SURNAME .....  FIRST NAME .....

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JUNIOR SCHOOL .....  SENIOR SCHOOL .....

Independent Schools Examinations Board

# COMMON ENTRANCE EXAMINATION AT 13+

# MATHEMATICS

## PAPER 2

### Non-Calculator Paper

**Monday 6 June 2005**

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. Find the value of

(i) 9.4 + 6.82

Answer: 16.22 (1)

(ii) 9.4 – 6.82

Answer: 2.58 (2)

(iii) 8.52 × 0.3

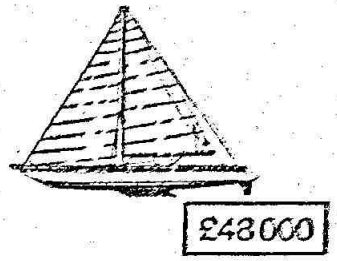
Answer: 2.556 (2)

(iv) 8.52 ÷ 0.3

Answer: 28.4 (2)

2. (a) The Captain's new yacht costs £48 000

He pays $\frac{2}{5}$ of the price as the first payment.




(i) How much is the first payment?

$\frac{2}{5}(48,000) = 19200$

Answer: £ 19,200 ..... (2)

The remainder is paid monthly in equal amounts over the next 24 months.

(ii) How much does the Captain pay each month?

$\frac{28,800}{24} = 1200$

Answer: £ 1200 ..... (2)

(b) Manuel uses a whole carton to fill 25 glasses each with 140 millilitres of orange juice.

How many litres did the carton hold when full?

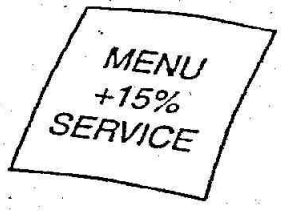
$25(140) = 3500\ ml = 3.5\ l$

Answer: 3.5 ..... litres (2)

(c) *Billy's Bistro* adds 15% to the price of a meal as a service charge.

The price of Marcel's meal is £53

How much is added as his service charge?




$53(.15)$

Answer: £ 7.95 ..... (2)

3. (a) Write 0.8 as a percentage.

Answer: 80 ..... % (1)

(b) Write $7\frac{1}{2}\%$ as a fraction.

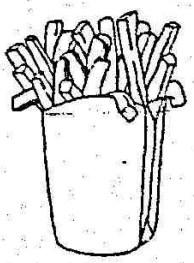
$\frac{7.5}{100} = \frac{75}{1000} = \frac{3}{40}$

Answer: $\frac{3}{40}$ ..... (2)

(c) Write $\frac{3}{8}$ as a decimal.

Answer: 0.375 ..... (2)

(d) Robin has £2.50 in his pocket.
He spends 75 pence on a bag of chips.
What fraction of the £2.50 does he spend on chips?



$\frac{75}{250} = \frac{75}{250} = \frac{3}{10}$

Answer: $\frac{3}{10}$ ..... (2)

4. (a)

$$\frac{6.15 \times 196}{42.7}$$

(i) Rewrite the calculation shown above, giving each number correct to 1 significant figure.

Answer: $\frac{6 \times 200}{40}$ (1)

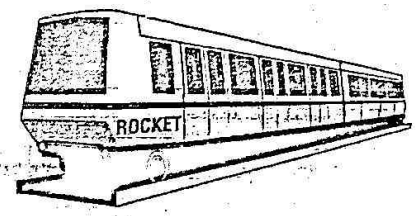
(ii) Find the value of your answer to part (a)(i).

Answer: 30 ..... (1)

(b) It costs 9.73 pence per mile to travel on *Rocket Railways*.

**Estimate** the cost of a 145 mile journey on *Rocket Railways*.

$145(9.73) = 1410.85$ pence




Answer: £ 14.11 (2)

5. (a) Calculate the value of

(i) $8 - 3 \times 4 + 6$

Answer: 2 ..... (2)

(ii) $2^6$

Answer: 64 ..... (1)

(b) (i) Write 324 as the product of prime factors, using indices.

