.5	26.1	26.4	27.9	27.3
Line B	26.8	26.7	27.1	27.0	26.9	27.0	27.3	26.9	27.0	27.3

Draw a box plot for line A and line B.

Which is the better production line ? (Give a reason for your answer)

Q4. Two sixth year classes take part in a Sponsored Fast for Famine Relief. The number of hours each pupil lasted are shown below.

6C1	20	22	21	20	22	20	22	20	20	24	21	22	23	22	22	23
6C2	15	20	24	23	22	24	18	24	22	23	24	17	20	24	24	20

Show each class on a box plot and comment on any differences.

Statistics 1~ Mean, Median, Mode (revision)

Q1. Find the mean, median, mode and range for each of the following data sets.

- a. 7 8 9 10 12 12 12 13 13 13 13
- b. 50 51 51 51 51 52 52 53 53 53 53
- c. 0.4 2.1 3.6 4.8 5.3 5.3 5.5 5.7 6.0
- d. 7 9 10 11 12 14 14 15 16
- e. 6 8 11 12 14 15 15 17 21 22 24
- f. 8 10 11 12 14 14 15
- g. 0.31 0.34 0.35 0.38 0.40 0.42 0.43 0.43 0.45
- h. 2 3 3 3 5 5 5 5 6 6 7 7 8

Q2. Find the mean, median, mode and range for each of the following data sets. (Remember to write the numbers in order before finding the median)

- a. 7 6 3 11 8 7 10 4 7
- b. 1 3 11 4 9 15 7 2 6 3 5
- c. 2.0 2.5 3.3 1.7 2.2 2.7 1.9 2.2 2.9 1.5 2.4
- d. 85 81 80 89 88 81 85 86 81 90
- e. 4 2 3 1 2 4 3 2 1 2 2 3 2 4
- f. 1.2 0.8 2.0 0.9 0.8 0.6 1.1 2.2 1.2 0.8 0.9 1.9
- g. 332 308 340 325 336 341 319 324 317 306 308 320
- h. 8.8 12.4 15.2 10.3 11.9 9.7 20.0 16.9 9.7 17.1

Q3. Mr. Khan timed how long it took each of his class to complete an exercise. The times are in seconds.

300 480 216 311 419 333 281 295 308 276
402 343 398 290 364 378 399 294 401 300

Calculate the mean and the median.

Q4. The weights, in kilograms, of 20 new-born babies are shown below.

2.8 3.4 2.8 3.1 3.0 4.0 3.5 3.8 3.9 2.9
2.7 3.6 2.5 3.3 3.5 4.1 3.6 3.4 3.2 3.4

Find the median, mode and range.

Q5.

number of people in flat	frequency
1	3
2	5
3	12
4	3
5	1
<i>Total</i>	24

The frequency table shows the results of a survey conducted in a block of flats to find out how many people were living in each house.

- Use the table to calculate the mean, median and range.
- What is the modal number of people in a flat ?

Q6. The absences of a class of 30 first year pupils were recorded over a term.

- How many pupils had 100% attendance ?
- Calculate the mean number of absences.
- Write down the mode and the median.

number of absences	frequency
0	6
1	5
2	1
3	10
4	5
5	1
6	1
7	1
<i>Total</i>	30

Q7. The table shows the marks out of 10 achieved by pupils in a class test.

mark	0	1	2	3	4	5	6	7	8	9	10	<i>total</i>
frequency	1	0	1	3	3	2	3	5	7	4	3	32

Calculate the mean, median and mode.

Q8. A passage was picked at random from a book and the number of letters in the first 100 words were counted.

letters	1	2	3	4	5	6	7	8	9	10
frequency	4	12	30	24	17	5	2	3	3	1

Calculate the mean, median and mode.

Statistics 2 ~ Mean & Standard Deviation

Q1. Calculate the mean and standard deviation for the following sets of data.

a.	20	21	19	22	21	20	19	20	21	20	
b.	303	299	306	298	304	307	299	302	305	299	300
c.	15.3	14.9	15.1	15.2	14.8	14.7	15.1	14.8	15.0	15.0	
d.	87	89	84	88	89	87	86	87	86	87	
e.	48	73	29	82	54	43	95	41	92	71	
f.	4.4	4.6	4.8	4.0	4.2	4.3	4.5	4.7	4.9	4.1	
g.	0.2	0.3	0.4	0.2	0.2	0.0	0.4	0.1	0.2	0.3	
h.	40	40	39	38	38	40	40	42	40	39	

Q2. A third year pupil conducting an experiment with a die got the following results

6	1	1	4	4	2	2	6	5	6
1	1	1	5	1	4	2	3	4	6
1	4	4	1	5	4	4	3	6	2
5	3	5	6	3	2	6	5	5	2
3	1	4	5	2	4	1	4	4	3

- a. Show these results in a frequency table
- b. Use your table to calculate the mean and standard deviation.

Q3. An assistant in a shoe shop was asked to do a stock check on the numbers of different sizes of ladies shoes sold that week.

4	3	5	4	4 ½	4	5 ½	4 ½	4	3
5	6	4 ½	5 ½	4 ½	5	6 ½	5	6 ½	5
3 ½	5	5	4 ½	6	4	5	4	4 ½	3 ½
5 ½	4 ½	5	4	5	5 ½	4 ½	6 ½	6	4 ½
5	5 ½	5	5	4 ½	6 ½	5 ½	7	5 ½	4 ½
4	6	3 ½	4	5 ½	4	5	4 ½	3 ½	5 ½
4	6	3 ½	6	5 ½	5	5	7	5	7
4 ½	6 ½	6	5 ½	5	6	7	5 ½	4 ½	5
6	4 ½	6	5	4	4 ½	4	4	5	4 ½
4	5	3	5 ½	6 ½	4	4 ½	5	5 ½	4 ½

Draw a frequency table and calculate the mean and standard deviation.

Q4. A company that manufactures shoelaces spot checks the length (in cm) of the laces. Here are the results for two different production lines.

Line A	26.8	27.2	26.5	27.0	27.3	27.5	26.1	26.4	27.9	27.3
Line B	26.8	26.7	27.1	27.0	26.9	27.0	27.3	26.9	27.0	27.3

Calculate the mean and standard deviation and comment on any differences between line A and line B.

Q5. The running times, in minutes, of films shown on television over a week are as follows.

