

Take a look at our GCSE Maths: Exemplar student responses

- Understand our approach
- See how students responded
- Gain an insight into how marks are awarded

Paper 2 Foundation tier (8300/2F) 1 hour 30 minutes

Paper 1 Higher tier (8300/1H) 1 hour 30 minutes

The performance data for each question shows the percentage of students in the trial who scored each available mark on that question. The x row gives the percentage who made no attempt at the question. In this trial, the no attempt figures were very much higher than we would see in a live exam.

Got any questions?

Call us on 0161 957 3852 and get straight through to the Maths team, or email us at maths@aqa.org.uk

Answer **all** questions in the spaces provided.

1 What is the probability of rolling a 5 on an ordinary fair dice?

Circle your answer.

[1 mark]

$$\frac{1}{6}$$

$$\frac{1}{5}$$

$$\frac{5}{6}$$

$$\frac{1}{2}$$

1

Performance

1 82.7%

0 16.0%

X 1.3%

2 Which unit is **not** a unit of speed?

Circle your answer.

[1 mark]

km/h

mph

m/s

km

2

Performance

1 80.1%

0 18.6%

X 1.3%

3 Work out 81 as a power of 3

Circle your answer.

[1 mark]

$$3^3$$

$$3^4$$

$$3^5$$

$$3^6$$

3

Performance

1 75.6%

0 19.2%

X 5.1%

4 Which statement is true?

Circle your answer.

[1 mark]

$$10\% \text{ of } 50 = 50\% \text{ of } 20$$

$$10\% \text{ of } 10 = 20\% \text{ of } 20$$

$$10\% \text{ of } 20 = 20\% \text{ of } 10$$

$$10\% \text{ of } 40 = 25\% \text{ of } 100$$

4

This was the least well answered of the early multiple choice questions with the second and fourth options equally popular incorrect choices. As with all multiple choice questions, we try and provide space for rough working and students should be encouraged to use this.

Performance

1 54.5%

0 37.2%

X 8.3%

5 15 rulers cost £3

How much do 40 rulers cost?

[2 marks]

$$15 \div 3 = 5$$

$$5 \times 40 = 200$$

Answer £ 200

5

The exemplar here shows a common tendency to always divide a larger number by a smaller one when attempting to reason multiplicatively. Whilst this first step could lead to a correct answer if the 5 were understood to be the number of rulers per pound, most successful students worked out and scaled up the unit cost.

Performance

2 55.1%

1 1.9%

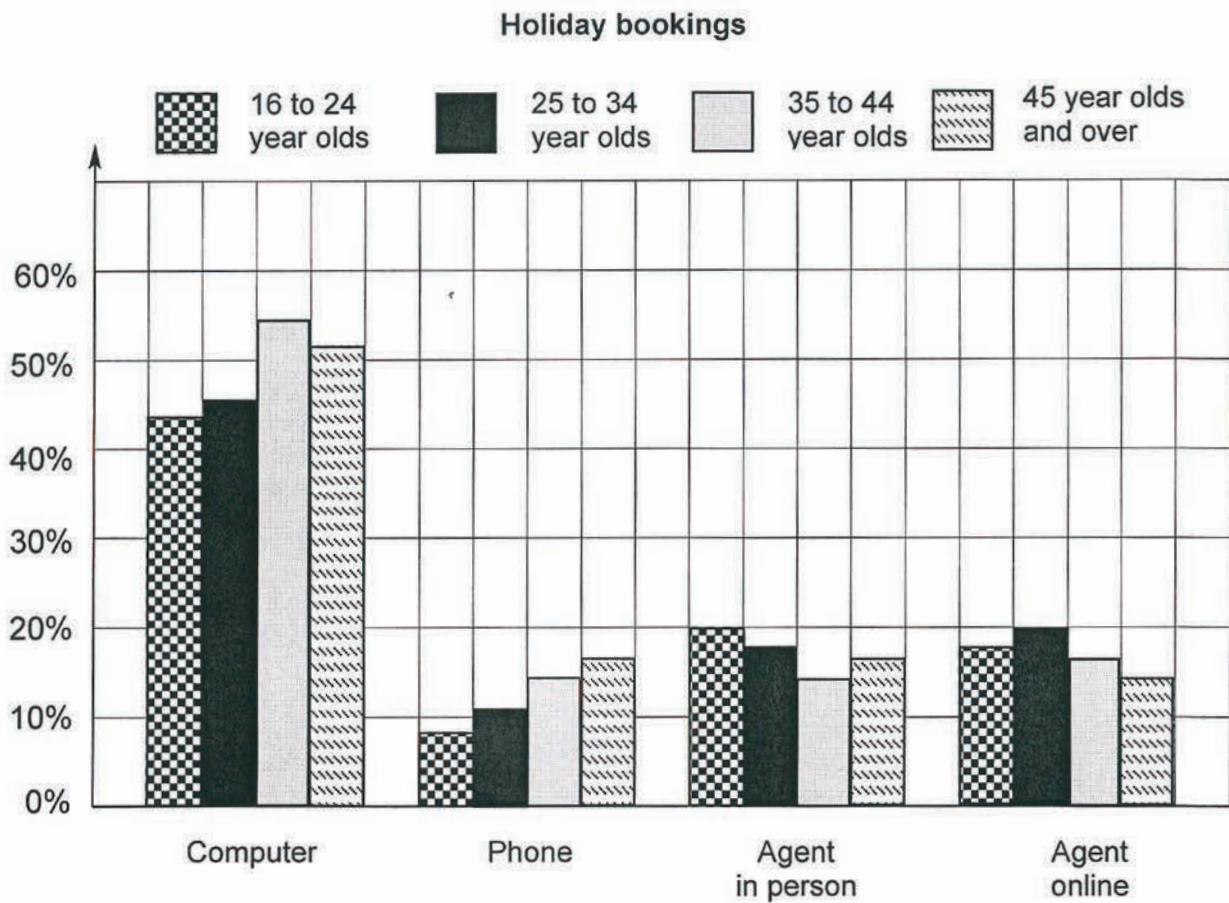
0 41.0%

X 1.9%

Turn over for the next question

6

The bar chart shows how people in different age groups book their holidays.



- 6 (a) Which **two** ways of booking are most popular for 16 to 24 year olds?

[2 marks]

Answer Computer and Agent in person

- 6 (b) In total, what percentage of 16 to 24 year olds booked with an agent?

Give your answer to the nearest 10%

[2 marks]

$$20\% + 18\% = 38\%$$

6b	Performance
2	57.1%
1	6.4%
0	31.4%
X	5.1%

Answer 40% %

6a	Performance
2	93.0%
1	4.5%
0	0.6%
X	1.9%

- 6 (c) Compare the bookings for 25 to 34 year olds with the bookings for 45 year olds and over. [2 marks]

2

The graphs show that a lower percentage (45%) of 25-34 use computer than 45+ (51%)

A higher percentage of 25-34 use an agent on line or in person than 45+ about 37% to about 30%

A lower percentage (11%) of 25-34 use a phone to book than 45+ (17%)

6c	Performance
2	2.6%
1	25.6%
0	50.6%
X	21.2%

Turn over for the next question

- 6 Parts (a) and (b) were well answered but few students produced a rigorous comparison as in this example and 1 mark for a partial response was very common. In this type of question, a good response will usually have these features
- As many different points of comparison made as there are marks for the question
 - Giving figures and using words such as 'a higher percentage or proportion' rather than less precise language such as 'more' or 'less' with no numbers
 - Actual comparisons made rather than statements about one cohort or the other.