324
||
2 x 162
||
2 x 81
||
9 x 9
|| ||
3 x 3 3 x 3

Answer: $2^2 \times 3^4$ ..... (3)

(ii) Hence, or otherwise, calculate the square root of 324

$\sqrt{2^2 \times 3^4} = 2(3^2) = 2(9) = 18$

Answer: 18 ..... (1)

6. (a) Simplify

(i) $3b^4 \times 2b$

Answer: $6b^5$ (2)

(ii) $\frac{6c^3}{9c^6}$

Answer: $\frac{2}{3c^3}$ (2)

(iii) $\frac{8d^3 + 4d^3}{12}$

$\frac{12d^3}{12}$

Answer: $d^3$ (2)

(b) Remove the brackets and simplify

$3(3p - 2q) - 4(p + 2q)$

$9p - 6q - 4p - 8q$

Answer: $5p - 14q$ (3)

(c) Factorise completely

$8x^8 + 2x^2$

$2x^2(4x^6 + 1)$

Answer: $2x^2(4x^6 + 1)$ (2)

7. When $a = 3$ $b = -2$ $c = -4$
find the value of

(i) $2a + c$

$6 - 4$

Answer: 2 (2)

(ii) $ab - c^2$

$-6 - (16)$

$-22$

Answer: $-22$ (2)

(iii) $a(b - c)^3$

$3(2)^3$

$3(8)$

Answer: 24 (2)

(iv) $\frac{2ac}{b^3}$

$\frac{2(3)(-4)}{-8}$

$\frac{-24}{-8}$

Answer: 3 (2)

8. To convert temperature from Celsius scale (°C) to Fahrenheit scale (°F), you multiply the Celsius temperature by $\frac{9}{5}$ and then add 32

(i) What is the Fahrenheit equivalent of 55 °C?

$\frac{9}{5}(55) + 32$

Answer: 131 ..... °F (2)

(ii) What is the Celsius equivalent of 77 °F?

$\frac{9}{5}x + 32 = 77$

$\frac{9}{5}x = 45$

$9x = 225$

$x = 25$

Answer: ..... °C (3)

9. The $n$th term of a sequence is $2n^2 - 1$

(i) Write down the twelfth term of the sequence.

$2(12)^2 - 1 =$

Answer: 287 ..... (2)

(ii) What is the value of $n$ when the $n$th term is equal to 799?

$2n^2 - 1 = 799$

$2n^2 = 800$

$n^2 = 400$

$n = 20$

Answer: $n$ = 20 ..... (3)

10. Boris enters a triathlon which consists of swimming, cycling and running.

(i) He swims 2000 metres at 80 metres/minute.
How long does the swimming take?

$T = \frac{D}{S} = \frac{2000}{80} = 25$

Answer: 25 min (2)

(ii) He cycles for 45 minutes at 40 km/h.
How far does he cycle?

$D = S \times T = 40 \times \frac{45}{60} = 30$

Answer: 30 km (2)

(iii) He completes the 8000 m run in half an hour.
At what average speed does he run in km/h?