110	95	135	70	100	125	140	105	95	105
95	95	110	90	110	100	125	105	90	120
125	120	100	130	90	75	100	105	105	110
130	115	85	120	90	75	100	110	105	100
110	105	105	115	100	90	120	80	105	100

Construct a frequency table to help you calculate the mean and standard deviation.

Q6. The temperatures, in °C, at a seaside resort were recorded at noon over a 30-day period.

19	20	19	17	21	18	19	24	25	28
25	23	18	19	18	20	18	17	20	22
22	23	25	27	25	24	22	22	20	17

Make a frequency table and use it to help find the mean and standard deviation.

Q7. John James plays golf with his brother Joe each month. They keep a note of their score cards.

John	74	73	74	73	71	73	72	75	73	73	72	73
Joe	68	74	70	67	80	81	69	68	79	67	70	71

Calculate the mean and standard deviation and comment on John's and Joe's performance over the year.

Q8. The weekly takings in small store, to the nearest £, for a week in December and March are shown below

December	2131	2893	2429	3519	4096	4810
March	1727	2148	1825	2397	2901	3114

Calculate the mean and standard deviation and comment on any differences.

Q9. Two sixth year classes take part in a Sponsored Fast for Famine Relief. The number of hours each pupil lasted are shown below.

6C1	20	22	21	20	22	20	22	20	20	24	21	22	23	22	22	23
6C2	15	20	24	23	22	24	18	24	22	23	24	17	20	24	24	20

Calculate the mean and standard deviation for each class and comment on how well each class did.

Statistics 3~ Median and Quartiles

Q1. For each of the data sets below find the median, lower quartile, upper quartile and semi-interquartile range.

- a. 2 4 4 6 7 8 10 14 15
- b. 29 30 32 33 34 37 40
- c. 17 19 20 22 23 25 26
- d. 0 0 0 1 1 2 2 2 3 3 4
- e. 1.8 1.8 2.8 2.9 4.0 4.0 4.0 4.7 5.1 5.2 5.3
- f. 0.13 0.18 0.18 0.19 0.25 0.26 0.29 0.29 0.30 0.31 0.33 0.39
- g. 133 136 136 138 140 141 143 145
- h. 371 375 376 379 380 384 385 387 389 390
- i. 57 58 58 60 63 67 67 69 82 85 86 90
- j. 11 11 11 12 13 14 15 15 16 18 20

Q2. For each of the data sets below find the median, lower quartile, upper quartile and semi-interquartile range

- a. 47 56 58 48 60 65 50 52 61 53 63
- b. 12 20 27 15 35 16 26 34 38 24 26
- c. 149 165 154 167 170 179 151 168 158
- d. 1 8 3 1 2 5 3 1 4 3 2
- e. 108 114 132 95 144 120 116 125 172 188 155 160
- f. 65 74 59 43 63 52 48 63 67 85 92 48
- g. 190 165 174 187 166 172 184 190 166 183 180
- h. 325 363 347 359 314 329 364 372 301 317 346
- i. 0.5 1.3 0.4 1.0 0.9 1.4 0.8 0.9 1.1 0.6
- j. 10 13 11 11 20 10 10 14 50 10 11 10

Q3. A class of pupils noted the number of brothers and sisters they each had

0	3	0	1	0	1	1	3
2	3	3	2	1	5	0	1
4	1	2	2	2	2	1	2

- a. Show the results on a frequency table
- b. Add a cumulative frequency column to your table.
- c. Find the median and quartiles.

Q4. The table below shows the marks out of 10 gained by pupils in a class test.

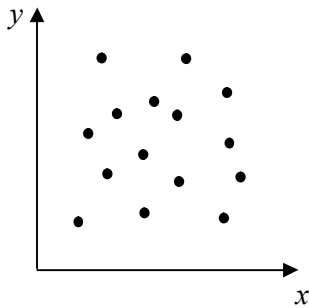
mark	0	1	2	3	4	5	6	7	8	9	10
frequency	1	0	1	3	3	2	3	5	7	4	3

Add a cumulative frequency column and use it to find the median and quartiles.

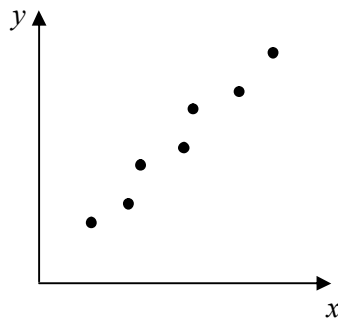
Statistics 4~ Scattergraphs & Correlation

Q1. Using the words positive, negative or no relation, describe the correlation in each of the diagrams below.

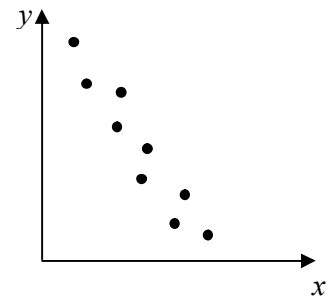
a.



b.

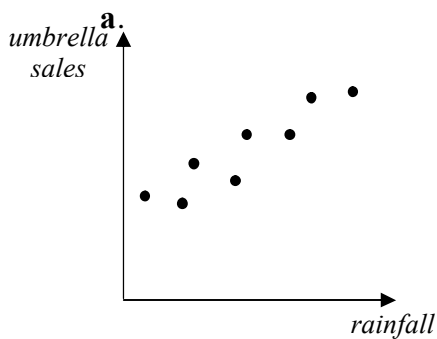


c.

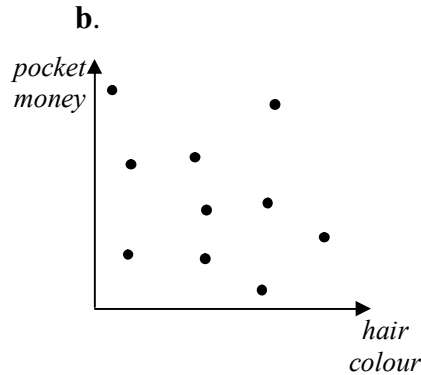


Q2. What do the diagrams tell you about the correlation between the two variables involved?

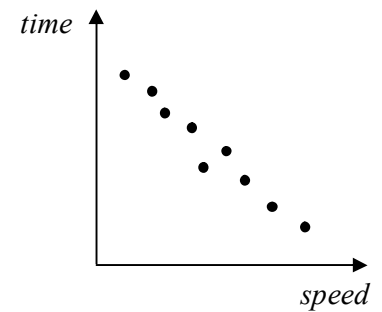
a.



b.



c.