7

Sam spends exactly £20 on petrol.

The petrol costs £1.45 per litre.

Work out the number of litres of petrol she buys.

Give your answer to 1 decimal place.

[3 marks]

2

$$20 \div 1.45 = 13.79310345$$

Answer 13.7 litres

7

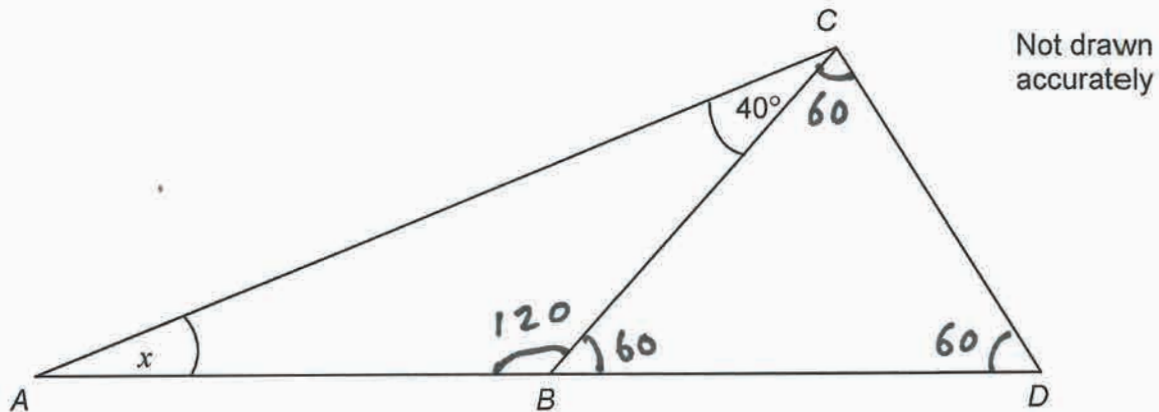
As in the example here, many students carried out the correct calculation for two marks but lost a mark through incorrect or no rounding. Careful reading and re-reading of the question is essential good practice and this is one of several instances in the paper where students lost marks that were accessible to them.

Performance

3	50.0%
2	9.6%
1	7.1%
0	30.1%
X	3.2%

8

The diagram shows a triangle ACD and an equilateral triangle BCD .



Work out the size of angle x .

[2 marks]

$$120 + 40 = 160$$

$$180 - 160 = \underline{\underline{20}}$$

Answer 20 degrees

8

In this example and in many of the correct responses to this question, students used the diagram to show their reasoning. Working seen on diagrams is always accepted and considered good practice. We always seek to produce clear, large diagrams to help with this approach.

Turn over for the next question

Performance

2 31.4%

1 11.5%

0 42.3%

X 14.7%

- 9 Jack makes a game for a school fair.
 Players can win money by picking a 'Win' ticket from a tub.
 A player chooses a tub by picking a blue disc or a red disc out of a bag.

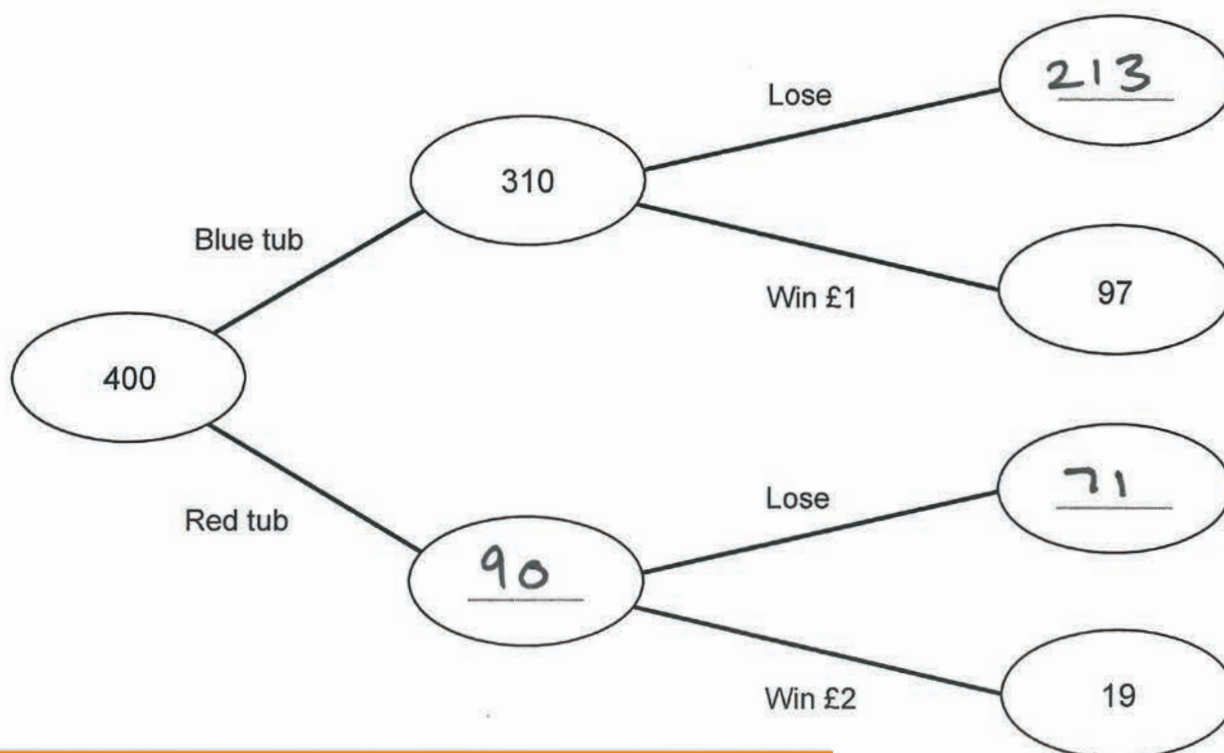
Blue tub



Red tub



400 people play the game at the fair.
 The frequency tree shows some of the outcomes.



9 Although a new topic, students appear to work naturally with frequency trees even though the term is unfamiliar and part (a) of this question was well answered. In part (b) a single mark was often given for sight of 116 but, as here, use of the correct denominator was often absent. In the last part, as here, a reluctance to divide a smaller number by a larger one led to a common wrong answer of £2.50.

- 9 (a) Complete the frequency tree.

9a	Performance
2	76.3%
1	5.1%
0	11.5%
X	7.1%

[2 marks]

2

- 9 (b) A player has one go at Jack's game.

Use the frequency tree to estimate the probability that the player wins some money.

[2 marks]

1

$$\begin{array}{r} 97 + 19 = 116 \\ 213 + 71 = 284 \end{array} \quad ; \quad \begin{array}{r} 29 \\ 71 \\ \hline 29 \\ 71 \end{array}$$

Answer

9b	Performance
2	28.2%
1	15.4%
0	34.0%
X	22.4%

- 9 (c) Jack makes a profit of £25 from his game.

Work out how much Jack charges players to have a go at his game.

[3 marks]

1

$$\begin{array}{l} 19 \times 2 = 38 \\ 38 + 97 = 135 \\ 135 + 25 = 160 \\ 400 \div 160 = 2.5 \end{array}$$

9c	Performance
3	7.1%
2	0.6%
1	16.0%
0	41.0%
X	35.3%

Answer

£ 2.50

- 10 A bakery makes 480 pizzas and 2400 rolls each day.
In 1 hour each baker can make 20 pizzas or 75 rolls.
Each baker works for 8 hours a day.

