**Instructions**

**Time: 2 hours**

**4MA1/PP4H**

**Practice paper 4H**

* Use **black** ink or ball-point pen.
* **Fill in the boxes** at the top of this page with your name,
centre number and candidate number.
* Answer **all** questions.
* Without sufficient working, correct answers may be awarded no marks.
* Answer the questions in the spaces provided

– *there may be more space than you need*.

* **Calculators may be used.**
* You must **NOT** write anything on the formula page.

Anything you write on the formulae page will gain no credit.

**Information**

* The total mark for this paper is 100.
* The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question*.

**Advice**

* Read each question carefully before you start to answer it.
* Check your answers if you have time at the end.

**Answer ALL TWENTY THREE questions.**

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

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

**1** Here is a biased 4-sided spinner.

The spinner is spun.

The table shows the probability that the spinner lands on 1 and the probability that it

lands on 2.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Number** | 1 | 2 | 3 | 4 |
| **Probability** | 0.15 | 0.4 |  |  |

(*a*)Work out the probability that the spinner will land on 1 or on 2.

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

**(1)**

The probability that the spinner will land on 3 is twice the probability that the spinner

will land on 4.

(*b*)Work out the probability that the spinner will land on 3.

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

**(2)**

Daljit is going to spin the spinner 160 times.

(*c*)Work out an estimate for the number of times the spinner will land on 2.

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

**(2)**

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

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

**2** *y* is an integer.

–2 < *y* ⩽ 3

Write down all the possible values of *y*.

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

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

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

**3** Use ruler and compasses only to construct the perpendicular bisector of line *AB*.

You must show all your construction lines.

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

**4** 2.2 × 107 passengers passed through Beijing Capital International Airport in 2014.

(*a*)Write 2.2 × 107 as an ordinary number.

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

**(1)**

950 000 tonnes of cargo traffic passed through Tokyo International Airport in 2014.

(*b*)Write 950 000 as a number in standard form.

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

**(1)**

(*c*)Work out 

 Give your answer in standard form.

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

**(1)**

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

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

**5** Abri walks along a path from her home to a local village.

Here is the distance-time graph for her journey from her home to the village.

Benito leaves the village at 12 30 and walks at a constant speed along the same path to

Abri’s home.

He arrives at Abri’s home at 13 15

(*a*)Show the information about Benito’s journey on the grid.

**(2)**

(*b*)How far from the village were Abri and Benito when they passed each other?

....................................................... km

**(1)**

**(Total for Question 5 is 3 marks)**

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

**6**

(*a*)List the members of the set *P*.

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

**(2)**

(*b*)List the members of the set *Q*.

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

**(1)**

**(Total for Question 6 is 3 marks)**

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

**7** Solve 

Show clear algebraic working.

*m* = ........................................

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

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

**8** The diagram shows the positions of two towns, *A* and *B*.

The distance from *A* to *B* is 110 km.

*B* is 60 km east of *A*.

(*a*)Work out the size of angle *x*.

 Give your answer correct to 1 decimal place.

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

**(3)**

(*b*)Work out the bearing of *B* from *A*.

 Give your answer correct to the nearest degree.

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

**(2)**

The distance from *A* to *B* is 110 km correct to 2 significant figures.

(*c*)(i) Write down the lower bound for the distance from *A* to *B*.

....................................................... km

 (ii) Write down the upper bound for the distance from *A* to *B*.

....................................................... km

**(2)**

**(Total for Question 8 is 7 marks)**

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

**9** Solve the simultaneous equations

5*x −* 2*y* = 33

5*x +* 8*y* = 18

Show clear algebraic working.

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

*y* = .......................................................

**(Total for Question 9 is 3 marks)**

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

**10** The straight line **L** is shown on the grid.

(*a*)Find an equation of **L**.

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

**(2)**

(*b*)Find an equation of the line that is parallel to **L** and passes through the point (5, 4)

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

**(2)**

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

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**11** Here is a regular 10-sided polygon.

Work out the value of *x*.

Show your working clearly.

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

**(Total for Question 11 is 4 marks)**

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

**12** Make *t* the subject of 5(*t* – *g*) = 2*t* + 7

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

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

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**13** Amil invests £9000 for 3 years in a savings account.

He gets 1.8% per year compound interest.

How much money will Amil have in his savings account at the end of 3 years?

£.......................................................

