GCSE Maths: Answers and commentaries

Higher Tier – Paper 1

A closer look at the live questions from summer 2022

v1.0

Contents

Help prepare your GCSE Maths students with confidence

Every year in GCSE Maths exams, students often misread, misunderstand or misinterpret questions and don't always do what the question is asking them to do.

This booklet has been designed by our curriculum experts for you to use with your students to explore real responses. Inside you'll find best practice approaches, example responses, examiner commentaries and tips on how to access more marks.

Higher Tier – Paper 1

Questions 1, 2 and 3

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

1 Which of these is the equation of a straight line?

Circle your answer.

[1 mark]

$$y = 6x^2 \qquad y = x - 6 \qquad y = x^2 + 6 \qquad y = \frac{6}{x}$$

2 What is 0.28 as a fraction of 0.8 ?

Circle your answer.

[1 mark]

$$\frac{7}{20} \qquad \frac{2}{7} \qquad \frac{20}{7} \qquad \frac{7}{2}$$

3 Circle the calculation that increases 240 by 7.5%

[1 mark]

$$240 \times 1.0705 \qquad 240 \times 1.705 \qquad 240 \times 1.075 \qquad 240 \times 1.75$$

Question 1

Commentary

A large majority of students chose the correct option. The most common wrong selection was $y = x^2 + 6$, possibly due to students remembering $y = mx + c$ and relating $+6$ to $+c$. Students should be reminded that c can be negative.

Question 2

Commentary

Just under 70% of students chose the correct option. $\frac{2}{7}$ was the most common incorrect choice, presumably from students starting with $\frac{8}{28}$, which is incorrect in two ways.
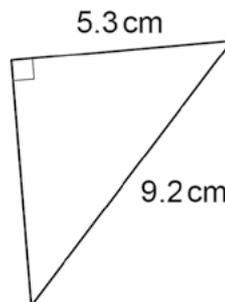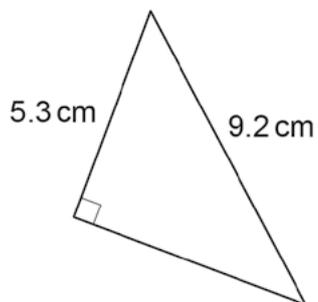
Question 3

Commentary

Over 85% of students chose the correct option. The only other option chosen by more than a few students was 240×1.75. Here students did not realise that this would increase an amount by 75%

Questions 4 and 5

4

5.3 cm

9.2 cm

5.3 cm

9.2 cm

Not drawn accurately

Circle the reason why the triangles are congruent.

[1 mark]

ASA   RHS   SAS   SSS

5   Work out $80\,000\,000 \div 200$

Give your answer in standard form.

[2 marks]

Answer _____

Question 4

Only half of the students chose the correct option here. SAS was selected almost as many times, probably because two sides and an angle are shown on the given triangles. The R should really give it away on a right-angled triangle, and students should remember that for SAS to work the angle has to be formed by the two sides.

Question 5

Students followed one of two paths here; do the division first and then convert to standard form or convert both values to standard form and then divide.

In the first, cancelling two zeros and then dividing 800,000 by 2 gives 400,000, which converts to 4×10^5. Students occasionally got the wrong number of zeros, but could then score B1 for a correct conversion of their number into standard form.

In the second, the values become 8×10^7 and 2×10^2. Dividing 8 by 2 gives 4, and when you divide numbers with the same base you subtract the powers, so dividing 10^7 by 10^2 gives 10^5. Students who chose this method generally made fewer errors.

Questions 6(a) and 6(b)

6 **(a)** Work out $\dfrac{3^{12}}{3^7}$

Give your answer as a whole number.

[2 marks]

Answer _____

6 **(b)** Simplify $8 \times 2^6 \times 2^4$

Give your answer as a power of 2

[2 marks]

Answer _____

Question 6(a)

Most students knew that they had to subtract the indices, but some also divided the 3s to get 1^5. Nearly a quarter of all students did not convert to a whole number, and of those who did some went wrong by starting with 9 and going on to 27, 81, 243, 729.

Question 6(b)

Similarly to 6(a), students knew that they had to add the indices, but many did not know how to convert the 8, or multiplied the bases to get 32^{10}
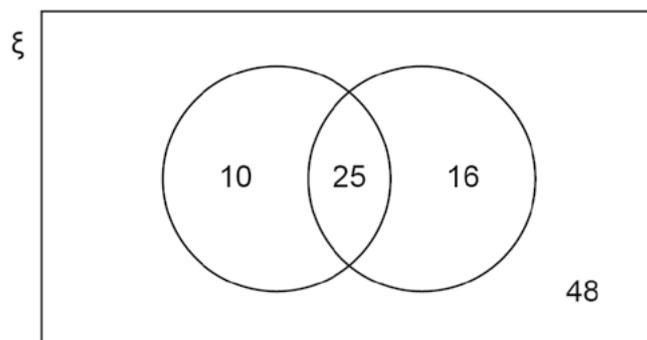
Question 7

7 In a group of 98 students

25 study both Art and French

10 study Art but do not study French

41 study French.

Joel draws this Venn diagram to represent the information.

ξ = the group of 98 students

A = the students who study Art

F = the students who study French

Make **two** criticisms of his diagram.

[2 marks]

Criticism 1 _____

_____

Criticism 2 _____

_____

Make **two** criticisms of his diagram.

[2 marks]

Criticism 1 _doesn't have labels on which ven diagram is which._

Criticism 2 _doesn't label what the diagram is or name it._

Commentary

A majority of students scored both marks here, but there were some common errors.

This student's second criticism is that there is no title, but Venn diagrams do not generally have a title.

1 mark

Make **two** criticisms of his diagram.

[2 marks]

Criticism 1 _The numbers in the diagram add up to 99 not 98_

Criticism 2 _The number of people that study neither is wrong._

Commentary

This student's criticisms have the same base – that the numbers are wrong. This cannot be used twice, so it only scores 1 mark.

1 mark

Question 7, response 3

Make **two** criticisms of his diagram.

[2 marks]

Criticism 1 _More People don do not study both subjects_

Criticism 2 _I T i) more likely that you will study both subjes at the Same time than just studying one_