- 10 (a) Work out the **minimum** number of bakers needed each day.

[4 marks]

8 hours $20 \times 8 = 160$ pizzas - 1 baker

$75 \times 8 = 600$ rolls - 1 baker

Pizzas

Rolls

$480 \div 160 = 3$ bakers $2400 \div 600 = 4$ bakers

$3 + 4 = 7$ bakers

Answer

7

10a

Performance

4	31.4%
3	28.2%
2	17.3%
1	3.2%
0	9.0%
X	10.9%

10

Both parts of this question discriminated well. Good answers for part (a) tended to be well organised as in this example which shows clearly what each calculation means. In part (b) the correct calculation of income from rolls sales was a source of common error with many answers of £72 or £720 seen. This only lost a single mark as marking followed through on an incorrect answer at this point.

10 (b) The bakery makes some changes.

In 1 hour each baker now makes 10% more pizzas or 20% more rolls.

Pizzas are sold for £2.50

Rolls are sold for 8p

The manager does these calculations.

Making pizzas for 1 hour

$$10\% \text{ more pizzas} = 20 + 2 = 22 \text{ pizzas}$$

$$\text{Sales of pizzas} = 22 \times £2.50 = £55$$

Making rolls for 1 hour

$$20\% \text{ more rolls} = 75 + 20 = 95 \text{ rolls}$$

$$\text{Sales of rolls} = 95 \times 8 = £760$$

$$\text{Total from sales} = £55 + £760 = £815$$

10b	Performance
4	12.2%
3	26.9%
2	12.8%
1	12.8%
0	14.7%
X	20.5%

Check his working, correct any mistakes and write out the correct calculations below.

[4 marks]

3

Making pizzas for 1 hour

$$10\% \text{ more pizzas} = 20 + 2 = 22 \text{ pizzas}$$

$$\text{Sales of pizzas} = 22 \times £2.50 = £55$$

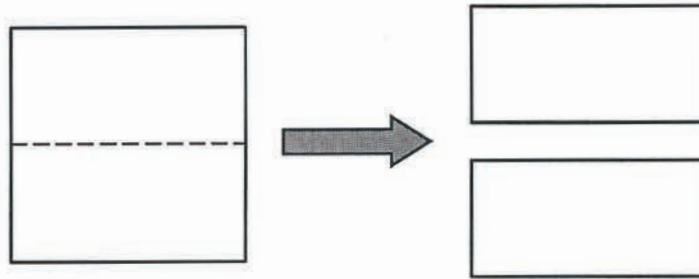
Making rolls for 1 hour

$$20\% \text{ more rolls} = 75 + 15 = 90 \text{ rolls}$$

$$\text{Sales of rolls} = 90 \times 0.8 = £72$$

$$\text{Total from sales} = 72 + 55 = £127$$

- 11 A square is cut into two equal rectangles as shown.



11a	Performance
3	27.6%
2	53.2%
1	8.3%
0	1.9%
X	9.0%

- 11 (a) Tick a box to show whether each statement is true or false.

[3 marks]

2

area of the square = $2 \times$ area of one rectangle

True False

<input checked="" type="checkbox"/>	<input type="checkbox"/>
-------------------------------------	--------------------------

perimeter of the square = $2 \times$ perimeter of one rectangle

<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
-------------------------------------	-------------------------------------

longer side of one rectangle = $2 \times$ shorter side of one rectangle

<input checked="" type="checkbox"/>	<input type="checkbox"/>
-------------------------------------	--------------------------

diagonal of the square = $2 \times$ diagonal of one rectangle

<input type="checkbox"/>	<input checked="" type="checkbox"/>
--------------------------	-------------------------------------

11b	Performance
3	14.1%
2	14.7%
1	0.0%
0	48.7%
X	22.4%

- 11 (b) The perimeter of each rectangle is 24 cm

Work out the area of the square.

[3 marks]

2

$$8 + 8 + 4 + 4 = 24$$

$$8 \times 4 = 32$$

Answer 32 cm² cm²

11 In this question the first statement was most often correctly ticked as true whereas the second statement was the one most likely to be incorrectly ticked as true. In part (b) it was rare to see evidence of the reasoning leading to 8 and 4 as the dimensions of the rectangle even though many students found the right lengths somehow. A common wrong answer of 32, as here, again suggests students were not checking what the question was asking for and lost a mark as a result.

- 12 This formula works out the tax you pay.

$$T = 0.2(E - 10\,600)$$

T is the tax you pay in pounds.

E is the amount you earn in pounds.

- 12 (a) How much tax do you pay if you earn £20 000?

[2 marks]

$$0.2(20000 - 10600) = 4000 - 2120$$

Answer £ 1880

12a	Performance
2	41.0%
1	5.8%
0	31.4%
X	21.8%

- 12 (b) What is the most you can earn without paying tax?

[1 mark]

Answer £ 10600

12b	Performance
1	13.5%
0	49.4%
X	37.2%

- 12 (c) Alison pays £5200 tax.

Work out the amount she earns.

[3 marks]

$$5200 \div 0.2 = 26000$$

$$26000 + 10600 = 36600$$

Answer £ 36600

12c	Performance
3	19.2%
2	7.7%
1	4.5%
0	33.3%
X	35.3%

- 13 Circle the number written in standard form.

[1 mark]

0.5×10^4

5×10^{-4}

50×10^4

$5 \times 10^{0.4}$

13	Performance
1	16.0%
0	71.2%
X	12.8%

- 14 Jack and Kylie are asked to work out this calculation to 2 decimal places.

$$\frac{\sqrt{9.8 \times 12.1}}{19.4 + 30.2}$$

Jack's answer is 0.22

Kylie's answer is 30.76

How have they obtained these answers?

Is either answer correct?

[3 marks]

$$\frac{10.88944443}{49.6} = 0.219545 \rightarrow 0.22$$

$$10.8894443 \div 19.4 + 30.2 = 30.7613 \rightarrow 30.76$$

- 14 This exemplar shows yet again the importance of answering fully the question asked. This student was rare in that they showed both methods clearly and understood where Kylie went wrong. However, they did not answer the second question. The four words 'Jack is correct and Kylie is wrong' would have brought 2 additional marks in this case. It was more common to see students showing, wholly or partly, that Jack was correct and making no attempt to explain Kylie's answer.

Performance	
3	0.0%
2	16.0%
1	16.7%
0	43.0%
X	24.4%

15 (a) Solve the inequality $3x \leq 18$

[1 mark]

Answer

6

15a

Performance

1 15.4%

0 51.9%

X 32.7%

15 (b) Solve the inequality $4(x + 2) > 12$

[2 marks]

$$4x + 8 > 12$$

Answer

$$x = 1$$

15b

Performance

2 12.2%

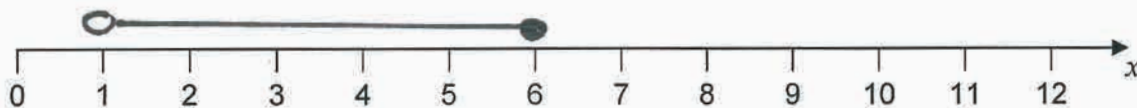
1 18.6%

0 33.3%

X 35.9%

15 (c) Represent the solution set that satisfies **both** answers to parts (a) and (b) on the number line.

