



Independent Schools
Examinations Board

COMMON ENTRANCE EXAMINATION AT 13+

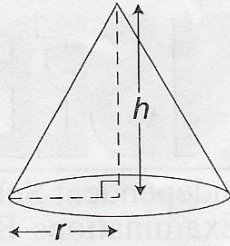
MATHEMATICS III

Practice Paper 2001–2002

Please read this information before the examination starts.

- This examination is 60 minutes long.
- Answer as many questions as possible. They may be done in any order.
- **Failure to show necessary working may result in loss of marks.**
- Electronic calculators may be used in any question.
- Candidates are expected to give answers to an appropriate degree of accuracy.
- Solutions to questions which require accurate drawing should be done on graph or squared paper.

1.



(a) The volume V of a cone of radius r and height h is given by the formula

$$V = \frac{\pi r^2 h}{3}$$

Find the value of

(i) V when $r = 6$ and $h = 20$ (2)

(ii) r when $V = 2500$ and $h = 15$ (3)

(b) Solve the equations

(i) $\frac{x-1}{3} = \frac{x}{2}$ (3)

(ii) $x(2x+1) = x+32$ (3)

(c) (i) Solve the inequalities

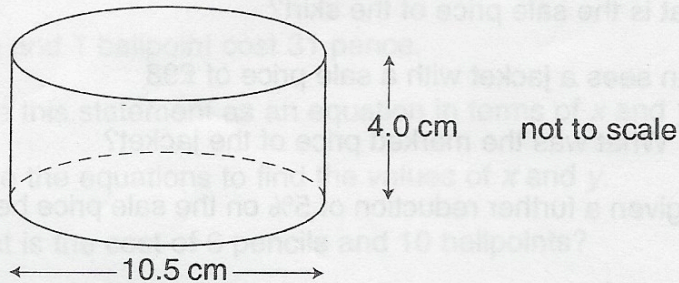
(a) $6(x+1) \leq 48$ (2)

(b) $8 - 3x < 2 - x$ (2)

(ii) Write down the prime numbers that satisfy both inequalities in part (c) (i). (2)

2. The diagram shows a whole cheese in the shape of a cylinder.

The diameter is 10.5 centimetres and the height is 4.0 centimetres.



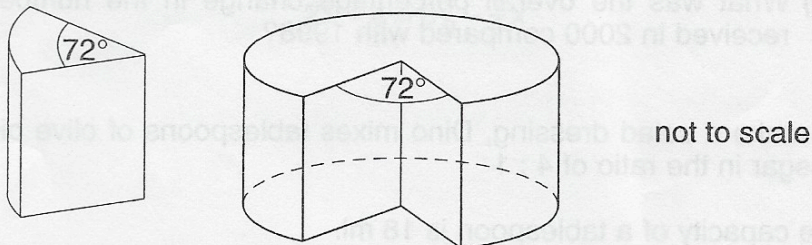
(i) Calculate the area of the base of the cheese. (3)

(ii) Calculate the volume of the cheese. (2)

1 cm³ of cheese has a mass of 0.72 g.

(iii) Calculate the mass of the cheese to the nearest 10 grams. (3)

A slice is removed, as shown in the diagram, so that the angle made at the centre is 72°



(iv) Calculate the mass of the slice. (3)

The manufacturer makes a similar shaped cheese in which all the lengths are doubled.

(v) What is the mass of a similar slice from the larger cheese? (3)

3. (a) In a sale the marked price of all goods is reduced by 30% to give the sale price.

(i) Alex buys a skirt marked at £54

What is the sale price of the skirt? (2)

(ii) Brian sees a jacket with a sale price of £98

(a) What was the marked price of the jacket? (3)

Brian is given a further reduction of 5% on the sale price because he pays cash.

(b) How much does Brian pay for the jacket? (2)

(b) Carol likes receiving postcards.

In 1998 she received 200 cards.

In 1999 she received 10% more cards than in 1998.

In 2000 she received 10% fewer cards than in 1999.

(i) How many postcards did Carol receive in 2000? (3)

(ii) What was the overall percentage change in the number of cards received in 2000 compared with 1998? (2)

(c) To make a salad dressing, Dino mixes tablespoons of olive oil and wine vinegar in the ratio of 4 : 1

The capacity of a tablespoon is 18 ml.