$AS = \frac{TD}{TT} = \frac{8}{.5} = 16$

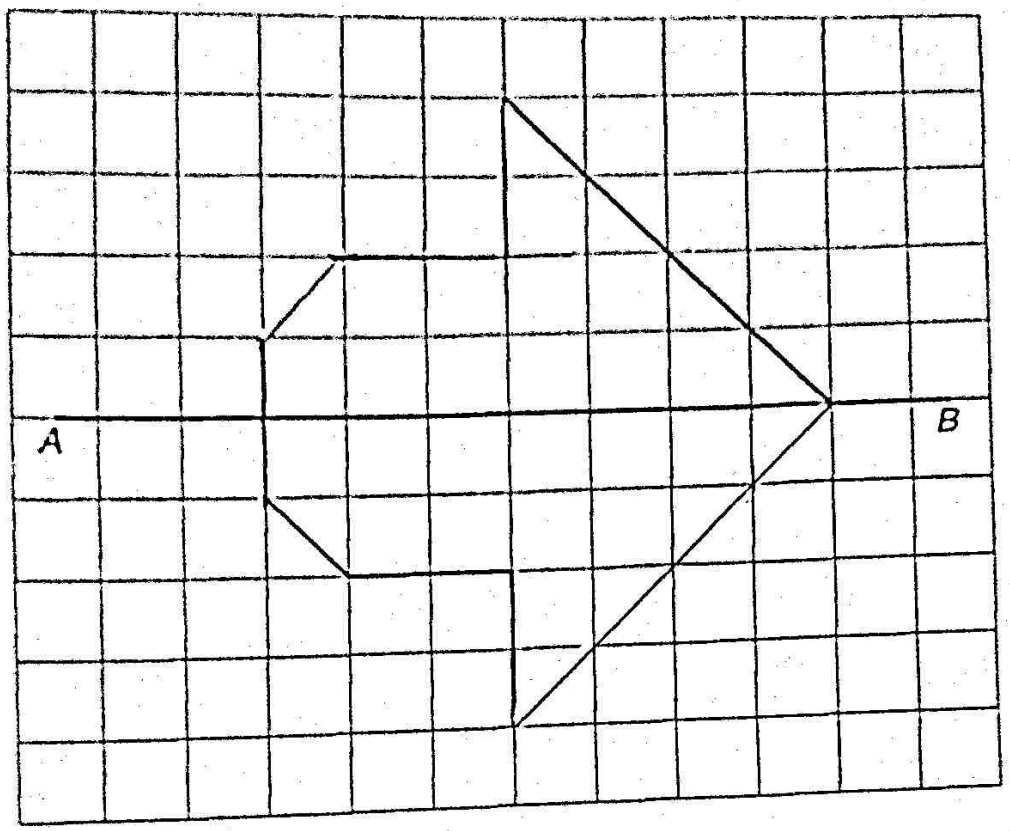
Answer: 16 km/h (2)

(iv) Without counting the length of changeover times between events, what is Boris' average speed for the complete triathlon in km/h?

$AS = \frac{2 + 30 + 8}{\frac{25}{60} + \frac{45}{60} + \frac{30}{60}} = \frac{40}{\frac{100}{60}} = 24$

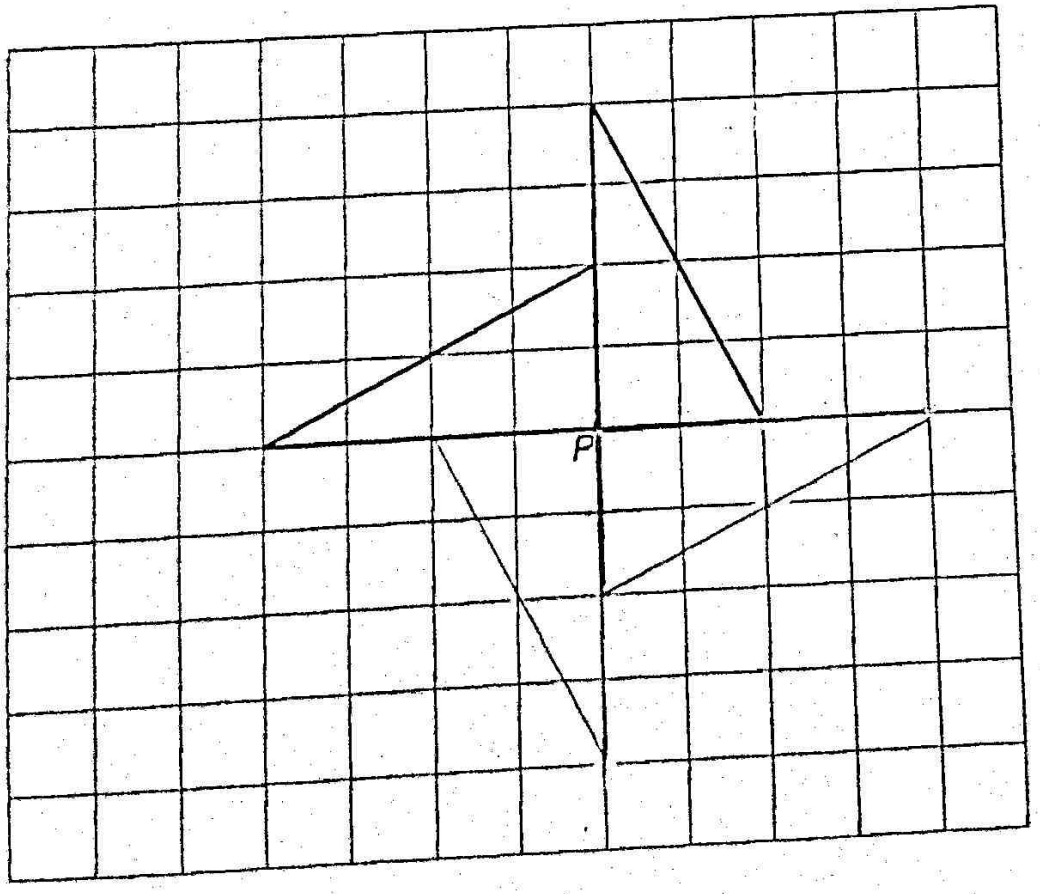
Answer: 24 km/h (3)