[1 mark]



15c

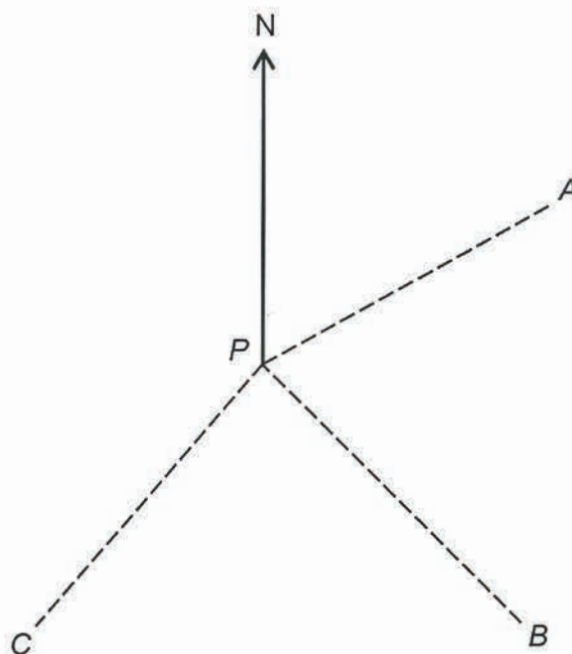
Performance

1 6.4%

0 44.9%

X 48.7%

- 16** Ali (A), Bayo (B) and Carly (C) start walking from P at the same time.
 They all walk at 4 mph
 Ali walks on a bearing of 075°
 Bayo walks on a bearing of 165°
 Carly walks on a bearing of 230°



Not drawn
accurately

- 16 (a)** How long does it take Ali to walk 1 mile?

Give your answer in minutes.

[1 mark]

Answer 15 minutes

16a	Performance
1	23.7%
0	43.0%
X	33.3%

16 (b) Bayo says,

"After 1 hour Ali and Carly will have walked 4 miles each,
4 miles + 4 miles equals 8 miles,
so they are 8 miles apart."

Is he correct?

Tick a box.

Yes

☐

No

☒

Give a reason for your answer.

[2 marks]

*Their bearings are different
so they are not 8 miles apart*

16b	Performance
2	10.3%
1	7.7%
0	57.1%
X	25.0%

16 (c) Who is closer to Bayo after 1 hour?

Tick a box.

Ali

☐

Carly

☒

You **must** show your working.

[2 marks]

*230 - 165 = 065 Carly is closer
165 - 075 = 090*

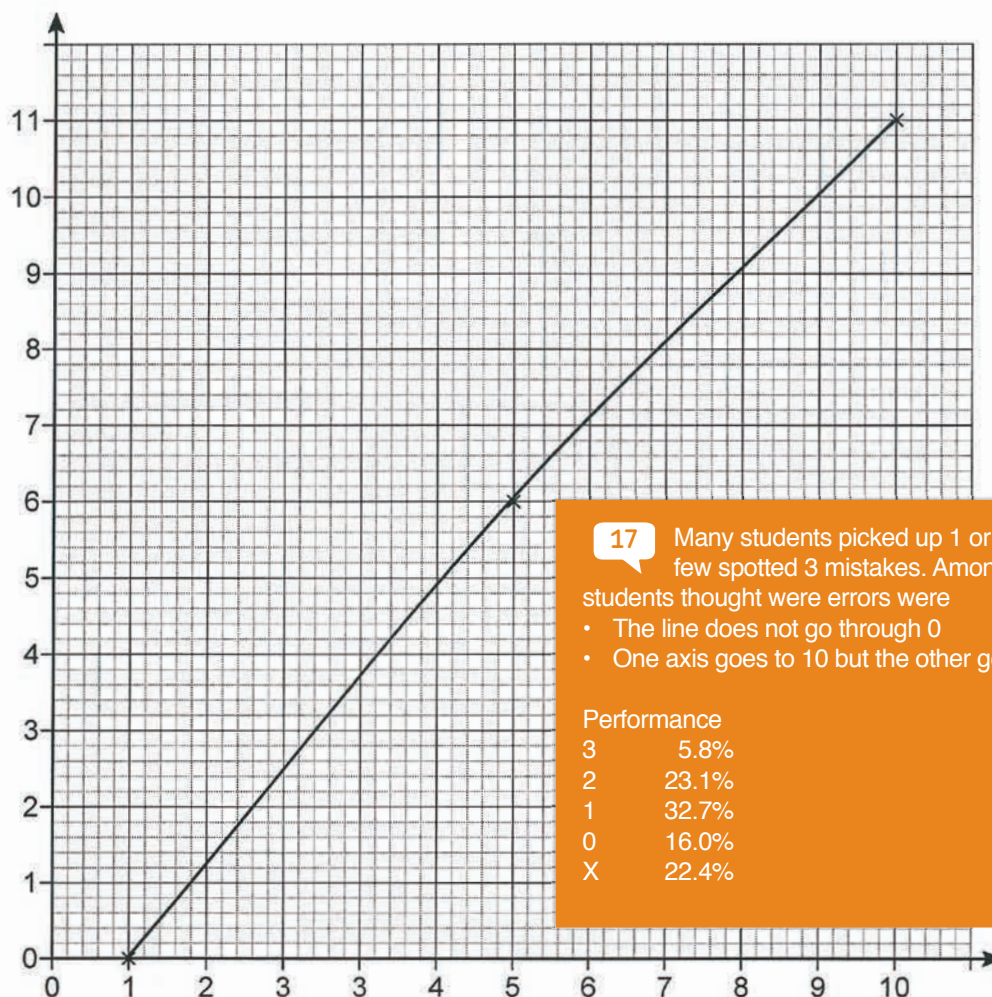
16c	Performance
2	18.0%
1	6.4%
0	39.7%
X	35.9%

17

Guy is using this table of results to draw the graph of $y = x + 1$ for values of x from 0 to 10

x	0	5	10
y	1	6	11

This is his graph.



17

Many students picked up 1 or 2 marks here but few spotted 3 mistakes. Among the things that students thought were errors were

- The line does not go through 0
- One axis goes to 10 but the other goes up to 11.

Performance

3	5.8%
2	23.1%
1	32.7%
0	16.0%
X	22.4%

Write down **three** different mistakes he has made.

[3 marks]

2

Mistake 1 he's marked 1, 0 not 0, 1

Mistake 2 his y axis goes up to 11 but ~~the~~ x axis goes up to 10

Mistake 3 he had 2 number 3's along the x axis

18 Solve $x^2 = 30.25$

[2 marks]

18 No student sitting the Foundation papers in this trial knew that two answers were expected here

Performance

2	0.0%
1	43.6%
0	20.5%
X	35.9%

Answer

5.5

19 Cola is sold in packs of 6 and packs of 8



1 pack of 6 for £1.95

or

2 packs of 6 for £3.50



1 pack of 8 for £2.64

or

2 packs of 8 for £5.00

What is the cheapest way to buy 48 cans of cola?

You **must** show your working.

[4 marks]

$$£3.50 \times 4 = £14$$

$$£5 \times 3 = £15$$

$$1.95 \times 8 = £15.6$$

$$£2.64 \times 6 = £15.84$$

19 This question discriminated well with the full range of marks being used. Well organised answers scaling up all possibilities correctly were common. In the example, there is a slip of notation in some of the working but this is not penalised as the reasoning is clear and correct.

Performance

4	23.7%
3	8.3%
2	9.0%
1	16.0%
0	14.1%
X	28.9%

Answer

2 packs of 6 for £3.50 four times

20

Here are two piles of the same type of paper.

Each sheet of paper is $\frac{7}{1000}$ cm thick.