Commentary

This student has not made criticisms of the diagram, but instead has queried the data, which would be a different question. The student has said "More people do not study both subjects" and "It is more likely that you will study both subjects at the same time than just studying one."
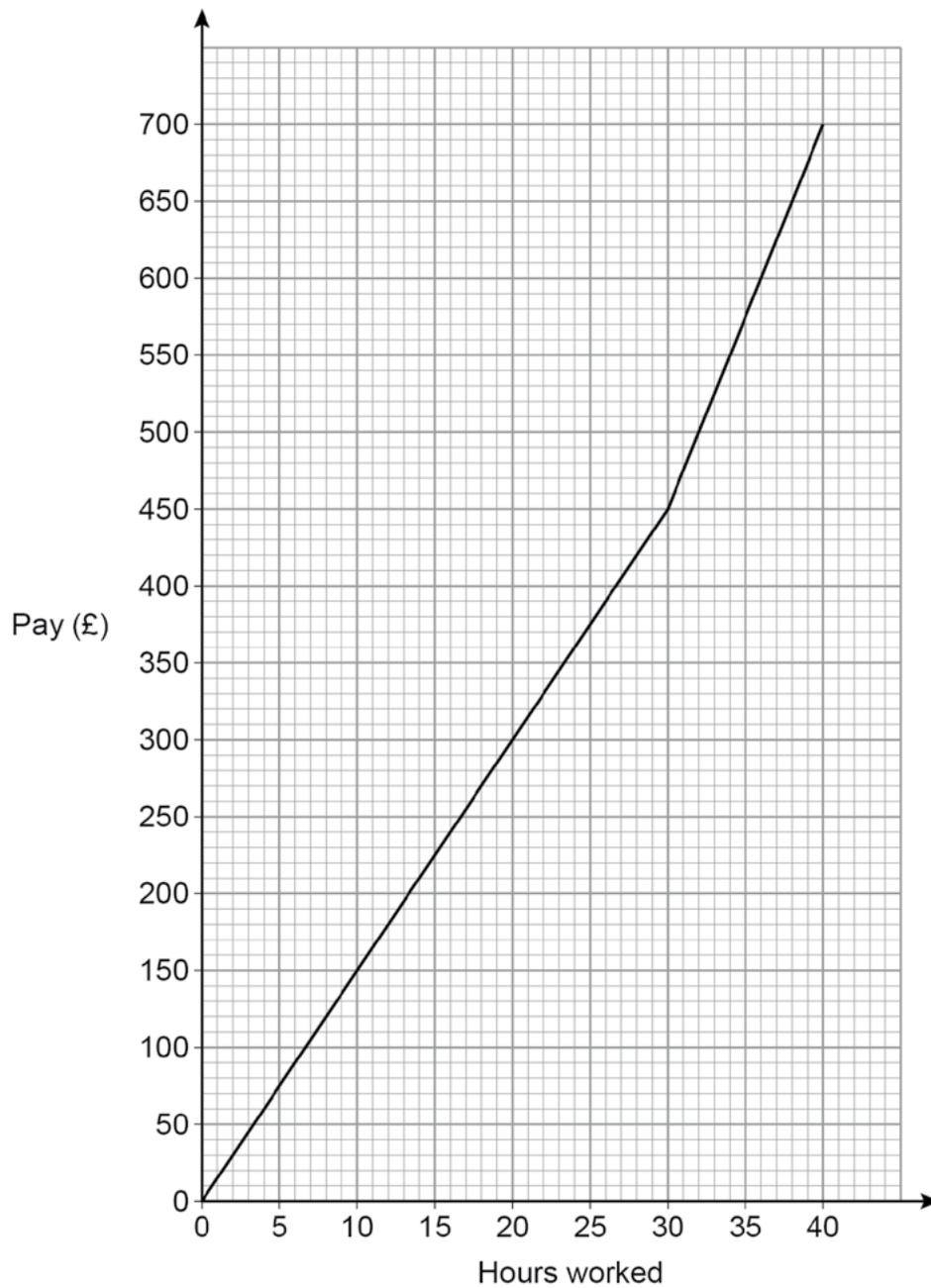
0 marks

8 In a week, Samir is paid

a basic hourly rate for the first 30 hours worked

an overtime hourly rate for any extra hours worked.

The graph shows his pay for working up to 40 hours in a week.

Work out the ratio   basic hourly rate : overtime hourly rate

Give your answer in its simplest form.

[3 marks]

Answer _____ : _____

Work out the ratio   basic hourly rate : overtime hourly rate

Give your answer in its simplest form.

[3 marks]

basic hourly rate : Overtime hourly rate

45 700-450=250   450 : 250

45 : 25

9 : 5

Answer ___9_ : _5___

Commentary

Nearly all students scored at least one mark here thanks to the B1 follow through for simplification of their ratio. Over half scored all three marks, and those who didn't misinterpreted the diagram in one of several ways.

This student has used the amounts earned in the first 30 and last 10 hours, rather than the hourly rates.

1 mark

Question 8, response 2

Work out the ratio   basic hourly rate : overtime hourly rate

Give your answer in its simplest form.

[3 marks]

basic hour work = £450

Over hourly rate = £700

450 : 700

45 : 70

9 : 14

Answer   9   :   14

14
5⟌70

Commentary

This student has used the cumulative pay after 30 and 40 hours.

1 mark

Work out the ratio   basic hourly rate : overtime hourly rate

Give your answer in its simplest form.

[3 marks]

$\div 10 \left(\dfrac{30 : 10}{3 : 1} \right) \div 10$

Answer $\underline{\quad 3 \quad}$: $\underline{\quad 1 \quad}$

Commentary

This student has simply used the number of hours split into 30 and 10.

1 mark

Questions 9(a) and 9(b)

9 (a) In each box, write a fraction **less** than 1 to make a correct calculation.

[1 mark]

$$\boxed{\phantom{\frac{a}{b}}} \times \boxed{\phantom{\frac{a}{b}}} = \frac{3}{10}$$

9 (b) In each box, write a decimal **less** than 1 to make a correct calculation.

[1 mark]

$$\boxed{} \times \boxed{} = 0.06$$

Question 9(a)

Three quarters of the students gave a correct answer. Those who didn't often gave fractions which multiplied to give $\frac{3}{100}$ or gave $\frac{1}{5} \times \frac{3}{2}$, which did not satisfy the rule that both fractions had to be less than 1
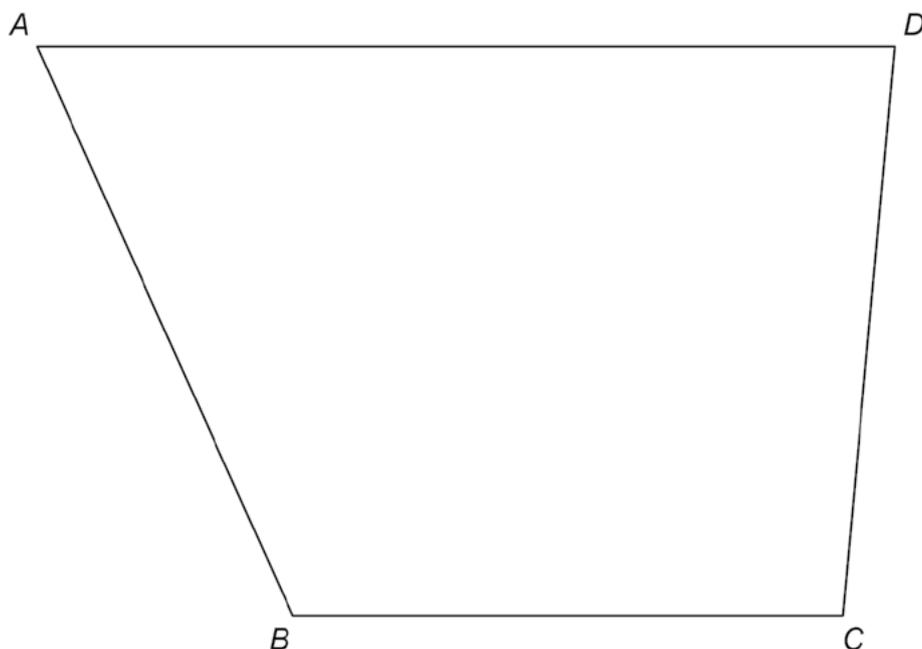
Question 9(b)

Half of the students gave a correct combination here. By far the most common incorrect answer was 0.02 × 0.03

Question 10

10 Use a ruler and compasses in this question.

ABCD represents a garden.

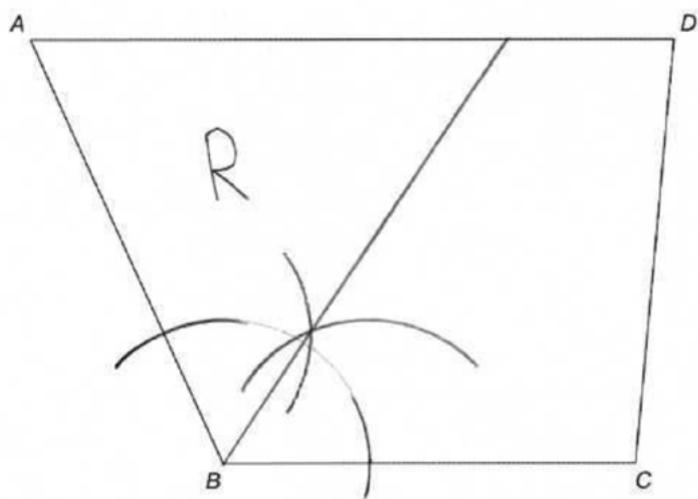A tree is to be planted in the garden.
The tree will be in the region that is closer to *AB* than to *BC*.

