

Mathematics III

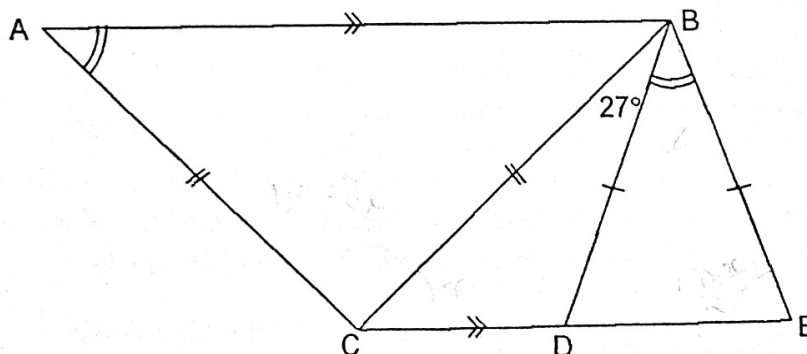
1½ hours

You may not use a calculator in this paper.

All working should be clearly shown.

You should attempt as many questions as possible, in any order you like.

- 1 A car with a petrol consumption of 49 miles per gallon can cover 260 km using 15 litres of petrol
- How far would such a car travel on 9 litres of petrol?
 - A different car has a petrol consumption of 35 miles per gallon. How many litres of petrol would this car use to cover 260 km?
- 2 Solve the simultaneous equations
- $$x + 7y = 5$$
- $$y = 7x + 5$$
- 3 A shop manager decides the price he will sell a product at, by adding 75% to the price he paid for it. In a sale he offers $N\%$ discount. He finds that he is still selling his products at 5% more than he paid for them. What is the value of N ?
- 4 Peter weighs 3 kilograms more than Quentin; Quentin weighs 4 kilograms more than Rufus; Rufus weighs 5 kilograms more than Sasha. The average weight of all four boys is 62 kilograms. How much does each boy weigh?
- 5 A head master looks at his school's games lists and sees that:
- 80% of the boys are rugby players.
 - 40% of the school are boys and 60% are girls
 - 50% of the school are rugby players
- What percentage of the girls are rugby players?
- 6 In the diagram line AB is parallel to line CE, length AC = length BC and length BD = length BE. Angle CBD = 27° .



Given that angle BAC is equal to angle DBE, find angle BDE, explaining each step in your argument.

- 7 a Arav and Bilal are addressing some envelopes for a charity appeal. It takes them an hour and forty-five minutes to address all their envelopes.
Arav writes 50% more addresses than Bilal.
How long would it have taken Arav to address all the envelopes on his own?
- b Chris and David are also addressing envelopes for the appeal. It also takes them an hour and forty-five minutes to address all their envelopes.
However, if David had addressed all the envelopes on his own, it would have taken him four hours and forty minutes.
How long would it have taken Chris to address all the envelopes on his own?

- 8 In a 10% salt solution, the weight of salt is 10% of the weight of the solution; that is, of the combined weight of the salt and water together.
- a What weight of salt needs to be added to 135 grams of water to make a 10% salt solution?
Suppose you had 100 grams of 10% salt solution,
- b How many grams of water would you have to add to make a 5% salt solution?
- c How many grams of salt would you have to add to make a 20% salt solution?

- 9 a Explain why, at 5:00, the angle between the hour hand and the minute hand of a clock is 150° .
- b Explain why, at 5:20, the angle between the hands of a clock is 40° .
- c In each part of c, your answer will be an expression in m .
- i At m minutes after five o'clock, through what angle has the minute hand of a clock rotated since five o'clock?
- ii At m minutes after five o'clock, through what angle has the hour hand of a clock rotated since five o'clock?
- iii At m minutes after five o'clock, what is the angle between the hands of a clock?
- f At what number of minutes after five o'clock will the angle between the hands of a clock be 62° ?

- 10 Tom leaves Aysgarth at 12:00 and walks at 3 miles per hour along the path from Aysgarth to Beesdale. Ian leaves Beesdale at 13:30 and jogs at 7 miles per hour along the path from Beesdale to Aysgarth. The distance from Aysgarth to Beesdale is 27 miles.
- a At what time do Tom and Ian meet?
- b How far from Aysgarth are they at this time?

- 11 The positive digits are the numbers 1, 2, 3, 4, 5, 6, 7, 8, 9.
The list below shows all the sets of three positive digits that add up to 9
- {6, 1, 2}
{5, 1, 3}
{3, 4, 2}

Notice that digits cannot be repeated in the set (so {1, 4, 4} is not included) and that sets are the same if they include the same digits in a different order (so {1, 2, 6} is not included).

- a List all the sets of three positive digits that add up to 15.

As part of a game, Sam must use all the positive digits once each to make

- set i a set of three that add up to 7;
set ii a set of two that add up to 11;
set iii a set of two that add up to 13;
set iv a set of two that add up to 14
- b What is the only set of digits Sam can choose for set i?
- c What are the two possible sets of digits that Sam can choose for set ii?
- d Show that one of Sam's choices for set ii does not leave any possibilities for set iii.
- e Give the only possible solution to Sam's problem, by listing sets i, ii, iii and iv.

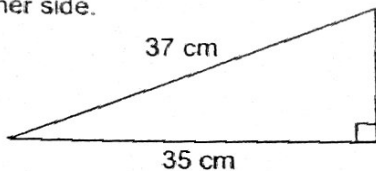
As part of a game, Ben must use all the positive digits once each to make

- set i a set of three that add up to 10;
set ii a set of two that add up to 6;
set iii a set of two that add up to 14;
set iv a set of two that add up to 15
- f Give the only possible solution to Ben's problem. Show carefully that no other solution is possible.

- 12 a William says "the probability it will rain at some time tomorrow is $\frac{2}{5}$; the probability that it will be dry all day tomorrow is $\frac{5}{8}$." Explain why this is not a reasonable thing to say.
- b William says "the probability it will rain at some time tomorrow is $\frac{2}{5}$; the probability that I will forget to do my maths prep tomorrow is $\frac{5}{8}$." Explain why this may be a reasonable thing to say.

13 a Multiply out the brackets in $(x + 2)^2 - x^2$ and simplify your answer.

- b The diagram shows a right angled triangle, with hypotenuse 37 cm and one side 35 cm. Find the length of the other side.



- c The diagram shows a right angled triangle, with hypotenuse $x + 2$ cm and one side x cm. The other side has length 14 cm. Find the value of x .

