



**THE BEWDLEY SCHOOL**

Learning for Life - Achievement for All

**Year 10**

**Work Booklet**

This workbook contains English, Maths and Science Resources

**GCSE English Language**

Paper 1

Explorations in creative reading and writing



Study pack

**Work through Questions 1-4 on the following pages. Suggested answers are provided to help you if you are stuck.**

**Any subject terms which you don't understand, you can look up on the internet.**

**Once you reach *Lullaby*, by Elizabeth Berridge you will be able to tackle the questions on your own.**

**Remember to try to do your best and make sure your explanations are extremely clear.**

Extract from *The Goldfinch*, by Donna Tartt

I allowed myself another stealthy glimpse in the girl's direction. She was standing on one leg, with her hip swung out to the side. Then—quite suddenly—she turned and looked me in the eye; and in a heart-skip of confusion, I looked away.

What was her name? Why wasn't she in school? I'd been trying to make out the scribbled name on the flute case but even when I leaned in as far as I dared without being obvious, still I couldn't read the bold spiky marker strokes, more drawn than written, like something spray-painted on a subway car. The last name was short, only four or five letters; the first looked like R, or was it P?

"People die, sure," my mother was saying. "But it's so heartbreaking and unnecessary how we lose things. From pure carelessness. Fires, wars. The Parthenon, used as a munitions storehouse. I guess that anything we manage to save from history is a miracle."

The grandfather had drifted away, a few paintings over; but she was loitering a few steps behind, the girl, and kept casting glances back at my mother and me. Beautiful skin: milky white, arms like carved marble. Definitely she looked athletic, though too pale to be a tennis player; maybe she was a ballerina or a gymnast or even a high diver, practicing late in shadowy indoor pools, echoes and refractions, dark tile. Plunging with arched chest and pointed toes to the bottom of the pool, a silent pow, shiny black swimsuit, bubbles foaming and streaming off her small, tense frame.

Why did I obsess over people like this? Was it normal to fixate on strangers in this particular vivid, fevered way? I didn't think so. It was impossible to imagine some random passer-by on the street forming quite such an interest in me. And yet it was the main reason I'd gone in those houses with Tom: I was fascinated by strangers, wanted to know what food they ate and what dishes they ate it from, what movies they watched and what music they listened to, wanted to look under their beds and in their secret drawers and night tables and inside the pockets of their coats. Often I saw interesting-looking people on the street and thought about them restlessly for days, imagining their lives, making up stories about them on the subway or the crosstown bus. Years had passed, and I still hadn't stopped thinking about the dark-haired children in Catholic school uniforms—brother and sister—I'd seen in Grand Central, literally trying to pull their father out the door of a seedy bar by the sleeves of his suit jacket. Nor had I forgotten the frail, gypsyish girl in a wheelchair out in front of the Carlyle Hotel, talking breathlessly in Italian to the fluffy dog in her lap, while a sharp character in sunglasses (father? bodyguard?) stood behind her chair, apparently conducting some sort of business deal on his phone. For years, I'd turned those strangers over in my mind, wondering who they were and what their lives were like, and I knew I would go home and wonder about this girl and her grandfather the same way. The old man had money; you could tell from how he was dressed. Why was it just the two of them? Where were they from? Maybe they were part of some big old complicated New York family – music people, academics, one of those large, artsy West Side families that you saw up around Columbia or at Lincoln Center matinees. Or, maybe—homely, civilized old creature that he was – maybe he wasn't her grandfather at all. Maybe he was a music teacher, and she was the flute prodigy he had discovered in some small town and brought to play at Carnegie Hall—

"Theo?" my mother said suddenly. "Did you hear me?"

Her voice brought me back to myself. We were in the last room of the show. Beyond lay the exhibition shop – postcards, cash register, glossy stacks of art books – and my mother, unfortunately, had not lost track of the time.

0	1
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Read again the first part of the source, from **lines 1 to 3**.

List **four** things about Theo and 'the girl' from this part of the source.

[4 marks]

0	2
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Look in detail at this extract, from **lines 4 to 7** of the source.

What was her name? Why wasn't she in school? I'd been trying to make out the scribbled name on the flute case but even when I leaned in as far as I dared without being obvious, still I couldn't read the bold spiky marker strokes, more drawn than written, like something spray-painted on a subway car. The last name was short, only four or five letters; the first looked like R, or was it P?

How does the writer use language here to describe Theo's confusion?

You could include the writer's choice of:

- words and phrases
- language features and techniques
- sentence forms.

[8 marks]

Rhetorical question	Tone
Simile	Syntax
Adjective	Semi-colon

0	3
---	---

You now need to think about the **whole** of the source.

This text is from the beginning of a novel.

How has the writer structured the text to interest you as a reader?

You could write about:

- what the writer focuses your attention on at the beginning of the source
- how and why the writer changes this focus as the source develops
- Any other structural features that interest you.

[8 marks]

Beginning	Zooms in
Middle	Perspective
End	Flashback

## Basic Indicative Content

0	1
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- Theo looks at the girl
- The girl was standing on one leg
- Her hip was swung out to the side
- She looks Theo in the eye
- Theo looks away.

0	2
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- The use of **rhetorical questions** indicate Theo's confusion
- The **adjective** 'scribbled' shows that the writing is hard to decipher
- The graffiti **simile** emphasises the obscure form of the writing
- Theo's eager **tone** amplifies his desire to find out the girl's name
- The **semi-colon** marks a progression in Theo's thought process.

0	3
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- The extract **begins** with Theo seeing the girl. The writer **zooms in** on his thoughts, which show his confusion about her identity. This helps to create a sense of intrigue.
- The perspective **shifts** to his mother talking. We aren't given any context about what she is saying – we are disconnected from it. Its inclusion in the narrative emphasises that Theo is not interested in anything but the girl.
- The writer then **refocuses** Theo's thoughts on the physical appearance of the girl. This helps to emphasise his fixation on her.
- Towards the end of the extract, Theo **reflects** on his own character. He wonders why he 'obsesses' over people and he dreamily **reminisces** about other strangers he has observed in the past – Catholic school children and a 'gypsyish girl'.
- The end of the source **returns** Theo sharply back to reality and the present moment.

If you really want to hear about it, the first thing you'll probably want to know is where I was born, and what my lousy childhood was like, and how my parents were occupied and all before they had me, and all that David Copperfield kind of crap, but I don't feel like going into it, if you want to know the truth. In the first place, that stuff bores me, and in the second place, my parents would have about two haemorrhages apiece if I told anything pretty personal about them. They're quite touchy about anything like that, especially my father. They're nice and all – I'm not saying that – but they're also touchy as hell. Besides, I'm not going to tell you my whole goddam autobiography or anything. I'll just tell you about this madman stuff that happened to me around last Christmas just before I got pretty run-down and had to come out here and take it easy. I mean that's all I told D.B. about, and he's my brother and all. He's in Hollywood. That isn't too far from this crummy place, and he comes over and visits me practically every week end. He's going to drive me home when I go home next month maybe. He just got a Jaguar. One of those little English jobs that can do around two hundred miles an hour. It cost him damn near four thousand bucks. He's got a lot of dough, now. He didn't use to. He used to be just a regular writer, when he was home. He wrote this terrific book of short stories, *The Secret Goldfish*, in case you never heard of him. The best one in it was "The Secret Goldfish." It was about this little kid that wouldn't let anybody look at his goldfish because he'd bought it with his own money. It killed me. Now he's out in Hollywood, D.B., being a prostitute. If there's one thing I hate, it's the movies. Don't even mention them to me.

Where I want to start telling is the day I left Pencey Prep. Pencey Prep is this school that's in Agerstown, Pennsylvania. You probably heard of it. You've probably seen the ads, anyway. They advertise in about a thousand magazines, always showing some hotshot guy on a horse jumping over a fence. Like as if all you ever did at Pencey was play polo all the time. I never even once saw a horse anywhere near the place. And underneath the guy on the horse's picture, it always says: "Since 1888 we have been molding boys into splendid, clear-thinking young men." Strictly for the birds. They don't do any damn more molding at Pencey than they do at any other school. And I didn't know anybody there that was splendid and clear-thinking and all. Maybe two guys. If that many. And they probably came to Pencey that way.

Anyway, it was the Saturday of the football game with Saxon Hall. The game with Saxon Hall was supposed to be a very big deal around Pencey. It was the last game of the year, and you were supposed to commit suicide or something if old Pencey didn't win. I remember around three o'clock that afternoon I was standing way the hell up on top of Thomsen Hill, right next to this crazy cannon that was in the Revolutionary War and all. You could see the whole field from there, and you could see the two teams bashing each other all over the place. You couldn't see the grandstand too hot, but you could hear them all yelling, deep and terrific on the Pencey side, because practically the whole school except me was there, and scrawny and faggy on the Saxon Hall side, because the visiting team hardly ever brought many people with them.

There were never many girls at all at the football games. Only seniors were allowed to bring girls with them. It was a terrible school, no matter how you looked at it. I like to be somewhere at least where you can see a few girls around once in a while, even if they're only scratching their arms or blowing their noses or even just giggling or something. Old Selma Thurmer – she was the headmaster's daughter – showed up at the games quite often, but she wasn't exactly the type that drove you mad with desire. She was a pretty nice girl, though. I sat next to her once in the bus from Agerstown and we sort of struck up a conversation. I liked her. She had a big nose and her nails were all bitten down and bloody – looking and she had on those damn falsies that point all over the place, but you felt sort of sorry for her. What I liked about her, she didn't give you a lot of horse manure about what a great guy her father was. She probably knew what a phony slob he was.

The reason I was standing way up on Thomsen Hill, instead of down at the game, was because I'd just got back from New York with the fencing team. I was the goddam manager of the fencing team. Very big deal. We'd gone in to New York that morning for this fencing meet with McBurney School. Only, we didn't have the meet. I left all the foils and equipment and stuff on the goddam subway. It wasn't all my fault. I had to keep getting up to look at this map, so we'd know where to get off. So we got back to Pencey around two-thirty instead of around dinnertime. The whole team ostracized me the whole way back on the train. It was pretty funny, in a way.

The other reason I wasn't down at the game was because I was on my way to say good-bye to old Spencer, my history teacher. He had the grippe, and I figured I probably wouldn't see him again till Christmas vacation started. He wrote me this note saying he wanted to see me before I went home. He knew I wasn't coming back to Pencey.

I forgot to tell you about that. They kicked me out. I wasn't supposed to come back after Christmas vacation on account of I was flunking four subjects and not applying myself and all. They gave me frequent warning to start applying myself – especially around midterms, when my parents came up for a conference with old Thurmer – but I didn't do it. So I got the ax. They give guys the ax quite frequently at Pencey. It has a very good academic rating, Pencey. It really does.

0	4
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Focus this part of your answer on the second part of the source, from **line 18 to the end**.

A student said, 'This part of the story, about Pencey Preparatory School, shows that Holden Caulfield is rightly dissatisfied with his life there.'

To what extent do you agree?

In your response, you could:

- consider your own impressions of the Holden Caulfield
- evaluate how the writer conveys Caulfield's views on the school
- support your response with references to the text.