Label the region, R, where the tree could be planted.
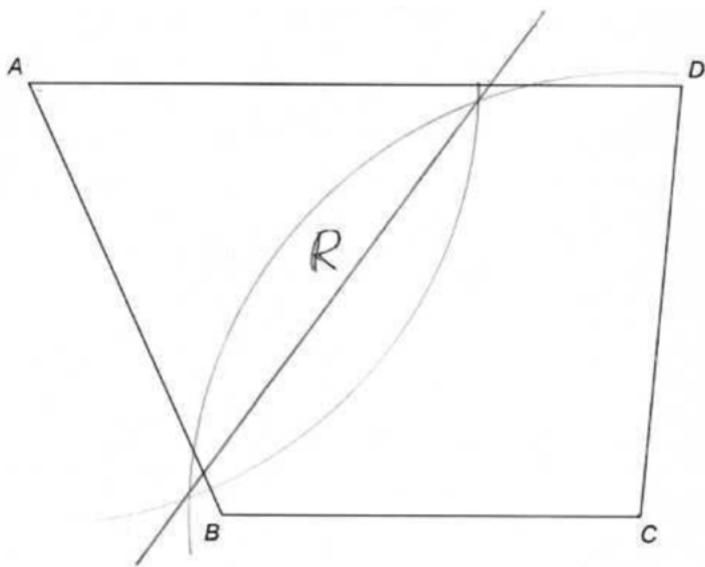Show all your construction lines.

[3 marks]

Commentary

Some students, like this one, gave a precise and economical diagram to gain all three marks.
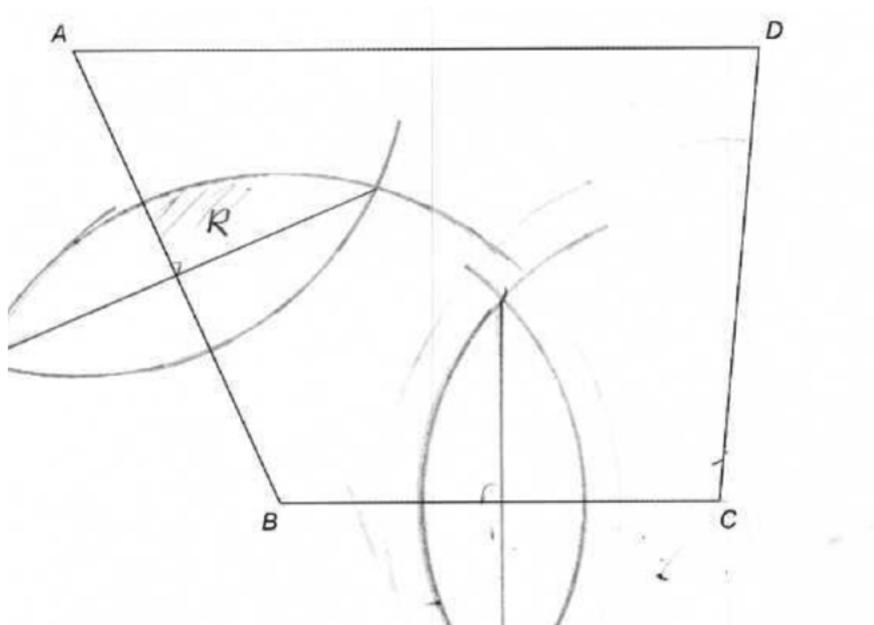
3 marks

Question 10, response 2

Commentary

This student was among those who drew equal arcs from A and C. Their answer must be wrong as their line does not go through B.
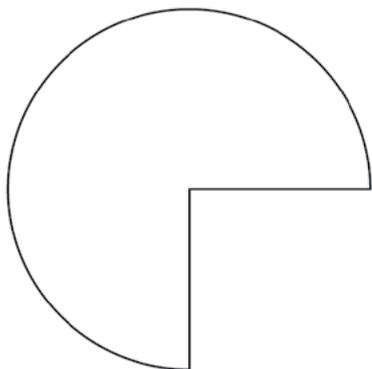
0 marks

Commentary

A fair proportion of students, including this one, had an idea of how to construct a perpendicular line, but were unable to use them to any effect in this question.

0 marks

Question 11

11   Here are two shapes, P and Q.

P

$\frac{3}{4}$ of a circle, radius 20 cm

Q

$\frac{1}{3}$ of a circle, radius 15 cm

Not drawn accurately

How many times bigger is the area of P than the area of Q?

You **must** show your working.

[4 marks]

Answer _____

$P = \pi r^2$ $Q = \pi r^2 =$

$\pi \times 20^2$ $\pi \times 15^2 = 225\pi$

400π ~~225~~

$400 \div 4 = 100$ $225 \div 3 = 75\pi$ area Q

$100 \times 3 = 300\pi \, cm^2$

$\hookrightarrow$ Area P $300 \div 75 = 4$

  $P = 4$ times bigger

Answer ___4___

Commentary

Just over half of the students scored all 4 marks on this question, often giving efficient working like the student below.

4 marks

Question 11, response 2

How many times bigger is the area of P than the area of Q?

You **must** show your working.

[4 marks]

$$9/4 = \frac{9}{4}$$

$$20^2/15^2$$

$$400/225$$

$$\frac{400}{225}$$

$$\frac{80}{45}$$

$$\frac{16}{9}$$

$$\frac{9}{4} \times \frac{16}{9} = \frac{144}{36} = \frac{16}{4} = 4$$

Answer _____ 4

Commentary

This student also scored all 4 marks, from an unusual and very clever method. They got 9/4 from the ratio of 9/12 and 4/12 and multiplied it by the ratio of the areas of the two full circles. This goes straight to the answer.

4 marks

$$P = \frac{3}{4} \times \pi r^2 \qquad Q = \frac{1}{3} \times \pi r^2$$

$$P = \frac{3}{4} \times \pi \times 20^2 \qquad Q = \frac{1}{3} \times \pi \times 15^2$$

$$P = \frac{3}{4} \times 400\pi \qquad Q = \frac{1}{3} \times \frac{225\pi}{1}$$

$$P = \frac{1200\pi}{4} \qquad Q = \frac{225\pi}{3}$$

$$P = \frac{3600\pi}{12} \qquad Q = \frac{900\pi}{12}$$

Answer Area P is 4× bigger than area Q

$$9\sqrt{36} \quad ^{0\,4}$$

Commentary

This student also scored all 4 marks, again from an unusual method. Instead of working out the actual areas they have used fractions with common denominators to compare the numerators.

4 marks

Question 12(a)

12 In a game, two bags, A and B, contain cards.

Each card is marked Yes or No.

The table shows the number of each type of card in the bags.

	Yes	No
Bag A	3	2
Bag B	1	9

In the game, a player picks one card at random from each bag.

The cards are then put back into the bags.

12 (a) Complete the tree diagram.

[2 marks]

12 (b) To win a prize, a player must pick two cards marked Yes.

450 people each play the game once.

How many people are expected to win a prize?

[3 marks]

Answer _____

Question 12, response 1

$$P(YY) = 3/5 \times 1/10 = 3/50$$
$$P(YN) = 3/5 \times 9/10 = 27/50 \quad + \quad 32/50$$
$$P(NY) = 2/5 \times 1/10 = 2/50$$

$$\frac{32}{50} \text{ of } 450$$

$$50 \overline{\smash{)}450}$$

$$32 \times 9$$

Answer   288

Commentary

Three quarters of the students scored both marks in part (a), with those who didn't usually putting numbers rather than probabilities. This may have been due to a confusion between probability trees and frequency trees. Part (b) was slightly less well done, with those who only put numbers in part (a) rarely recovering to score any marks in (b).

This student scored both marks in (a) and obviously understands expectation. Unfortunately, they did not read the question carefully and have given the expected number of players who picked at least one 'Yes' card instead of those who picked two.

1 mark

[3 marks

$$3/5 \times 1/10$$

$$6/10 \times 1/10 = 6/10$$

$$450 \div 10 = 45$$

$$\begin{array}{r} 45 \times \\ 6 \\ \hline 270 \end{array}$$

Answer   270

Commentary

Over 10% of the students scored two marks in part (b), almost always due to arithmetical errors. Stating that $\frac{6}{10} \times \frac{1}{10} = \frac{6}{10}$ was a common one.

