

SURNAME FIRST NAME

JUNIOR SCHOOL SENIOR SCHOOL



Independent Schools
Examinations Board

COMMON ENTRANCE EXAMINATION AT 13+

MATHEMATICS

LEVEL 3: CALCULATOR PAPER

Tuesday 8 June 2010

Please read this information before the examination starts.

- This examination is 60 minutes long.
- All questions should be attempted.
- A row of dots denotes a space for your answer.
- Where answers are not exact, they should be given to three significant figures, unless specified otherwise.
- The π button on your calculator should be used for calculations involving π .



1. (i) Rewrite all the numbers in the following expression correct to 1 significant figure.

$$\frac{184}{9.8 + 32.3}$$

Answer: $\frac{\dots\dots\dots}{\dots\dots\dots + \dots\dots\dots}$ (2)

(ii) Calculate your answer to part (i).

Answer: (1)

(iii) Writing down all the figures shown on your calculator, find the value of

$$\frac{184}{9.8 + 32.3}$$

Answer: (2)

(iv) Write your answer to part (iii) correct to

(a) 3 significant figures

Answer: (1)

(b) 3 decimal places

Answer: (1)

2. Shares in *Angora Knitwear* are priced at 92.7 pence each.
Doris buys 850 of these shares.

Angora 1 share 92.7p

(i) How much does Doris spend when she buys these shares?

Answer: £ (2)

After 6 months, the shares are worth only 79.2 pence each.

(ii) (a) How much less is each share worth after 6 months?

Answer: p (1)

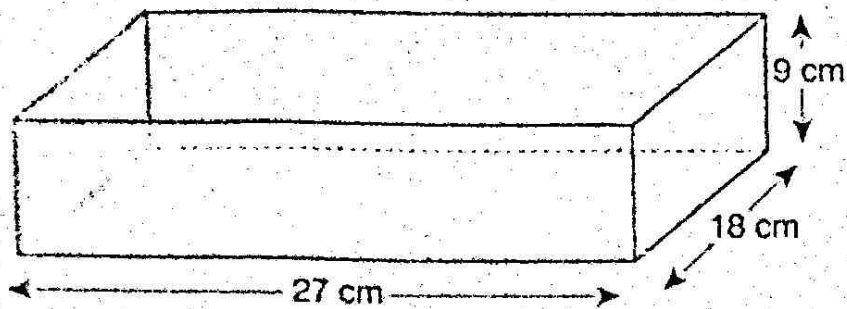
(b) Express this loss as a percentage of the original price.

Answer: % (2)

Doris decides to sell 72% of her shares in *Angora Knitwear*.

(iii) How many shares does Doris keep?

Answer: (2)



not to scale

An open box, with no lid, is in the shape of a cuboid.
The inside measures 27 centimetres by 18 centimetres by 9 centimetres.

(i) Calculate the volume of the box.

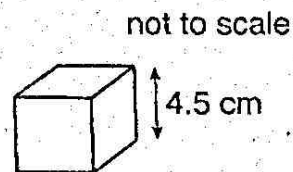
Answer: cm^3 (1)

(ii) Calculate the surface area of the inside of the box.

Answer: cm^2 (3)

The box is filled with toy bricks which are 4.5-centimetre cubes.

(iii) What is the largest number of bricks which fit completely inside the box?



Answer: (2)

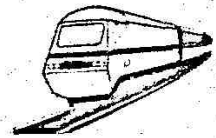
4. (a) Victoria cycles at an average speed of 24 kilometres per hour.
How far does she travel in 25 minutes at this speed?



$$\frac{25 \times 24}{60} = 10$$

Answer: km (2)

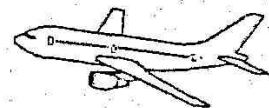
- (b) It is 260 miles from London to Oldcastle.
How long does it take a train to cover this distance at an average speed of 80 miles per hour?



$$\frac{260}{80} = 3\frac{1}{4} = 3 \text{ hrs } 15 \text{ mins}$$

Answer: h min (2)

