

# GCSE Mathematics

## Practice Tests: Set 5

### Paper 3H (Calculator)

Time: 1 hour 30 minutes

You should have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator.

#### Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- **Calculators may be used.**
- Diagrams are NOT accurately drawn, unless otherwise indicated.
- You must **show all your working out.**



#### Information

- The total mark for this paper is 80
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*

#### Advice

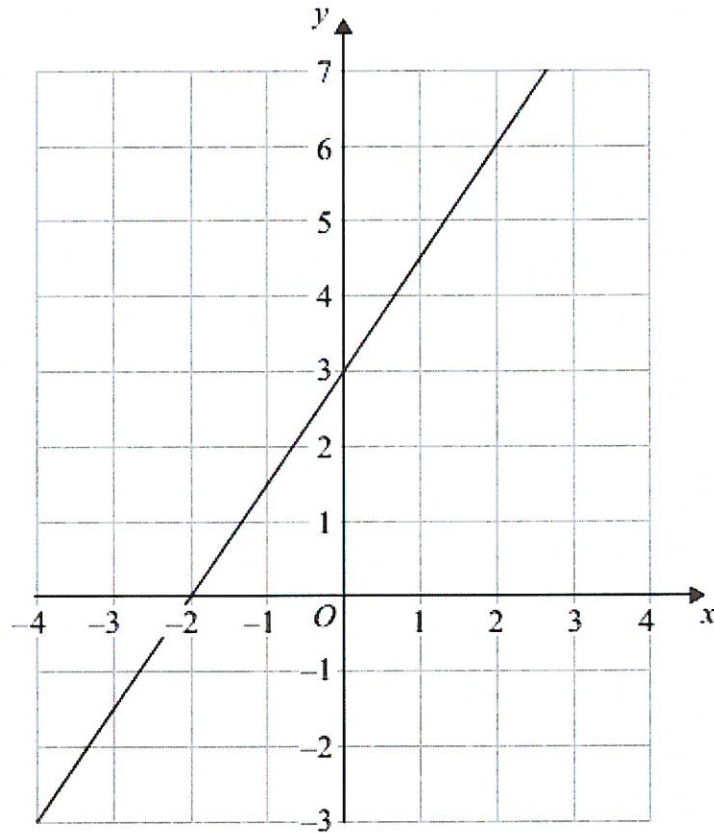
- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1.



Find the gradient of the straight line drawn on this grid.

$$\frac{3}{2} = 1.5$$

.....  
1.5

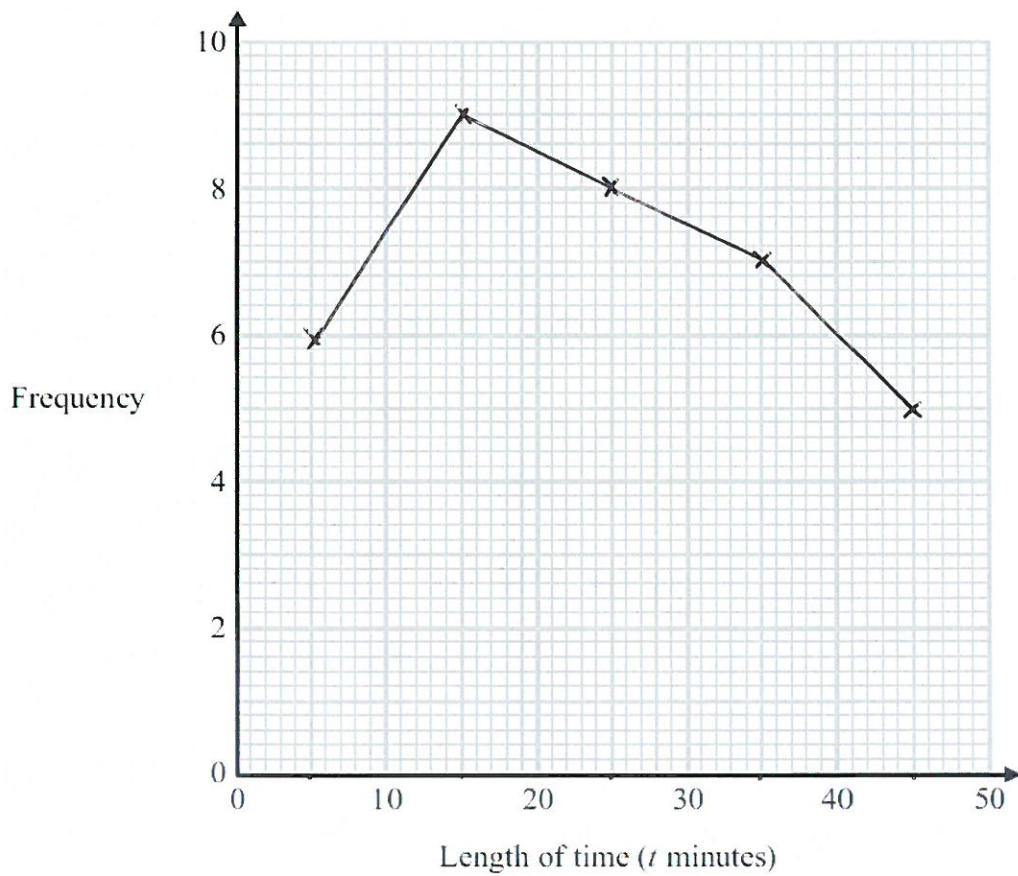
(Total 2 marks)