2 marks

Question 13

13   Solve $\dfrac{2w}{15} = \dfrac{4}{5}$

[2 marks]

$w = $ _____

Question 13

Commentary

Students did very well with this question. The most common error was multiplying the numerator and denominator when multiplying $\frac{4}{5}$ by 15, arriving at $\frac{60}{75}$. Some simplified this to $\frac{4}{5}$, not realising that was not a sensible outcome.

Question 14

14 15 workers can complete a job in 8 days.

How many **more** workers are needed to complete the job in 6 days?

Assume that all of the workers work at the same rate.

[3 marks]

Answer _____

$15 = 8 \text{ days}$ $15 : 8$

$15 \div 8 = 1.87$

$15w = 8d$

$? = 6d$

$8\overline{)15.7000}$ = 01.877

Commentary

Students struggled with this question, as they usually do with inverse proportion questions of this type. The majority of students took the first step of dividing 15 by 8, as demonstrated here. This often led to complicated decimal calculations and an incorrect answer.

1 mark

15 workers = 8 days
1 worker = 120
2 workers = 60
3 workers = 30
4 workers = 15
5 workers = 7.5
6 workers = 3.25
7 workers =

Commentary

Some students did well to work out that 120 days of work were required, but did not know how to relate that to 6 days. This student has halved the number of workers required for each added day, leading to less than one worker for 8 days. The student should have recognised their mistake, given that it took 15 workers 8 days.

1 mark

Question 14, response 3

$$15 \times 8 = 120 \qquad \frac{120}{6} = 20$$
$$80 + 40$$

$$\frac{120}{6} = x$$

$$x = \text{number of workers required}$$

Answer 20

Question 15

15 The cross section of a prism has n sides.

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

[1 mark]

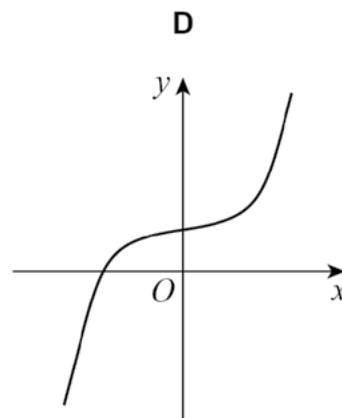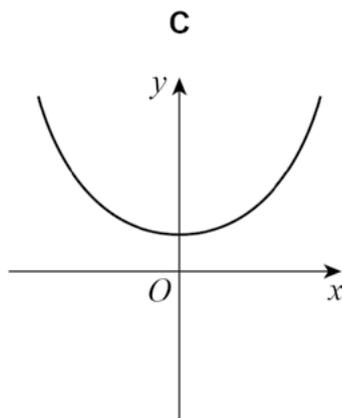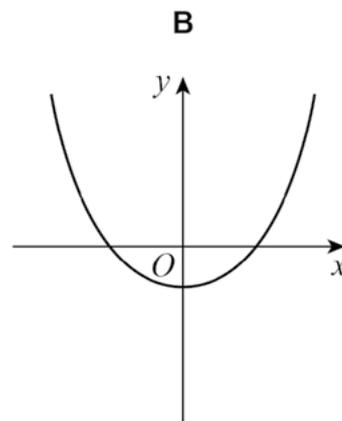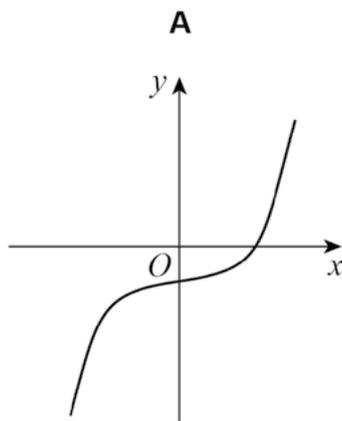n $\qquad$ $2n$ $\qquad$ $3n$ $\qquad$ $n + 2$

Question 16

16 Circle the letter of the possible sketch graph of $\quad y = x^3 - 4$

**[1 mark]**

Question 15

Commentary

Just over half of the students chose the correct option, with the remainder fairly evenly split between $2n$ and $3n$. Very few chose n.

Question 16

Commentary

Over two thirds of the students chose the correct option. Of the rest, hardly any chose C. There was a fairly even split between B, where the '−4' made sense, and D, which is cubic.

Question 17

17 75 people attend a clinic.

Their ages are recorded and a cumulative frequency diagram is drawn.
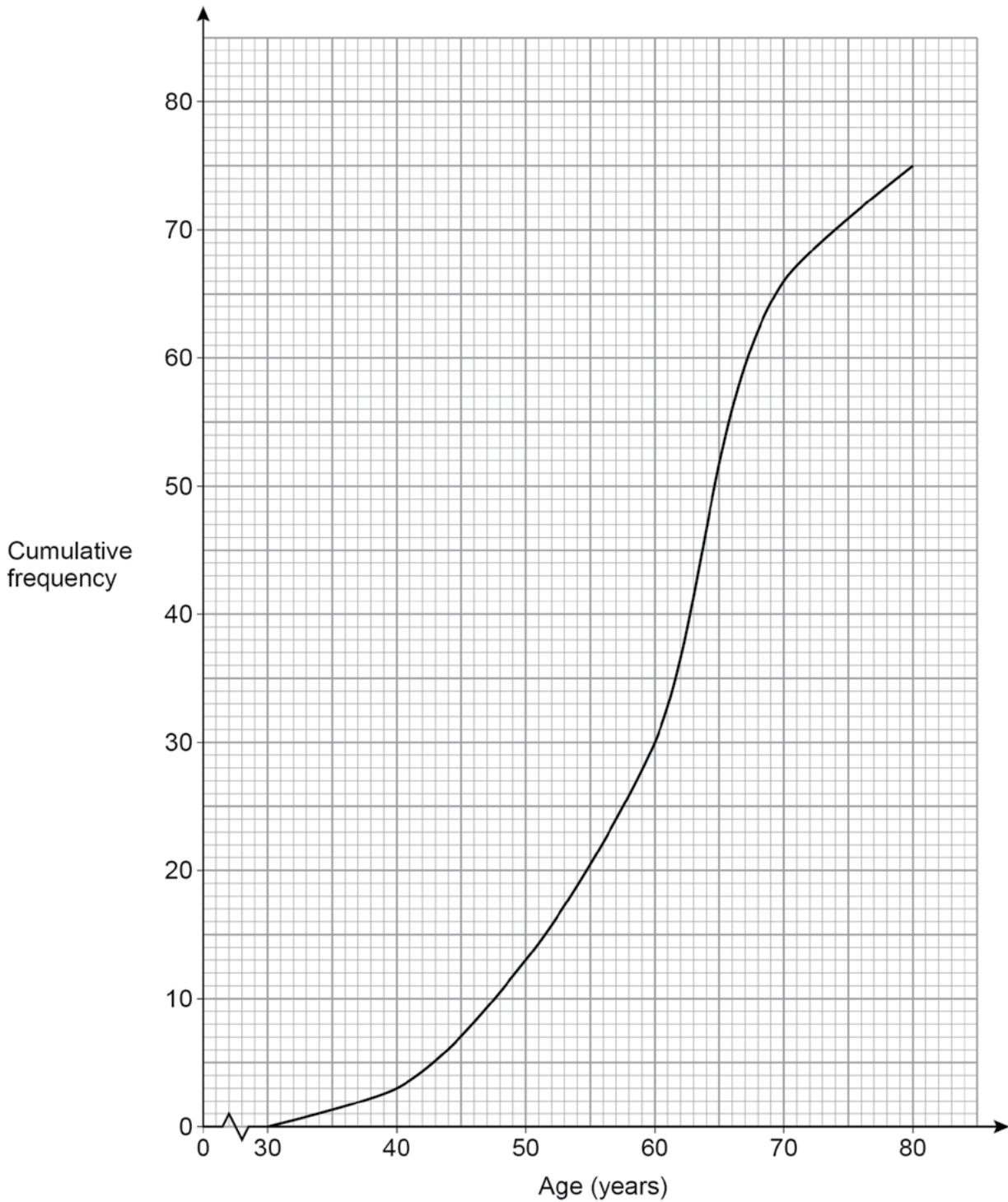
A nurse makes a statement about the **ages** of the people at the clinic.

