

# Formulae

Exam questions

## Foundation and Higher tiers

Please write clearly in block capitals.

Name

Class

Teacher

Time allowed: 95 minutes

### Materials

For this booklet you need a black pen, a pencil, a ruler, a rubber and a calculator for Section B.

### Instructions

- Use black ink or black ballpoint pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer all questions in the spaces provided.
- **Section A** (questions 1 to 11): you must not use a calculator.
- **Section B** (questions 12 to 30): you may use a calculator.
- Do all rough work in this booklet. Cross through any work you do not want marked.

### Information

- The marks for each question are shown in brackets.
- The maximum mark for this booklet is 83.

### Advice

- Read each question carefully.
- In all calculations, show clearly how you work out your answer.

For teacher's use

| Q     | Mark | Q  | Mark |
|-------|------|----|------|
| 1     |      | 16 |      |
| 2     |      | 17 |      |
| 3     |      | 18 |      |
| 4     |      | 19 |      |
| 5     |      | 20 |      |
| 6     |      | 21 |      |
| 7     |      | 22 |      |
| 8     |      | 23 |      |
| 9     |      | 24 |      |
| 10    |      | 25 |      |
| 11    |      | 26 |      |
| 12    |      | 27 |      |
| 13    |      | 28 |      |
| 14    |      | 29 |      |
| 15    |      | 30 |      |
| TOTAL |      |    |      |

**Section A****You must not use a calculator**Do not  
write  
outside  
the box

- 1** A dog walker uses this rule to work out what to charge for one walk.

$$\text{Charge (£)} = 6 \times \text{number of dogs} + 4$$

- (a) Work out the charge for walking 3 dogs.

Answer £ \_\_\_\_\_

**[1 mark]**

- (b) The charge for one walk is £40  
How many dogs are walked?

Answer \_\_\_\_\_

**[2 marks]**

**2**  $T = 5n - 2m$

- (a) Work out the value of  $T$  when  $n = 4$  and  $m = -3$

Answer \_\_\_\_\_

[2 marks]

- (b) Work out the value of  $n$  when  $T = 31$  and  $m = 2$

Answer \_\_\_\_\_

[2 marks]

- 3** A theatre charges £9 for each ticket.  
There is also a booking fee of £2.50 for each order.

Write a formula for the total cost,  $C$  pounds, of an order for  $n$  tickets.

Answer \_\_\_\_\_

[2 marks]

- 4** Make  $t$  the subject of  $w = 5t - 9$

Answer \_\_\_\_\_

[2 marks]

- 5**  $k = 3(m - 2n)$

Circle the formula with  $m$  as the subject.

$$m = \frac{k}{3} + 2n \quad m = \frac{k+2n}{3} \quad m = \frac{k}{3} - 2n \quad m = 3k + 2n$$

[1 mark]

- 6**  $s = ut + \frac{1}{2}at^2$

Work out the value of  $s$  when  $u = 6$ ,  $t = 4$  and  $a = -2.5$

Answer \_\_\_\_\_

[2 marks]

7

Ava makes  $x$  the subject of the formula  $y = \frac{2x-5}{4}$

Here is her working.

$$y = \frac{2x-5}{4}$$

$$4y = 2x - 5$$

$$4y - 5 = 2x$$

$$x = \frac{4y-5}{2}$$

(a) Describe the mistake Ava makes.

[1 mark]

(b) Write down the correct formula for  $x$ .

Answer \_\_\_\_\_

[1 mark]

8

$$f = \frac{uv}{u+v}$$

Work out the value of  $v$  when  $f = 6$  and  $u = 10$

Answer \_\_\_\_\_

[3 marks]

Do not  
write  
outside  
the box

**9** Make  $v$  the subject of  $E = \frac{1}{2}mv^2$

Answer \_\_\_\_\_

[2 marks]

**10** Make  $p$  the subject of  $3p + b = pc - 2$

Answer \_\_\_\_\_

[3 marks]

**11** Make  $x$  the subject of  $y = \frac{x+2}{x-3}$

Answer \_\_\_\_\_

[4 marks]

## Section B



You may use a calculator

Do not  
write  
outside  
the box

- 12** A garden company uses this formula to work out the cost of laying new turf.

$$C = 6.85A + 45$$

$C$  is the cost in pounds.