2. Helen went on 35 flights in a hot air balloon last year.

The table gives some information about the length of time,  $t$  minutes, of each flight.

Length of time ( $t$ minutes)	Frequency
$0 < t \leq 10$	6
$10 < t \leq 20$	9
$20 < t \leq 30$	8
$30 < t \leq 40$	7
$40 < t \leq 50$	5

On the grid below, draw a frequency polygon for this information.



(Total 2 marks)

\*3. Henry is thinking about having a water meter.

These are the two ways he can pay for the water he uses.

**Water Meter**

A charge of £28.20 per year

**plus**

91.22p for every cubic metre of water used

**1 cubic metre = 1000 litres**

**No Water Meter**

A charge of £107 per year

Henry uses an average of 180 litres of water each day.

Henry wants to pay as little as possible for the water he uses.  
Should Henry have a water meter?

$$180 \text{ l} = \frac{180}{1000} = 0.18 \text{ m}^3$$

$$1 \text{ YEAR} = 365 \text{ DAYS} \therefore 365 \times 0.18 = 65.7 \text{ m}^3 / \text{year}$$

$$\begin{aligned} \therefore \text{COST / YEAR} &= 65.7 \times \pounds 0.9122 \\ &= \pounds 59.93 \end{aligned}$$

$$\begin{aligned} \therefore \text{WITH A WATER METER, TOTAL COST} &= \pounds 28.20 + \pounds 59.93 \\ &= \pounds 88.13 \end{aligned}$$

$\therefore$  HENRY SHOULD HAVE A WATER METER BECAUSE  
 $\pounds 88.13 < \pounds 107$