The taller pile is $10\frac{1}{2}$ cm high.



height of taller pile : height of shorter pile = 3 : 2

Work out the number of sheets of paper in the shorter pile.

[3 marks]

$$\frac{10.5}{3} = \frac{3.5}{2x}$$

$$\frac{10.5}{3} = \frac{3.5}{7}$$

Answer 7 cm

20

Few Foundation students were successful with this question which was common to both tiers. Many were daunted by the calculation with fractions of a centimetre and those who picked up any marks often did so by using the ratio to find the height of the smaller pile and stopping there.

Performance

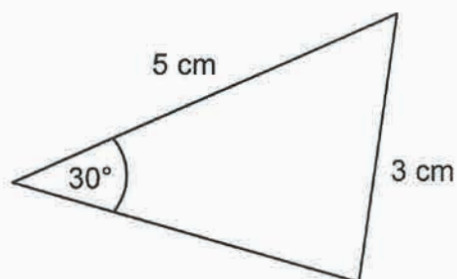
3	6.4%
2	1.3%
1	12.2%
0	26.3%
X	53.9%

21

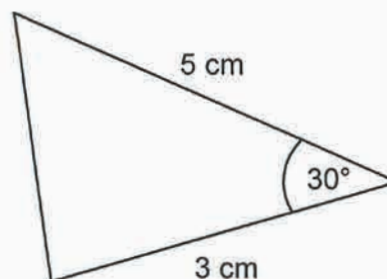
Here are four triangles.

Not drawn
accurately

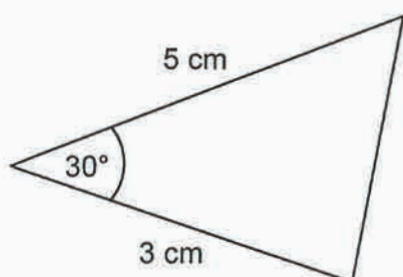
A



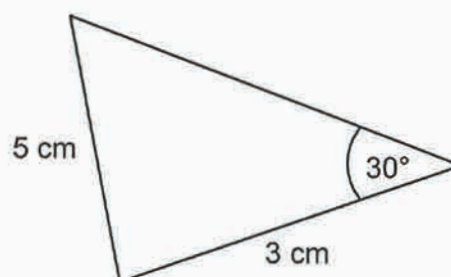
B



C



D



- 21 (a) Which **two** triangles are congruent?
Circle your answers.

[1 mark]

A

B

C

D

21a	Performance
1	43.6%
0	27.6%
X	28.9%

- 21 (b) Circle the reason for your answer to part (a).

[1 mark]

SSS

ASA

SAS

RHS

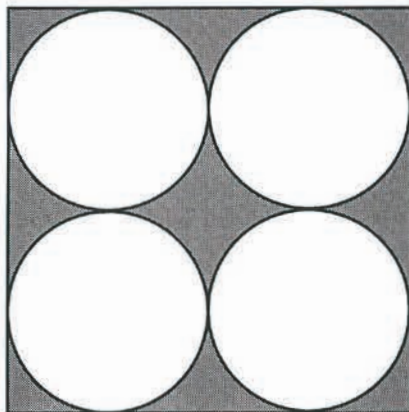
21b	Performance
1	23.7%
0	39.7%
X	36.5%

22

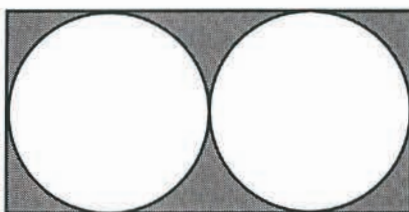
Volume of a sphere = $\frac{4}{3} \pi r^3$ where r is the radius.

Identical spheres of radius 9.5 cm are packed tightly into a cuboid.

Plan view



Front view



22 In the trial exam, most students did not attempt this final question, possibly through lack of time as we know some schools were not able to give the full 90 minutes. Those that did attempt it often missed that the volume of 4 spheres was required and only picked up a single mark. In the second part, it was quite common to see volume calculations with all lengths half of what they should have been, as here. This was treated as a special case worth 2 marks.

22 (a) Work out the total volume of the spheres in the cuboid.

[3 marks]

$$\frac{4}{3} \times \pi \times 9.5^3 = 3591.364002$$

22a	Performance
3	12.2%
2	1.3%
1	14.1%
0	16.7%
X	55.8%

Answer 3519.36 cm³

22 (b) Work out the volume of the cuboid.

[4 marks]

2

$$19 \times 19 \times 9.5$$

22b	Performance
4	4.5%
3	0.0%
2	7.7%
1	9.0%
0	13.5%
X	65.4%

Answer 3429.5 cm³

22 (c) Work out the total volume of the spheres as a percentage of the volume of the cuboid.

[2 marks]

0

$$\frac{3519.36}{3429.5} \times 100$$

22c	Performance
2	6.4%
1	1.9%
0	14.7%
X	76.9%

$$\frac{3429.5}{3519.36} \times 100 = 97.4466$$

Answer 97 %

END OF QUESTIONS

Paper 1 Higher tier

(8300/1H) 1 hour 30 minutes

Answer **all** questions in the spaces provided.

- 1 Expand $x(x + 3)$
Circle your answer.

[1 mark]

$2x + 3$

$x^2 + 3$

$x^2 + 3x$

$3x^2$

1	Performance
1	91.7%
0	8.3%
X	0.0%

- 2 Which of these has the greatest value?
Circle your answer.

[1 mark]

6.15×10^4

$61\,499$

6.2×10^3

61.6×10^3

2	Performance
1	63.3%
0	36.7%
X	0.0%

3

What is 0.12 as a fraction of 0.8?

Circle your answer.

[1 mark]

$\frac{3}{20}$

$\frac{2}{3}$

$\frac{20}{3}$

$\frac{3}{2}$

3

3/2 was the most common wrong response to this question, suggesting most students had the numerator and denominator in the right place but worked with 12 over 8 rather than 80, possibly because they hurried to an answer without writing anything in the working space.

Performance

1	48.2%
0	48.2%
X	3.6%

4

The base of a pyramid has n sides.

Circle the expression for the number of faces of the pyramid.

[1 mark]

$2n$

$n - 1$

n

$n + 1$

4

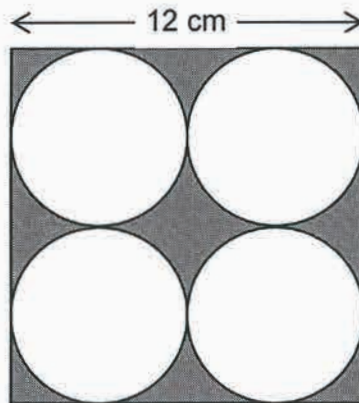
Performance

1	43.2%
0	51.4%
X	5.4%

Turn over for the next question

5

Four identical circles just fit inside a square as shown.



Not drawn accurately

Work out the area of the shaded section.

Give your answer in terms of π .

[4 marks]

3

$$12 \times 12 = 144$$

$$\pi 3^2$$

$$\pi \times 9 = 9\pi$$

$$9\pi \times 4 = 36\pi$$

$$144 - 36\pi = 108\pi$$

Answer 108 π cm²

5

A lot of students lost the last mark in this question by 'simplifying' the correct answer to 108π as in this example. Often, further working after a correct answer is not penalised if it does not invalidate the answer. For example, incorrect cancelling of a fraction that has not been asked for in simplest form will not lead to loss of marks. In this case, however, the incorrect further work shows a misconception and a mark was lost.