[20 marks]



## Key words

Dissatisfied	Despondent	Perspective
Alienated	Pessimistic	Tone
Awkward	Insightful	Syntax
Lonely	Realistic	Colloquialism
Disappointed	Sensitive	Metaphor

## Indicative content

- Caulfield is a socially **awkward** and **isolated** character; he does not seem to fit into life at Pencey Prep. He does not excel academically and he struggles to manage the fencing team.
- Caulfield is **disillusioned** at the **disconnection** between the public image of Pencey and the reality of school life. He emphasizes how much the school invests in marketing through the use of exaggeration – he says that ‘they advertise in about a thousand magazines.’
- Caulfield **exaggerates** again when he reflects on the **rivalry** between Pencey and Saxon Hall. He says that ‘you were supposed to commit suicide or something if old Pencey didn’t win.’ His clear lack of seriousness helps to convey a sarcastic, disillusioned tone.
- Caulfield does not attend the game, despite ‘practically the whole’ school turning out to support Pencey. This helps to highlight his **isolation** from his peers.
- Caulfield says of Pencey that ‘it was a **terrible** school, no matter how you looked at it.’ To Caulfield, every single aspect of school life is unsatisfactory.
- Caulfield claims that he ‘forgot’ to tell the reader about his **expulsion**. He says that he got the ‘axe’ for ‘flunking four subjects’. His use of colloquial language not only highlights his **dissatisfaction** with Pencey, but also his lack of regret for not ‘applying’ himself at all. We are given the impression that he’s glad to leave.

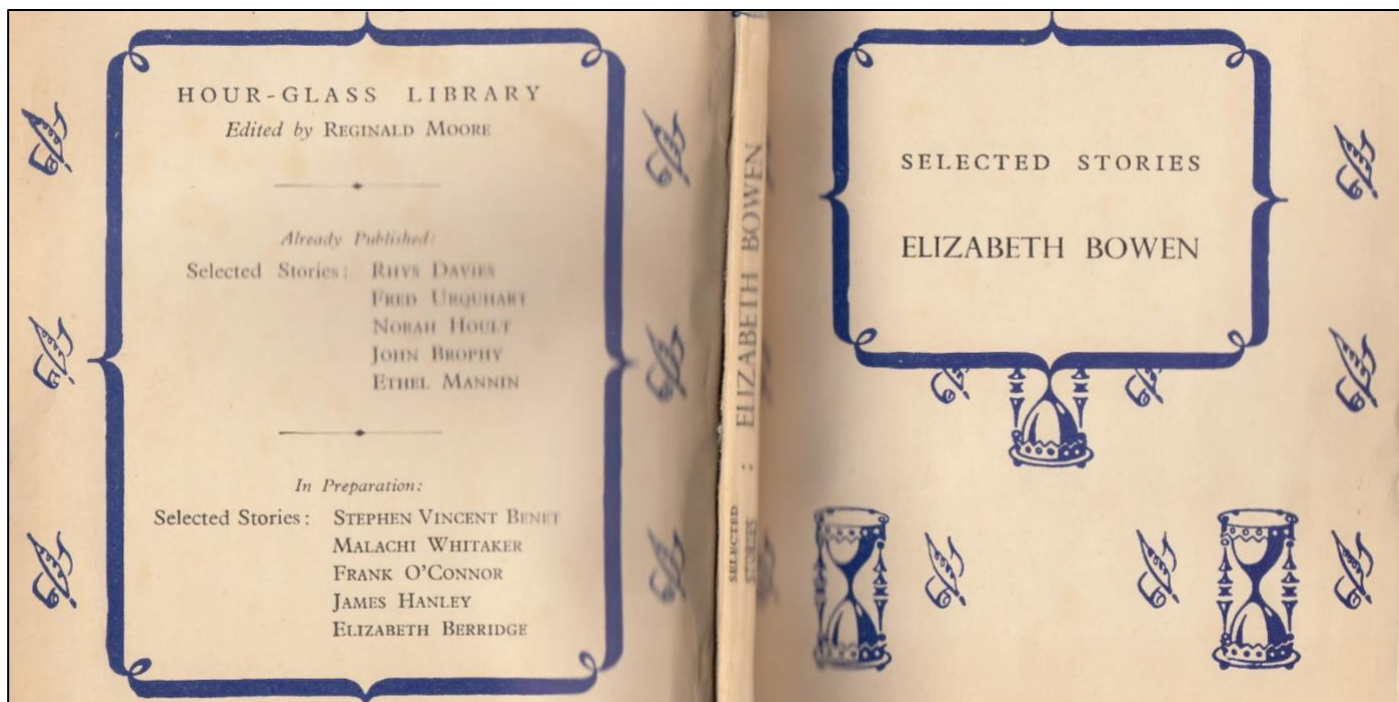
*Please read this carefully before you begin the task.*

**Background about the writer you are about to study. This information was taken from her obituary, the review of her life that appeared in the newspaper after her death.**

The novelist Elizabeth Berridge, who has died aged 89, was a writer of rare distinction who deserved more recognition than she ever received. She was born in south London, of English/Welsh ancestry. Her father was a land agent, administering large London and country estates, and she may have inherited something of his eye for property, for her descriptions of houses and localities, especially of the growth and development of the southern suburbs where she grew up and lived for large parts of her life, are **memorable for their sharpness and accuracy**.

Although [Berridge] was, on the surface, a conventional master of conservative suburban fiction, her work concealed a deep subversiveness. The reader continually finds his expectations railroaded on to a completely different track. She was, par excellence, the **celebrator of family life**. There is, as she said herself, no substitute for the family: 'It is society's first teething ring, man's proving ground. When repudiated, it still leaves its strengthening mark. When it does the rejecting, the outcast is damaged. Within its confines, devils and angels rage together, emotions creep underfoot like wet rot, or flourish like Russian ivy. It is the world in microcosm, the nursery of tyrants, the no man's land of suffering, a place and a time, a rehearsal for silent parlour murder.

Berridge was an expert at **charting the small cruelties that husband and wife**, parent and child, can inflict on each other in the domestic arena, and at describing the intrinsic dignity and extrinsic humiliations of old age. On the other hand, she freely admitted to a preoccupation with aunts, and this is manifest in most of her finely crafted fiction, where aunts of all varieties – mainly elderly – proliferate on the page, realistically, if lovingly, described. Readers of *Across the Common* will not soon forget Aunt Seraphina, expertly stuffing her bag with cuttings from the flowerbeds of Regent's Park under the nose of the keeper for the benefit of her garden at home.



Source: <https://www.theguardian.com/books/2009/dec/16/elizabeth-berridge-obituary>

## The Source - *Lullaby*, by Elizabeth Berridge

She had never been quite sure about it, but he was convinced.

'It's a great idea, a marvellous idea,' he said, 'but of course if you don't want to come out with me when I'm on leave, just say so.'

So she had given in. She always did. Life with him was precarious; always had been. She had sudden terrible fears of him leaving her. Suddenly walking from the room, out of the house, knowing he had gone on to some other life and needed no one. 'It's being in the air so much, doing so much flying,' she thought. 'It must do something to you.' Hanging on to a cloud and never coming down – only of course you fell through a cloud.

When they had the child it was better, for a time. Then the juggling began. She could keep them both spinning equably, dexterously, for a time; father and son, son and father, but then her hand would become tired, the trick fail. This was such a time, so she said yes, and they went to friend of his who had cashed in on the pre-war vanity of people who wanted their voices recorded.

'Only a few left,' he said. Wistfully he looked over the wax discs. 'Still, it was fun while it lasted.– Did I tell you the story of the man who was too nervous to propose on the spot?'

'Yes,' he was told.

'Oh.' He was obviously disappointed, 'Well, what are you going to do?'

It was explained.

'Why, that's wonderful' he exclaimed. 'That's – come on, let's hear you.'

They tried it out that evening and sat listening in the next room. The child was in his cot, but was talking to himself in a queer half-language

of his own. He sang a little, chuckled and made astonished noises. Then the record was started.

'Go to sleep, darling,' came his mother's voice from the black box. There was a pause, then 'Hush now, bye-byes.' The baby stopped murmuring and settled down. Then the voice said: 'Everything's all right, Mama's here.' The child seemed to be asleep, but they let the record run to the end. 'It won't disturb him,' she whispered, and gazed as the voice sang, a little self-consciously spinning from under the needle. 'What's to be done with the baby son –'

A little breathlessly the record stopped, clicked. The next room was silent.

'There!' he said triumphant. 'That's all right, isn't it? He only needs to hear your voice and off he goes.' She smiled. It did seem a good idea.

'Come on,' he said, 'let's go.'

They did it once or twice after that, until he had to return to his station. But he couldn't forget it. 'You must make one for me,' he wrote. But somehow she never did. She hated her voice spinning off the black disc; she felt as if her whole being was caught beneath the sharp needle, dragged round like a piece of fluff in the shining grooves.

When he next came on leave he said: 'Sanders tells me we positively must see that film at the Empire. It's tremendous.'

'The Empire?' she said. 'It's a long way.'

He looked at her with the peculiarly blank expression he assumed when he was determined to do something in the face of any obstacle.

'We've got the record,' he said. 'We'll be home by ten if we go early.'

So that evening she put the baby to bed earlier, and they set the record off as they went out of the door. In the hall, he stopped suddenly and caught her in his arms. 'You're sure you feel all right about leaving him, darling?' he asked. 'I'm a selfish brute.'

She laughed. Her fear was always there, but it must not spoil his evening, and the idea of him being worried somehow strengthened her.

'He'll be all right,' she said firmly. 'Don't worry.'

Together they walked down the road.

'What a wind!' she said.

Back in the nursery the wind in a sudden gust shifted aside the blackout curtain they had always meant to fix. The house stood on a corner and took the full force of any storm.

'More of a gale,' he said.

The nightlight, usually unwavering in its saucer, flickered unsteadily; a tiny edge of the curtain was blown across and remained a little above it. From his cot the baby watched the flame grow bright. He chuckled and sang to himself. Then his mother's voice came gently. 'Go to sleep, darling.' He turned over and put his thumb in his mouth. But the brightness still fascinated him; he wanted

to tell his mother about it. 'Hush now, bye-byes.' Obediently he closed his eyes. A sudden intensity of light swept across his eyelids; the curtains were blazing. He opened his mouth to scream with sudden inexplicable fear, but across the lighted room came the trusted voice that was with him all day, 'You're quite all right. Mama's here.' He looked about, where was she?

He didn't like it. The wind rushed round the corner and swept the fire across to the chest of drawers – cottonwool, picture-books. The baby was standing in his cot now, gripping the rail and shaking, his eyes wide and black with fear, almost islanded by flame and across the room came the lullaby... 'we'll put him away for a rainy day...'

As they got off the bus, she gripped his arm. The journey had passed in silence, but now it was as if she lay beneath the sharp needle, caught in the spinning grooves.

'Did you hum that song we made up for the baby just then?' Her voice was edged, and he looked at her, startled.

'No,' he said, 'I could have sworn you were singing it.'

For a moment they looked at one another. Then:

'Taxi!' he shouted. 'Taxi!'

0 | 1 Read again the **third paragraph** of the source.

List **four** things about the (unnamed) wife from this part of the source

[4 marks]

**Don't** write lengthy, unfocused answers

**Don't** make inferences on the passage

**Do** write short, succinct answers

**Do** select short, relevant quotations

0 | 2 Look in detail at this extract, from **paragraph four** of the source:

When they had the child it was better, for a time. Then the juggling began. She could keep them both spinning equably, dexterously, for a time; father and son, son and father, but then her hand would become tired, the trick fail. This was such a time, so she said yes, and they went to friend of his who had cashed in on the pre-war vanity of people who wanted their voices recorded.

How does the writer use language here to convey the wife's views on family life?

You could include the writer's choice of:

- words and phrases
- language features and techniques
- sentence forms.

[8 marks]

**Don't** simply list technical terms

**Do** focus on why the writer has used certain words, short phrases and language devices

0 | 3 You now need to think about the whole of the source.

This text is a complete short story.

How has the writer structured the text to interest you as a reader?

You could write about:

- what the writer focuses your attention on at the beginning of the source
- how and why the writer changes this focus as the source develops
- any other structural features that interest you

[8 marks]

**Don't** retell the sequence of events

**Don't** write about the writer's use of language

**Do** write about shifts and changes in the text

**Do** note a structural feature at a certain point and then comment on how it is developed



**0 | 4** Focus this part of your answer on the **second page of the source to the end**.

A student said, 'This part of the story, where the two parents decide to go to the cinema, shows how neglectful and selfish they are, and the fire is ultimately their fault.'