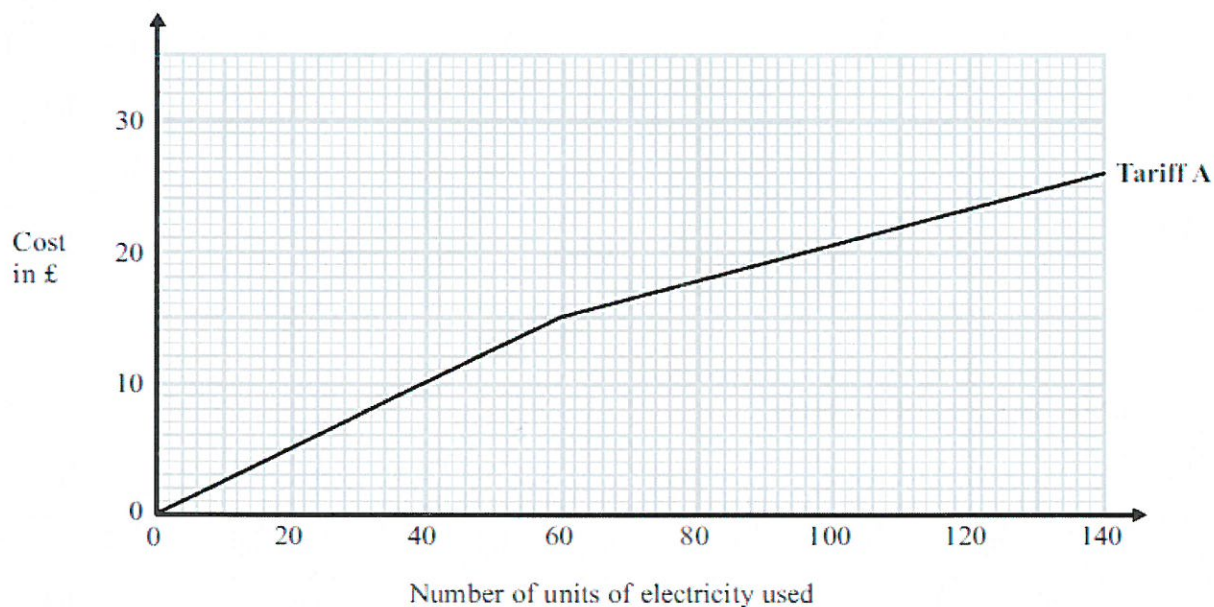
(Total 5 marks)

4. Kalinda pays on Tariff A for the number of units of electricity she uses. Kalinda can use this graph to find out how much she pays each month.

(a) How much does Kalinda pay for each unit of electricity she uses up to a total of 60 units?

£10 FOR 40 UNITS  
 $\frac{1000 \text{ p}}{40} = 25 \text{ p PER UNIT}$

..... 25 ..... p  
 (2)



Kalinda could change to Tariff B. Here is the monthly charge for Tariff B.

20p per unit of electricity used

On average, Kalinda uses 90 units of electricity each month. Kalinda wants to pay the least amount of money for the units of electricity she uses.

\*(b) Should Kalinda change to Tariff B? You must show all your working.

TARIFF B:  $£0.20 \times 90 = £18$   
 TARIFF A: ~~1st 40 UNITS COST £10~~  
 90 UNITS COST £19

KALINDA SHOULD CHANGE TO TARIFF B.

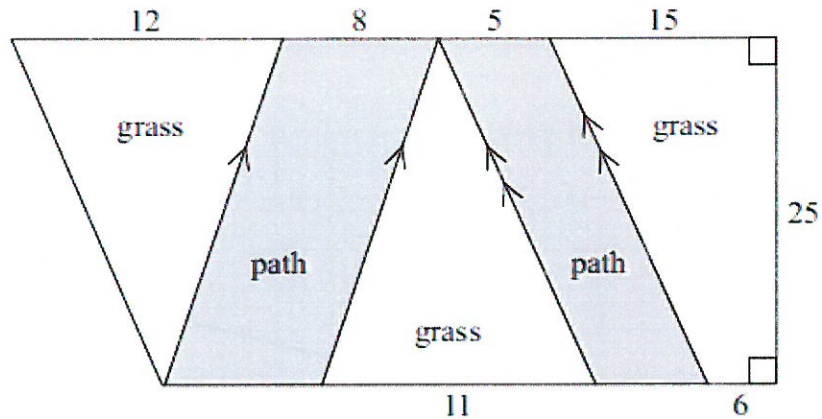
(3)

(Total 5 marks)

5. David is planning his garden.

There will be two paths in the garden.  
The rest of the garden will be grass.

The diagram shows David's plan for his garden.



