SURNAME ..... FIRST NAME .....
(Block capitals, please)
JUNIOR SCHOOL ..... SENIOR SCHOOL .....

Independent Schools Examinations Board

COMMON ENTRANCE EXAMINATION AT 13+

MATHEMATICS

PAPER 2

Non-Calculator Paper

Monday 23 February 2004

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.
- A completely correct answer may receive no marks unless you show all your working.
- Answers given as fractions should be reduced to their lowest terms.

1. Jane scored half marks in a test marked out of 72

(i) Calculate the mark which Jane scored.

Answer: 36 (1)

David scored 75% in the same test.

(ii) Calculate David's mark.

$\frac{75}{100} \times \frac{72}{1} = \frac{75}{50} \times \frac{36}{1} = \frac{15}{10} \times \frac{36}{1} = \frac{3}{2} \times \frac{36}{1} = \frac{3}{1} \times \frac{18}{1}$

Answer: 54 (2)

(iii) By how many marks did David beat Jane?

$54 - 36 = 18$

Answer: 18 (1)

2. Calculate

(i) $3.5 + 4.5 \div 5$

$5\overline{)4.5}$ 0.9

3.5
0.9
4.4

Answer: 4.4 (2)

(ii) $1.5 + 2.5 \times (3.5 - 4.5)$

$3.5 - 4.5 = -1$

$\Rightarrow 1.5 + 2.5(-1) = 1.5 - 2.5 = -1$

Answer: -1 (2)

3. (a) Alicia bought 2 videos costing £9.99 each and 3 audio tapes costing £3.99 each.

(i) How much did Alicia spend?

Total cost = 2(9.99) + 3(3.99)

Answer: £ 31.95 ..... (2)

(ii) How much change should Alicia have received from two £20 notes?

$$\begin{array}{r} 40.00 \\ 31.95 \\ \hline 8.05 \end{array}$$

Answer: £ 8.05 ..... (1)

(b) Mrs Redwood purchased 25 identically priced copies of a mathematics text book for her class at a total cost of £187.50

What was the cost of each book?

$$\frac{187.50}{25} = \frac{18750}{2500} = \frac{1875}{250} = \frac{375}{50} = \frac{75}{10} = \frac{15}{2} = 7.5$$

Answer: £ 7.50 ..... (2)

7. Hugo and Trina find a box of sweets. Hugo takes $\frac{1}{3}$ of the number in the box.

Then Trina takes $\frac{3}{5}$ of the number of sweets remaining.

(i) What fraction of the original number of sweets in the box is taken by Hugo and Trina?

$\frac{1}{3} + \frac{3}{5}\left(\frac{2}{3}\right) = \frac{1}{3} + \frac{6}{15} = \frac{5}{15} + \frac{6}{15} = \frac{11}{15}$

Answer: $\frac{11}{15}$ (2)

(ii) What fraction of the original number of sweets in the box is left over?

Answer: $\frac{4}{15}$ (1)

There is a label on the box of sweets.

This box contains between 28 and 36 sweets.

(iii) How many more sweets did Trina take than Hugo?

To take $\frac{1}{3}$ must be either 30, 33 or 36

$\frac{1}{3}(30) = 10, 20$ R

$\frac{1}{3}(33) = 11, 22$ R Which one of these can be take $\frac{3}{5}$'s of exactly? 20

$\frac{1}{3}(36) = 12, 24$ R

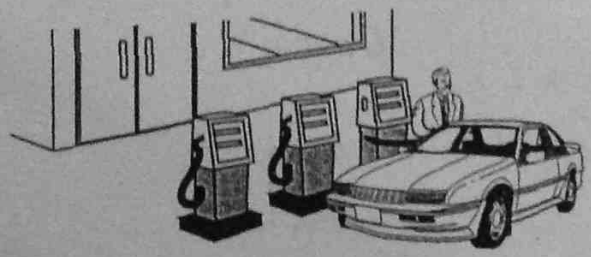
Must be 30

H = 10

T = $\frac{3}{5}(20) = 12$

Answer: 2 (2)

8. (a) William fills the tank in his car with 41.5 litres of petrol at 74.9 pence per litre.