He says,

"More than twice as many people are in their 60s as in their 50s."

Is he correct?

Tick a box.

Yes ☐ No ☐

Show working to support your answer.

[3 marks]

_____

_____

_____

_____

_____

_____

Yes ☑   No ☐

Show working to support your answer.

$66 - 30 = 36$ people in 60s

$30 - 13 = 17$ people in 70s

$17 \times 2 < 36$

$34 < 36$

34 is smaller than 36

Commentary

This is a good response, with accurate reading from the graph leading to clear and efficient working.

3 marks

Question 17, response 2

Tick a box.

Yes ☐   No ☑

Show working to support your answer.

[3 mark

60's = 36 from frequency

50's = 17 frequency

17 × 2 = 34 not 36 so he
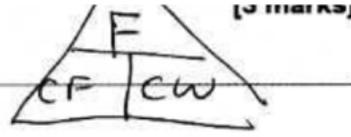
is incorrect

Commentary

Some students did all the working correctly, but chose the wrong option, presumably thinking that the nurse had said 'Exactly twice' rather than 'More than twice'.

2 marks

[3 marks]

frequency per 50 = 13 × to 5·1
= 13

frequency per 60 = 30 × 1
= 30

double 13 = 26 which is less than 30
30 is more than twice 13.

> **Commentary**
>
> Many students did not understand how to use the cumulative frequency graph, and by far the modal answer was to read the cumulative frequencies at 50 and 60 and compare them, as this student has done. This scored one mark for the two readings.
>
> *1 mark*

Question 17, response 4

Tick a box.

Yes ✓   No ☐

Show working to support your answer.

$60s = 64-30 = 34 \text{ people}$

$50s = 28 - 13 = 15 \text{ people}$

$$\begin{array}{r} 28 \\ -13 \\ \hline 15 \end{array}$$

$34 \div 2 = 17$

$17 > 15$

$$2\overline{)3\,^1 4}\;\;^1 7$$

Commentary

Other students understood how to use the graph, but thought that people were in their 50s from the start of being 50 to the start of being 59. This could gain them two marks with correct readings and subtractions.

2 marks

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12 (b) To win a prize, a player must pick two cards marked Yes.

450 people each play the game once.

How many people are expected to win a prize?

[3 marks]

Answer _____

Question 18, response

[3 marks]

$$12\ x^3 + 7x^2 + 3x - 10 \equiv 2ax^3 + 2x^2 + 4x - 10 + bx^2 + xc$$
$$12x^3 + 5x^2 + 3x = 2ax^3 + 4x - 10 + bx^2 + xc$$
$$12x^3 + 5x^2 - 3x = 2ax^3 - 10 + bx^2 + xc$$

Commentary

Students tended to either understand this question and score 3 marks quite easily or fail to see the link between the coefficients. The modal mark was one, where students such as this one multiplied out the right hand side but then didn't know how to proceed.

1 mark

Question 19

19 The first three terms of a sequence are $\quad x \quad y \quad xy$

The sequence is continued by multiplying the previous two terms.

19 (a) Circle the 5th term of the sequence.

[1 mark]

$$x^3 y^3 \qquad\qquad x^5 y^5 \qquad\qquad x^3 y^4 \qquad\qquad x^2 y^3$$

19 (b) The 8th term of the sequence is $\ x^8 y^{13}$

The value of this term is negative.

What does this mean about the values of x and y ?

Tick **one** box for each row.

[2 marks]

	Must be positive	Must be negative	Could be either
x			
y			

Question 19

Commentary

Part (a) was the best-answered question on the paper, with over 86% of the students choosing the correct option. Those who chose wrongly had usually gone one term too far and got x^3y^4.

In part (b), most students realised that y had to be negative, but there was a fairly even split between the three options for x.

20 Rearrange $y = \dfrac{5x + 9}{x}$ to make x the subject.

[4 marks]

Answer _____

Question 20, response 1

$$yx = 5x + 9$$

$$yx - 9 = 5x$$

$$y - 9 = \frac{5x}{x}$$

$$x(y - 9) = 5x$$

$$x = \frac{5x + 9}{y}$$

Commentary

To just over a third of the students, including this example, this was a standard and well-practised topic. A few lines of working arrived at the correct answer.

4 marks

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$$y = \frac{5x + 9}{x}$$

$$y - 9 = \frac{5x^{-9}}{x}$$

$$\frac{y - 9}{5} = \frac{x}{x}$$

Commentary

This student was one of many that went wrong at the first step by attempting to subtract 9 from each side. This led to a number of lines of inaccurate algebra.

0 marks

Question 20, response 3

$$y = \frac{5x + 9}{x} \Big) \times x$$

$$y = \frac{5x^2 + 9x}{x} =$$

$$y - 9x = 5x^2$$

$$\frac{y - 9x}{5} = x^2$$
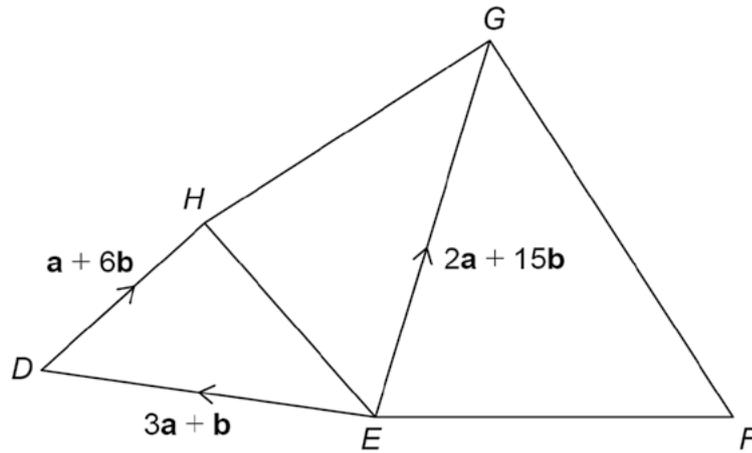
$$x = \sqrt{\frac{y - 9x}{5}}$$

Commentary

Another common mistake was to multiply $5x + 9$ by x to get rid of the denominator. In the case below the student has failed to multiply the left-hand side by x, but even if they had there was no path to the correct answer.

0 marks

Question 21

21 Five points are connected by vectors.

Not drawn accurately

$\overrightarrow{FG} = 2\overrightarrow{EH}$

Work out $\overrightarrow{FE}$ in terms of **a** and **b**.

[4 marks]

Answer _____

Question 21, response

$$\overrightarrow{EH} = 3a+b+a+6b = 4a+7b$$
$$\overrightarrow{FG} = 2(4a+7b) = 8a+14b$$

$$\overrightarrow{FE} = 8a+14b-2a+15b = 6a+29b$$

Answer $\quad 6a+29b$

Commentary

40% of students gained all four marks on this question, which was a better outcome than usual for a vectors question of this difficulty level. Nearly 10% of students gained 3 marks, usually because they went wrong with the final subtraction, omitting to use brackets (as above). This was covered in the mark scheme.

3 marks

It was rare to see students use the vertex notation to build up their paths, but those who did had greater success.

22 Work out $0.6\dot{8} - 0.4\dot{5}$

Give your answer as a fraction in its simplest form.

[5 marks]

Answer _____

Question 22, response 1

$100x - 10x = 68.888 - 6.888$

$\dfrac{90x}{90} = \dfrac{62}{90}$

$x = \dfrac{31}{45}$

$\dfrac{31^{\times 2}}{45_{\times 2}} - \dfrac{41}{90}$

$x = 0.4555$

$10x = 4.555$

$100x = 45.555$

$\dfrac{62}{90} - \dfrac{41}{90}$

$= \dfrac{22}{90} = \dfrac{11}{45}$

$100x - 10x = 45.555 - 4.555$

$\dfrac{90x}{90} = \dfrac{41}{90}$

Answer $\boxed{\dfrac{11}{45}}$

Commentary

Over half of the students were fully correct on this question. Those who did the subtraction first had fewer ways to go wrong and generally had more success. Those who converted both fractions first also did well, but often made silly errors, such as here, where they have calculated that 62 − 41 = 22. In this case, it only cost them the first A mark, as they were able to score the second on follow through.