All measurements on the diagram are given in feet.  
Work out the total area of the grass.

$$\begin{aligned} \text{AREA OF TRAPEZIUM} &= \frac{25}{2} (11 + 12 + 8 + 5 + 15) \\ &= \frac{25}{2} (2+5+6) \\ &= \frac{25}{2} \times 13 \\ &= 162.5 \end{aligned}$$

$$\begin{aligned} \text{AREA OF PATH} &= 8 \times 25 + 5 \times 25 \\ &= 325 \end{aligned}$$

$$\begin{aligned} \therefore \text{AREA OF GRASS} &= 162.5 - 325 \\ &= -162.5 \text{ feet}^2 \end{aligned}$$

(Total 4 marks)

6. (a) Simplify  $p^5 \times p^4$

$$p^9$$

(1)

(b) Simplify  $q^5 \div q^2$

$$q^3$$

(1)

(c) Simplify  $12tu^6 \div 6tu^5$

$$2u$$

(2)

(d) Simplify  $(9w^2y^6)^{\frac{1}{2}}$

$$3wy^3$$

(2)

(e) For  $x > 1$ , write the following expressions in order of size.  
Start with the expression with the least value.

$$x^0 \quad x^2 \quad x \quad x^{-2} \quad x^{\frac{1}{2}}$$
$$x^{-2} \quad x^0 \quad x^{\frac{1}{2}} \quad x \quad x^2$$

(2)

**(Total 8 marks)**

7. Here are three cubes.

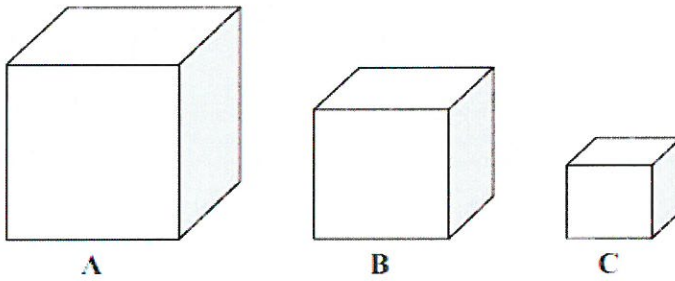


Diagram NOT  
accurately drawn

The volume of cube **B** is 20% less than the volume of cube **A**.  
The volume of cube **C** is 20% less than the volume of cube **B**.

Cube **A** has a volume of  $8000 \text{ cm}^3$ .

What is the volume of cube **C** as a percentage of the volume of cube **A**?

$$\begin{aligned} \text{VOLUME OF C} &= 0.8 \times 0.8 \times \text{VOLUME OF A} \\ &= 0.64 \times \text{VOLUME OF A} \end{aligned}$$

64%

(Total 4 marks)



8. In a sale, normal prices are reduced by 15%.

Janice buys a computer in the sale.  
She pays £578.

Work out what the normal price of the computer was.