Estimate the cost of the petrol in pounds, showing your working clearly.

40 (.75)

Answer: £ 30 ..... (2)

(b) Georgina can run 100 metres in 18 seconds.

Calculate her speed in kilometres per hour.

$S = \frac{D}{T} = \frac{100}{18} = \frac{50}{9}$ m/sec $= \frac{50}{9} \div 1000$ km/sec

$= \frac{1}{180}$ km/sec

$\frac{1}{180} \times 60 \times 60 = \frac{3600}{180} = \frac{360}{18} = 20$ km/hour

Answer: 20 ..... km/h (2)

9. (a) (i) Write down the 1st term (t_1) and 100th term (t_{100}) of the following sequence:

$$t_n = n^2 - 1$$

$t_1 = (1)^2 - 1 = 0$

$t_{100} = (100)^2 - 1 = 9999$

Answer: t_1 = 0 ..... (1)

t_{100} = 9999 ..... (1)

(ii) Find the smallest value of n for which $t_n > 900$

$n^2 - 1 > 900$

$n^2 > 901$

$n > 30.02$

Answer: n = 31 ..... (2)

(b) (i) Write down the 1st and 100th term of the following sequence:

$$t_n = \frac{2n-1}{3n+1}$$

$t_1 : \frac{2(1)-1}{3(1)+1} = \frac{1}{4}$

$t_{100} : \frac{2(100)-1}{3(100)+1} = \frac{199}{301}$

Answer: t_1 = $\frac{1}{4}$ ..... (1)

t_{100} = $\frac{199}{301}$ ..... (1)

(ii) What happens to t_n as n gets very large?

as $n \to \infty$ t_n tends to $\frac{2}{3}$

Answer: t_n tends to $\frac{2}{3}$ ..... (1)

10. (a) Simplify the following expressions:

(i) $6a^3 + 2a^3$

Answer: $8a^3$ (1)

(ii) $6a^3 \times 2a^3$

Answer: $12a^6$ (2)

(iii) $\dfrac{6a^3 \times 2a^3}{2a}$

$\frac{12a^6}{2a} = 6a^5$

Answer: $6a^5$ (2)

(b) (i) Solve the inequality

$3(2x - 1) > 19$

$6x - 3 > 19$

$6x > 22$

$x > \frac{22}{6}$

$x > 3\frac{4}{6} \Rightarrow x > 3\frac{2}{3}$

Answer: $x > 3.6$ (2)

(ii) What is the smallest prime number that satisfies the inequality in part (b) (i)?

Answer: 5 (1)

11. Solve the following equations:

(i) $5 - 2q = 7$

$2q = -2$

$q = -1$

Answer: $q = -1$ (2)

(ii) $3(r - 2) = r + 8$

$3r - 6 = r + 8$

$2r = 14$

$r = 7$

Answer: $r = 7$ (2)

(iii) $\frac{5(s+1)}{3} = 2$

$5s + 5 = 6$

$5s = 1$

$s = \frac{1}{5}$

Answer: $s = \frac{1}{5}$ (3)

12. If $a = 6$ $b = 5$ $c = {}^{-}4$

and $$x = \frac{{}^{-}b + \sqrt{b^2 - 4ac}}{2a}$$

find

(i) b^2

Answer: 25 ..... (1)

(ii) $4ac$

$4(6)(-4) = -96$

Answer: $^{-}96$ ..... (1)

(iii) $\sqrt{b^2 - 4ac}$

$\sqrt{25-(-96)} = \sqrt{121} = 11$

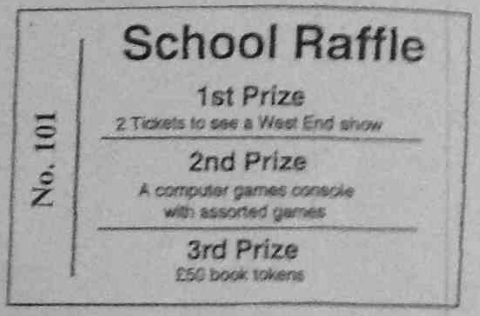
Answer: 11 ..... (2)

(iv) x

$\frac{-5 + 11}{12}$

Answer: 0.5 ..... (2)

13. In a school raffle 160 tickets have been sold.



Faye has bought 1 ticket.