Q3. A random survey of 20 pupils gave the following results

Pupil	1	2	3	4	5	6	7	8	9	10
Age	16	17	14	17	14	12	12	16	18	15
Height(cm)	182	199	171	200	183	159	170	179	198	180
Weight (kg)	71	78	69	66	54	60	46	72	76	63
Cash carried (£)	4.23	10.90	25.50	1.43	2.98	6.24	3.18	0.72	1.98	0.25

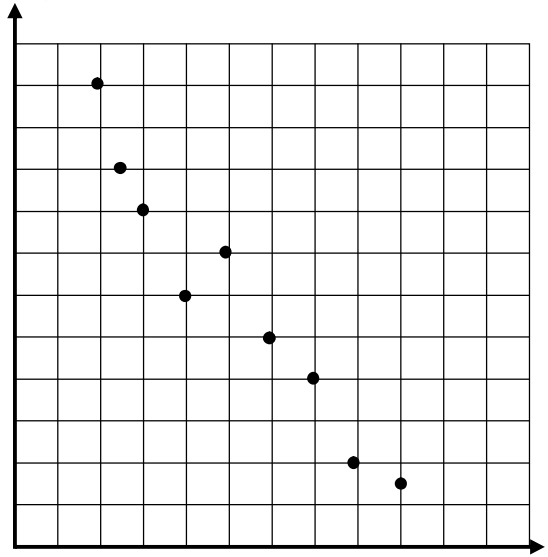
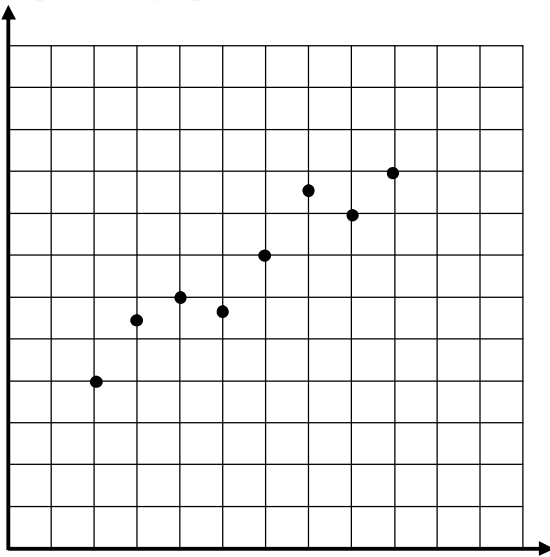
Pupil	11	12	13	14	15	16	17	18	19	20
Age	18	18	17	16	11	11	13	12	14	14
Height (cm)	190	179	187	169	160	151	150	171	170	182
Weight (kg)	68	75	77	76	49	41	55	53	60	67
Cash carried (£)	12.06	4.31	2.38	12.30	2.15	4.12	2.71	0.40	1.80	3.10

Draw a scatter diagram to find out if there is a correlation between

- age and height
- height and weight
- age and weight
- age and amount of cash carried.

Statistics 5~ Regression (best fit line)

Q1. Copy these graphs and use your ruler to draw what you think is the line of best fit.



Q2. For the following sets of data, draw a scatter diagram and find the equation of the line of best fit.

a.

x	1	2	3	4	5
y	5	7	8	10	12

b.

x	1	2	3	4	5
y	2	2.5	2.5	3.5	3

c.

x	6	7	8	9	10
y	1	2	4	4.5	6

d.

x	1	2	3	4	5
y	8	6	5	4	2

e.

x	1	2	3	4	5
y	8	10	8	5	3

f.

x	5	6	7	8	9
y	6	5.5	5.4	5.5	5

Q3. The height of a plant measured over five days is shown below.

Days (D)	1	2	3	4	5
Height (H)	1.6	1.9	2.5	3.4	3.5

- a. Plot the points and draw the best fitting straight line through them
- b. Work out the equation of the line.
- c. Use your line to estimate the height after $1\frac{1}{2}$ days.

Q4. The table shows the results of an experiment.

x	1	2	3	4	5	6
y	9.2	12.0	18.3	19.0	25.1	30.2

Plot the points, draw a best fitting straight line and find its equation.

Q5. The results below show the length of a spring when a force is applied.

Force (F)	1	2	3	4	5	6
Length (l)	3.0	3.9	4.8	5.9	6.9	8.1

- Plot the points and draw the best fitting straight line through them.
- Find the equation of the line.
- Use your graph to estimate the length when a force of 4.5 is applied.

Q6. The following table gives the temperature of a bottle of water as it cools.

Time, min (T)	1	3	5	7	9
Temperature ($^{\circ}C$)	66	61	57	53	50

- Plot the points and draw the best fitting straight line through them.
- Find the equation of the line.
- Use your graph to estimate the temperature after $2\frac{1}{2}$ minutes.

Q7. The following table shows the speed of a car accelerating from rest.

Time (secs)	0	2	6	8	12	16
Speed (mph)	0	14	44	56	82	110

- Plot the points and draw the best fitting straight line through them.
- Find the equation of the line.
- Use your graph to estimate the speed after 10 seconds.

Q8. A restaurant manager finds that the cost of running his restaurant depends on the number of meals served.

Number of meals	10	20	30	40	50	60
Cost in £	188	192	220	216	232	248

- Plot the points and draw the best fitting straight line through them.
- Find the equation of the line.
- Use your equation to estimate the cost when 35 meals are served.

Q9. The results of an experiment are shown in the table below.

V	0	0.35	0.6	0.95	1.2	1.3
R	0.60	0.48	0.33	0.18	0.11	0.05

- Plot the points and draw the best fitting straight line through them.
- Find the equation of the line.
- Use your graph to estimate R when V is 0.8.