To what extent do you agree?

In your response, you could:

- consider your own impressions of what the actions of the parents
- evaluate how the writer conveys the actions of the parents
- support your response with references to the text.

[20 marks]

- Don't** write about details outside the stated lines
- Don't** feel you need to construct artificial counter-arguments
- Don't** include unrelated information about historical context
- Do** remember that the best answers are 'detailed' and 'perceptive'
- Do** adopt a method-based approach (e.g. the writer used the word/phrase to show...)
- Do** explicitly refer back to the question
- Do** consider to what extent you agree or disagree with the statement.

0 | 5 A magazine has asked for contributions for their creative writing section.

Either

Write a description of a visit to the cinema as suggested by the picture below:



or

Write a story about a time when you made a bad decision.

(24 marks for content and organisation

16 marks for technical accuracy)

[40 marks]

- Don't** use plots based on films or computer games
- Don't** write about gory or unpleasant incidents
- Do** plan your response
- Do** spell key words correctly
- Do** use correct and varied punctuation
- Do** remember that 'advanced' words do not always add clarity

### Now Assess What You Have Learnt

Answer the questions **below**.

If you get stuck, think harder. And if you're still stuck, look in your book.

1. Is the section A text fiction or non-fiction?
2. What does section B require you to do?
3. How many marks are available for the whole paper?
4. How many marks are available for question 3?
5. How many marks are available for question 4?
6. How many marks are available for question 5?
7. How many of the marks for question 5 are awarded for technical accuracy?
8. What are you required to do for question 1?
9. What are you required to do for question 2?
10. What are you required to do for question 4?
11. List three 'language' terms?
12. List three 'structure' terms?

# Maths - Percentages and ratios

## Section A

### Question 1

Sam bought a car for £700  
He sold the car for a 20% profit.

Work out how much Sam sold his car for.

£ .....

**(Total 3 marks)**

### Question 2

Jackie orders a new washing machine.  
The washing machine costs £350  
Jackie pays a deposit of 20% of the cost.

Work out how much deposit Jackie pays.

£ .....

**(total 3 marks)**

**Question 3**

Angela earns £35 240 a year.

She has to pay income tax.

She is allowed to earn £6475 before paying tax.

She pays 20% tax on the rest.

Her employer deducts the income tax each month.

Work out how much income tax Angela gets deducted each month.

£ .....

**(Total 5 marks)**

**Question 4**

Christie wants to buy this car.

The salesman reduces the price by 15%.

Work out 15% of £7250.



£ .....

[2]

**Question 5**

A computer costs £650. This price is reduced by 18%.

Calculate the reduced price of the computer.

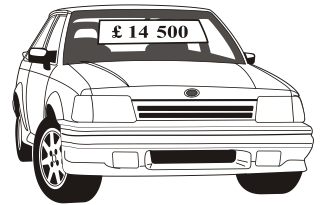


£ .....

[3]

**Question 6**

The price of a new car is £14 600 plus 17.5% VAT. Calculate the total cost of the car.



£ ..... [3]

**Question 7**

The rate of VAT was reduced in December 2008 from  $17\frac{1}{2}\%$  to 15%.



**For sale**

**Lawnmower £ 140 + VAT**

Work out the difference in price of a lawnmower due to the reduction in VAT.

.....

.....

.....

Answer £ ..... (3 marks)

**Section B**

**Question 8**

This table gives information about three burgers. Which of these burgers has the highest percentage of carbohydrate by weight? Show your working clearly.

	Total Weight (g)	Carbohydrate (g)
Bumper burger	274	47
Cheese burger	173	29
Veggie burger	252	54

..... [3]



**Question 9**

Andrew got 42 out of 50 marks in a history test.  
He got 48 out of 60 marks in a geography test.

The marks for each test were changed to a percentage.

In which test did Andrew get the higher percentage mark?  
You must show all your calculations.

.....

**(total 4 marks)**

**Question 10**

Greg goes shopping with £20.  
He spends £5.60 on his lunch.  
He needs £1.30 for his bus fare.  
He sees this advert for shoes.

<p style="text-align: center;"><b>Shoes</b></p> <p style="text-align: center;">Normal Price £ 15</p> <p style="text-align: center;">Sale price 10% off normal price</p>
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Does he have enough money to buy them?

You **must** show your working

.....

.....

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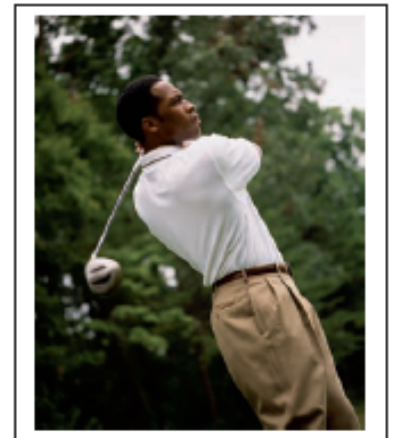
.....

*(4 marks)*

**Question 11**

The table shows the membership and annual fees of a local golf club.

	<b>Full members</b>	<b>Weekday members</b>	<b>Lady members</b>	<b>Junior members</b>
<b>Number of members</b>	243	64	77	36
<b>Annual Fee</b>	£600	£300	£250	£120



The club needs to raise £7200 to refurbish the clubhouse next year.

In the committee meeting, the club Captain suggests that the fee for each full member next year should be increased by 5%.

The club President says that next year each member should pay an extra £18

Which is the better suggestion?

You must show all your working.

**(total 5 marks)**

**Section C**

**Question 12**

Two girls share £24.80 in the ratio 3:5

Work out the difference between the larger share and the smaller share.

£ .....

**(Total 3 marks)**

**Question 13**

In a classroom the ratio of tables to chairs is 6 : 30

(a) Express the ratio 6 : 30 in its simplest form.

.....  
**(1)**

The ratio of boys to girls in a class is 1 : 2

(b) What fraction of the class are boys?

.....  
**(1)**

**(Total 2 marks)**

**Question 14**

Rosa makes pizzas.

She uses cheese, topping and dough in the ratios 2 : 3 : 5  
Rosa uses 70 grams of dough.

Work out the number of grams of cheese and the number of grams of topping Rosa uses.

Cheese ..... g

Topping ..... g

**(Total 3 marks)**

**Question 15**

A box contains only red pencils and blue pencils.

The ratio of the number of red pencils to the number of blue pencils is 2 : 3

What fraction of the pencils are red?

.....

**(Total 2 marks)**

**Question 16**

Ann and Bob shared £240 in the ratio 3 : 5

Ann gave a **half** of her share to Colin.

Bob gave a **tenth** of his share to Colin.

What fraction of the £240 did Colin receive?

.....  
**(Total 3 marks)**

**Question 17**

Mr Green makes some compost.

He mixes soil, manure and leaf mould in the ratio 3:1:2

Mr Green makes 72 litres of compost.

How many litres of leaf mould does he use?

..... litres  
**(3)**

**Question 18**

Jenny uses her mother's recipe to make cheese scones.

Her recipe uses a mixture of self-raising flour, butter and cheese in the ratio 6 : 2 : 1 by weight.

In her kitchen, Jenny has:

2 kg of self-raising flour,

500 grams of butter,

200 grams of cheese.

When Jenny makes cheese scones each scone needs about 45 grams of mixture.

Work out the largest number of cheese scones that Jenny can make.

.....  
**(Total 4 marks)**

# Product of prime factors, HCF/LCM and BIDMAS

## Section A

### Question 1

Write 200 as a product of its prime factors.

-----  
(3)

### Question 2

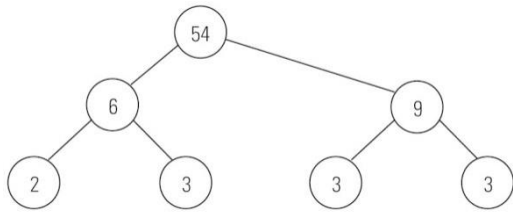
(a) Express 120 as a product of its prime factors.

.....  
(2)



**Question 3**

Use this factor tree to write 54 as a product of its prime factors.



.....

**Question 4**

Write each of the following numbers as the product of its prime factors.

a 24 ..... b 40 .....

c 50 ..... d 72 .....

**(Total 4 marks)**

**Question 5**

Express 420 as the product of its prime factors.

.....

[2]

**Question 6**

As a product of prime factors,

$$24 = 2 \times 2 \times 2 \times 3.$$

Write 40 as a product of prime factors.

.....

[2]

**Question 7**

Write 48 as the product of prime factors.

Give your answer in index form.

.....

.....

.....

.....

.....

.....

.....

Answer .....

**(2 marks)**

**Section B**

**Question 8**

- (a) Find the highest common factor (HCF) of 30 and 45

-----  
**(2)**

- (b) Find the lowest common multiple (LCM) of 30 and 45

-----  
**(2)**

**Question 9**

Find the Highest Common Factor (HCF) of 44 and 77

-----  
**(3)**

**Question 10**

Find the highest common factor (HCF) of 90 and 120

(1)

.....

**Question 11**

(a) Work out the highest common factor (HCF) of  
16 and 20

(1)

.....

(b) Work out the Lowest common multiple (LCM) of  
16 and 20

(1)

.....

**Question 12**

Find the lowest common multiple (LCM) of 25 and 30.

.....

[2]

**Question 13**

- (i) Work out the highest common factor (HCF) of 24 and 40.

.....

[2]

- (ii) Work out the lowest common multiple (LCM) of 24 and 40.

.....

[2]

**Section C**

**Question 14**

Work out.

(a)  $6 - 2 \times 5$

.....

[1]

(b)  $(4 + 2)^2$

.....

[1]

(c)  $3 \times 5^2 + 4 \times 5$

.....

[2]

**Question 15**

(a) Anwar and Colin work out this sum.

$$4 + 2 \times 3 =$$

Anwar says the answer is 18.

Colin says the answer is 10.

Who is correct? Give a reason.

*Write Anwar or Colin on the first space.*

..... because .....

.....

[1]

(b) Work out.

$$(14 - 6) \times 3^2$$

.....

[2]

**Question 16**

Insert brackets in each of the following calculations so that they are correct.

$$2 + 5 \times -4 = -28$$

$$2 \times 5 + -4^2 = 2$$

$$2 \times 5 + -4^2 = 36$$

[3]

**Question 17**

Work out the value of  $(4 + 5) \times 2 + 3$

.....  
(1)

**Question 18**

Work out the answers to:

a)  $4 + 5 \times 3 =$  \_\_\_\_\_

b)  $3^2 + 2^2 =$  \_\_\_\_\_

c)  $\frac{7 + 3}{5} =$  \_\_\_\_\_

(Total 3 marks)



**Question 19**

**Work out**

**a**  $37 - (6 \times 3)$

**b**  $(7 + 2) - (16 - 9)$

**c**  $7 \times 5 + 3 \times 8$

**d**  $45 \div (8 - 3)$

**(Total 4 marks)**

# Area, surface area and Pythagoras' Theorem

## Section A

### Question 1

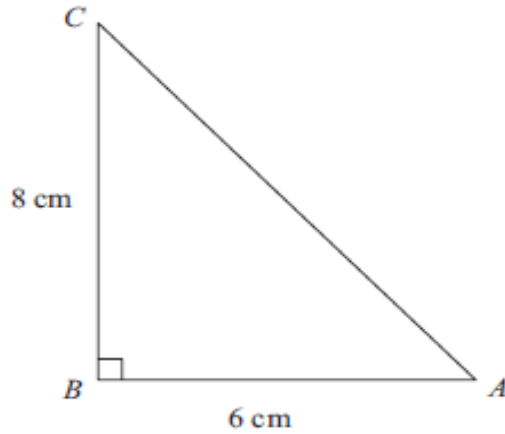


Diagram **NOT** accurately drawn

Calculate the area of the triangle.