(i) What is the probability that Faye will win first prize in the raffle?

Answer: $\frac{1}{160}$ (1)

Pete has bought 24 tickets.

(ii) What is the probability that Pete does **not** win first prize in the raffle?

Answer: $\frac{136}{160}$ (2)

The first ticket is drawn and Faye wins first prize.
Her ticket is removed and a new ticket is drawn for the second prize.

(iii) What is the probability that

(a) Faye will win second prize in the raffle?

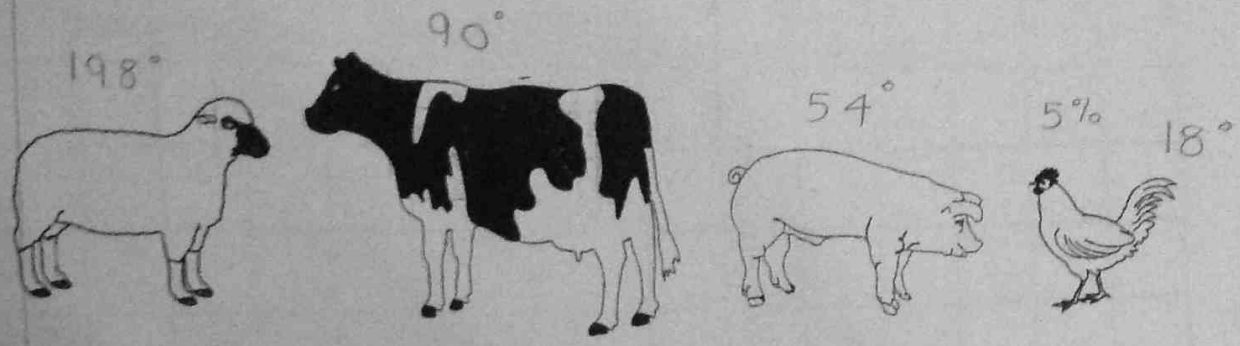
Answer: 0 (1)

(b) Pete will win second prize in the raffle?

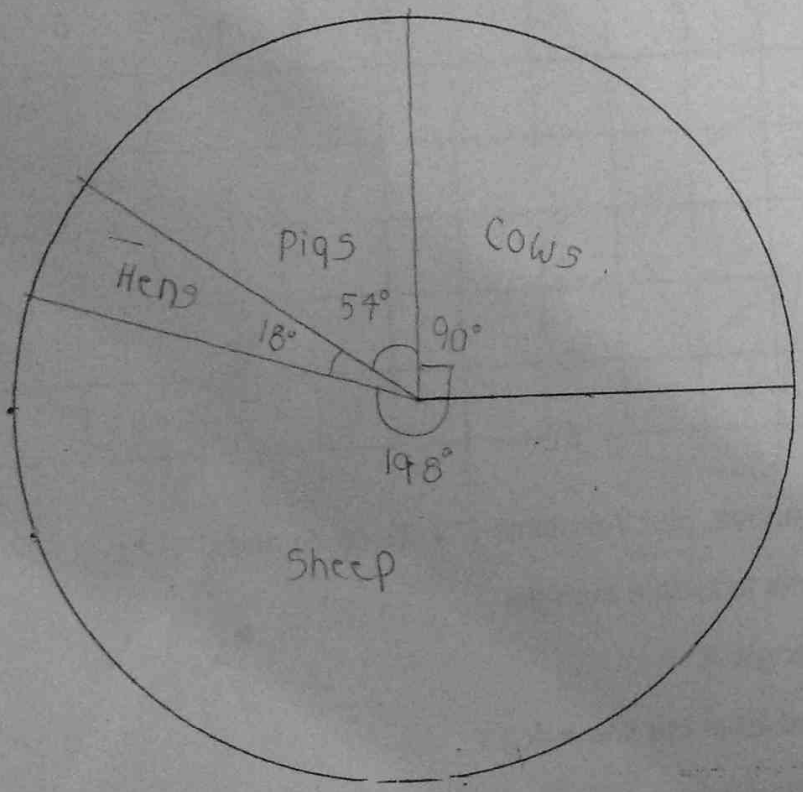
$\frac{24}{159}$

Answer: $\frac{24}{159}$ (1)