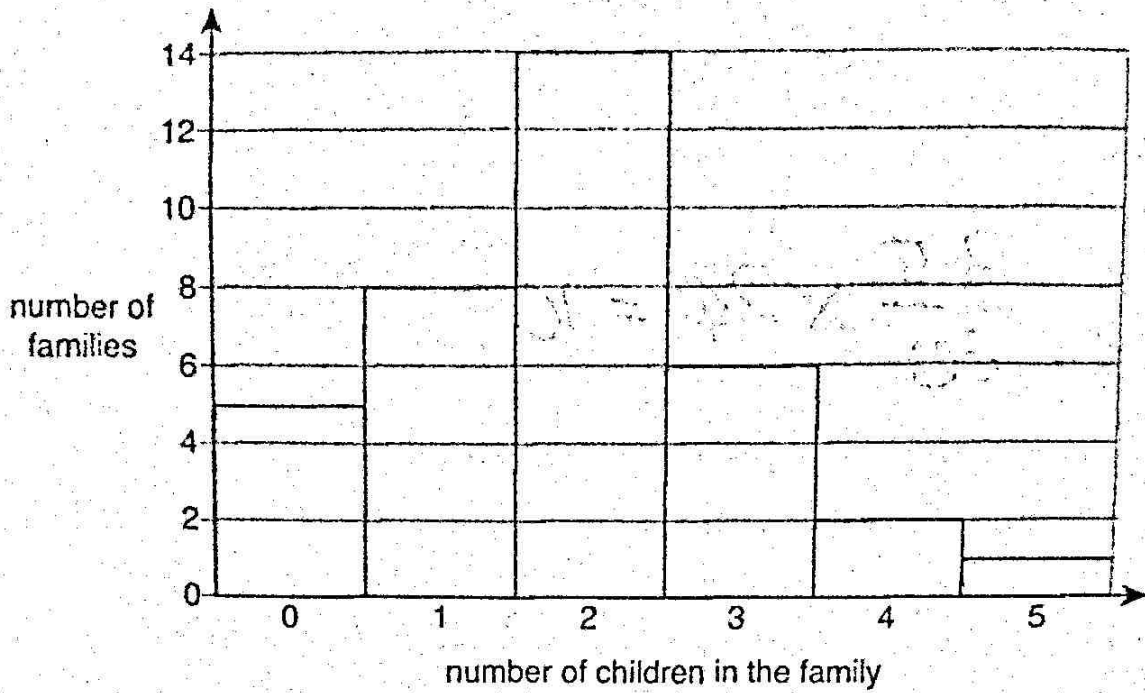
- (c) An aeroplane flies at an average speed of 900 kilometres per hour.
What is this speed in metres per second?



$$\frac{900 \times 1000}{60 \times 60} = 250$$

Answer: m/s (2)

5.



A survey of families living in Toddler Road counts the number of children in each family. The graph above shows the results of the survey.

(i) How many families live in Toddler Road?

Answer: (1)

(ii) How many children live in Toddler Road?

Answer: (2)

(iii) In Toddler Road,

(a) what is the mean number of children per family?

Answer: (1)

(b) what is the modal number of children per family?

Answer: (1)

6. (a) Multiply out the bracket and simplify

$$5q - 3(4r + q) - 7r$$

Answer: (2)

(b) Simplify

$$\frac{8s^4 - 12s^2}{4s^2}$$

Answer: (2)

(c) Factorise completely

$$8t^2 + 24t$$

Answer: (2)

7. (i) Given that $y = x^2 - 2x$ complete the following table:

x	-2	-1	0	1	2	3
y		3				

(3)

(ii) Draw and label the graph of $y = x^2 - 2x$ on the grid opposite.