Fractions

Q1. Express these fractions in their simplest form.

a. $\frac{3}{6}$

b. $\frac{8}{12}$

c. $\frac{30}{16}$

d. $\frac{54}{72}$

Q2. Express each sum as a fraction in its simplest form

a. $\frac{1}{5} + \frac{3}{5}$

b. $\frac{2}{5} + \frac{1}{10}$

c. $\frac{3}{4} + \frac{1}{8}$

d. $\frac{1}{6} + \frac{2}{3}$

e. $\frac{1}{9} + \frac{2}{3}$

f. $\frac{1}{3} + \frac{1}{4}$

g. $\frac{3}{5} + \frac{1}{4}$

h. $\frac{1}{4} + \frac{1}{6}$

i. $\frac{1}{3} + \frac{5}{8}$

j. $\frac{1}{2} + \frac{2}{5}$

k. $\frac{3}{4} + \frac{1}{6}$

l. $\frac{1}{2} + \frac{3}{7}$

m. $\frac{2}{7} + \frac{1}{8}$

n. $\frac{1}{5} + \frac{3}{8}$

o. $\frac{2}{9} + \frac{3}{7}$

Q3. Express each difference as a fraction in its simplest form

a. $\frac{3}{4} - \frac{1}{4}$

b. $\frac{1}{2} - \frac{1}{6}$

c. $\frac{5}{6} - \frac{2}{3}$

d. $\frac{11}{12} - \frac{5}{6}$

e. $\frac{11}{12} - \frac{2}{3}$

f. $\frac{1}{2} - \frac{1}{16}$

g. $\frac{2}{3} - \frac{1}{4}$

h. $\frac{1}{2} - \frac{2}{5}$

i. $\frac{4}{5} - \frac{1}{2}$

j. $\frac{7}{8} - \frac{3}{16}$

k. $\frac{11}{12} - \frac{2}{3}$

l. $\frac{7}{12} - \frac{1}{3}$

m. $\frac{5}{8} - \frac{2}{5}$

n. $\frac{5}{6} - \frac{3}{5}$

o. $\frac{7}{9} - \frac{3}{7}$

Q4. Express each product as a fraction in its simplest form

a. $\frac{1}{4} \times \frac{4}{7}$

b. $\frac{1}{3} \times \frac{3}{10}$

c. $\frac{1}{2} \times \frac{4}{7}$

d. $\frac{2}{3} \times \frac{1}{8}$

e. $\frac{4}{5} \times \frac{1}{16}$

f. $\frac{6}{7} \times \frac{2}{3}$

g. $\frac{3}{5} \times \frac{10}{21}$

h. $\frac{3}{8} \times \frac{4}{21}$

i. $\frac{21}{32} \times \frac{4}{7}$

j. $\frac{1}{9} \times \frac{12}{13}$

k. $\frac{5}{16} \times \frac{6}{25}$

l. $\frac{5}{7} \times \frac{14}{15}$

m. $\frac{7}{9} \times \frac{12}{35}$

n. $\frac{12}{13} \times \frac{39}{48}$

o. $\frac{2}{3} \times \frac{5}{9}$

Q5. Express as a single fraction

a. $\frac{1}{4} \div \frac{1}{3}$

b. $\frac{2}{5} \div \frac{2}{7}$

c. $\frac{4}{5} \div \frac{3}{4}$

d. $\frac{3}{7} \div \frac{2}{5}$

e. $\frac{5}{12} \div \frac{5}{3}$

f. $\frac{5}{9} \div \frac{1}{3}$

g. $\frac{2}{5} \div \frac{9}{10}$

h. $\frac{3}{7} \div \frac{11}{14}$

i. $\frac{4}{9} \div \frac{2}{3}$

j. $\frac{2}{5} \div \frac{4}{5}$

k. $\frac{24}{35} \div \frac{20}{21}$

l. $\frac{6}{25} \div \frac{9}{20}$

m. $\frac{8}{21} \div \frac{9}{14}$

n. $\frac{10}{21} \div \frac{8}{9}$

o. $\frac{20}{33} \div \frac{15}{44}$

Vectors

1. The vertices of a triangle are $A(2,3)$, $B(-4,1)$ and $C(5,-4)$.
- (a) Find in component form the vectors represented by the following displacements :

i) \vec{AC} ii) \vec{CB}

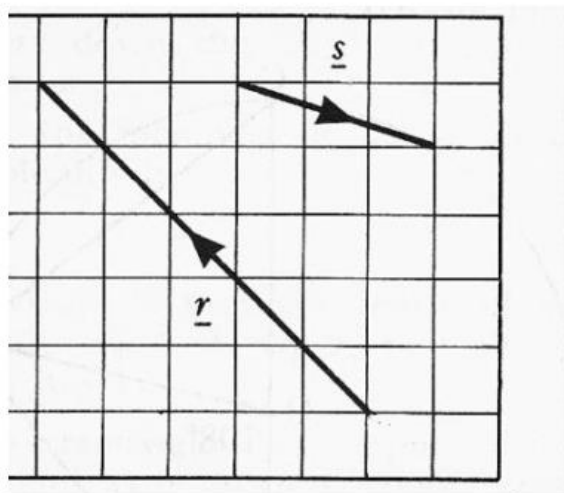
- (b) Calculate the magnitude of \vec{AB} .

2. Given that $\underline{a} = \begin{pmatrix} 2 \\ -1 \\ 4 \end{pmatrix}$, $\underline{b} = \begin{pmatrix} 0 \\ 1 \\ -2 \end{pmatrix}$ and $\underline{c} = \begin{pmatrix} 6 \\ 1 \\ -4 \end{pmatrix}$.

- (a) Find in component form the vectors represented by i) $\underline{a} + 2\underline{b}$ ii) $3\underline{c} - \underline{a}$.

- (b) Calculate $|(2\underline{a} - \underline{b})|$.

3. (a) The diagram below shows representatives of the vectors \mathbf{r} and \mathbf{s}

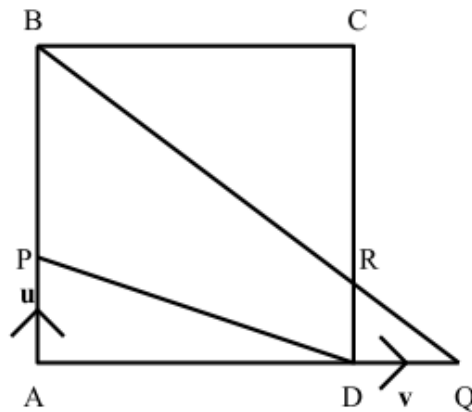


Write down the components of

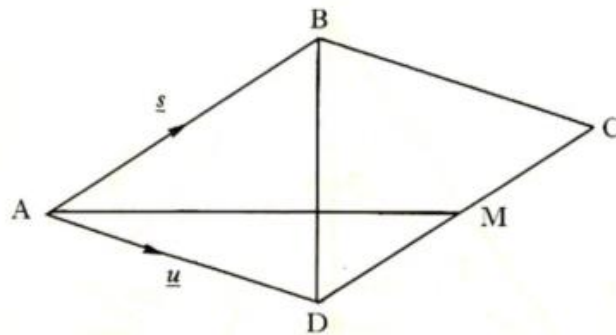
(i) (1) \mathbf{r} (2) \mathbf{s} (3) $\mathbf{r} + \mathbf{s}$

- (ii) Express $|\mathbf{r}|$ as a surd in its simplest form.