14. On a farm, 55% of the animals are sheep, 25% are cows, 15% are pigs and the rest are hens.



(i) Represent this information on a pie chart, clearly marking the angles and the sectors for each type of farm animal.



(5)

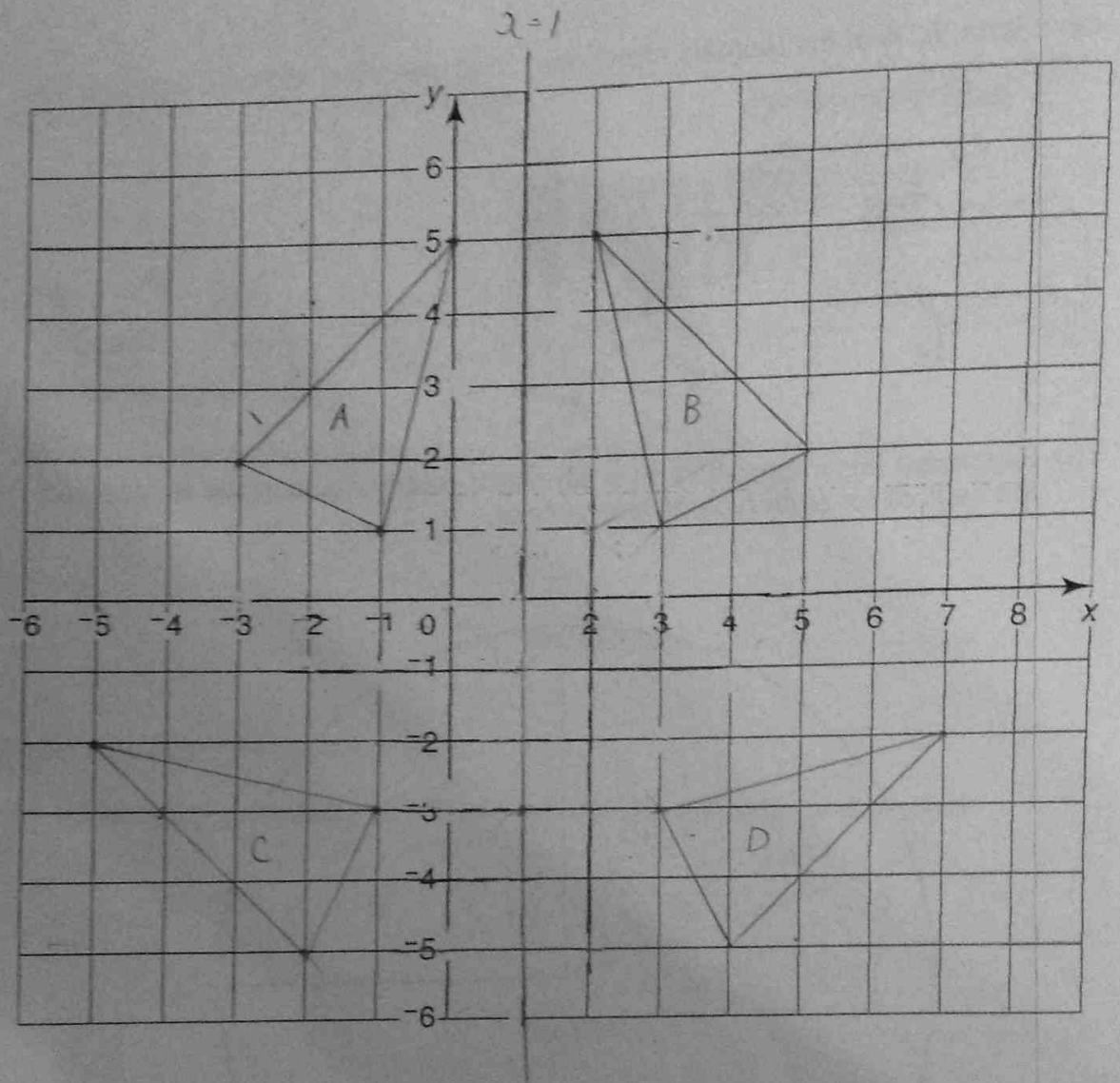
(ii) If the farmer sells all the sheep and then draws a new chart, which angle now represents cows on the farm? cows, pigs, hens