..... cm<sup>2</sup>  
(2)

### Question 2

The diagram shows a 6-sided shape made from a rectangle and a right-angled triangle.

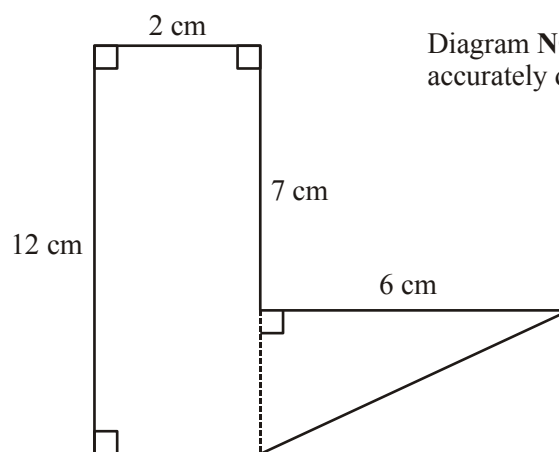


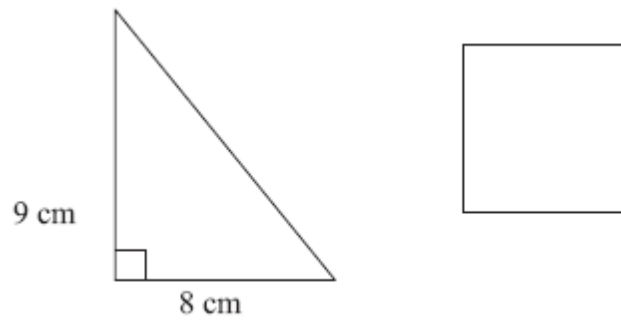
Diagram **NOT** accurately drawn

Work out the total area of the 6-sided shape.

.....cm<sup>2</sup>  
(Total 3 marks)

**Question 3**

The diagram shows a triangle and a square.



Diagrams **NOT**  
accurately drawn

Calculate the area of the triangle. The square has the same area.

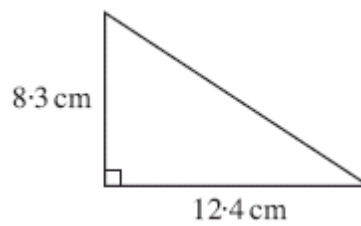
What is the length of one side of the square?

(Total marks 3)

**Question 4**

Calculate the area of this right-angled triangle.

Give the units of your answer.

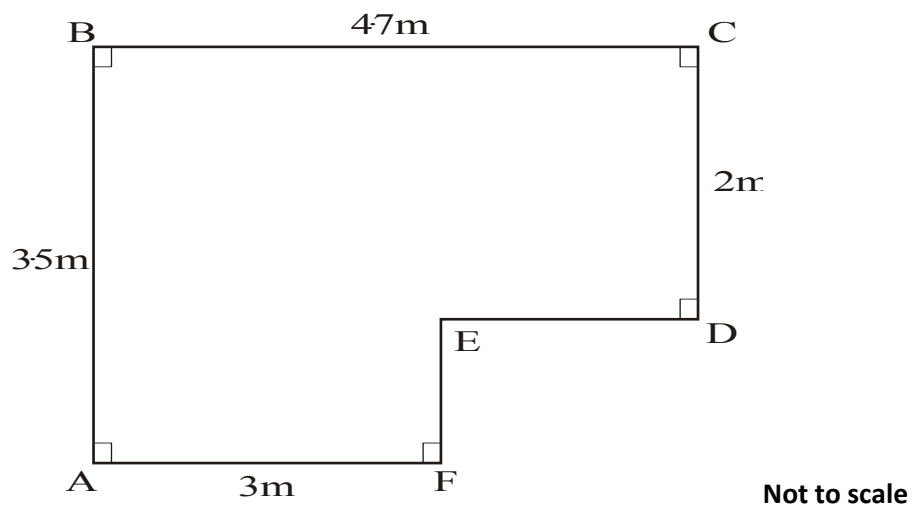


Not scale

.....

[3]  
[1]

Question 5



Work out the area of this shape.

..... m<sup>2</sup>

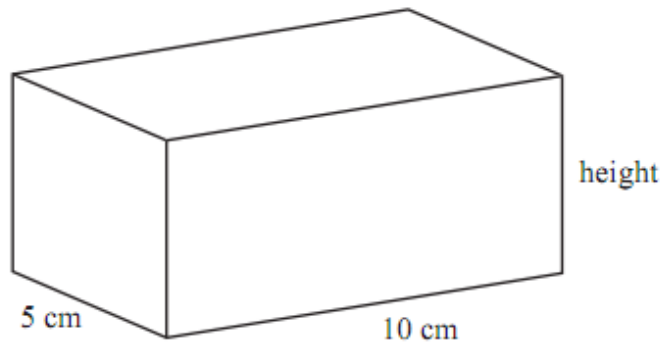
[3]

**Section B**

**Question 6**

Here is a solid cuboid.

Diagram **NOT**  
accurately drawn



The cuboid has a width of 5 cm and a length of 10 cm.

The cuboid has a total surface area of  $280 \text{ cm}^2$ .

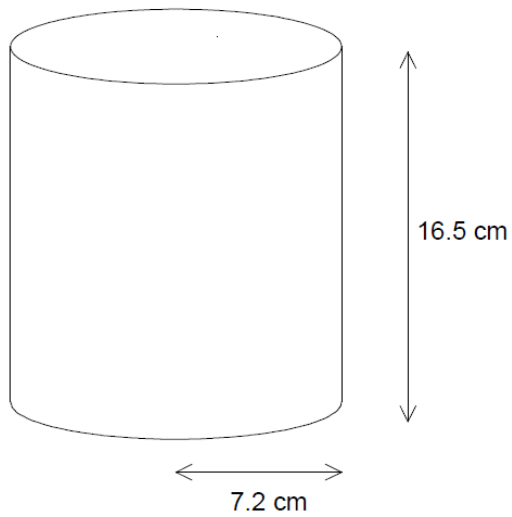
Work out the height of the cuboid.

**Question 7**

A cylinder has radius 7.2cm and height 16.5cm.

Find the surface area of the cylinder.

Give your answer correct to 3 significant figures. You must state the units.

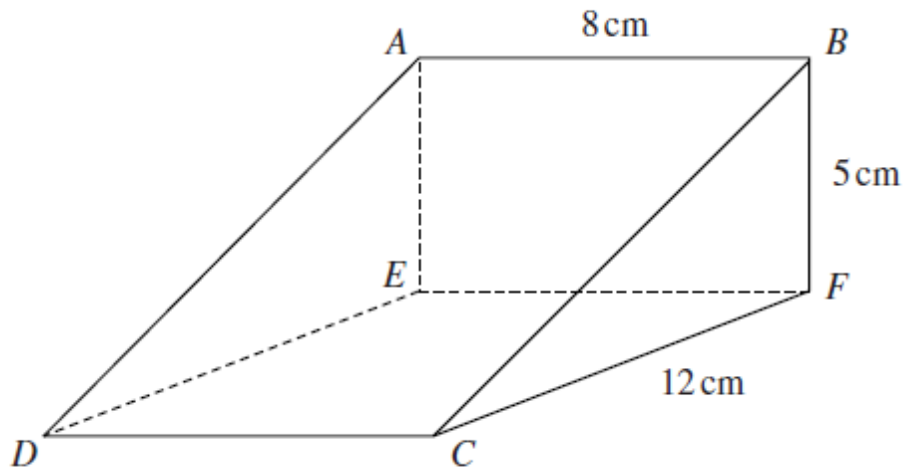


.....

[4]

**Question 8**

A prism  $ABCDEF$  with a right-angled triangular cross section has dimensions as shown.



Not drawn accurately

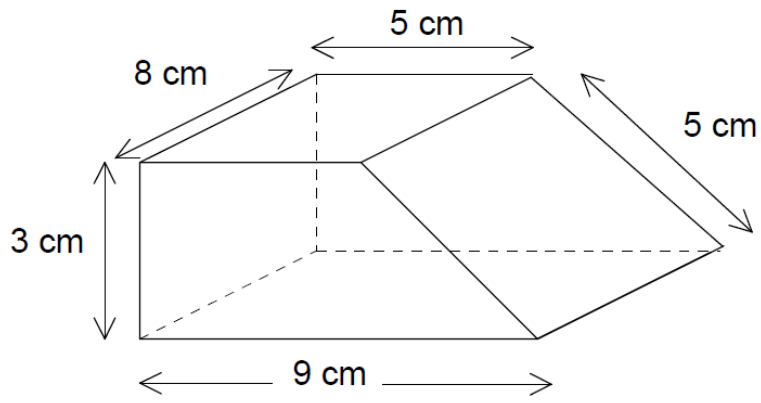
Calculate the surface area

(3 marks)

**Question 9**

Calculate the surface area of the prism.

You must state the units.



.....

[3]



Section C

Question 10

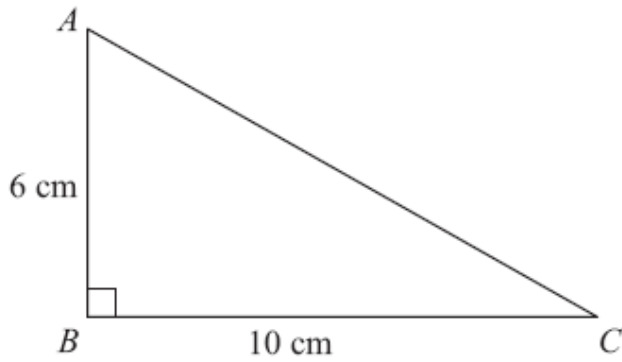


Diagram NOT  
accurately drawn

$ABC$  is a right-angled triangle.  
 $AB = 6$  cm.  
 $BC = 10$  cm.  
Calculate the length of  $AC$ .  
Give your answer correct to 1 decimal place.

..... cm

(Total 3 marks)

Question 11

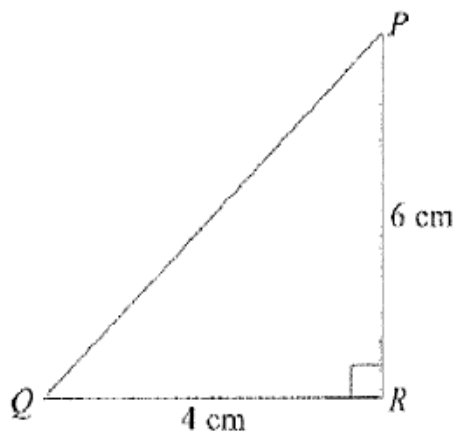


Diagram **NOT**  
accurately drawn

$PQR$  is a right-angled triangle.

$PR = 6\text{ cm}$ .

$QR = 4\text{ cm}$ .

Work out the length of  $PQ$ .

Give your answer correct to 3 significant figures.

.....

(3)

Question 12

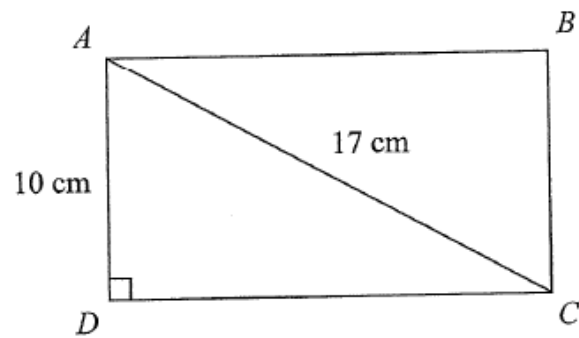


Diagram **NOT**  
accurately drawn

$ABCD$  is a rectangle.  
 $AC = 17\text{ cm}$ .  
 $AD = 10\text{ cm}$ .