4 marks

$$x = 0.68\dot{8}$$

$$1000x = 6.8\ 68.868\ 68......$$

$$99x = 68$$

$$= \frac{68}{99}$$

$$0.4\dot{5} = x$$

$$45.\dot{4}\dot{5}... = 100x$$

$$45 = 98x$$

$$\frac{45}{99} =$$

Commentary

This type of error was also seen far more often from those students choosing the 'convert first' method. They have acted as if there were a recurring dot on both decimal digits. From here it was impossible to score marks.
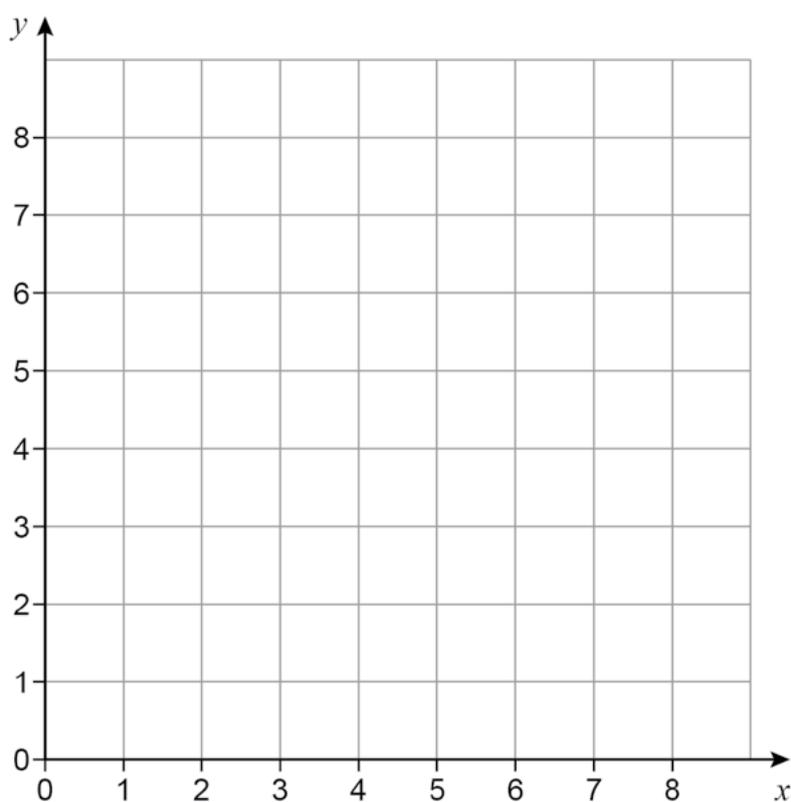
0 marks

Question 23
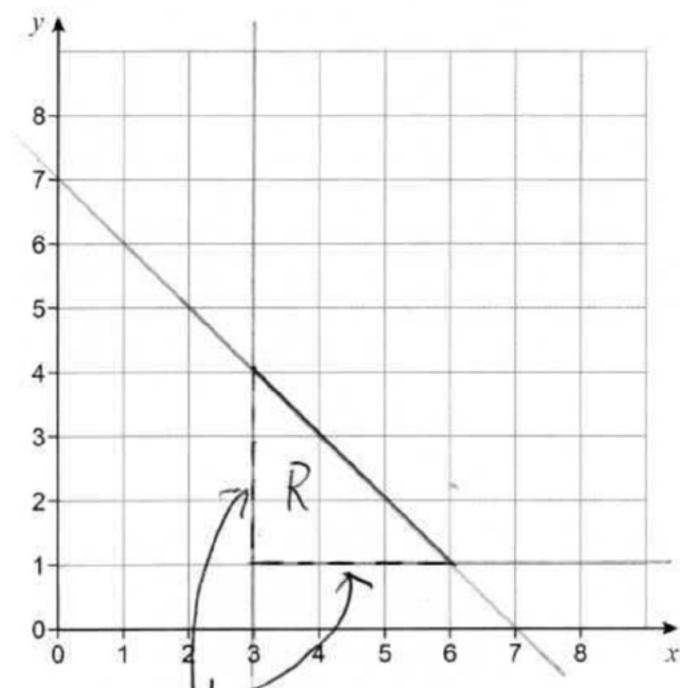
23 On the grid, identify the region represented by

$$x > 3 \quad \text{and} \quad y > 1 \quad \text{and} \quad x + y \leqslant 7$$
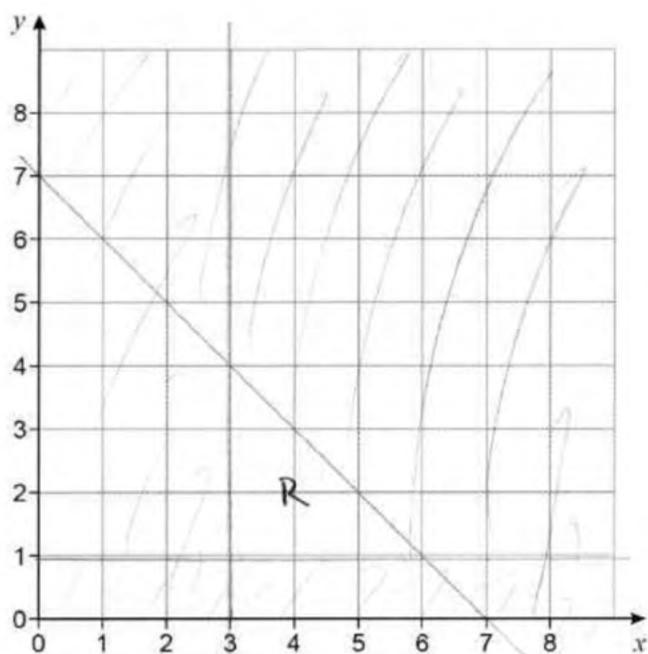
Label the region R.

[3 marks]

Commentary

There was a very good spread of marks on this question.

Note that students did not have to draw the lines across the complete grid for full marks, as with this student.
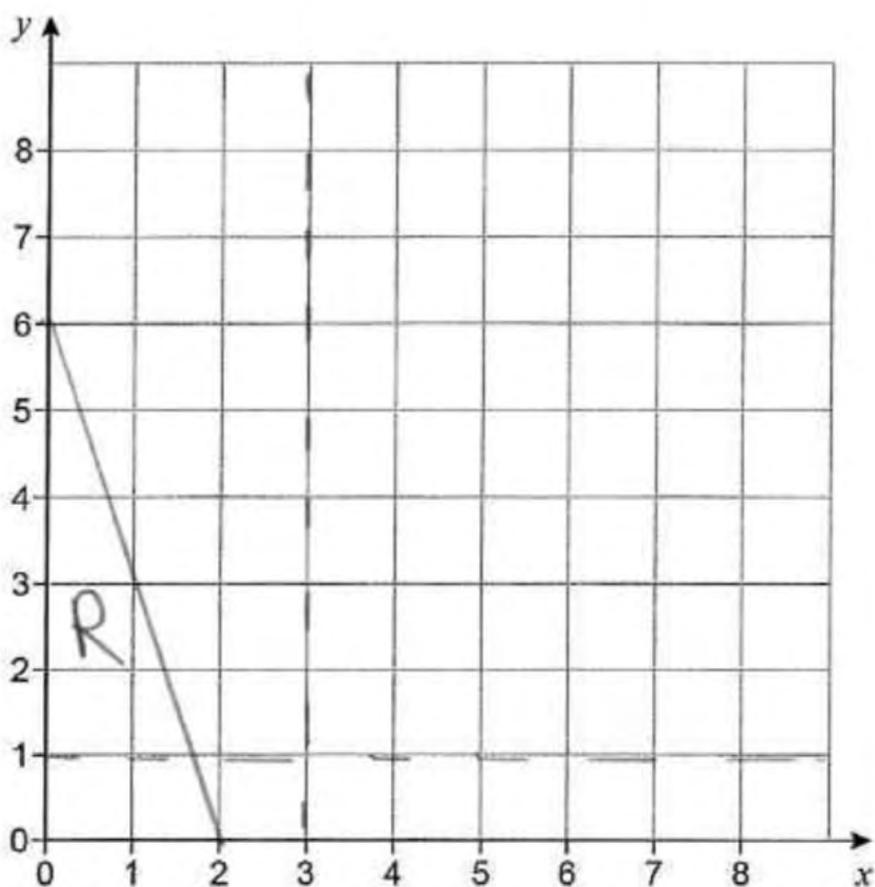
3 marks

