****

**Answer ALL questions.**

**Write your answers in the spaces provided.**

**You must write down all the stages in your working.**

**1** (*a*)Expand and simplify (*x* + 5)(*x* – 9)

.......................................................

**(2)**

(*b*)Factorise fully 9*x*2 + 6*x*

.......................................................

**(2)**

**(Total for Question 1 is 4 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**2** (*a*)Use your calculator to work out 

Write down all the figures on your calculator display.

..................................................................................

**(2)**

(*b*)Write your answer to part (*a*)correct to 4 significant figures.

.......................................................

**(1)**

**(Total for Question 2 is 3 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**3** The scatter graph shows information about the marks a group of students got in a Science

test and in a Maths test.



Jamie got a mark of 34 in the Science test.

Using the scatter graph, find an estimate for Jamie’s mark in the Maths test.

.......................................................

**(Total for Question 3 is 2 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**4** The table gives information about the times taken, in seconds, by 18 students to run a race.

|  |  |
| --- | --- |
| **Time (*t* seconds)** | **Frequency** |
| 5 < *t* ⩽ 10 | 1 |
| 10 < *t* ⩽ 15 | 2 |
| 15 < *t* ⩽ 20 | 7 |
| 20 < *t* ⩽ 25 | 8 |

Work out an estimate for the mean time.

Give your answer correct to 3 significant figures.

....................................................... seconds

**(Total for Question 4 is 3 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**5** Write 37 cm3 in mm3

.......................................................mm3

**(Total for Question 5 is 1 mark)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**6** Nimer was driving to a hotel.

He looked at his Sat Nav at 13 30

|  |  |
| --- | --- |
| Time | 13 30 |
| Distance to destination | 65 miles |

Nimer arrived at the hotel at 14 48

Work out the average speed of the car from 13 30 to 14 48

You must show all your working.

.......................................................mph

**(Total for Question 6 is 4 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**7** (*a*)Write 32 460 000 in standard form.

.......................................................

**(1)**

(*b*)Write 4.96 × 10−3 as an ordinary number.

.......................................................

**(1)**

Asma was asked to compare the following two numbers.

*A* = 6.212 × 108 and *B* = 4.73 × 109

She says,

“6.212 is bigger than 4.73 so *A* is bigger than *B*.”

(*c*)Is Asma correct?

You must give a reason for your answer.

......................................................................................................................................................

......................................................................................................................................................

......................................................................................................................................................

**(1)**

**(Total for Question 7 is 3 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**8** The diagram shows a regular pentagon and a parallelogram.



Work out the size of the angle marked *x*.

You must show all your working.

.......................................................°

**(Total for Question 8 is 4 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**9**



Enlarge triangle **A** by scale factor 2.5 with centre (0, 1)

**(Total for Question 9 is 2 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**10** (*a*)Solve  = 11 − *x*

*x* = .......................................................

**(3)**

(*b*)Simplify 

.......................................................

**(1)**

**(Total for Question 10 is 4 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**11** The probability tree diagram shows the probabilities that Bismah will be late for work on

two days next week.



Calculate the probability that Bismah will be late on exactly one of the two days.

.......................................................

**(Total for Question 11 is 3 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**12** The stem and leaf diagram shows information about the heights, in cm, of 23 sunflowers.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 17 | 3 | 4 | 9 |  |  |  |  |  |  |
| 18 | 6 | 8 | 8 |  |  |  |  |  |  |
|  |
| 19 | 0 | 0 | 1 | 4 | 6 | 7 | 8 |  | Key: 17|3 represents 173 cm |
| 20 | 1 | 4 | 7 | 7 | 9 | 9 |  |  |  |
|  |
| 21 | 4 | 8 | 8 | 9 |  |  |  |  |  |

On the grid, draw a box plot for this information.



**(Total for Question 12 is 3 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**13** Liquid A and liquid B are mixed together in the ratio 2 : 13 by volume to make liquid C.

Liquid A has density 1.21 g/cm3

Liquid B has density 1.02 g/cm3

A cylindrical container is filled completely with liquid C.

The cylinder has radius 3 cm and height 25 cm.

Work out the mass of the liquid in the container.

Give your answer correct to 3 significant figures.

You must show all your working.

.......................................................g

**(Total for Question 13 is 4 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**14** A group of people went to a restaurant.

Each person chose one starter and one main course.

|  |  |
| --- | --- |
| **starter** | **main course** |
| soup | lasagne |
| prawns | curry |

the number of people who chose soup : the number of people who chose prawns = 2 : 3

Of those who chose soup,

the number of people who chose lasagne : the number of people who chose curry = 5 : 3

Of those who chose prawns,

the number of people who chose lasagne : the number of people who chose curry = 1 : 5

What fraction of the people chose curry?

You must show how you get your answer.

.......................................................

**(Total for Question 14 is 4 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**15** Prove algebraically that the sum of the squares of any two consecutive even numbers is

always a multiple of 4

**(Total for Question 15 is 3 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**16** *y* is inversely proportional to the square of *x*.

*y* = 8 when *x* = 2.5

Find the negative value of *x* when *y* = 

.......................................................

**(Total for Question 16 is 3 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**17** Here is the graph of *y* = *x*2 – 3



Use the graph to find estimates for the solutions to the equation *x*2 – 2*x* – 2 = 0

You must show how you get your solutions.

..............................................................................................................

**(Total for Question 17 is 4 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**18** The diagram shows triangle *ABC*.



*AB* = 3.4 cm *AC* = 6.2 cm *BC* = 6.1 cm

*D* is the point on *BC* such that

size of angle *DAC* =  × size of angle *BCA*

Calculate the length *DC*.

Give your answer correct to 3 significant figures.

You must show all your working.

.......................................................cm

**(Total for Question 18 is 5 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**19** The graph shows information about part of a cyclist’s journey.



Work out an estimate of the speed, in m/s, of the cyclist at time 6 seconds.

.......................................................m/s

**(Total for Question 19 is 3 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**20** Here are the first five terms of a sequence.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| −1 | 0 | 3 | 8 | 15 |

Find an expression, in terms of *n*, for the *n*th term of this sequence.

.......................................................

**(Total for Question 20 is 2 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**21** When a biased coin is thrown 4 times, the probability of getting 4 heads is 

Work out the probability of getting 4 tails when the coin is thrown 4 times.

.......................................................

**(Total for Question 21 is 2 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**22** Show that  simplifies to *ax* where *a* is an integer.

**(Total for Question 22 is 4 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**23** The diagram shows a sector *OACB* of a circle with centre *O*.

The point *C* is the midpoint of the arc *AB*.

The diagram also shows a hollow cone with vertex *O*.

The cone is formed by joining *OA* and *OB*.



The cone has volume 56.8 cm3 and height 3.6 cm.

Calculate the size of angle *AOB* of sector *OACB*.

Give your answer correct to 3 significant figures.

You must show all your working.

....................................................... °

**(Total for Question 23 is 5 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**24** *OXYZ* is a parallelogram.



 = **a**

 = **b**

P is the point on *OX* such that *OP* : *PX* = 1 : 2

R is the point on *OY* such that *OR* : *RY* = 1 : 3

Work out, in its simplest form, the ratio *ZP* : *ZR*

You must show all your working.

.......................................................

**(Total for Question 24 is 5 marks)**

**TOTAL FOR PAPER IS 80 MARKS**