Calculate the length of the side  $CD$ .  
Give your answer correct to one decimal place.

.....

(4)

**Question 13**

Alan and Bhavana are planning their fitness program.

They plan to run on parts of a field.

The diagram below shows a rectangular field 80 metres by 60 metres.

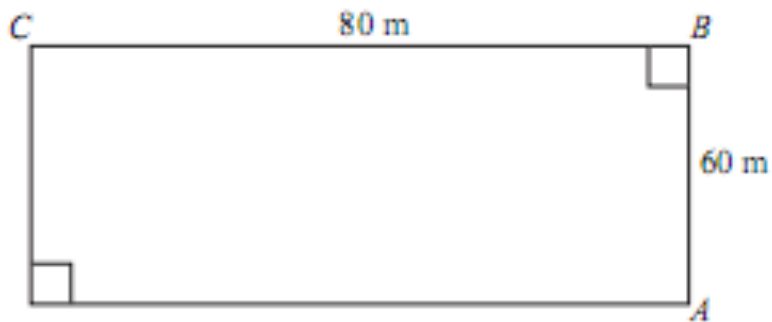


Diagram **NOT** accurately drawn

Alan runs around the field from A to C via B.

Bhavna runs directly across the diagonal of the field from A to C.

- (a) How far does Alan run?
- (b) How far does Bhavna run?
- (c) Who has to run furthest and by how much?

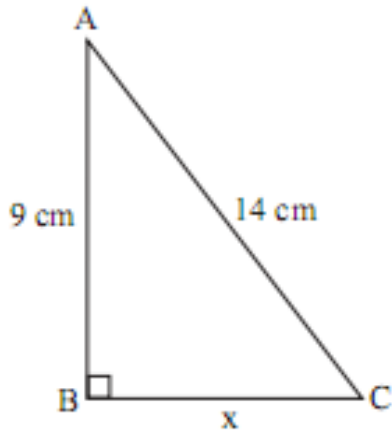
You must explain your answer.

**(Total 3 marks)**

**Question 14**

Find the length of side BC.

Give your answer correct to one decimal place.

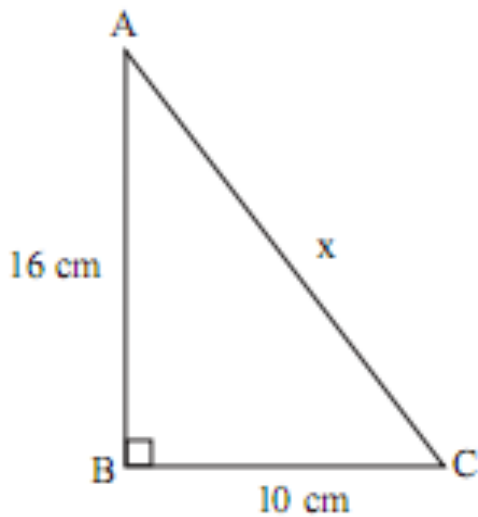


BC = \_\_\_\_\_ cm

**Question 15**

Find the length of side AC.

Give your answer correct to one decimal place.

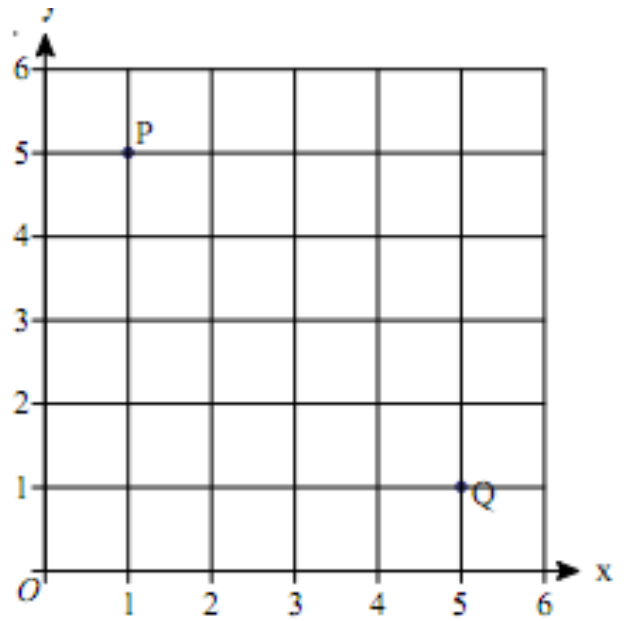


BC = \_\_\_\_\_ cm

Question 16

Points P and Q are on a centimetre grid as shown. Find the distance PQ, giving your answer correct to one decimal place.

Distance PQ = \_\_\_\_\_ 3



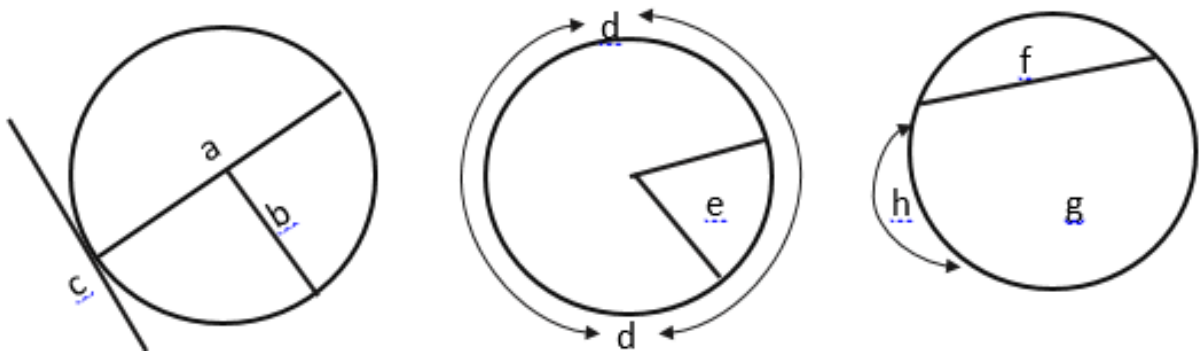
(Total 3 marks)

# The circle, converting between measures and volumes

## Section A

### Question 1

Write down the names of the labelled parts of the circles below.



- |         |         |         |
|---------|---------|---------|
| a ..... | d ..... | f ..... |
| b ..... | e ..... | g ..... |
| c ..... |         | h ..... |

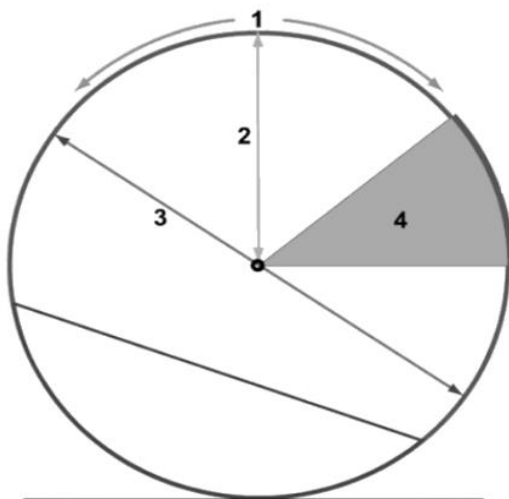
(Total 3 marks)

### Question 2

Here is a list of words that are connected with circles.

arc    radius    chord    diameter    circumference    sector

Label the four boxes on this diagram, by choosing the correct word from the list.



- |         |
|---------|
| 1 ..... |
| 2 ..... |
| 3 ..... |
| 4 ..... |

(Total 4 marks)

**Question 3**

A circle has a radius of 4 cm.

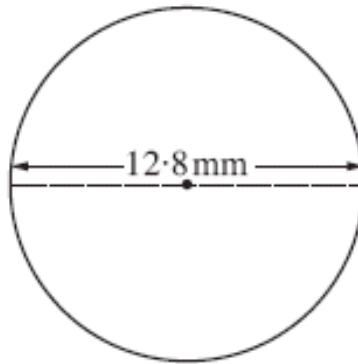
Write down the length of the diameter.

Answer ..... cm

**(Total 1 mark)**

**Question 4**

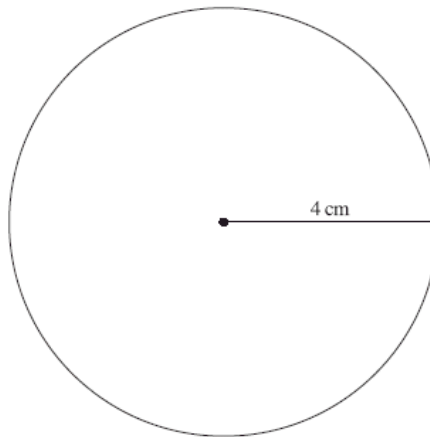
(a) Calculate the circumference of this circle.



..... mm

[2]

(b) The radius of this circle is 4 cm. Calculate the area of the circle.



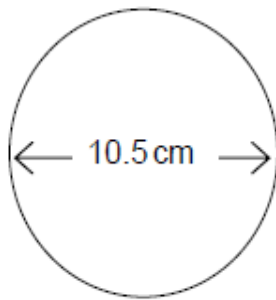
..... cm<sup>2</sup>

[2]



**Question 5**

Work out the circumference of a circle of diameter 10.5 cm.



Not drawn accurately

.....

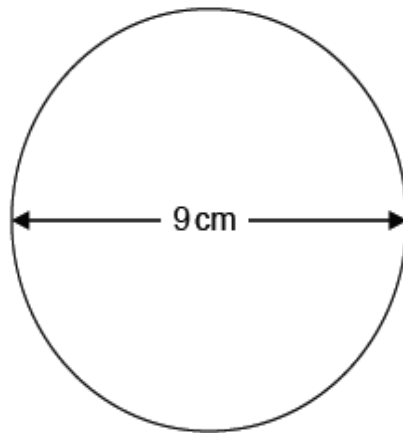
.....

.....

Answer ..... cm (2 marks)

**Question 6**

Calculate the circumference of a circle with a diameter of 9 cm.



Not drawn accurately

.....

.....

.....

.....

Answer ..... cm (2 marks)

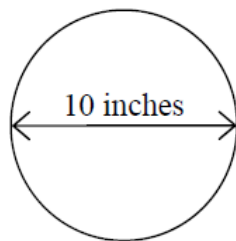
**Question 7**

- (a) Show that the area of a circle of diameter 10 inches is 78.5 square inches.

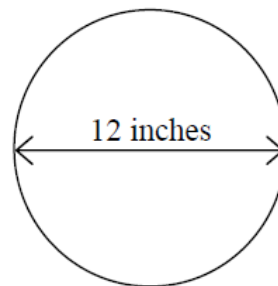
.....  
.....  
.....

*(2 marks)*

- (b) A circular 10 inch thin crust Margherita pizza costs £ 3.60  
A circular 12 inch thin crust Margherita pizza costs £ 6.60



£ 3.60



£ 6.60

Which of these pizzas is the better value for money?

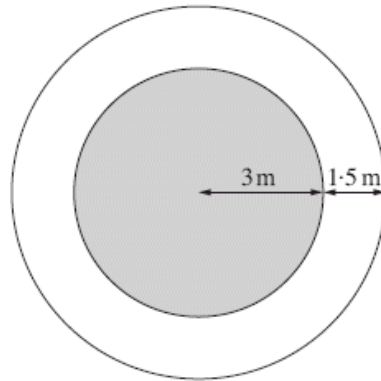
You **must** show your working.

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

*(4 marks)*

**Question 8**

A path of width 1.5 m is laid round the pond, as shown in this plan view.



**Not to scale**

Calculate the area of the path.