Question 23, response 2

Commentary

It was common for students to score 2 marks by forgetting that the strict inequality lines had to be dashed, as here.
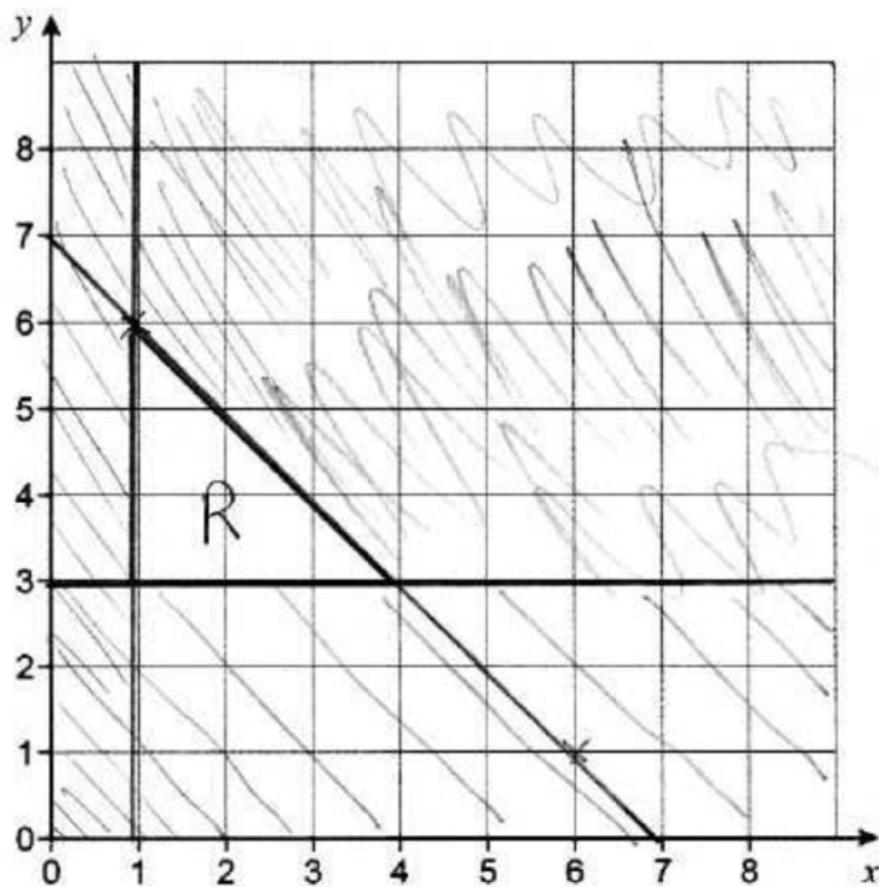
2 marks

Commentary

Students could pick up one mark for any correct line, such as this student, who has the correct dashed vertical and horizontal lines.

1 mark

Question 23, response 4

Commentary

This student also picks up one mark. As was fairly common, they have confused $x = 3$ with $y = 3$, etc, but do have the $x + y = 7$ line correct.

1 mark

24 (a) Simplify fully $\dfrac{6}{a} - \dfrac{11}{4a}$

[2 marks]

Answer _____

24 (b) Simplify fully $(y^2 - 3y) \times \dfrac{y^2 + 10y + 21}{y^2 - 9}$

[4 marks]

Answer _____

Question 24(a)

Commentary

Two thirds of the students scored both marks here. The most common error was subtracting the numerators and denominators to get $-\dfrac{5}{3a}$

Question 24(b), response 1

$$\frac{(y^2 - 3y)(y^2 + 10y + 21)}{y^2 - 9}$$

$$= \frac{y(y - 3)(y + 3)(y + 7)}{(y + 3)(y - 3)}$$

$$= y(y + 7)$$

Commentary

The best students took only a few lines to answer this question, correctly factorising and cancelling the three expressions.

4 marks

$$\frac{(y^2 - 3y) \times y^2 + 10y + 21}{y^2 - 9}$$

$$-9(y^2 - 3y) \times 10y + 21$$

$$(-9y^2 + 27y) \times (10y + 21)$$

$$-90y^3 \div 189y + 270y + 567y$$

$$-90y^3 - 1026y$$

21   Answer $-90y^3 - 1026y$

Commentary

At the other end of the scale, some students made one or more errors, as below, by thinking that the numerators had to be multiplied out and/or the denominator could be multiplied to the top and/or the y^2 could be immediately cancelled.

0 marks

Question 24(b), response 3

[4 marks]

$$\frac{(y+7)(y+3)}{(y+3)(y-3)}$$

$$\frac{y^2-3y}{1} \times \frac{y+7}{y-3} = \frac{y^3+4y^2-21y}{y-3}$$

Commentary

This student was one of the roughly 20% who correctly factorised both parts of the fraction but did not realise that the other expression could also be factorised.

2 marks

25   Here is the speed-time graph for a 50-second journey.

25 (a)   Circle the acceleration, in m/s², halfway through the journey.

[1 mark]

0   2   20   25

25 (b)   Work out the total distance travelled.

[2 marks]

Answer _____ m

Question 25

Commentary

Part (a) was fairly well answered, with nearly 60% of the students choosing the correct option.

Just under half scored both marks in part (b), with the most common error being to simply multiply 20 and 50 to get 1000.
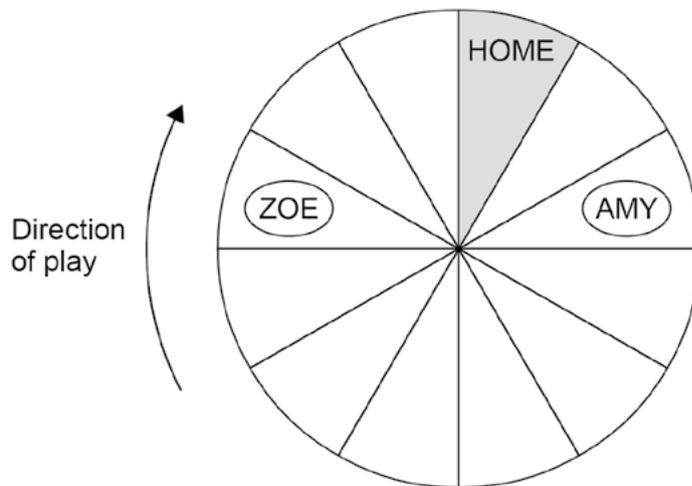
26 Zoe and Amy are playing a board game.

- They each have one disc and take turns to roll a fair, ordinary dice.
- The player moves their disc **clockwise** the number of spaces shown on the dice.
- The winner is the first player whose disc is on HOME at the end of a turn.

Here is the board after Amy's turn.

Work out the probability that Zoe wins within her next two turns.

[4 marks]

Answer _____

Question 26, response 1

$P(\text{Zoe wins}) = \frac{1}{6} \times \frac{1}{6} = \frac{1}{36}$

$P(1 \text{ and } 2) = \frac{1}{6} \times \frac{1}{6} = \frac{1}{36}$

$P(2 \text{ and } 1) = \frac{1}{6} \times \frac{1}{6} = \frac{1}{36}$

$P(3 \text{ First try}) = \frac{1}{6}$

$P(\text{Zoe wins}) = \frac{1}{36} + \frac{1}{36} + \frac{1}{6}$

$= \frac{8}{36} = \frac{4}{18}$

Answer $\quad \frac{8}{36} = \frac{4}{18}$

Commentary

Students who wrote down how Zoe could win were usually the most successful on this question, as with this clear and efficient solution.