**(Total for Question 13 is 3 marks)**

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

**14**

*B*, *D* and *E* are points on a circle, centre *O*.

*ABC* is a tangent to the circle.

*DEC* is a straight line.

Angle *ABD* = 79° and angle *ECB* = 41°

(*a*)Write down the size of angle *BED*.

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

**(1)**

(*b*)Work out the size of angle *BOE*.

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

**(2)**

**(Total for Question 14 is 3 marks)**

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

**15** There are 52 cards in a pack.

12 cards are picture cards.

40 cards are number cards.

Melina takes at random a card from the pack.

She keeps the card and then takes at random a second card from the remainder of the pack.

(*a*)Complete the probability tree diagram.

 **(3)**

(*b*)Work out the probability that the two cards Melina takes are both picture cards or

 both number cards.

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

**(3)**

**(Total for Question 15 is 6 marks)**

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

**16** *P* is directly proportional to *r*3

*P* = 343 when *r* = 3.5

Find a formula for *P* in terms of *r*.

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

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

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

**17**

 

(*a*)Find, as a column vector, **

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

**(2)**

*BCDE* is a parallelogram.

= 2

(*b*)Find the length of *CE*.

 Give your answer correct to 2 decimal places.

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

**(3)**

**(Total for Question 17 is 5 marks)**

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

**18** *g* = 23 × 3 × 72 *h* = 2 × 3 × 73

(*a*)Express *gh* as a product of powers of its prime factors.

 Simplify your answer.

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

**(2)**

  = 2*a* × 3*b* × 7*c*

(*b*)Find the value of *a*, the value of *b* and the value of *c*.

*a* = .......................................................

*b* = .......................................................

*c* = .......................................................

**(2)**

(*c*)Show that (7 − 2)(7 + 2) = 29

 Show your working clearly.

**(2)**



(*d*)Work out the exact value of *n*.

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

**(3)**

**(Total for Question 18 is 9 marks)**

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

**19** Here are nine graphs.

Complete the table below with the letter of the graph that could represent each given

equation.

|  |  |
| --- | --- |
| **Equation** | **Graph** |
| *y* = sin *x* |  |
| *y* = 2 – 3*x* |  |
| *y* = *x*2 + *x* – 6 |  |
| *y* = *x*3 + 3*x*2 – 2 |  |

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

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

**20** The function f is such that f (*x*) = 

(*a*) Find f(−2)

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

**(1)**

The function g is such that g (*x*) = 

(*b*)Find g−1 (6)

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

**(2)**

(*a*) Find fg (−5)

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

**(2)**

(*d*)Solve the equation f (*x*) = g (*x*)

 Show clear algebraic working.

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

**(4)**

**(Total for Question 20 is 9 marks)**

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

**21** Here is the graph of *y* = h (*x*)

(*a*)Use the graph to find an estimate for the gradient of the curve *y* = h (*x*) at (−1, 6)

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

**(3)**

(*b*)By drawing a suitable straight line on the grid, find an estimate for the solution of the

 equation h (*x*) = 7 − 2*x*

 Give your answer correct to 1 decimal place.

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

**(2)**

The equation h (*x*) = *k* has 3 different solutions for *a* < *k* < *b*

(*c*)Use the graph to find an estimate for the value of *a* and the value of *b*.

*a* = .......................................................

*b* = .......................................................

**(2)**

**(Total for Question 21 is 7 marks)**

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

**22** The histogram shows information about the times taken by 160 cyclists to complete the

Tour de France cycle race.

6 cyclists took less than 85 hours.

(*a*)Work out an estimate for the number of the 160 cyclists who took less than 86 hours.

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

**(2)**

(*b*)For these 160 cyclists, work out an estimate for the time taken by the cyclist who

 finished in 50th position.

....................................................... hours

**(2)**

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

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

**23** The diagram shows a cuboid *ABCDEFGH*.

*AB* = 21 cm and *CH* = 9 cm.

*K* is the point on *EH* such that angle *AKB* = 68° and *BK* = 16.5 cm.

(*a*)Calculate the size of angle *BAK*.

 Give your answer correct to 1 decimal place.

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

**(3)**

(*b*)Calculate the size of the angle between the line *BK* and the plane *ABCD*.

 Give your answer correct to 1 decimal place.

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

**(2)**

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

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

**TOTAL FOR PAPER: 100 MARKS**