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**Answer ALL TWENTY FIVE questions.**

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

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

**1** Show that 

**(Total for Question 1 is 3 marks)**

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

**2** A biased spinner can land on green or on yellow or on brown or on pink.

The table gives the probabilities that, when the spinner is spun, it will land on green or

on yellow or on brown.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Colour** | **green** | **yellow** | **brown** | **pink** |
| **Probability** | 0.32 | 0.13 | 0.28 |  |

Timucin spins the spinner 200 times.

Work out an estimate for the number of times the spinner lands on pink.

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

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

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

**3** *ABCD* is a trapezium.

*A picture containing text, line, diagram, font

Description automatically generated*

*BC* is parallel to *AD*

Find the size of the largest angle inside the trapezium.

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

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

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

**4** (*a*)Complete the table of values for *y* = *x*2 – *x* – 4

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| *x* | –3 | –2 | –1 | 0 | 1 | 2 | 3 |
| *y* |  | 2 |  |  | –4 |  |  |

**(2)**

(*b*)On the grid below, draw the graph of *y* = *x*2 – *x* – 4 for values of *x* from –3 to 3

**A graph paper with x and y axis

Description automatically generated with medium confidence**

**(2)**

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

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

**5** Nancy has some coins with a total value of 85 pence.

She has only 2 pence coins and 5 pence coins.

The ratio

number of 2 pence coins : number of 5 pence coins = 1 : 3

Nancy has more 5 pence coins than 2 pence coins.

How many more?

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

**(Total for Question 5 is 4 marks)**

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

**6** (*a*)Write 76 000 000 in standard form.

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

**(1)**

(*b*)Write 5.4 × 10–4 as an ordinary number.

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

**(1)**

**(Total for Question 6 is 2 marks)**

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

**7**

A diagram of a circle

Description automatically generated with medium confidence

*A* and *C* are points on a circle, centre *O*

*DA* is the tangent to the circle at *A* and *DC* is the tangent to the circle at *C*

Angle *ADC* = 48°

Work out the size of reflex angle *AOC*

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

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

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

**8** Charlotte buys a painting for $680

The value of the painting increases by 4% each year.

Work out the value of the painting at the end of 3 years.

Give your answer correct to the nearest $

$.......................................................

**(Total for Question 8 is 3 marks)**

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

**9** Change a speed of 27 kilometres per hour to a speed in metres per second.

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

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

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

**10** Team **A** and Team **B** take part in a quiz league.

After 11 rounds, Team **A** has a mean score per round of 17

After 9 rounds, Team **B** has a mean score per round of 18

Both teams take part in a further round.

After this round, both teams have a mean score per round of 18.5

In the further round, Team **A** scored more points than Team **B**.

How many more?

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

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

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

**11** Here is a 9-sided regular polygon *ABCDEFGHJ*, with centre *O*

*A picture containing diagram, line

Description automatically generated*

*ODK* and *FEK* are straight lines.

Work out the value of *x*

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

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

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

**12** The diagram shows right-angled triangle *ABD*

*A picture containing line, text, diagram

Description automatically generated*

*AB* = 14 cm *AD* = 8 cm

*C* is the point on *BD* such that angle *BAC* = 38°

Work out the length of *CD*

Give your answer correct to 3 significant figures.

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

**(Total for Question 12 is 4 marks)**

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

**13** Narin has two fair 6-sided dice.

Dice **A** has 2 red faces and 4 yellow faces.

Dice **B** has 1 red face and 5 yellow faces.

Narin is going to throw each dice once.

(*a*)Complete the probability tree diagram.

A picture containing diagram, line, text, plot

Description automatically generated

**(2)**

(*b*)Work out the probability that both dice land on yellow.

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

**(2)**

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

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

**14**

A picture containing diagram, line, circle

Description automatically generated

*P*, *Q*, *R* and *S* are points on a circle, centre *O*

*ROP* is a diameter of the circle.