4 marks

Zoe = 3 moves to win.

roll a 3 or roll 2 then 1

3 ⅙   ⅙ × ⅙ ¹/₁₂

⅙ × ¹/₁₂ = ¹/₇₂

Answer _____ ¹/₇₂ _____

Commentary

It was common for students to score the first two marks but miss out on the last two by forgetting that on the second roll the 2 and 1 could be in either order.

2 marks

Question 26, response 3

$$\frac{4}{6}$$

She could could roll:

|	
1 and 2	$\frac{1}{6} \times \frac{1}{6} = \frac{1}{12}$
2 and 1	$\frac{1}{6} \times \frac{1}{6} = \frac{1}{12}$ $= \frac{4}{12} = \frac{1}{3}$
Just a 3	$\frac{1}{6} = \frac{1}{6} = \frac{2}{12}$

Answer _____ $\frac{1}{3}$ _____

Commentary

Many students made arithmetic errors when multiplying fractions. This student employed a correct method but lost the accuracy mark. Note that the addition is implied for the third mark as their answer is correct for their three probabilities.
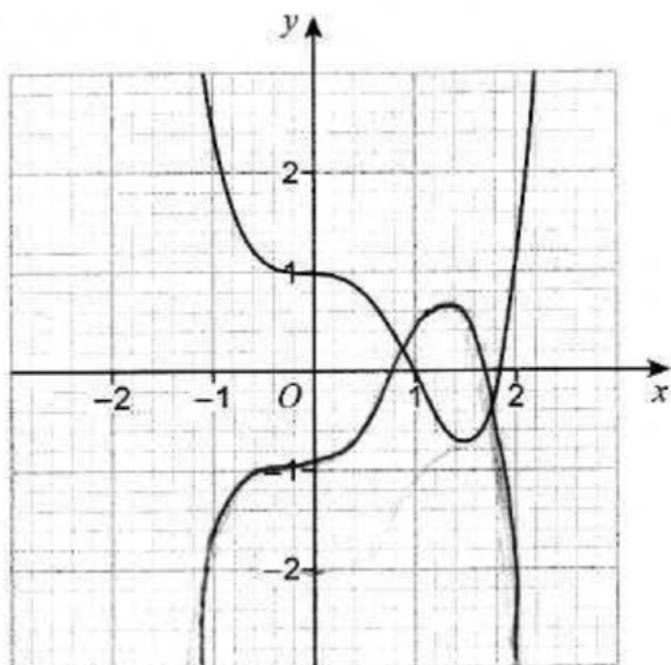
3 marks

Question 27

27   The grid shows the graph of $y = f(x)$
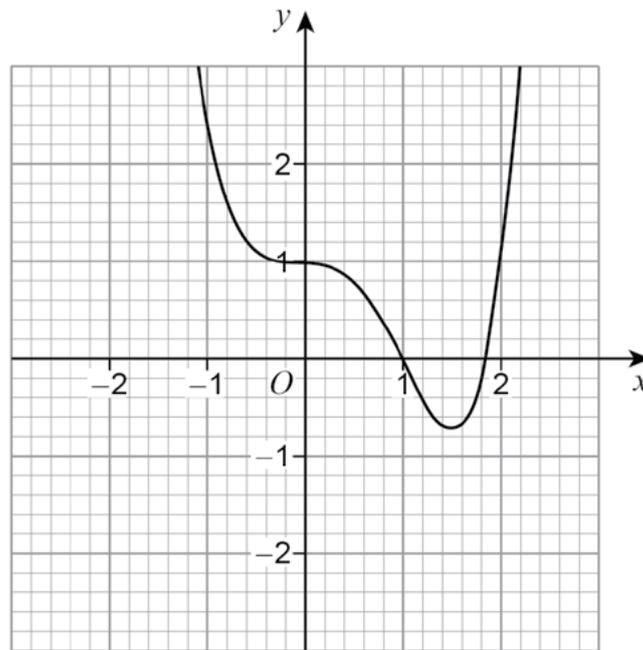
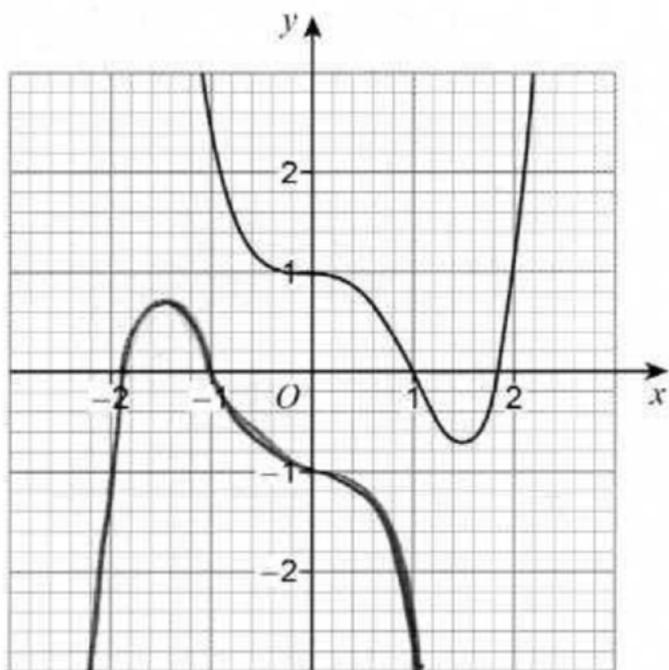On the grid, draw the graph of $y = -f(x)$

[2 marks]

Question 27, response 1

Commentary

Only one fifth of the students drew the correct curve accurately, with another 13% understanding where the curve should go but doing an inaccurate drawing, such as this one.

1 mark

Commentary

The most common error was to draw the curve as a rotation, perhaps because that was where the blank space was in the grid.

0 marks

Question 28

28   Work out the value of $(\cos 30° \times \sin 45° \times \tan 60°)^2$

[4 marks]

Answer _____

$$30 \times 45$$

$$
\begin{array}{lll}
45 & 1350 & 81000^2 \\
30 & 60 & \\
00 & 0000 & \\
1350 & 81000 & \\
1 & 23 &
\end{array}
$$

Answer 81000^2

Commentary

Recall of the trig values is improving, and under 30% of students failed to score here. Those who gained no marks sometimes worked with the angle values, as above.

0 marks

Question 28, response 2

Work out the value of $(\cos 30° \times \sin 45° \times \tan 60°)^2$

$$\frac{\sqrt{3}}{2} \times \frac{\sqrt{2}}{2} \times \sqrt{3}$$

$$\frac{\sqrt{3 \times 2 \times 3}}{2 \times 2 \times 1} = \frac{\sqrt{18}}{4} = \frac{\sqrt{2 \times 9}}{4} = \frac{3\sqrt{2}}{4}$$

Commentary

Those who did know the three values often lost the last two marks by forgetting to square, as with this student.

2 marks

$\tan 60° = \sqrt{3}$

$$\left(\sqrt{3}/2 \times \sqrt{2}/2 \times \sqrt{3}\right)\left(\sqrt{3}/2 \times \sqrt{2}/2 \times \sqrt{3}\right)$$

$3/2 \times \sqrt{6}/2 \times 3/2 \times 2/2 \times \sqrt{6}/2 \times \sqrt{6}/\sqrt{6} \times 3\sqrt{6} \times 6 \times 3$

$\sqrt{18}/4 \times \sqrt{6}/4 \times 6/2 \times 3/\sqrt{2} \times 6 \times 3$

$\sqrt{18}/4 \times 36/8 \times 3/\sqrt{2} \times 18$

$\sqrt{648} = \sqrt{1944}/32 \times \sqrt{2} \times 18$

$\times \sqrt{3}$

Answer _____ $\sqrt{1944}/32 \times \sqrt{2} \times 18$ _____

Commentary

Others treated the brackets with multiplication signs as if they were addition signs, therefore cross-multiplying and ending up with far too many terms.

2 marks

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