He makes 270 ml of dressing.

(i) How many tablespoons of olive oil does he use? (3)

A 500 ml bottle of wine vinegar costs £1.20

(ii) What is the cost of the wine vinegar used in making 270 ml of dressing?

(Give your answer to the nearest penny.) (3)

4. (a) At the school suppliers a pencil costs x pence and a ballpoint costs y pence.
1 pencil and 3 ballpoints cost 53 pence.

(i) Write this statement as an equation in terms of x and y . (2)

2 pencils and 1 ballpoint cost 31 pence.

(ii) Write this statement as an equation in terms of x and y . (2)

(iii) Solve the equations to find the values of x and y . (4)

(iv) What is the cost of 6 pencils and 10 ballpoints? (1)

(b) (i) Using a scale of 1 cm to 1 unit, draw co-ordinate axes with values for x from -1 to $+8$ and for y from -6 to $+5$ (1)

(ii) Plot the graphs of

(a) $y = 2x - 4$

(b) $y = 3\frac{1}{2} - \frac{1}{2}x$ (5)

(iii) Hence, or otherwise, solve the equation

$$2x - 4 = 3\frac{1}{2} - \frac{1}{2}x \quad (2)$$

5. To get to work Mr Bowler cycles to the station, where he catches a train which takes him to London. On arrival, he gets a taxi to take him to his office.

He cycles the 4 km from his home to the station at 16 km/h.

- (i) How long does it take him to cycle to the station? (3)

He waits 8 minutes for the train.

The train takes 1 hour 45 minutes to cover the 140 km to London.

- (ii) What is the average speed of the train in km/h? (3)

He finds a taxi after 12 minutes and then completes his journey to the office in 20 minutes at 24 km/h.

- (iii) How far does he travel in the taxi? (3)

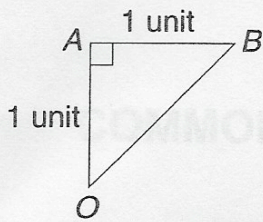
- (iv) What is the total distance from his home to the office? (1)

- (v) How long does the journey take in total? (3)

- (vi) What is the average speed of the complete journey in km/h? (3)

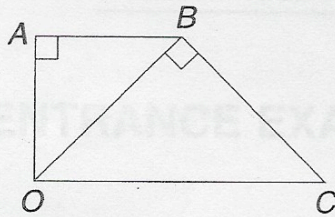
6. A 'spiral' pattern is made with right-angled isosceles triangles. Each new triangle is added to the hypotenuse of the previous one. The length of the hypotenuse of the new triangle is then calculated **leaving a square root sign in the answer.**

The first 3 stages have been drawn.

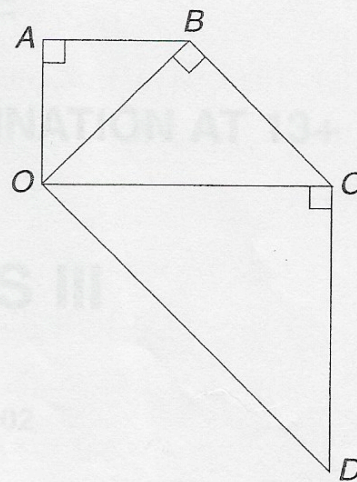


$$OA = AB = 1 \text{ unit}$$

stage 1



stage 2



stage 3

- (i) Calculate the length of OB , leaving a square root sign in the answer. (2)
- (ii) Show that $OC = \sqrt{4}$ units. (2)
- (iii) Find x , if $OD = \sqrt{x}$ where x is a whole number. (2)
- (iv) Continuing the pattern, find the length of the hypotenuse
- (a) OE in stage 4 (2)
- (b) OF in stage 5 (2)
- (v) What is the length of the hypotenuse in stage 8? (2)
- (vi) At what stage is the hypotenuse 64 units long? (3)
- (vii) What is the length of the hypotenuse in the n th stage? (3)

Solutions to questions which require accurate drawing should be done on graph or squared paper.

(Total marks: 100)