11. (a) Complete the diagram so that it is symmetrical about the line *AB*.




(2)

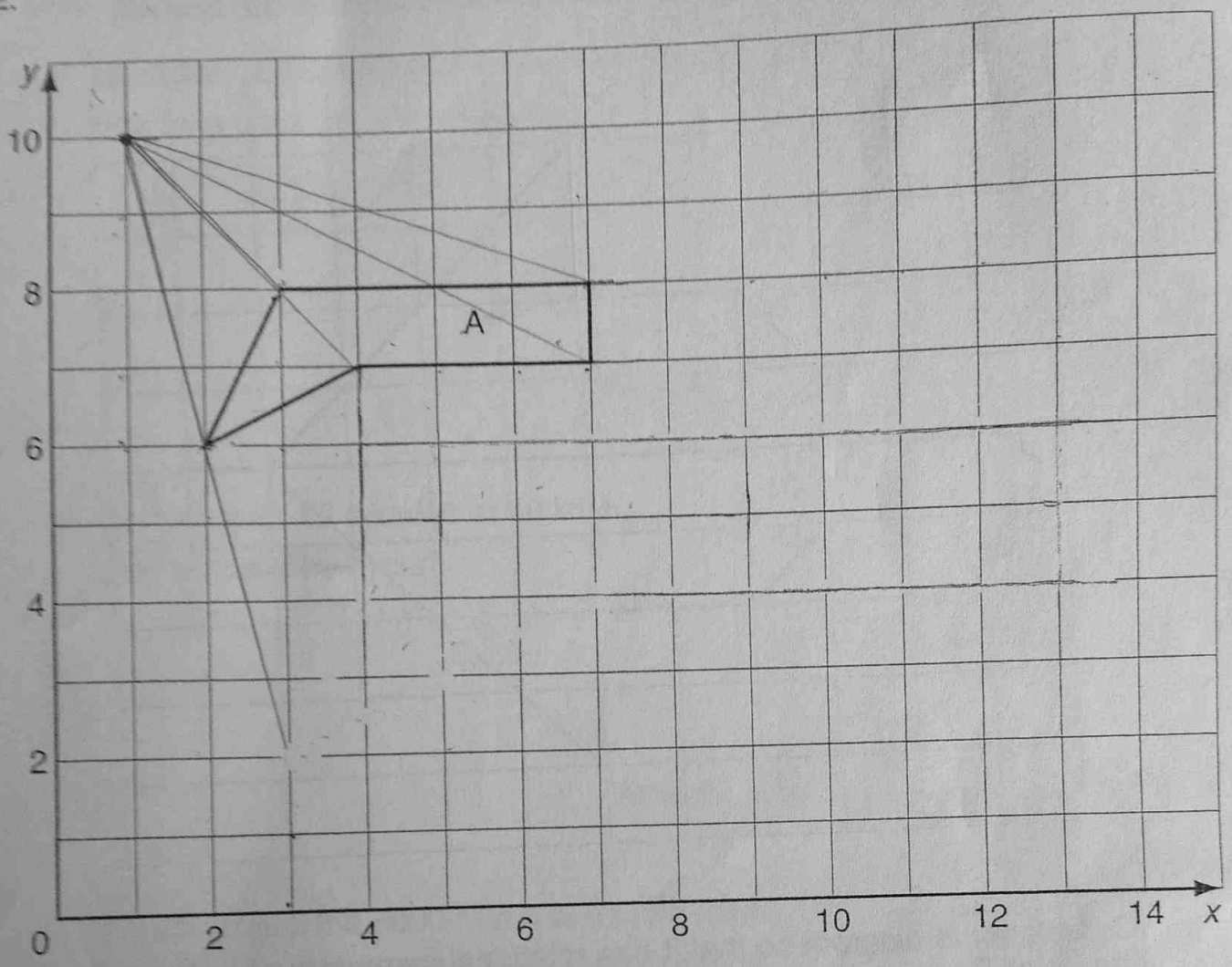
(b) Complete the diagram so that it has rotational symmetry of order 4 about the point *P*.