..... m<sup>2</sup>

[3]

**Question 9**

The area of a semi-circle is 36cm<sup>2</sup>. Calculate the radius, correct to three significant figures.

..... cm

[3]

**Section B**

**Question 10**

Change  $7 \text{ m}^2$  to  $\text{cm}^2$ .

..... $\text{cm}^2$   
(Total 2 marks)

**Question 11**

The volume of a cube is  $8 \text{ m}^3$ . (b) Change  $8 \text{ m}^3$  to  $\text{cm}^3$ .

.....  $\text{cm}^3$   
(2)

**Question 12**

The volume of a cylinder is  $350\text{cm}^3$ . Express the volume in  $\text{mm}^3$ .

.....  $\text{mm}^3$   
(1)

**Question 13**

The area of a classroom is  $5\text{m}^2$ . What is the area of the classroom in  $\text{mm}^2$  ?

.....  $\text{mm}^2$   
(1)

**Question 14**

A field has an area of  $105\text{m}^2$ . What is this in  $\text{km}^2$  ?

.....  $\text{km}^2$   
(1)

**Question 15**

Convert :

(a)  $94,000 \text{ mm}^2$  into  $\text{cm}^2$

.....  $\text{cm}^3$

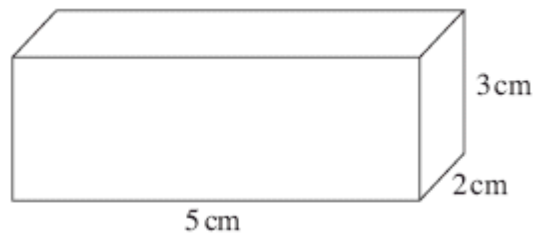
(b)  $0.08\text{cm}^3$  into  $\text{mm}^3$

.....  $\text{mm}^3$

(2)

Section C

Question 16



Calculate the volume of the cuboid. Give the units of your answer.

.....

[3]

Question 17

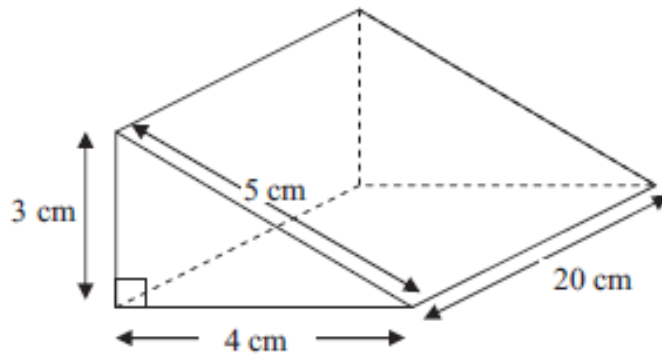


Diagram **NOT**  
accurately drawn

Work out the volume of the triangular prism.

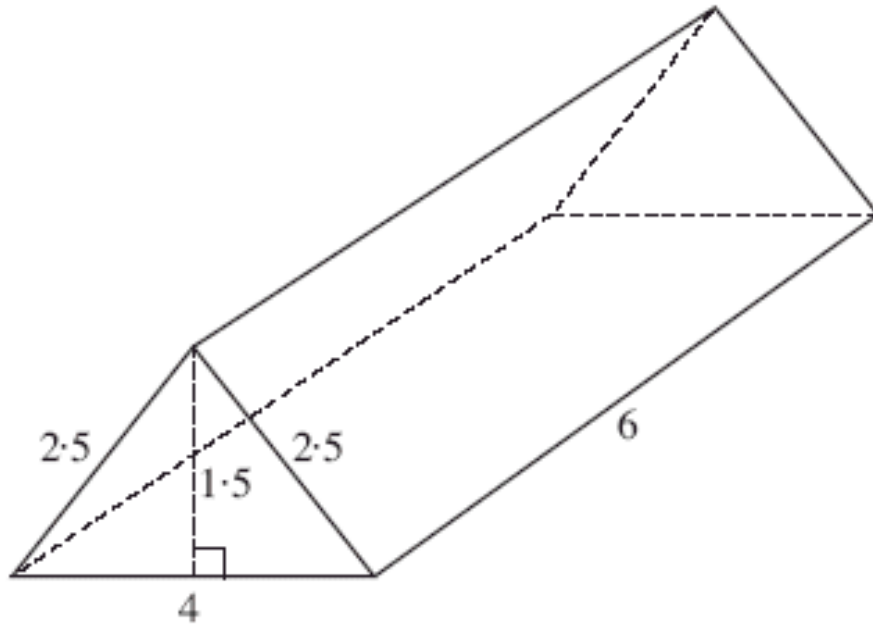
..... cm<sup>3</sup>

(Total 2 marks)

**Question 18**

The sketch shows a triangular prism.

All the measurements are in centimetres.



Calculate the volume of the prism.

Show your method clearly.

Give the units of your answer.

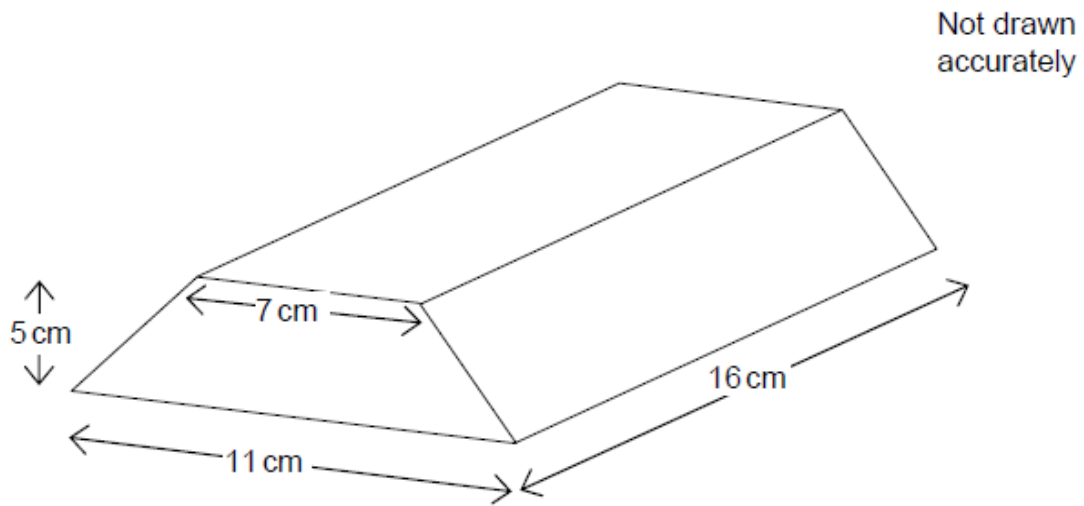
.....

[4]

**Question 19**

A gold bar has a trapezium cross-sectional area.

The dimensions are shown in the diagram.



Calculate the cross-sectional area of the gold bar.

.....

.....

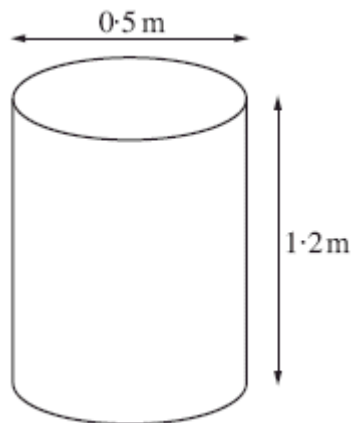
.....

.....

Answer .....  $\text{cm}^2$  (2 marks)

**Question 20**

A cylindrical drum is shown below.



Calculate the volume of the drum.

..... m<sup>3</sup>

[3]

**Question 21**

Calculate the volume of this cylinder.

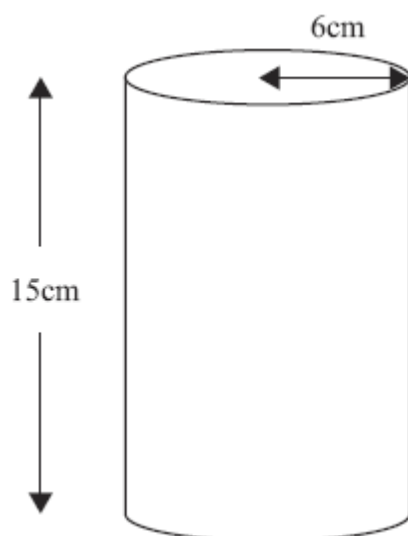


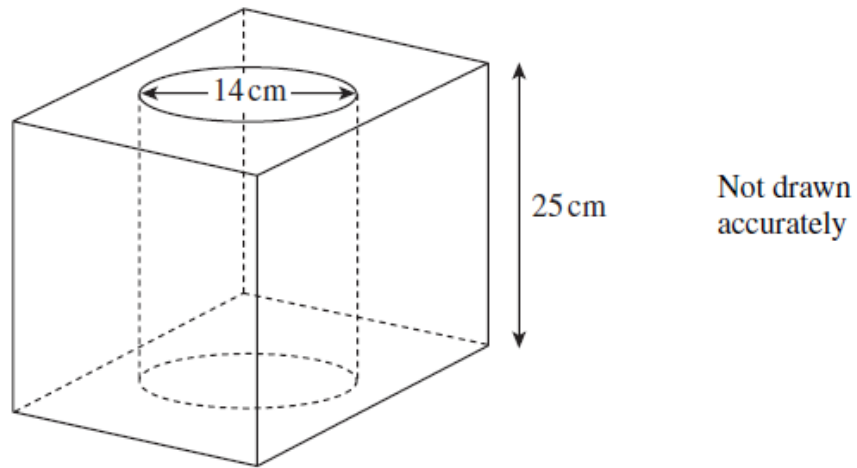
Diagram **NOT**  
accurately drawn

(Total 2 marks)



**Question 22**

A solid cube of side 25 cm has a circular hole cut through vertically. The circle has a diameter of 14 cm.



Calculate the volume remaining.

.....

.....

.....

.....

.....

.....

.....

Answer .....  $\text{cm}^3$  (4 marks)

# Best value comparisons

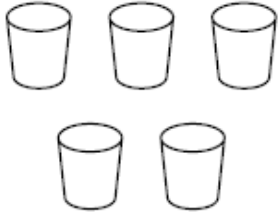
Section A – Do these questions by finding out the cost of a single item

## Question 1

Two shops, Food Mart and Jim's Store, both sell Kreemy Yoghurts.

**Food Mart**

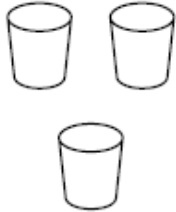
Kreemy Yoghurts



5 for £1.80

**Jim's Store**

Kreemy Yoghurts



3 for £1.05

At which shop are Kreemy Yoghurts the better value for money?  
You must show all your working.

## Question 2

Here are the costs of pens in two shops.

<p><b>Shop A</b></p> <p>3 pens for £2</p>
---

<p><b>Shop B</b></p> <p>5 pens for £3</p>
---

Mrs Evans wants to buy 30 pens for the cheapest possible cost.

Which shop should she buy the pens from?

You must show all your working.

**Section B**

**Question 3– now do this question again, by working out the cost of 30 pens in each shop**

Here are the costs of pens in two shops.

<p><b>Shop A</b></p> <p>3 pens for £2</p>
---

<p><b>Shop B</b></p> <p>5 pens for £3</p>
---

Mrs Evans wants to buy 30 pens for the cheapest possible cost.

Which shop should she buy the pens from?  
You must show all your working.

**Question 4**

Jack sees the bicycle he wants to buy in two shops.


**Bye-cycles**



Price without VAT £130

VAT is 20%

**Just Bykes**



Normal price £195

Now  $\frac{1}{4}$  off

VAT is included

In which shop is the bicycle cheaper?  
You **must** show your working.

**[5 marks]**

### Section C

#### Question 5

Simon is a salesman.

He gets paid expenses of 40p for every mile that he drives during work.