Performance

4	22.3%
3	39.6%
2	4.7%
1	26.3%
0	4.3%
X	2.9%

6

Bag A contains 10 blue balls and 20 red balls.

Bag B contains 8 blue balls and 12 red balls.



A ball is chosen at random from each bag.

Jo says,

"It is more likely that a blue ball is chosen from Bag A than Bag B because there are more blue balls in Bag A."

Is she correct?

You **must** show your working.

[3 marks]

3

$$\begin{array}{r|l} \frac{10}{30} = \frac{1}{3} \text{ (A)} & \frac{8}{20} = \frac{4}{10} = \frac{2}{5} \text{ (B)} \\ \hline = 33.\dot{3}\% & = 40\% \end{array}$$

She is wrong as there is a higher percentage of getting a blue ball in bag B

Turn over for the next question

6

Some students were successful in this question with an approach that compared ratios or fractions of blue to red rather than the more conventional comparison of blue to total. Such an approach is not recommended as it would not have worked if the question had asked for probabilities to be stated and compared. It is important in questions like this that, at some point, students state clearly whether Jo is right or wrong and show a clear, like for like comparison.

Performance

3	44.6%
2	2.5%
1	38.8%
0	12.2%
X	1.8%

- 7 (a) Rob is going to drive 130 miles from Hull to Liverpool.
There are road works for 25 miles of the journey.
He assumes his average speed will be

50 mph where there are road works

70 mph for the rest of the journey.

Using his assumptions, work out his journey time.

[4 marks]

4

25 miles 50 mph $\frac{1}{2}$ hour
105 miles 70 mph 1 hour 30 minutes

70 miles - 1 hour

35 miles - $\frac{1}{2}$ hour

Answer 2 hours

7a

Performance

4	49.6%
3	12.9%
2	9.4%
1	15.8%
0	9.0%
X	3.2%

- 7 (b) Rob's assumptions about the average speeds are too high.
How does this affect his journey time?

[1 mark]

1

It will take him longer to get there

7b

Performance

1	78.1%
0	14.4%
X	7.6%

- 8 There are between 25 and 35 students in a class.
The ratio of boys to girls is 4 : 7
How many students are in the class?

[2 marks]

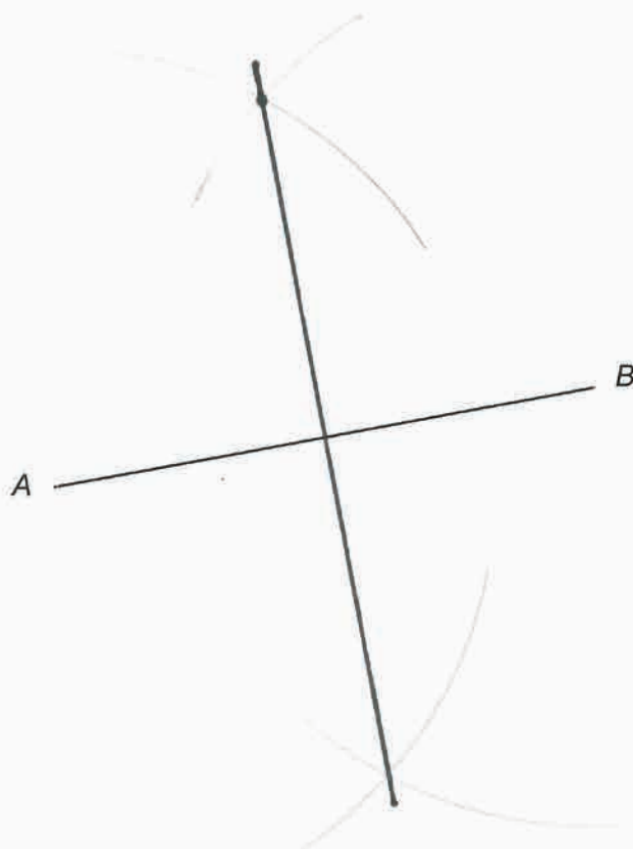
$$\begin{array}{l} 4:7 = 11 \\ 8:14 = 22 \\ 12:21 = 33 \\ 16:28 = 44 \end{array}$$

8	Performance
2	70.5%
1	4.0%
0	20.5%
X	5.0%

Answer 33

- 9 Use a ruler and a pair of compasses in this question.
Construct the perpendicular bisector of AB.

[2 marks]



9	Performance
2	55.0%
1	4.0%
0	24.5%
X	16.5%

10

A ball is dropped from a height of 50 metres.

After each bounce, the ball reaches 20% of its previous height.

How high does it reach after the second bounce?

[2 marks]

$$50 \quad 10\% = 5 \quad 20\% = 10$$

1st 40 m

$$40 \quad 10\% = 4 \quad 20\% = 8$$

10 Many students only gained a single mark here for calculating 10m correctly. As in the example, many students misread the question and tried to work with the situation where the ball lost rather than reached 20% of its previous height.

Performance

2	41.4%
1	51.8%
0	5.4%
X	1.4%

Answer

32

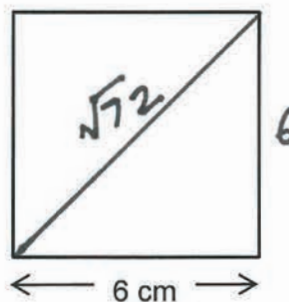
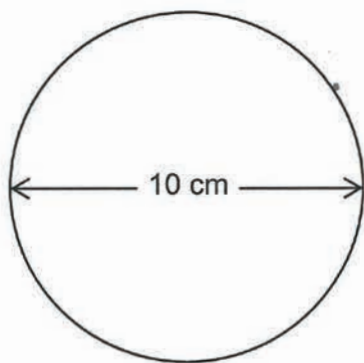
metres

11

A circle has diameter 10 cm

A square has side length 6 cm

Not drawn accurately



Use calculations to show that the square will fit inside the circle without touching the edge of the circle.

[3 marks]

$$6^2 + 6^2 = 72$$

$$10 = \sqrt{100}$$

$$\sqrt{72}$$

$$\sqrt{100} > \sqrt{72}$$

11 The very few students who realised the significance of the diameter of the square in this problem usually went on to gain full marks. The majority of students at both tiers attempted to compare areas which gained no credit.

Performance

3	4.0%
2	0.7%
1	0.4%
0	79.5%
X	15.5%

- 12 What percentage of a distribution is covered by the inter-quartile range?
Circle your answer.

[1 mark]

25%

37.5%

50%

75%

12

Performance

1 51.4%

0 44.2%

X 4.3%

- 13 Which of these values **cannot** be the cosine of an angle?
Circle your answer.

[1 mark]

-0.5

0

0.5

1.5

13

Performance

1 19.4%

0 75.5%

X 5.0%

- 14 A motor racing circuit has length $5\frac{5}{6}$ miles.

A straight section of the circuit has length $1\frac{3}{4}$ miles.

What fraction of the circuit is the straight section?

Give your answer in its simplest form.

[3 marks]

$$5\frac{5}{6} \quad 1\frac{3}{4}$$

$$5\frac{10}{12} \div 1\frac{9}{12}$$

$$\frac{70}{12} \div \frac{21}{12}$$

$$\frac{70}{12} \times \frac{12}{21} = \frac{10}{3}$$

$$3\frac{1}{3} = 3.\dot{3}$$

14 Many students gained a mark for converting the two mixed numbers to top heavy fractions but made no further useful progress. As in this example, a number of students attempted the unnecessary step of finding a common denominator and a number attempted the wrong operation or the right operation in the wrong order.