(2)

Turn over

12.




(i) On the 1 centimetre square grid, with the point (1, 10) as centre, enlarge shape A by scale factor 2

Label the image B.

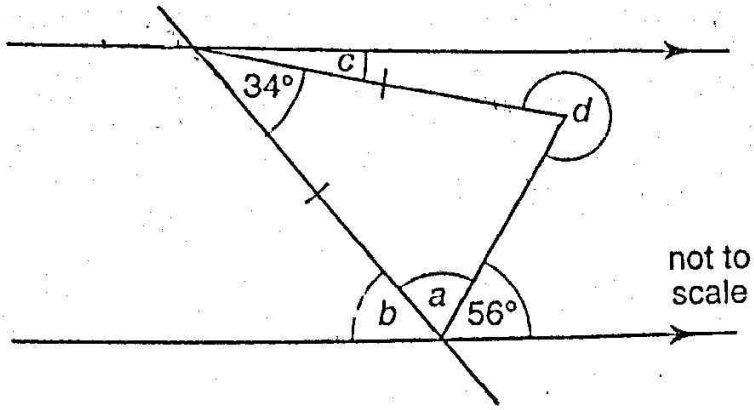
(3)

(ii) The area of shape A is 5 $cm^2$.

What is the area of shape B?

..... $cm^2$ (1)

13. (a) Calculate the size of each of the angles marked *a*, *b*, *c* and *d*.




Answer: $a$ = 73° ..... (2)

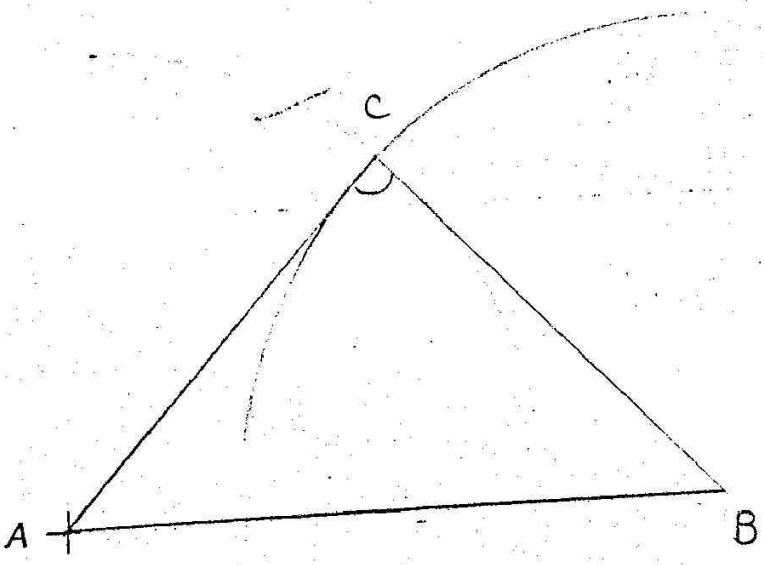
Answer: $b$ = 51 ..... (1)

Answer: $c$ = 17 ..... (2)

Answer: $d$ = 287 ..... (1)

(b) *ABC* is an isosceles triangle with $AB = 8$ cm and $AC = BC = 6$ cm.