He also gets £12 expenses as a meal allowance for any day that he drives during work.

The table gives information about the number of miles Simon drove on 5 days in one week.

Day	Number of miles
Monday	48
Tuesday	37
Wednesday	0
Thursday	78
Friday	21

(a) Work out Simon's total expenses.

(4)

Sasha works for the same company.

She gets paid expenses of 40p for each mile she drives during work.

Last year she worked for 48 weeks.

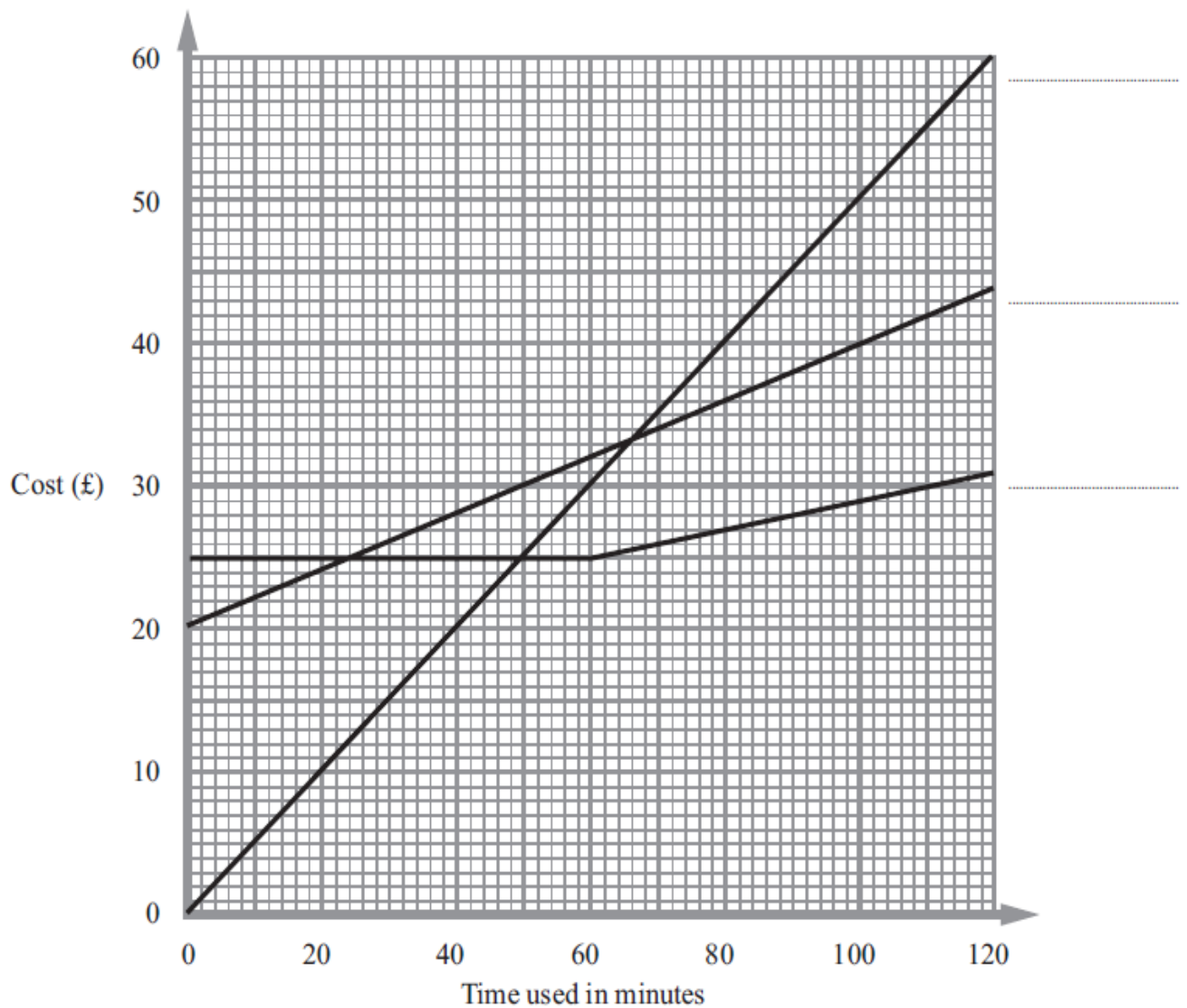
Her total **expenses** for driving for the year were £2116.80

(b) Work out an estimate for the average number of miles Sasha drove during work each week last year.

(3)

**Question 6**

The graph shows the cost of using a mobile phone for one month for three different tariffs.



The three tariffs are

- Tariff A    Rental £20        every minute costs 20p
- Tariff B    Pay as you go    every minute costs 50p
- Tariff C    Rental £25        first 60 minutes free, then each minute costs 10p

(a) Label each line on the graph with the letter of the tariff it represents.

(1)



Jim uses tariff A for 100 minutes in one month.

(b) Find the total cost.

(1)

£ .....

Fiona uses her mobile phone for about 60 minutes each month.

(c) Explain which tariff would be the cheapest for her to use.  
You **must** give the reasons for your answer.

(2)

### Question 7

Samantha wants to buy a new pair of trainers.

There are 3 shops that sell the trainers she wants.

<b>Sports '4' All</b>	<b>Edexcel Sports</b>	<b>Keef's Sports</b>
<b>Trainers</b>	<b>Trainers</b>	<b>Trainers</b>
<b>£5</b>	$\frac{1}{5}$ off	<b>£50</b>
plus	usual price of	plus
12 payments of £4.50	<b>£70</b>	VAT at 20%

From which shop should Samantha buy her trainers to get the best deal?

You must show all of your working.

### Question 8

The table gives information about an estate agent's charges for selling a house.

<b>Value of the house</b>	<b>Estate agent's charges</b>
Up to £60 000	2% of the value of the house
Over £60 000	2% of the first £60 000 plus 1% of the remaining value of the house

Ken uses this estate agent to sell his house.

The estate agent sold Ken's house for £80 000.

Work out the total charge that Ken will have to pay.

**Question 9**

A customer who cancels a holiday with Funtours has to pay a cancellation charge. The cancellation charge depends on the number of days before the departure date the customer cancels the holiday.

The cancellation charge is a percentage of the cost of the holiday.

The table shows the percentages.

Number of days before the departure date the customer cancels the holiday	Percentage of the cost of the holiday
29–55	40%
22–28	60%
15–21	80%
4–14	90%
3 or less	100%

The cost of Amy’s holiday was £840  
She cancelled her holiday 25 days before the departure date.

(a) Work out the cancellation charge she had to pay.

£ .....

**(2)**

The cost of Carol's holiday was £600

She cancelled her holiday and had to pay a cancellation charge of £480

(b) Give the range of the number of days in which Carol cancelled her holiday.

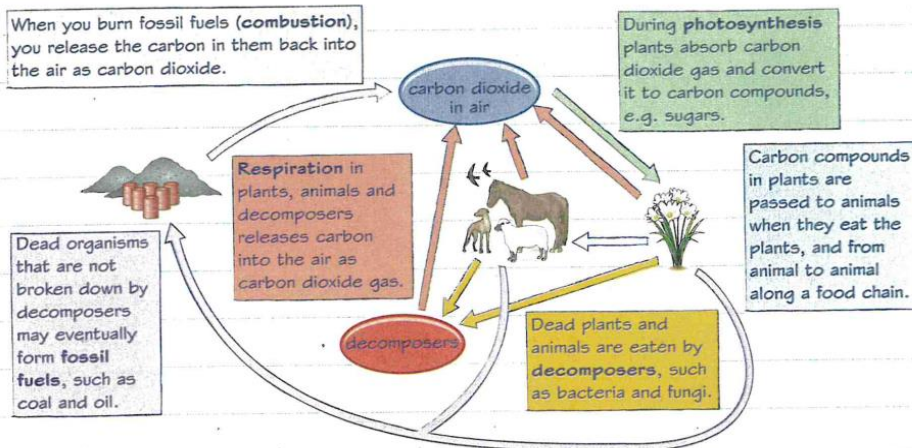
.....

**(3)**

## The carbon cycle

Living organisms need substances from the environment. As the amount of these on Earth is limited, they are recycled through both living (**biotic**) and non-living (**abiotic**) parts of the ecosystem. The **carbon cycle** shows how the element carbon passes between the environment and living organisms.

### Controls of the carbon cycle



In the air, carbon is part of carbon dioxide gas. In organisms, it is part of complex carbon compounds. The carbon cycle is important because it recycles carbon dioxide released in respiration to be taken in by plants in photosynthesis, to make organic molecules in living organisms.

### Worked example



A large forest is cleared by burning. What effects will this have on the amount of carbon dioxide in the air (a) immediately, and (b) over a longer period? (4 marks)

- Large amounts of carbon dioxide will be released into the air by the burning (combustion) of the trees.
- Less carbon dioxide will be removed from the air than before because the trees would have used some for photosynthesis. So the amount of carbon dioxide in the air is likely to remain high.

Two key processes in the carbon cycle are **respiration** and **photosynthesis**. These processes are important in maintaining oxygen and carbon dioxide concentrations in the air. Combustion can change this balance. Remember that plants photosynthesise in the light but, like all other living organisms, they respire all the time.

### Now try this



- Describe the importance of decomposers in the carbon cycle. (1 mark)

Decomposers respire using dead plant and animal matter, releasing carbon dioxide into the atmosphere.



- Explain the effect of respiration, photosynthesis and combustion in the carbon cycle in transferring carbon dioxide to and from the atmosphere. (3 marks)

In each case, explain whether these release carbon dioxide into the atmosphere, or remove it.

## Extended response — Ecosystems and material cycles

There will be at least one 6-mark question on your exam paper. For these questions, you will need to think scientifically and structure your answer logically, showing how the points you make are related to each other. You can revise the topics for this question, which is about the impact of human interactions on ecosystems and plant uptake of nitrates, on pages 81 and 85.

### Worked example



Explain why farmers are advised not to spread fertilisers on their crops when heavy rain is due. (6 marks)

Fertilisers contain nitrates and other mineral ions that plants need for healthy growth. Mineral ions in fertilisers dissolve in water, and are absorbed from the soil through plant roots.

If it rains heavily, then the mineral ions could be washed away from the crops and drain into nearby water, such as streams or rivers. This means that there will be fewer mineral ions for the crop plants so they will not grow so well. This will have been a waste of money for the farmer.

Extra mineral ions added to the streams and rivers will cause eutrophication. This will cause rapid growth of algae and water plants. The extra growth blocks light to organisms deeper in the water, meaning these organisms die, and takes oxygen from the water for respiration.

Bacteria that decompose dying plants and animals will also take oxygen from the water. If not enough oxygen is left in the water, fish and other animals may die and biodiversity may be reduced.

Remember the importance of mineral ions in plant growth when discussing fertilisers. This is a good way to start this answer.

#### Command word: Explain

In **explain** answers, make sure you give reasons for the statements you make. Use linking words like **because** or **this means that** to link cause and effect.

Use appropriate science words, such as eutrophication, in your answers, and make sure it is clear what you mean when you use them.

In questions about the environment, remember to consider how the interdependency of organisms, including microorganisms, can result in changes to biodiversity in the ecosystem.

Remember to consider the **advantages** and the **disadvantages** to ecosystems and biodiversity of fish farming.

### Now try this



Wild salmon take up to five years to reach adult size. Farmed salmon are kept in conditions so they reach this size in less than two years. Explain the impact of fish farming on ecosystems. (6 marks)

## Hazards, risks and precautions

You should be able to evaluate the risks in a practical procedure. You should also be able to suggest suitable precautions.

### Hazards

A **hazard** is something that could cause:

- damage or harm to someone or something
- adverse health effects, which may occur immediately or later on.

For example, ethanol is flammable. This is a hazard. If the ethanol ignited, it could cause burns or a fire.