(2)

(iii) When $y = 3 - x$ find the value of

(a) y when $x = 0$

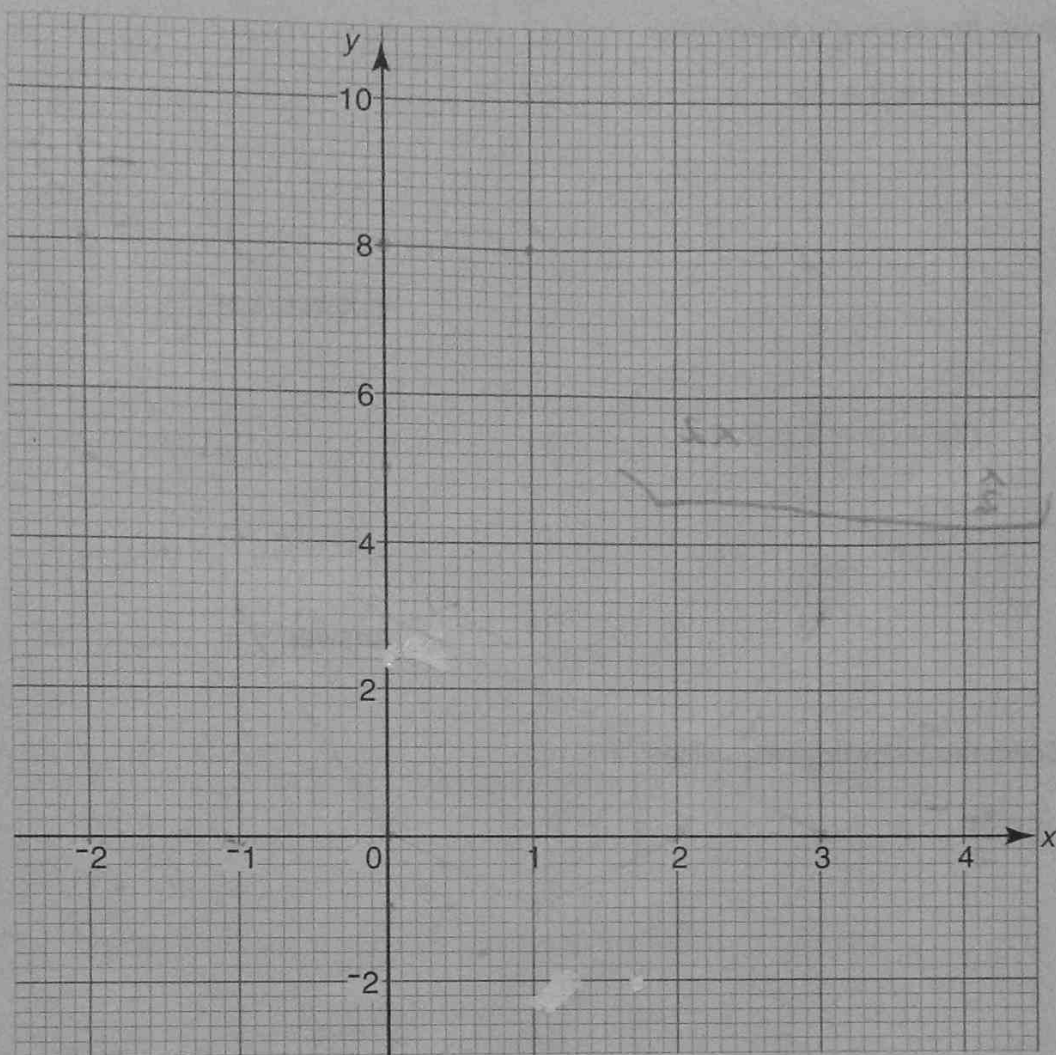
Answer: $y = \dots\dots\dots$ (1)

(b) x when $y = 0$

Answer: $x = \dots\dots\dots$ (1)

(iv) Draw and label the graph of $y = 3 - x$ on the grid opposite.

(1)



(v) What are the co-ordinates of the point where $y = x^2 - 2x$ and $y = 3 - x$ intersect and both x and y have a positive value?