(i) Showing your construction lines, draw triangle *ABC*.
The position of *A* has been marked for you.




(2)

(ii) Measure and write down the size of angle *ACB*.

Answer: angle *ACB* = 85° ..... (1)

14. For this question you are told that

11 pounds (lb) are equivalent to 5 kilograms (kg)

(i) How many kilograms are equivalent to 55 pounds?

11 lb = 5 kg

↓

55 lb

x 5

Answer: 25 kg ..... kg (1)

(ii) On the grid opposite draw a graph to convert pounds to kilograms for masses up to 55 pounds. (2)

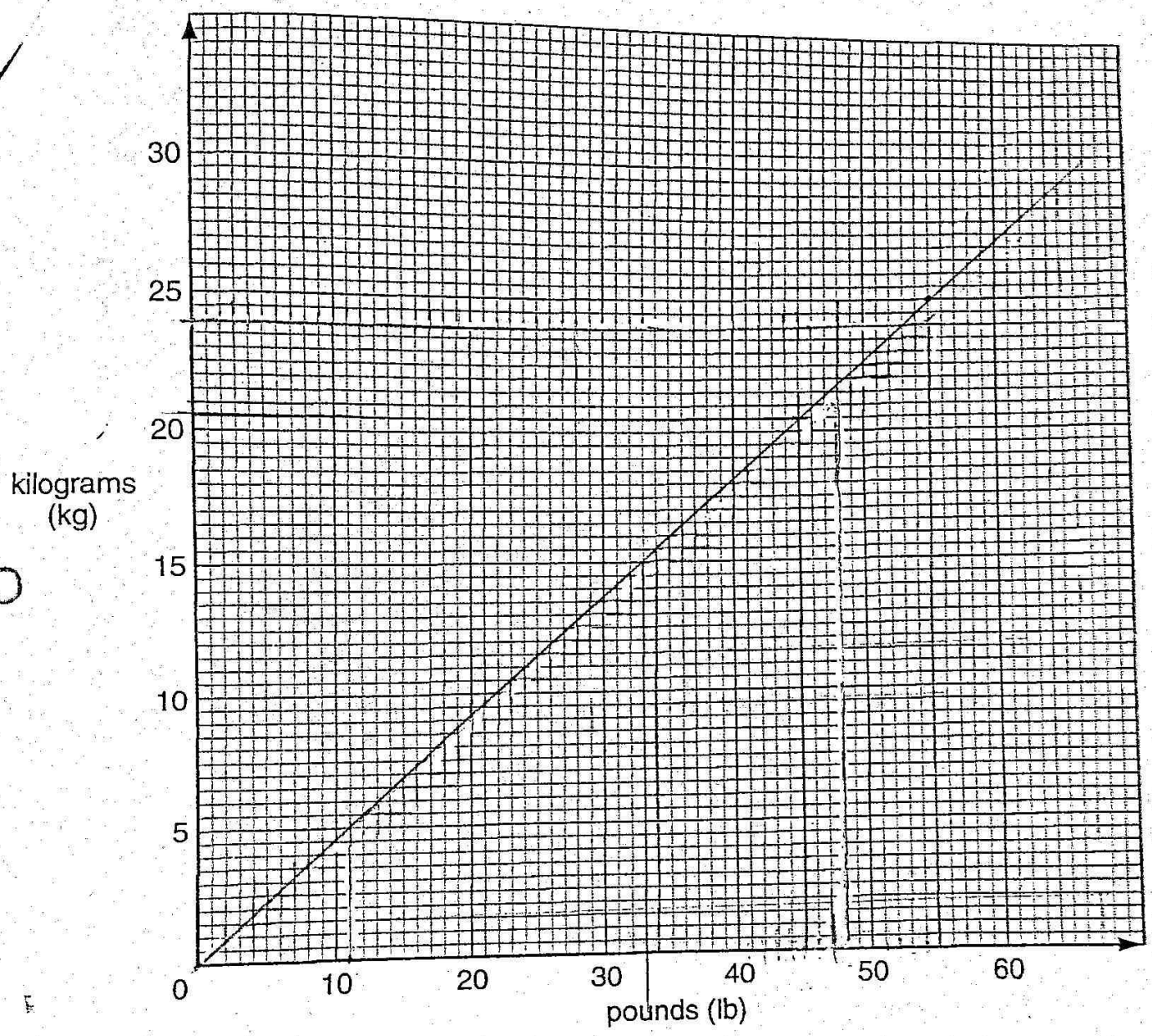
(iii) Use your graph to answer the following questions, showing clearly where you take your readings.