200

Answer: 200 ° (2)

Turn over

15.



(i) On the grid above, plot the points (⁻3, 2), (0, 5) and (⁻1, 1).

Join the points to form a triangle.

Label the triangle A. (2)

(ii) (a) Draw and label the line $x = 1$ (1)

(b) Reflect triangle A in the line $x = 1$

Label the image triangle B. (2)

(iii) Rotate triangle A through 90 degrees anticlockwise about the point (1, ⁻1).

Label the image triangle C. (3)

(iv) Draw in a fourth triangle so that the pattern made by the four triangles has one line of symmetry.

Label the fourth triangle D. (1)

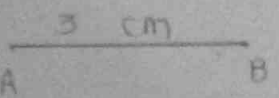
(a) The distance from A to B is 6 metres.

Use a scale of 1:200 to make a scale drawing of the line AB.

1 cm = 200 cm

1 cm = 2 m

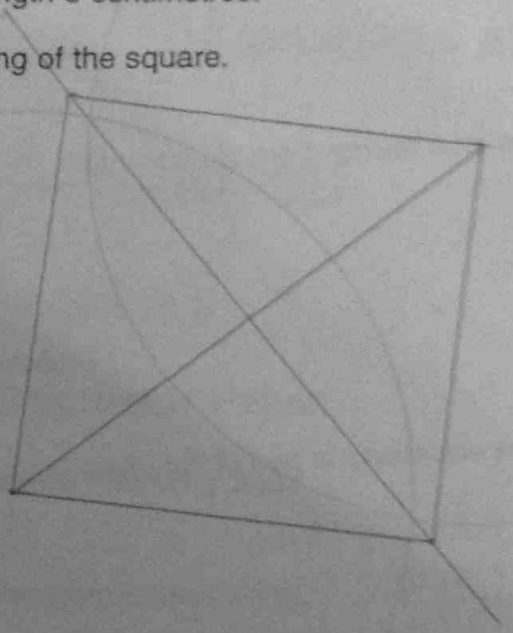
6 m = 3 cm



(2)

(b) A square has diagonals of length 8 centimetres.

(i) Make an accurate drawing of the square.



(3)

(ii) Calculate the perimeter of the square, leaving your answer in the form $a\times\sqrt{b}$, where a and b are integers.

$x^2 + x^2 = 8^2$

$2x^2 = 64$

$x^2 = 32$

$x = \sqrt{32} = 4\sqrt{2}$

$P = 4(4\sqrt{2}) = 16\sqrt{2}$

Answer: $16\sqrt{2}$ cm (3)

17. At a garden fete Sir Ion Brew sold ice creams and cans of soft drink. He sold c ice creams at 50 pence each and d cans of soft drink at 40 pence each.

Having sold 150 items by the end of the fete, he found that he had taken a total of £69.00

(i) Form separate equations, in terms of c and d, to represent

(a) the total number of items sold

Answer: $c + d = 150$ (1)

(b) the total takings from the sale of the items.

Answer: $50c + 40d = 6900$ (2)

(ii) Solve the equations in part (i) simultaneously.

$50c + 50d = 7500$
$50c + 40d = 6900$
$10d = 600$
$d = 60$
$\Rightarrow c =$

Answer: $c =$ 90

Answer: $d =$ 60 (4)

(iii) How much money was taken from the sale of soft drinks?

$40(60)$

Answer: £ 24 (1)

(Total marks: 100)