### Hazard symbols

The labels on containers of hazardous substances include **hazard symbols**.

These are intended to:

- warn about the dangers associated with the substance in the container
- let people know about the precautions to take when they use the substance.

### Precautions

A **precaution** is something that you can do to reduce the risk of harm from a hazard. Precautions include:

- using a less hazardous substance
- using protective clothing, such as gloves and eye protection
- using a different method or apparatus.

### Now try this

- 1 State **one** reason why hazard symbols are used. (1 mark)
- 2 A student carries out electrolysis on a concentrated sodium chloride solution. Toxic chlorine gas and flammable hydrogen gas are produced. Describe **two** precautions the student could take to reduce the risk of harm in this experiment. (2 marks)

### Practical skills Risks

A **risk** is the chance that someone or something will be harmed if exposed to a hazard. The amount of risk depends on factors such as:

- ✓ how much someone is exposed to a hazard
- ✓ the way in which exposure happens
- ✓ how serious the effects of exposure are.

The risk from heating ethanol using a hot water bath is less than when using a Bunsen burner.

### Some common hazard symbols



harmful or irritant



flammable



respiratory sensitiser



toxic



corrosive



oxidising

### Worked example



A student is preparing a dry sample of copper sulfate. She heats some copper sulfate solution in an evaporating basin. She then allows it to cool. Crystals of copper sulfate appear.

Describe and explain one safety precaution she should use. (3 marks)

She should heat the solution gently. This reduces the risk that it will spit out of the evaporating basin. The hot solution could cause skin burns or eye damage.

The answer is specific to this activity. It is not a general lab rule such as not running or not drinking the solution.

Other suitable precautions that could be mentioned, if linked to the activity, include:

- wearing gloves if toxic substances are used
- tying hair back or tucking in a tie if a Bunsen burner is used for heating.



## Relative formula mass

You should be able to calculate relative formula masses when given relative atomic masses.

### Calculating relative formula mass

Relative formula mass has the symbol  $M_r$ .

To calculate the  $M_r$  of a substance, add together the relative atomic masses of all the atoms shown in its formula:



oxygen molecule – formula  $O_2$   
 relative atomic mass of oxygen = 16  
 relative formula mass =  $2 \times 16$   
 = 32

#### No units

$M_r$  values are just numbers.

This is because an  $M_r$  value is the mass of a molecule or unit of a substance compared with 1/12th the mass of a  $^{12}C$  atom. The  $M$  in  $M_r$  stands for 'molecular'.

You might see or hear the term 'relative molecular mass'. This really applies only to covalent substances.

### Worked example



Calculate the relative formula mass of aluminium oxide,  $Al_2O_3$ . (1 mark)  
 (relative atomic masses: Al = 27, O = 16)

atoms in  $Al_2O_3$ :

$$(2 \times Al) + (3 \times O)$$

$$M_r = (2 \times 27) + (3 \times 16)$$

$$= 54 + 48$$

$$= 102$$

You do not need to learn any relative atomic masses. You will be given them in questions or you can find them on the periodic table.

This answer shows you the working out needed to obtain the answer.

If you show the working for steps in the calculation you may gain some marks even if your final answer is incorrect.

### Worked example



Calculate the relative formula mass of calcium nitrate,  $Ca(NO_3)_2$ . (1 mark)  
 (relative atomic masses: Ca = 40, N = 14, O = 16)

atoms in  $Ca(NO_3)_2$ :

$$(1 \times Ca) + (2 \times 1 \times N) + (2 \times 3 \times O)$$

$$M_r = (1 \times 40) + (2 \times 14) + (6 \times 16)$$

$$= 40 + 28 + 96$$

$$= 164$$

#### Maths skills

You may find it easier if you first add up the  $A_r$  values for the atoms inside the brackets:

$$M_r \text{ of } NO_3 = 14 + (3 \times 16)$$

$$= 14 + 48$$

$$= 62$$

Then multiply your answer by the number outside, and add that to the remaining  $A_r$  values:

$$M_r \text{ of } Ca(NO_3)_2 = (2 \times 62) + 40$$

$$= 124 + 40$$

$$= 164$$

### Now try this

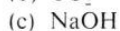
Calculate the relative formula masses,  $M_r$ , of the following substances.



(1 mark)



(1 mark)



(1 mark)



(1 mark)



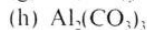
(1 mark)



(1 mark)



(1 mark)



(1 mark)

relative atomic masses: H = 1, C = 12, O = 16,  
 Na = 23, Al = 27, S = 32, Cl = 35.5, Cu = 63.5

## Empirical formulae

An empirical formula is the simplest whole number ratio of atoms of each element in a compound.

### Calculating an empirical formula

A 10 g sample of a compound X contains 8 g of carbon and 2 g of hydrogen.

- |          |  |                           |                       |
|----------|--|---------------------------|-----------------------|
| <b>1</b> | Write the symbol of each element as a header.  | C                         | H                     |
| <b>2</b> | Write down the mass of each element in g.  | 8                         | 2                     |
| <b>3</b> | Write down the $A_r$ of each element.  | 12                        | 1                     |
| <b>4</b> | For each element, calculate:<br>mass $\div$ $A_r$  | $\frac{8}{12} = 0.667$    | $\frac{2}{1} = 2$     |
| <b>5</b> | Divide each answer by the smallest answer (0.667 here).  | $\frac{0.667}{0.667} = 1$ | $\frac{2}{0.667} = 3$ |
| <b>6</b> | You may then need to multiply all the numbers to remove fractions, then write out the empirical formula. | $\text{CH}_3$             |                       |

### Finding a molecular formula

You can find the molecular formula of a compound from its empirical formula:

- if you know its relative formula mass,  $M_r$ .

The  $M_r$  of X in the example above is 30:

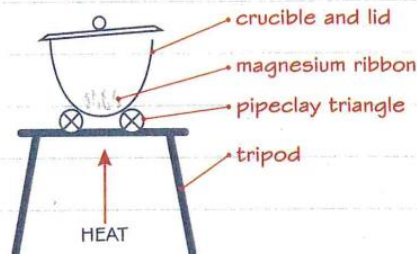
- Calculate the  $M_r$  of the empirical formula:  
 $M_r$  of  $\text{CH}_3 = 12 + (3 \times 1) = 15$
- Divide the  $M_r$  of X by answer 1:  
 $\frac{30}{15} = 2$
- Multiply each number in the empirical formula by answer 2:  
 $\text{CH}_3$  becomes  $\text{C}_2\text{H}_6$  – the molecular formula



### Determining empirical formula

You need to be able to describe an experiment to determine an empirical formula.

The apparatus below can be used to obtain results to do this for magnesium oxide.



The crucible and its contents are weighed before and after heating the magnesium.

### Worked example

The table shows the results of an experiment to find the empirical formula of magnesium oxide.

Object	Mass (g)
empty crucible and lid	19.06
crucible, lid and Mg before heating	19.42
crucible, lid and Mg after heating	19.66

- (a) Calculate the mass of magnesium used. (1 mark)

$$\text{mass of magnesium} = 19.42 - 19.06 = 0.36 \text{ g}$$

- (b) Calculate the mass of oxygen gained. (1 mark)

$$\text{mass of oxygen} = 19.66 - 19.42 = 0.24 \text{ g}$$

### Now try this



- (a) Use the masses given in the Worked example to determine the empirical formula of magnesium oxide. (relative atomic masses: O = 16, Mg = 24) (3 marks)



- (b) In the experiment described on this page, a lid is needed on the crucible. The lid must be kept slightly open during heating. Give two reasons why. (2 marks)

Had a look Nearly there Nailed it! Chemistry  
Papers 3 &

## Concentration of solution

You need to be able to calculate the concentration of solutions in  $\text{g dm}^{-3}$ .

### Solute, solvent and solution

A **solution** is a mixture of a solute in a solvent:

- The **solute** is the substance that dissolves.
- The **solvent** is the substance that the solute dissolves in.

Water is the solvent in an **aqueous solution**.

The state symbol for an aqueous solution in balanced equations is (aq). The symbol (l) is for substances in the liquid state.

### Mass and volume

To calculate the **concentration** of a solution, you need to know:

- the mass of solute in **grams**, g, and
- the volume of solution in **cubic decimetres**,  $\text{dm}^3$ .

### $\text{dm}^3$ and $\text{cm}^3$

Measuring cylinders and other lab apparatus show volumes in cubic centimetres,  $\text{cm}^3$ .

You need to convert these measurements into cubic decimetres,  $\text{dm}^3$ , when you calculate concentrations. It helps to know that:

- ✓  $1 \text{ dm}^3 = 10 \times 10 \times 10 = 1000 \text{ cm}^3$
- ✓ To convert  $\text{cm}^3$  to  $\text{dm}^3$ , divide by 1000.

If you are making a solution, you can use the volume of the solvent instead.

### Mass, volume and concentration

You use this equation to calculate the concentration of a solution in  $\text{g dm}^{-3}$ :

$$\text{concentration (g dm}^{-3}\text{)} = \frac{\text{mass of solute (g)}}{\text{volume of solution (dm}^3\text{)}}$$

**LEARN IT!**  
IT'S NOT ON THE EQUATIONS LIST



#### Units

The unit  $\text{g dm}^{-3}$  means 'grams per cubic decimetre'. You may also see it written as  $\text{g/dm}^3$ .



#### Rearranging equations

You need to be able to change the subject of an equation. For example:

- ✓ mass of solute = concentration  $\times$  volume
- ✓ volume =  $\frac{\text{mass of solute}}{\text{concentration}}$

### Worked example

2.50 g of sodium hydroxide is dissolved in 250  $\text{cm}^3$  of water. Calculate the concentration of the solution formed in  $\text{g dm}^{-3}$ . (2 marks)

$$250 \text{ cm}^3 = \frac{250}{1000} = 0.250 \text{ dm}^3$$

$$\text{concentration} = \frac{2.50 \text{ g}}{0.250 \text{ dm}^3} = 10 \text{ g dm}^{-3}$$

Remember to convert the volume to  $\text{dm}^3$  if it is given to you in  $\text{cm}^3$ .

The units are shown in the concentration calculation here. This makes it easier for you to see how it is done. You do not need to show units in your working out, but you must show the units in your final answer.

### Now try this

1 Calculate the concentrations of the following solutions formed:

- (a) 0.40 g of glucose dissolved in 0.50  $\text{dm}^3$  of water. (1 mark)

- (b) 1.25 g of copper chloride dissolved in 100  $\text{cm}^3$  of water. (2 marks)

- 2 Calculate the mass of sodium hydroxide needed to make 150  $\text{cm}^3$  of a 40  $\text{g dm}^{-3}$  solution. (2 marks)

# Other resources

If you require any other additional work, please visit the websites below:

## English:

<https://www.gcsepod.com/>

<https://www.bbc.co.uk/bitesize/subjects/z3kw2hv>

<https://www.educationquizzes.com/ks3/english/>

<https://www.senecalearning.com/>

## Maths:

[www.vle.mathswatch.co.uk](http://www.vle.mathswatch.co.uk)

Students have their own log in - Example name and Year (John Smith Year 9 – Johsmit9@lighthall)  
123456

[www.mathsgenie.co.uk](http://www.mathsgenie.co.uk)

[www.corbettmaths.com](http://www.corbettmaths.com)

## Science:

Primary resources - <https://www.gcsepod.com> - requires student login (provided by school)

Additional resources:

<https://www.bbc.co.uk/bitesize/subjects/zrkw2hv>

[https://www.youtube.com/channel/UCqbOeHaAUXw9II7sBVG3\\_bw](https://www.youtube.com/channel/UCqbOeHaAUXw9II7sBVG3_bw)

<https://www.gcsepod.com> - requires student login (provided by school)

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