4. In the diagram below ABCD is a square of side 3 units and P lies on AB such that $BP = 2$ units and AD is produced to Q so that $DQ = 1$ unit.
 \overline{AP} and \overline{DQ} are representatives of the vectors \mathbf{u} and \mathbf{v} respectively.

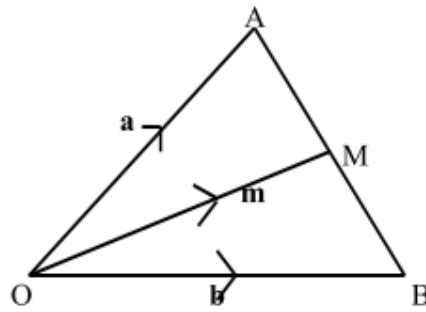


- (i) Express in terms of \mathbf{u} and/or \mathbf{v}
- (1) \overline{AD} (2) \overline{PD} (3) \overline{BQ}
5. The diagram below shows a parallelogram ABCD. M is the mid-point of CD and \overline{AD} and \overline{AB} represent the vectors \mathbf{u} and \mathbf{s} respectively.



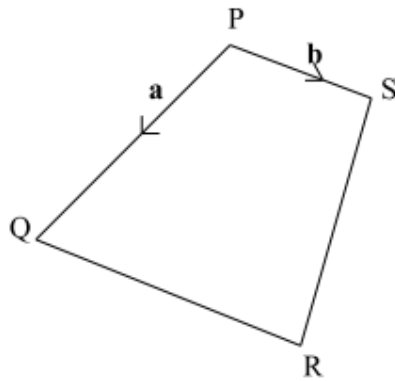
- (a) Express \overline{AM} and \overline{BD} in terms of \mathbf{u} and \mathbf{s} .
- (b) If $\mathbf{u} = \begin{pmatrix} 6 \\ -2 \end{pmatrix}$ and $\mathbf{s} = \begin{pmatrix} 6 \\ 4 \end{pmatrix}$, find the components of the vectors represented by \overline{AM} and \overline{BD} .
 What conclusion can you draw about the straight lines AM and BD?

6. Relative to an origin O , M is the mid-point of the line segment AB .
 Vectors \mathbf{a} , \mathbf{b} and \mathbf{m} represent the directed line segments \overrightarrow{OA} , \overrightarrow{OB} and \overrightarrow{OM} respectively.



- (a) Show that $\overrightarrow{AB} = \mathbf{b} - \mathbf{a}$
 (b) Show that $\overrightarrow{OM} = \frac{1}{2} \mathbf{a} + \mathbf{b}$

7.

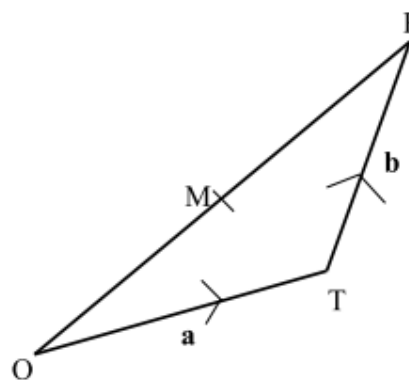


In the diagram \overrightarrow{PQ} represents the vector \mathbf{a} and \overrightarrow{PS} represents the vector \mathbf{b} .

$\overrightarrow{QR} = 2\overrightarrow{PS}$. T is the point on QS such that $\overrightarrow{QT} = \frac{2}{3}\overrightarrow{QS}$.

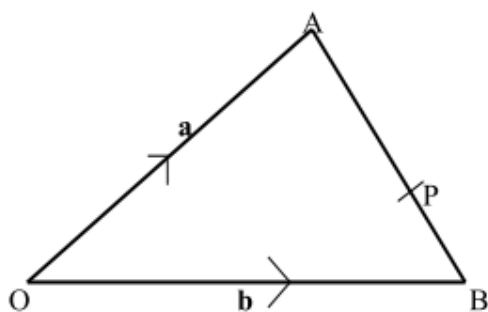
- (a) Give expressions in terms of \mathbf{a} and/or \mathbf{b} for
- (i) \overrightarrow{QR} (ii) \overrightarrow{PR} (iii) \overrightarrow{QS} (iv) \overrightarrow{QT}
 (v) \overrightarrow{PT}
- (b) Using your answers to (ii) and (v) show that $\overrightarrow{PT} = k\overrightarrow{PR}$ and evaluate k .
- (c) What conclusion can be made about T ?

8. OPT is a triangle. M is the mid-point of OP .
 $\overrightarrow{OT} = \mathbf{a}$ and $\overrightarrow{TP} = \mathbf{b}$.



- (a) Express \overrightarrow{OM} in terms of \mathbf{a} and \mathbf{b} .
 (b) Express \overrightarrow{TM} in terms of \mathbf{a} and \mathbf{b} . Give your answer in its simplest form.

9.



OAB is a triangle. $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.
 P is the point on AB such that $AP : PB = 2 : 1$.

- (a) Find the vector \overrightarrow{AB} in terms of \mathbf{a} and \mathbf{b} .
 (b) Find the vector \overrightarrow{OP} in terms of \mathbf{a} and \mathbf{b} . Give your answer in its simplest form.