Performance

3 9.4%

2 1.1%

1 35.3%

0 41.0%

X 13.3%

Answer

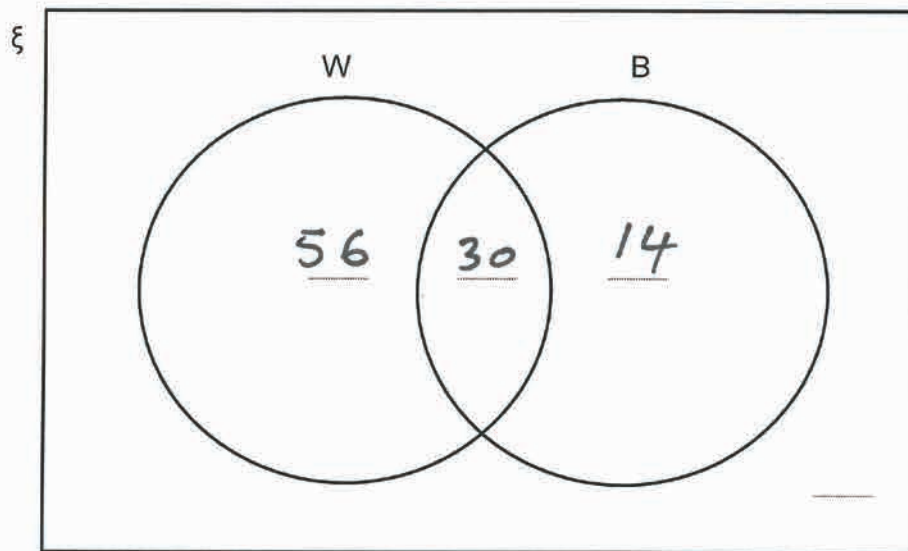
 $3\frac{1}{3}$

15 In the Venn diagram

$\xi = 100$ farms

$W =$ farms that grow wheat

$B =$ farms that grow barley



70 farms grow **only** wheat or **only** barley.

$\frac{4}{5}$ of these 70 farms grow **only** wheat.

The number of farms that grow wheat is three times the number that grow barley.

Complete the Venn diagram.

[5 marks]

$$W = \frac{4}{5} \times \frac{70}{1} = \frac{280}{5} = 56$$

$$B = \frac{56}{3} =$$

15

Two marks for 56 and 14 were common but few could correctly work out the intersection and simply wrote down 30 as here.

Performance

5	5.0%
4	0.7%
3	9.0%
2	34.5%
1	28.1%
0	13.7%
X	9.0%

16

$$(3x + 1)(x - 2) + ax + b \equiv 3x^2 + 8x - 5$$

Work out the values of a and b .

[4 marks]

2

$$\begin{aligned} & (3x + 1)(x - 2) \\ & = 3x^2 - 6x + x - 2 \\ & 3x^2 - 5x - 2 + ax + b = 3x^2 + 8x - 5 \\ & +5 \quad -5x - 2 + ax + b = 8x - 5 \\ & +5x \quad -5x + 3 + ax + b = 8x \\ & -3 \quad 3 + ax + b = 13x \\ & \quad \quad ax + b = 10x \end{aligned}$$

$$a = 4$$

$$b = 2$$

16 A lot of students got credit for a correct expansion of the brackets and went on to do some simplification and rearrangement, often without making progress. The student in the example got very close but did not appear to appreciate the key principle of equating coefficients.

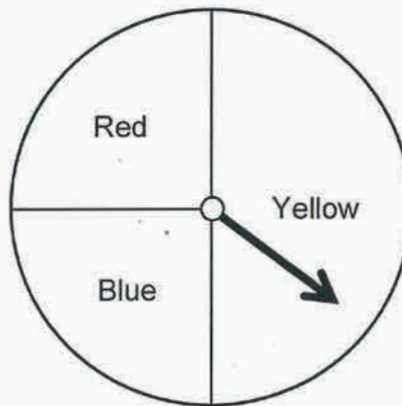
Performance

4	16.5%
3	15.5%
2	26.6%
1	8.6%
0	12.9%
X	19.8%

Turn over for the next question

17

In a game, a fair spinner has three sections.



Jack uses this method to work out the probability of getting two reds from two spins.

He writes,

There are three colours, so the probability of the spinner landing on red is $\frac{1}{3}$.

$\frac{1}{3} + \frac{1}{3} = \frac{2}{3}$, so the probability is $\frac{2}{3}$

Make **two** criticisms of Jack's method.

[2 marks]

Criticism 1 *Probability of getting red is not $\frac{1}{3}$
because yellow = $\frac{1}{2}$! Red = $\frac{1}{4}$*

Criticism 2 *$\frac{1}{4} + \frac{1}{4} = \frac{2}{4}$ ($\frac{1}{2}$)
not $\frac{1}{3} + \frac{1}{3}$!*

17

Most students appreciated and gained credit for a comment related to the size of the sectors. Far fewer students commented that multiplication rather than addition of the probabilities was required.

Performance

2	19.4%
1	67.3%
0	6.1%
X	7.2%

18

Rearrange

 $c = \frac{4-d}{d+3}$ to make d the subject.

[4 marks]

4

$$c(d+3) = 4-d$$

$$cd + 3c = 4-d$$

$$cd + d = 4 - 3c$$

$$d(c+1) = 4-3c$$

Answer

$$d = \frac{4-3c}{c+1}$$

18

This was a challenging but familiar rearrangement question with only the strongest students able to isolate the d successfully by factorising and dividing.

Performance

4	9.7%
3	5.8%
2	9.7%
1	10.4%
0	51.1%
X	13.3%

Turn over for the next question

 Turn over ►
8300/1H

- 19 A circle has equation $x^2 + y^2 = \frac{1}{4}$

Circle the length of its radius.

[1 mark]

$$\frac{1}{16}$$

$$\frac{1}{8}$$

$$\frac{1}{4}$$

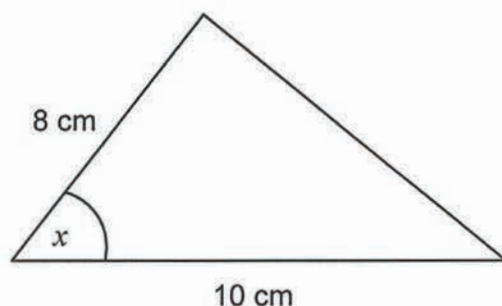
$$\frac{1}{2}$$

19

Performance

1	15.8%
0	73.4%
X	10.8%

- 20 Which expression gives the area, in cm^2 , of this triangle?



Not drawn accurately

Circle your answer.

[1 mark]

$$80 \sin x$$

$$40 \sin x$$

$$80 \cos x$$

$$40 \cos x$$

20

Performance

1	20.1%
0	72.7%
X	7.2%

19&20 It was unsurprising that not many students in the trial were familiar with the equation of a circle which is not part of the current GCSE specification. It was perhaps more surprising how few were familiar with $\frac{1}{2} ab \sin c$ which is on the current specification though, of course, the formula is currently given which was not the case for this trial and will not be the case for the new GCSE where such formulae are expected to be known.

21

Express $0.\dot{1}\dot{5}$ as a fraction in its simplest form.