Answer: (.....,) (2)



8. (a) Solve the following equations:

(i) $9 - x = 3 - 5x$

Answer: $x = \dots\dots\dots$ (2)

(ii) $\frac{1}{2}(7y + 1) - 3 = 8$

Answer: $y = \dots\dots\dots$ (3)

(b) Solve the following inequalities:

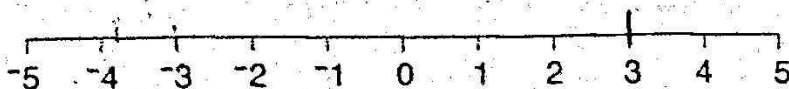
(i) $\frac{3z}{2} > -6$

Answer: $\dots\dots\dots$ (1)

(ii) $7 - 2z \geq 1$

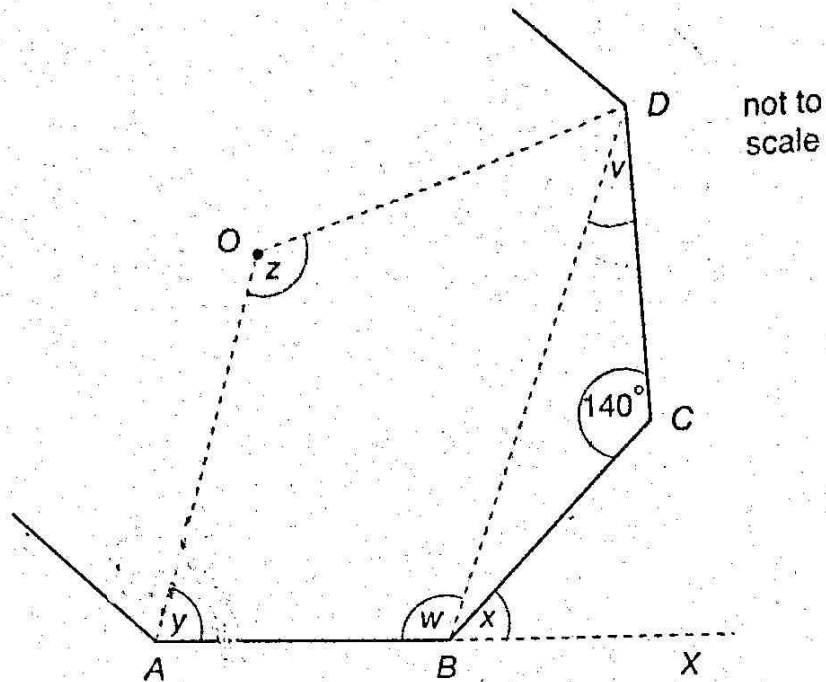
Answer: $\dots\dots\dots$ (2)

(iii) Show the range of values which z can have on the number line below.



(2)

9.



AB , BC and CD are three sides of a regular polygon with centre O .
 ABX is a straight line.
 Angle $BCD = 140^\circ$

(i) Calculate the size of each of the angles marked v , w , x , y and z .

20° Answer: $v = \dots\dots\dots$ (2)

120° Answer: $w = \dots\dots\dots$ (2)

40° Answer: $x = \dots\dots\dots$ (1)

65° Answer: $y = \dots\dots\dots$ (1)

120° Answer: $z = \dots\dots\dots$ (2)

(ii) What special name is given to the regular polygon of which $ABCD$ is part?

Answer: $\dots\dots\dots$ (1)

10. (a) Here is a number grid:

25	30	35	40
30	36	42	48
35	42	49	56
40	48	56	64

Pat chooses a number from the grid at random.

What is the probability that it is

(i) the number 48?

Answer: (1)

(ii) an even number?

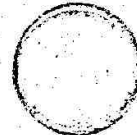
Answer: (1)

(iii) a prime number?

Answer: (1)

(b) When Anu tosses an ordinary 10p coin, it lands *heads* up.

What is the probability that the same coin lands *tails* up the next time Anu tosses it?



Answer: (1)

(c) The probability that Murphy will eat chips on any particular day is $\frac{2}{5}$
On how many days would you expect Murphy to eat chips this year?



Answer: days (2)

11. The plan of a campsite is drawn using a scale of 1 : 1000

(i) What distance, in metres, is represented by 1 centimetre on the plan?

Answer: m (1)

Gemma pitches her tent (*T*) at the campsite.