$A$  is the area of the lawn in  $\text{m}^2$

Work out the cost of laying turf on a lawn with an area of  $18.6 \text{ m}^2$

Answer £ \_\_\_\_\_

[2 marks]

- 13** An energy company uses this rule to work out the cost of running an appliance.

$$\text{Cost (pence)} = \text{power (kW)} \times \text{time (hours)} \times 27.5$$

Jade's tumble dryer has a power of 2.4 kW.

She uses it for 1.5 hours.

Work out the cost of running the tumble dryer.

Give your answer in pounds.

Answer £ \_\_\_\_\_

[2 marks]

- 14** This formula changes a temperature in degrees Celsius,  $C$ , to degrees Fahrenheit,  $F$ .

$$F = 1.8C + 32$$

- (a) Work out the value of  $F$  when  $C = 23.7$

Answer \_\_\_\_\_

[2 marks]

- (b) Work out the value of  $F$  when  $C = -13.4$

Answer \_\_\_\_\_

[1 mark]

- 15** Priya works out her weekly pay, £ $E$ , with this formula.

$$E = hr + b$$

$h$  is the number of hours she works.

$r$  is her rate of pay in pounds per hour.

$b$  is her bonus in pounds.

Work out Priya's pay when  $h = 37.5$ ,  $r = 11.44$  and  $b = 25$

Answer £ \_\_\_\_\_

[2 marks]

- 16** A cube has edges of length  $s$  cm.  
Its surface area,  $A \text{ cm}^2$ , and its volume,  $V \text{ cm}^3$ , are given by  
 $A = 6s^2$  and  $V = s^3$

**(a)** Work out the value of  $A$  when  $s = 3.4$

Answer \_\_\_\_\_  $\text{cm}^2$   
[2 marks]

**(b)** Work out the value of  $V$  when  $s = 3.4$

Answer \_\_\_\_\_  $\text{cm}^3$   
[1 mark]

- 17** A plumber works out her charge,  $\text{£}C$ , for a job that takes  $m$  minutes with this formula.

$$C = 45 + \frac{95m}{60}$$

Work out her charge for a job that takes 84 minutes.

Answer  $\text{£}$  \_\_\_\_\_  
[2 marks]

- 18** The fuel left in a car's tank,  $F$  litres, after it has travelled  $d$  km is given by

$$F = 52 - 0.065d$$

Work out the fuel left in the tank after the car has travelled 348 km.

Answer \_\_\_\_\_ litres

**[2 marks]**

- 19** The height,  $h$  metres, of a water rocket  $t$  seconds after it is launched is given by

$$h = 1.2 + 19.6t - 4.9t^2$$

Work out the height of the rocket 3.4 seconds after it is launched.

Give your answer to 1 decimal place.

Answer \_\_\_\_\_ m

**[2 marks]**

- 20** A print shop uses this rule to work out the cost of printing a booklet.

$$\text{Cost (£)} = 4.75 + 0.62 \times \text{number of pages}$$

- (a) Work out the cost of printing a booklet with 38 pages.

Answer £ \_\_\_\_\_

[2 marks]

- (b) Nadia has £20 to print one booklet.  
What is the greatest number of pages her booklet can have?

Answer \_\_\_\_\_

[2 marks]

- 21** Leon uses this rule to work out the time needed to roast a joint of lamb.

$$\text{Time (minutes)} = 42 \times \text{mass (kg)} + 25$$

The joint has a mass of 2.35 kg.

Work out the time needed.