[3 marks]

3

$$0.\dot{1}\dot{5} = n$$

$$1.\dot{5} = 10n$$

$$15.\dot{5} = 100n$$

$$\begin{array}{r} 15.\dot{5} \\ - 1.\dot{5} \\ \hline 14 \end{array}$$

$$\begin{array}{r} 100n \\ - 10n \\ \hline 90n \end{array}$$

$$\text{So } n = \frac{14}{90}$$

Answer

$$\frac{7}{45}$$

21

Performance

3 9.7%

2 6.8%

1 2.2%

0 59.4%

X 21.9%

Turn over for the next question

22

Ellie bought a scarf and a dress.

The scarf cost £4

She sold both items for a total of £26

She made

100% profit on the cost of the scarf

30% profit on the total cost.

Work out her percentage profit on the cost of the dress.

[5 marks]

$$\begin{array}{lcl} \text{Scarf} & 4 \times 2 & = \pounds 8 \\ \text{dress} & 26 - 8 & = \pounds 18 \end{array}$$

22

A single mark for calculating the sale price of the scarf and then no further progress was common. This may be one question where trial students gave up or were short of time but students in a live exam would show greater resilience and make more progress.

Performance

5	3.6%
4	0.4%
3	1.4%
2	1.8%
1	49.3%
0	30.2%
X	13.3%

Answer _____ %

23

Work out $\sqrt[3]{8} \times 5^{-2}$

Give your answer as a decimal.

[3 marks]

$$\sqrt[3]{8} = 2$$

$$2 \times \frac{1}{10}$$

Answer 0.2

23 The correct answer for the cube root of 8 was often seen and gained a single mark. Many students appeared unfamiliar with the meaning of negative indices and got no further with this question

Performance

3	9.0%
2	5.4%
1	27.7%
0	21.6%
X	36.3%

Turn over for the next question

24

Ravi is running a charity stall using two bags of counters.

Each bag will have

20 counters

the same number of red counters.

A player will pick one counter at random from each bag.

The player wins if **both** counters are red.

Ravi wants 9 people in every 25 to win.

How many of the 20 counters in each bag should be red?

You **must** show your working.

[4 marks]

4

$$\text{chance of 2 red} = \frac{9}{25}$$

$$\text{chance of 1 red} = \frac{3}{5} \left(\sqrt{\frac{9}{25}} \right)$$

$$\frac{3}{5} = \frac{12}{20}$$

12 red in each bag

Answer 12

24 A good number of students were able to realise that expressing Ravi's wish as a probability was the right starting point in this problem but few recognised the next step of finding the square root of the fraction. Those that did almost always went on to complete the problem successfully.

Performance

4	9.0%
3	0.4%
2	0.4%
1	34.5%
0	24.5%
X	31.3%

25 A sequence of numbers is formed by the iterative process $a_{n+1} = (a_n)^2 - a_n$

25 (a) Describe the sequence of numbers when $a_1 = 1$

Show working to justify your answer.

[1 mark]

$$a_2 = 1 - 1 = 0$$

$$a_3 = 0 - 0 = 0$$

25a

Performance
1 0.4%
0 37.1%
X 62.6%

After a_1 , it will always be 0

25 (b) Describe the sequence of numbers when $a_1 = -1$

Show working to justify your answer.

[2 marks]

$$a_2 = 1 + 1 = 2$$

$$a_3 = 4 - 2 = 2$$

After a_1 , it will always equal 2

25b

Performance
2 0.4%
1 1.4%
0 24.5%
X 73.7%

25 (c) Work out the value of a_2 when $a_1 = 1 - \sqrt{2}$

[2 marks]

$$(1 - \sqrt{2})^2 - (1 - \sqrt{2})$$

$$= 1 - \sqrt{2} - \sqrt{2} + 2 - 1 + \sqrt{2}$$

$$= 2 - \sqrt{2}$$

Answer $2 - \sqrt{2}$

25c

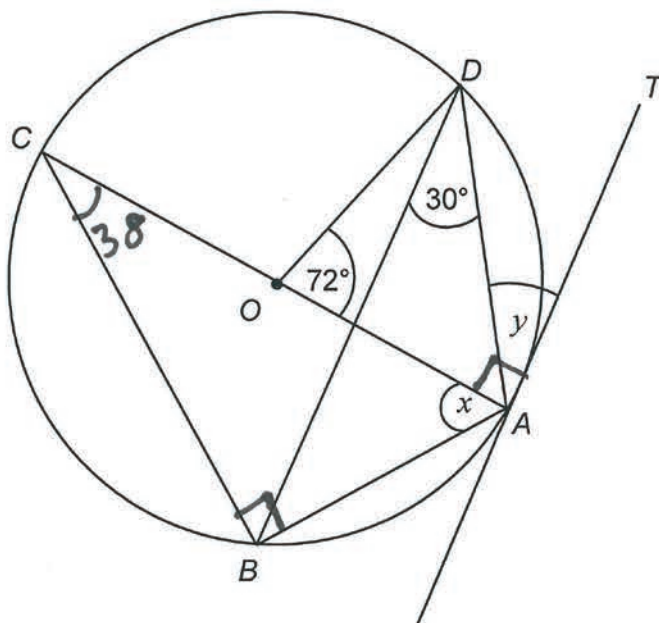
Performance
2 1.8%
1 0.7%
0 28.1%
X 69.4%

26

A, B, C and D are points on a circle, centre O .

AC is a diameter of the circle.

AT is a tangent to the circle.



Not drawn
accurately

Work out the size of angle x and the size of angle y .

[4 marks]

$$180 - (30 + 90) = 60$$

26 Dealing with this complex diagram was a problem for many students. Those who had some success usually annotated carefully and it was more common to see x found correctly than y .

Performance

4	4.0%
3	2.2%
2	6.5%
1	15.5%
0	49.6%
X	22.3%

$x = 60$ degrees $y =$ _____ degrees

27

Write $\sqrt{12} + \frac{15}{\sqrt{3}}$ in the form $a\sqrt{b}$ where a and b are prime numbers.

[3 marks]

3

$$\sqrt{12} = \sqrt{4 \times 3} = 2\sqrt{3}$$

$$\frac{15}{\sqrt{3}} = \frac{15\sqrt{3}}{3} = 5\sqrt{3}$$

$$2\sqrt{3} + 5\sqrt{3} = 7\sqrt{3}$$

Answer

$$7\sqrt{3}$$

27

Students who attempted this question often got a single mark for dealing with $\sqrt{12}$ successfully but struggled to rationalise the denominator.

Performance

3	8.6%
2	2.9%
1	19.4%
0	24.5%
X	44.6%

Turn over for the next question

28

Solve

$$5x - y = 5$$

$$2y - x^2 = 11$$

You **must** show your working.Do **not** use trial and improvement.

[6 marks]

5

$$10x - 2y = 10$$

$$2y - x^2 = 11$$

$$10x - 2y + 2y - x^2 = 10 + 11$$

$$10x - x^2 = 21$$

$$x^2 - 10x + 21 = 0$$

$$(x - 3)(x - 7) = 0$$

$$\text{So } \Rightarrow x - 3 = 0 \quad x = 3$$

or

$$x - 7 = 0 \quad x = 7$$

28

More students attempted and made some progress with this question than some of the other challenging questions at the end of this paper. Elimination rather than substitution approaches were generally seen. As here, a few students got through all the hard work of finding both values of x and then lost the last mark by not working out the y values.

Performance

6	3.2%
5	1.8%
4	0.0%
3	1.4%
2	8.6%
1	19.1%
0	41.7%
X	24.1%

Answer $x = 3$ or $x = 7$

END OF QUESTIONS

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