Angle *PRQ* = 22°

(*a*)(i) Find the size of angle *RQP*

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

**(1)**

(ii) Give a reason for your answer.

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

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

**(1)**

(*b*)(i) Find the size of angle *PSQ*

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

**(1)**

(ii) Give a reason for your answer.

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

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

**(1)**

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

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

**15** (*a*)Simplify fully 

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

**(2)**

(*b*)Express  in the form *pxn* where *p* and *n* are integers.

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

**(2)**

(*c*)Solve 

Show clear algebraic working.

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

**(3)**

**(Total for Question 15 is 7 marks)**

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

**16** *Q* is directly proportional to 

The graph shows the relationship between *Q* and *t* for 0 < *t* < 8

A graph of a function

Description automatically generated with low confidence

(*a*)Find a formula for *Q* in terms of *t*

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

**(3)**

*Q* is increased by 20%

(*b*)Find the percentage increase in *t*

.......................................................%

**(2)**

**(Total for Question 16 is 5 marks)**

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

**17** (*a*)Expand and simplify (*x* + 6)(3*x* – 2)(*x* + 6)

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

**(3)**

(*b*)Make *e* the subject of *w = *

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

**(4)**

**(Total for Question 17 is 7 marks)**

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

**18** Here are 6 graphs.

A picture containing diagram, text, line, plot

Description automatically generated

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

given equation.

Write your answers on the dotted lines.

|  |  |
| --- | --- |
| **Equation** | **Graph** |
| *y* = sin *x* | .................... |
| *y* = – | .................... |
| *y* = 4*x*3 – 5*x* | .................... |

**(Total for Question 18 is 3 marks)**

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

**19** Express 3*x*2 – 6*x* + 5 in the form *a*(*x* – *b*)2 + *c*

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

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

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

**20** There are 12 counters in a bag.

3 of the counters are red

9 of the counters are green

Ameya, Jack and Ella each take at random one counter from the bag.

Work out the probability that at least one red counter is still in the bag.

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

**(Total for Question 20 is 3 marks)**

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

**21** Solve the simultaneous equations

2*x*2 + 3*y*2 = 11

*x* = 3*y* – 1

Show clear algebraic working.

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

**(Total for Question 21 is 5 marks)**

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

**22** The diagram shows a triangle *ABC* and a flagpole *BF*

*A picture containing line, diagram, text

Description automatically generated*

*A*, *B* and *C* are points on horizontal ground.

*BF* is vertical.

*AB* = 9 m *BC* = 11 m *AC* = 16 m *BF* = 10 m

*D* is the point on *AC* such that angle *BDC* = 90°

Work out the size of the angle of elevation of the point *F* from the point *D*

Give your answer correct to one decimal place.

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

**(Total for Question 22 is 5 marks)**

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

**23** The diagram shows a cuboid with a square cross section.

*A black and white drawing of a rectangular object

Description automatically generated with low confidence*

The volume of the cuboid is (13 + 6) cm3

Without using a calculator, find the value of *x*

Give your answer in the form *a* + where *a* and *b* are integers.

Show your working clearly.

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

**(Total for Question 23 is 4 marks)**

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

**24** *ABCD* is a kite with *AB* = *AD* and *CB* = *CD*

*A* is the point with coordinates (–2, 10)

*B* is the point with coordinates 

*C* is the point with coordinates (4, –5)

Work out the coordinates of *D*

(........................... , ...........................)

**(Total for Question 24 is 6 marks)**

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

**25** A solid sphere has a radius of 2.8 centimetres, correct to 1 decimal place.

The sphere has a mass of *Mπ* grams, where *M* = 260 correct to 2 significant figures.

Work out the upper bound for the density of the sphere.

Give your answer in g/cm3 correct to 2 decimal places.

Show your working clearly.

....................................................... g/cm3

**(Total for Question 25 is 4 marks)**

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

**TOTAL FOR PAPER IS 100 MARKS**