ANSWERS

Percentages

- Q1. a. £2332.80, £332.80 b. £5955.08, £955.08 c. £5495.42, £495.42
d. £4348.04, £848.04 e. £1982.12, £382.12 f. 2393.35, 643.35
g. £23820.32, 3820.32 h. £21190.05, 3190.05 i. £64751.45, £14751.45
j. £439.32, £39.32
- Q2. £3136.32 Q3. £92317 Q4. £212.24 Q5. 6300 million
Q6. £1536 Q7. £5644.80 Q8. a. 270 000 b. after 3 years
Q9. £75 Q10. £11 500

Trigonometry ~ Area of a triangle

- Q1. a. 13 cm^2 b. 16.5 cm^2 c. 43.3 cm^2 d. 84.9 cm^2
e. 54.8 cm^2 f. 19.3 cm^2 g. 16.8 cm^2 h. 14.8 cm^2
i. 211.3 cm^2 j. 47.6 cm^2
- Q2. 3.9 m^2
- Q3. a. 0.93 m^2 b. 13 m^2

Trigonometry ~ Sine Rule

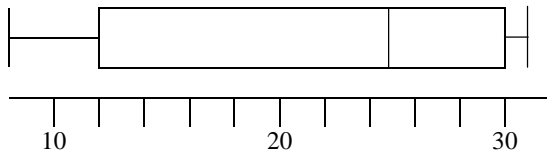
- Q1. a. 10.3 cm b. 18.1 cm c. 7.5 cm d. 5.3 cm
e. 19.2 cm f. 5.1 cm g. 12.6 cm h. 8.0 cm
i. 4.7 cm j. 2.5 cm k. 33.4 cm
- Q2. a. 27.2° b. 18.8° c. 49.0° d. 28.2°
e. 24.8° f. 42.7° g. 52.1° h. 57.7°
- Q3. golfer 1 ~ 61.7 m, golfer 2 ~ 31.5 m Q4. a. 16° b. 63.7 km
Q5. 126 km Q6. 20° , 40.6 m

Trigonometry ~ Cosine Rule

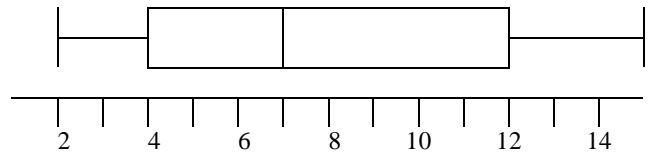
- Q1. a. 2.5 cm b. 5.9 cm c. 6.1 cm d. 4.6 cm
e. 19.9 cm f. 3.8 cm g. 9.1 cm h. 8.1 cm
i. 2.9 cm j. 7.5 cm k. 29.9 cm
- Q2. a. 22.3° b. 15.3° c. 66.4° d. 39.6°
e. 22.2° b. 42.0° c. 98.4° d. 67.3°
- Q3. 185 m Q4. 20.4 cm Q5. 214 m Q6. 64 km

Graphs, Charts & Tables ~ Box Plots

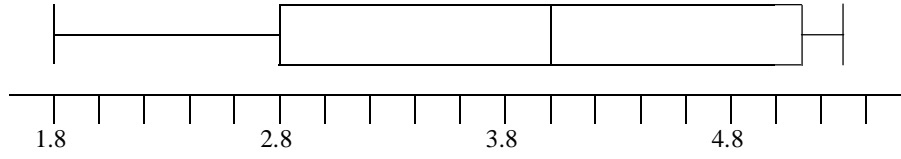
Q1. a.



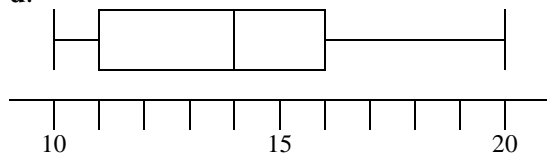
b.



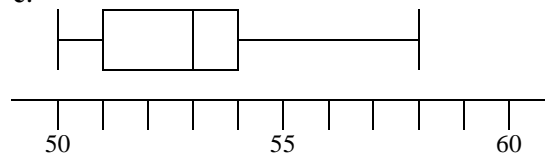
c.



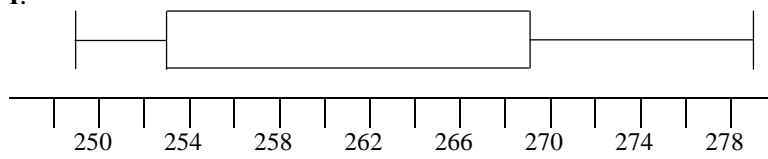
d.



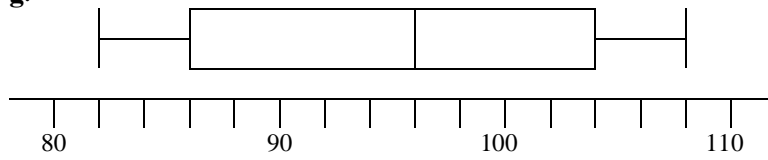
e.

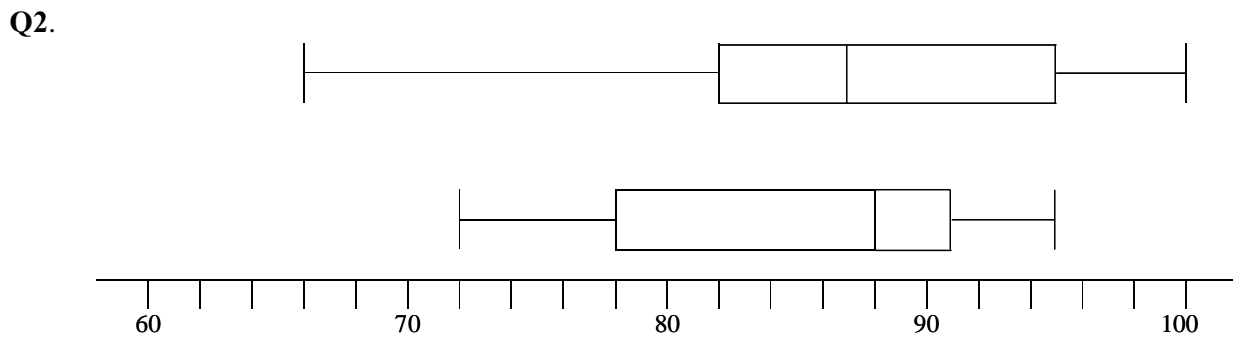
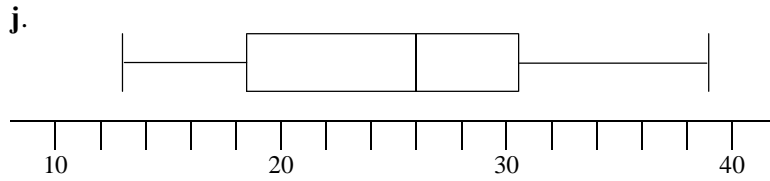
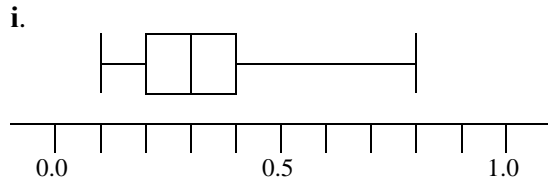
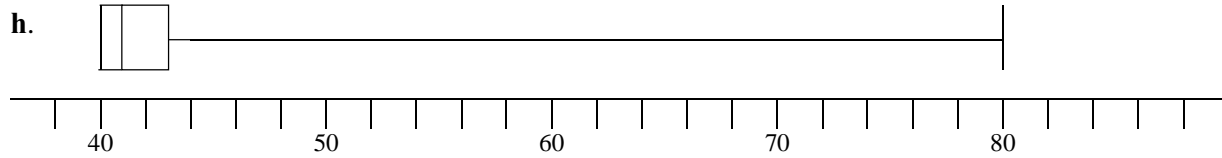


f.