(a) The baggage allowance on *Orbital Airways* is 15 kg.
What is the equivalent mass in pounds?

Answer: 33 ..... lb (1)

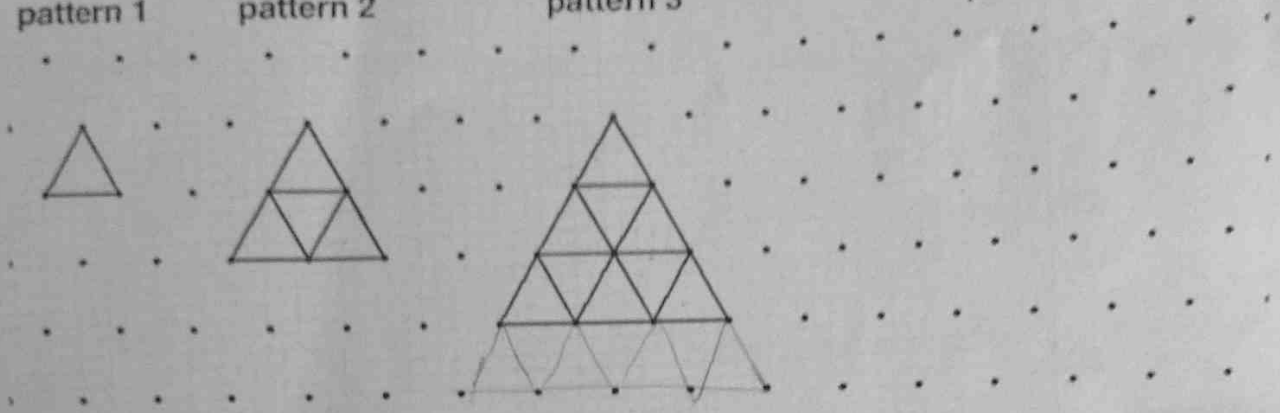
(b) A prize turkey has a mass of 48 lb.
What is the equivalent mass in kilograms?
Give your answer to the nearest kilogram.

Answer: 21 ..... kg (2)


30
25
20
15
10
5
0
kilograms
(kg)
10
20
30
40
50
60
pounds (lb)

15. Here are the first three patterns in a sequence with space to draw the fourth pattern.

pattern 1 pattern 2 pattern 3 pattern 4



In this question ▽ and △ are small triangles.

(i) Draw pattern 4 (1)

(ii) Complete the table below for patterns 1 to 4

| pattern number | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| number of small triangles | 1 | 4 | 9 | 16 |

$n^2$ (1)

(iii) How many small triangles are there in pattern 5?

Answer: 25 (1)

(iv) Which pattern will have 100 small triangles?

Answer: pattern 10 (1)

(v) Which pattern gives the sum of the odd numbers from 1 to 99 inclusive?

① ② ③ ④ → terms

1 + 3 + 5 + 7 + 9 + ... + 99

+2, +2

2n - 1

Answer: pattern 2n - 1 (2)

(Total marks: 100)