Give your answer in hours and minutes, to the nearest minute.

Answer \_\_\_\_\_

[3 marks]

- 22** An electric scooter company uses this rule to work out the cost of a ride.

$$\text{Cost (£)} = 1.15 + 0.23 \times \text{number of minutes}$$

Ellie pays £7.59 for a ride.

How many minutes is her ride?

Answer \_\_\_\_\_ minutes

**[3 marks]**

- 23** This formula changes a distance in miles,  $m$ , to a distance in kilometres,  $k$ .

$$k = 1.61m$$

- (a)** A marathon is 26.2 miles.  
Work out the length of a marathon in kilometres.  
Give your answer to 1 decimal place.

Answer \_\_\_\_\_ km

**[1 mark]**

- (b)** Zara runs 10 km.  
Leo runs 6.5 miles.  
Who runs further?  
You must show your working.

**[2 marks]**

**24** A garden centre sells bags of compost for £4.79 each and bags of bark for £6.35 each.

- (a) Write a formula for the total cost,  $C$  pounds, of  $x$  bags of compost and  $y$  bags of bark.

Answer \_\_\_\_\_

[2 marks]

- (b) Omar has £50  
He wants 4 bags of compost and 5 bags of bark.  
Does Omar have enough money?  
You must show your working.

[2 marks]

- 25** The circumference,  $C$ , of a circle with radius  $r$  is given by

$$C = 2\pi r$$

- (a)** Make  $r$  the subject of the formula.

Answer \_\_\_\_\_

**[1 mark]**

- (b)** A circle has a circumference of 47.1 cm.  
Work out its radius.  
Give your answer to 1 decimal place.

Answer \_\_\_\_\_ cm

**[2 marks]**

- 26** The simple interest,  $\pounds I$ , on  $\pounds P$  saved for  $T$  years at a rate of  $R\%$  each year is given by

$$I = \frac{PRT}{100}$$

Work out the simple interest on  $\pounds 2450$  saved for 4 years at a rate of 3.2% each year.

Answer  $\pounds$  \_\_\_\_\_

**[2 marks]**

27

Rhys hires a car for 4 days.

He drives 386 miles.

Company A uses this rule to work out the cost.

$$\text{Cost (£)} = 32.50 \times \text{number of days} + 0.18 \times \text{number of miles}$$

- (a) Work out the cost of hiring the car from Company A.

Answer £ \_\_\_\_\_

[2 marks]

- (b) Rhys could hire the car from Company B instead.  
Company B charges £215 for 4 days, however many miles he drives.  
Which company is cheaper for Rhys?

Answer \_\_\_\_\_

[1 mark]

- 28** The air temperature,  $T^{\circ}\text{C}$ , at a height of  $h$  km above sea level is given by

$$T = 15 - 6.5h$$

- (a) Work out the temperature at a height of 3.8 km.

Answer \_\_\_\_\_  $^{\circ}\text{C}$

[2 marks]

- (b) At what height is the temperature  $0^{\circ}\text{C}$ ?  
Give your answer to 1 decimal place.

Answer \_\_\_\_\_ km

[2 marks]

- 29** Here is a formula used in science.

$$v^2 = u^2 + 2as$$

Work out the value of  $v$  when  $u = 4.5$ ,  $a = 9.8$  and  $s = 12.6$   
 $v$  is positive.

Give your answer to 1 decimal place.

Answer \_\_\_\_\_

[3 marks]

- 30** The time,  $T$  seconds, for one swing of a pendulum of length  $L$  metres is given by

$$T = 2\pi\sqrt{\frac{L}{9.8}}$$

- (a)** Work out the value of  $T$  when  $L = 0.75$   
Give your answer to 2 decimal places.

Answer \_\_\_\_\_ seconds

**[2 marks]**

- (b)** Make  $L$  the subject of the formula.

Answer \_\_\_\_\_

**[3 marks]**

**END OF QUESTIONS**