The shower block (*B*) is 70 metres north-west of her tent.

(ii) Using the scale of 1 : 1000, plot the position of the shower block (*B*).



(2)

The shop (*S*) is on a bearing of 075° from the shower block and 105 metres from Gemma's tent.

(iii) Draw a north line at *B* and plot the position of the shop (*S*). (3)

In the morning, Gemma leaves her tent, walks to the shower block to wash and then visits the shop to buy milk before returning directly to her tent.

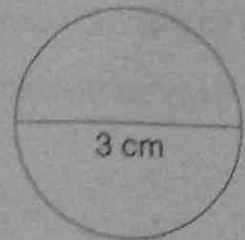
(iv) What distance, to the nearest 10 metres, does Gemma cover?

Answer: m (2)

12. A circle has diameter 3 centimetres.

(i) Calculate

(a) the circumference of the circle



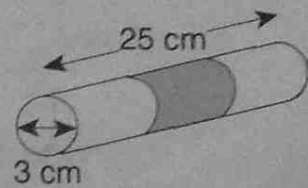
Answer: cm (2)

(b) the area of the circle

Answer: cm² (2)

(ii) *Standard* sticks of rock, 25 centimetres long, are made in the shape of a cylinder with a circular end 3 centimetres in diameter.

(a) Calculate the volume of a *Standard* stick of rock.

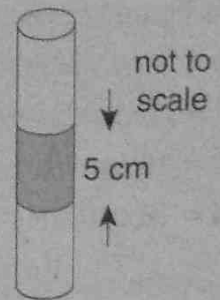


not to scale

Answer: cm³ (2)

A paper label, 5 centimetres wide, just fits round the stick.

(b) What is the area of the label?



Answer: cm² (2)

A *Presentation* stick of rock is similar in shape to the *Standard* stick.

The diameter of the circular end of the *Presentation* stick is 12 centimetres.

(c) What is

(i) the length of the *Presentation* stick?

Answer: cm (1)

(ii) the area of the label on the *Presentation* stick?

Answer: cm² (2)

16 x 47.1

To get area
you have
to times
by 16.
4²

$$\begin{array}{c} \boxed{4} \\ 2 \end{array} \times \begin{array}{c} \boxed{16} \\ 4 \end{array}$$

TURN OVER FOR QUESTION 13

13. This figure shows the sketch of a shelf support with right angles marked at B and X .

M is the mid-point of AC .

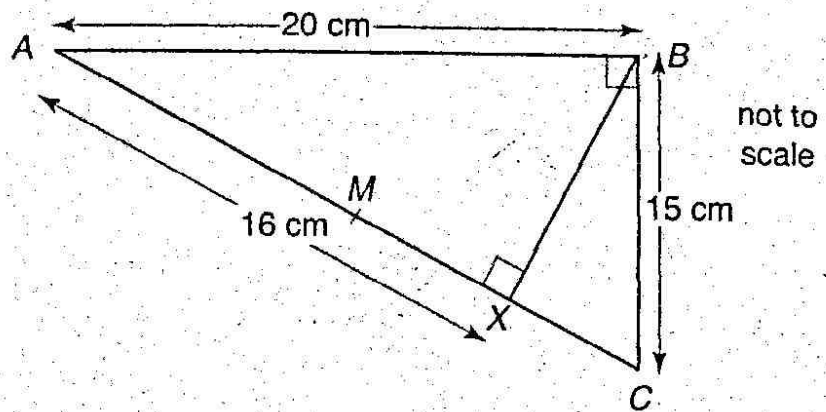
$AB = 20$ centimetres

$BC = 15$ centimetres

$AX = 16$ centimetres

Calculate

(i) the length of AC



Answer: $AC = \dots\dots\dots$ cm (2)

(ii) the length of BX

Answer: $BX = \dots\dots\dots$ cm (2)

(iii) the area of triangle BXC

Answer: $\dots\dots\dots$ cm² (2)

(iv) the length of BM

Answer: $BM = \dots\dots\dots$ cm (3)

(Total marks: 100)