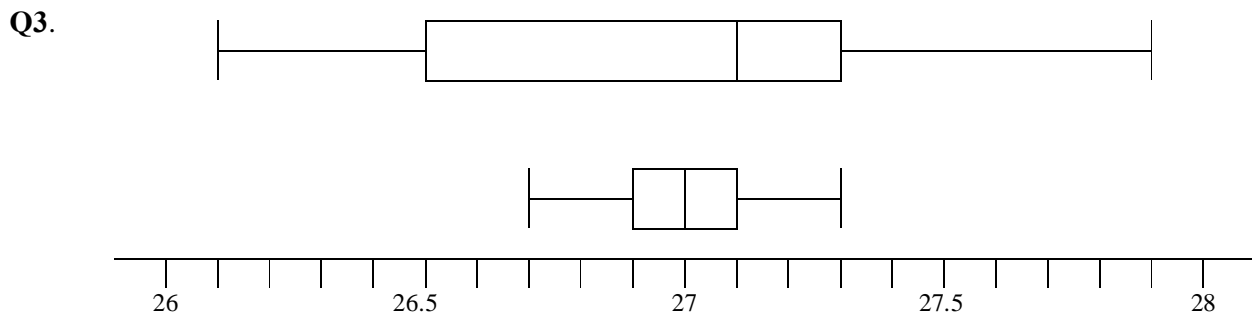


g.

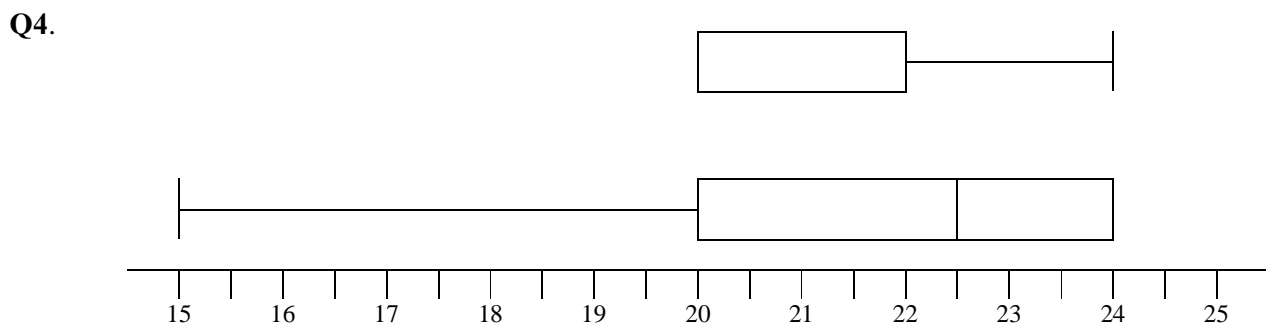




Class B has a higher median and a smaller range than class A.
 Although class A has a higher maximum mark there is a greater spread of ability.



Line B is the better line, there is less variation in the length of the shoe-laces.



Statistics 1 ~ Mean , median, mode (revision)

Q1.

	mean	median	mode	range
a	11	12	13	6
b	52	52	51	5
c	4.3	5.3	5.3	5.6
d	13	12	14	9
e	15	15	15	18
f	12	12	14	7
g	0.39	0.40	0.43	0.14
h	5	5	5	6

Q2.

	mean	median	mode	range
a	7	7	7	8
b	6	5	3	14
c	2.3	2.2	2.2	1.8
d	84.6	85	81	9
e	2.5	2	2	3
f	1.2	0.95	0.8	1.6
g	323	322	308	35
h	13.2	12.15	9.7	11.2

Q3. 339.4, 322

Q4. 3.4, 3.4, 1.6

Q5. a. 2.75, 3, 4 b. 3

Q6. a. 8 b. 2.5 c. 3, 3

Q7. 6.5, 7, 8

Q8. 3.96, 4, 4

Statistics 2 ~ Mean & Standard Deviation

Q1.

	a.	b.	c.	d.	e.	f.	g.	h.
mean	20.3	302	14.99	87	62.8	4.45	0.23	39.6
SD	0.95	3.19	0.19	1.49	22.9	0.30	0.13	1.17

Q2. 3.44, 1.72

Q3. 4.95, 0.94

Q4. line A 27, 0.55; line B

Q5. 104.86, 15.4

Q6. 21.4, 3.11

Q7. John 73, 1.64 ; Joe 72, 5.20

Joe has lower mean score but John has better overall performance (lower standard deviation)

Q8. Dec 3313, 1025; Mar 2352, 564

December has higher mean takings but March has less variation in takings

Q9. 6C1 21.5, 1.26 ; 6C2 21.5, 2.88

Same average but 6C1 has lower SD so less spread out.

Statistics 3 ~ Median & Quartiles

Q1.

	median	Q1	Q3	SIR
a.	7	4	12	4
b.	33	30	37	3.5
c.	22	19	25	3
d.	2	0	3	1.5
e.	4.0	2.8	5.1	1.15
f.	0.275	0.185	0.305	0.06
g.	139	136	142	3
h.	382	376	387	5.5
i.	67	59	83.5	12.25
j.	14	11	16	2.5

Q2.

	median	Q1	Q3	SIR
a.	56	50	61	5.5
b.	26	16	34	9
c.	165	152.5	169	8.25
d.	3	1	4	1.5
e.	128.5	115	157.5	21.25
f.	63	50	70.5	10.25
g.	180	166	187	10.5
h.	346	317	363	23
i.	0.9	0.6	1.1	0.25
j.	11	10	13.5	1.75

Q3.

	f	cf
0	4	4
1	7	11
2	7	18
3	4	22
4	1	23
5	1	24
	24	

Q1 = 1, median = 2, Q3 = 3

Q4.

	f	cf
0	1	1
1	0	1
2	1	2
3	3	5
4	3	8
5	2	10
6	3	13
7	5	18
8	7	25
9	4	29
10	3	32
	32	

Q1 = 9, median = 7, Q3 = 7.5

Statistics 4 ~ Scattergraphs & Correlation

- Q1. a. no relation b. positive c. negative
- Q2. a. positive correlation (more rain ó more people buy umbrellas)
- b. no relation
- c. negative correlation (the faster you go, the less time it takes)
- Q3. a. yes b. yes, but not strong c. yes d. no

Statistics 5 ~ Regression (best fit line)

- Q1. student's best fit lines
- Q2. Answers will vary depending on where line is drawn
- a. $y = 1.67x + 3.3$ b. $y = 0.4x + 1.5$ c. $y = 1.2x - 6$
- d. $y = -1.5x + 9$ e. $y = -1.5x + 12$ f. $y = -0.25x + 7$
- Q3. $H = 0.6D + 0.7$, 1.6
- Q4. $y = 3.8x + 6$
- Q5. $l = 0.9F + 2.2$, 6.25
- Q6. $C = -2T + 67$, 62°C
- Q7. $S = 7T$, 70 mph
- Q8. $C = 1.1m + 177$, £215.50
- Q9. $R = -0.35V + 0.61$, 0.3

Fractions

- Q1. a. $\frac{1}{2}$ b. $\frac{2}{3}$ c. $\frac{15}{8}$ d. $\frac{3}{4}$
- Q2. a. $\frac{4}{5}$ b. $\frac{1}{2}$ c. $\frac{7}{8}$ d. $\frac{5}{6}$ e. $\frac{7}{9}$ f. $\frac{7}{12}$
- g. $\frac{17}{20}$ h. $\frac{5}{12}$ i. $\frac{23}{24}$ j. $\frac{9}{10}$ k. $\frac{11}{12}$ l. $\frac{13}{14}$
- m. $\frac{23}{56}$ n. $\frac{23}{40}$ o. $\frac{41}{63}$
- Q3. a. $\frac{1}{2}$ b. $\frac{1}{3}$ c. $\frac{1}{6}$ d. $\frac{1}{12}$ e. $\frac{1}{4}$ f. $\frac{7}{16}$
- g. $\frac{5}{12}$ h. $\frac{1}{10}$ i. $\frac{3}{10}$ j. $\frac{11}{16}$ k. $\frac{1}{4}$ l. $\frac{1}{4}$

$$\text{m. } \frac{9}{40} \quad \text{n. } \frac{7}{30} \quad \text{o. } \frac{22}{63}$$

Q4.	a.	$\frac{1}{7}$	b.	$\frac{1}{10}$	c.	$\frac{2}{7}$	d.	$\frac{1}{12}$	e.	$\frac{1}{20}$	f.	$\frac{4}{7}$
	g.	$\frac{2}{7}$	h.	$\frac{1}{14}$	i.	$\frac{3}{8}$	j.	$\frac{4}{39}$	k.	$\frac{3}{40}$	l.	$\frac{2}{3}$
	m.	$\frac{4}{15}$	n.	$\frac{3}{4}$	o.	$\frac{10}{27}$						
Q5.	a.	$\frac{3}{4}$	b.	$\frac{7}{5}$	c.	$\frac{16}{15}$	d.	$\frac{15}{14}$	e.	$\frac{1}{4}$	f.	$\frac{5}{3}$
	g.	$\frac{4}{9}$	h.	$\frac{6}{11}$	i.	$\frac{2}{3}$	j.	$\frac{1}{2}$	k.	$\frac{18}{25}$	l.	$\frac{8}{15}$
	m.	$\frac{16}{27}$	n.	$\frac{15}{28}$	o.	$\frac{16}{9}$						

Vectors

1. (a) i) $\begin{pmatrix} 3 \\ -7 \end{pmatrix}$ ii) $\begin{pmatrix} -9 \\ 5 \end{pmatrix}$

(b) $\sqrt{40}$ or $2\sqrt{10}$

2. (a) i) $\begin{pmatrix} 2 \\ 1 \\ 0 \end{pmatrix}$ ii) $\begin{pmatrix} 16 \\ 4 \\ -16 \end{pmatrix}$

(b) $\sqrt{125}$ or $5\sqrt{5}$

3. (i) $\begin{pmatrix} -5 \\ 5 \end{pmatrix}$ $\begin{pmatrix} 3 \\ -1 \end{pmatrix}$ $\begin{pmatrix} -2 \\ 4 \end{pmatrix}$

(ii) $5\sqrt{2}$

4. (i) $\overline{AD} = 3\mathbf{v}$ $\overline{PD} = -\mathbf{u} + 3\mathbf{v}$ $\overline{BQ} = -3\mathbf{u} + 4\mathbf{v}$

5. (a) $\overline{AM} = \mathbf{u} + \frac{1}{2}\mathbf{s}$ $\overline{BD} = -\mathbf{s} + \mathbf{u}$

(b) $\overline{AM} = \begin{bmatrix} 9 \\ 0 \end{bmatrix}$ $\overline{BD} = \begin{bmatrix} 0 \\ 2 \end{bmatrix}$ (lines are at right angles to each other)

6. Proof

7. (a) (i) $2\mathbf{b}$ (ii) $-\mathbf{a}+2\mathbf{b}$ (iii) $-\mathbf{a}+\mathbf{b}$ (iv) $-\frac{2}{3}\mathbf{a}+\frac{2}{3}\mathbf{b}$ (v) $-\frac{1}{3}\mathbf{a}+\frac{2}{3}\mathbf{b}$

(b) $k = \frac{1}{3}$ so T lies on PR .

8. (a) $\frac{1}{2}\mathbf{a}+\frac{1}{2}\mathbf{b}$ (b) $-\frac{1}{2}\mathbf{a}+\frac{1}{2}\mathbf{b}$

9. (a) $\mathbf{b}-\mathbf{a}$ (b) $\frac{1}{3}\mathbf{a}+\frac{2}{3}\mathbf{b}$