$$\text{SALE PRICE} = 85\% \text{ OF NORMAL PRICE}$$

$$578 = 0.85 \times \text{NORMAL PRICE}$$

$$\text{NORMAL PRICE} = \frac{578}{0.85}$$

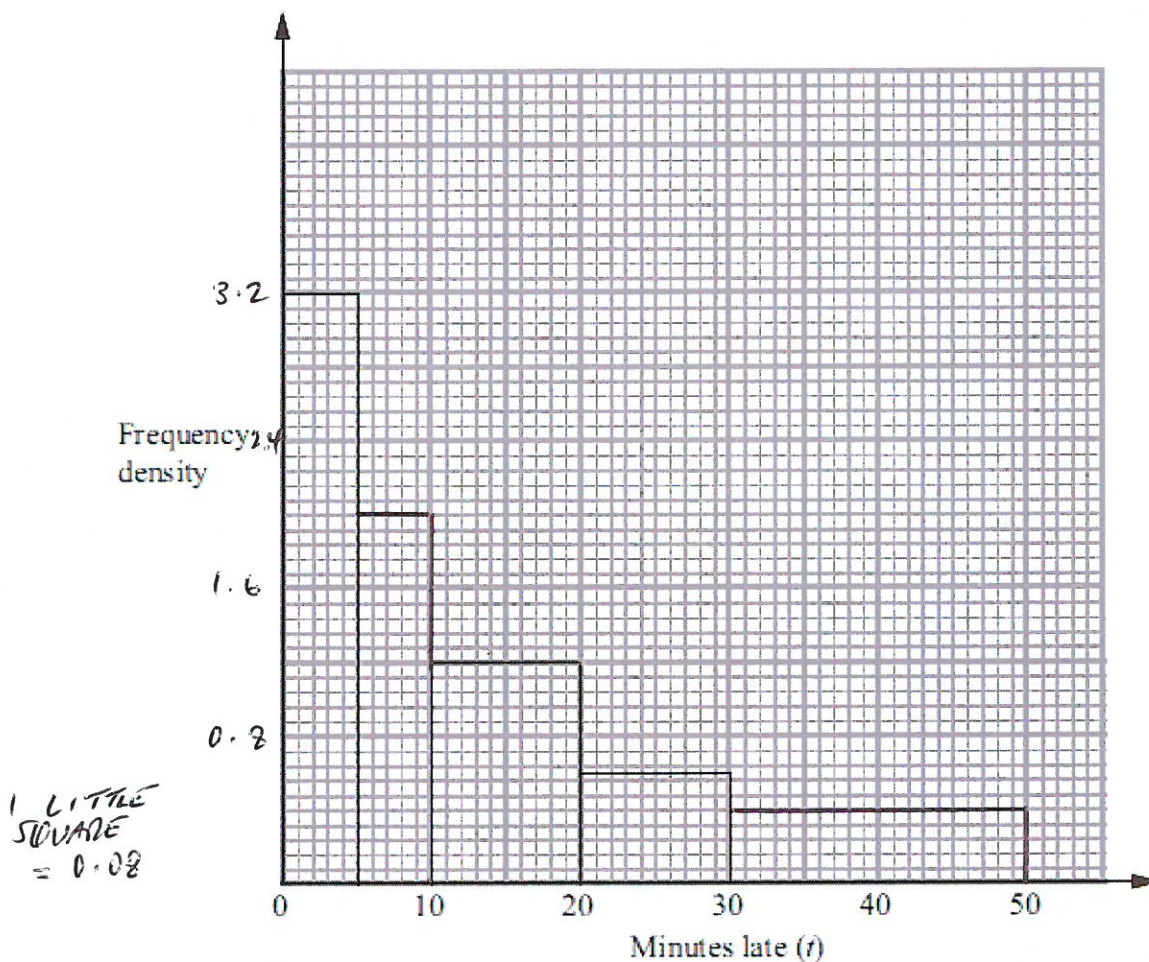
£ 680 .....

(Total 3 marks)

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9. Some trains from Manchester to London were late.  
The incomplete table and histogram gives some information about how late the trains were.

Minutes late ( $t$ )	Frequency	FREQUENCY DENSITY
$0 < t \leq 5$	16	$16 \div 5 = 3.2$
$5 < t \leq 10$	10	$10 \div 5 = 2$
$10 < t \leq 20$	$1.2 \times 10$ 12	1.2
$20 < t \leq 30$	$0.6 \times 10$ 6	0.6
$30 < t \leq 50$	8	$8 \div 20 = 0.4$



- (a) Use the information in the histogram to complete the table. (2)
- (b) Use the information in the table to complete the histogram. (2)

(Total 4 marks)

10. Make  $x$  the subject of  $y = \sqrt{\frac{2x+1}{x-1}}$ .

$$y^2 = \frac{2x+1}{x-1}$$

$$y^2(x-1) = 2x+1$$

$$xy^2 - y^2 = 2x+1$$

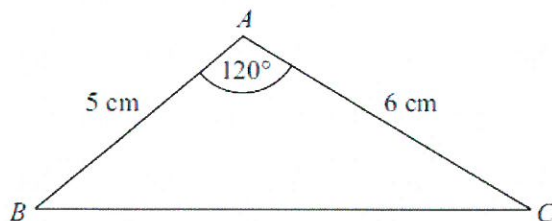
$$xy^2 - 2x = y^2 + 1$$

$$x(y^2 - 2) = y^2 + 1$$

$$x = \frac{y^2 + 1}{y^2 - 2}$$

(Total 4 marks)

11.



Calculate the length of the side  $BC$ .  
Give your answer correct to 3 significant figures.

$$BC^2 = 5^2 + 6^2 - 2 \times 5 \times 6 \times \cos 120$$

$$= 61 - 60 \cos 120$$

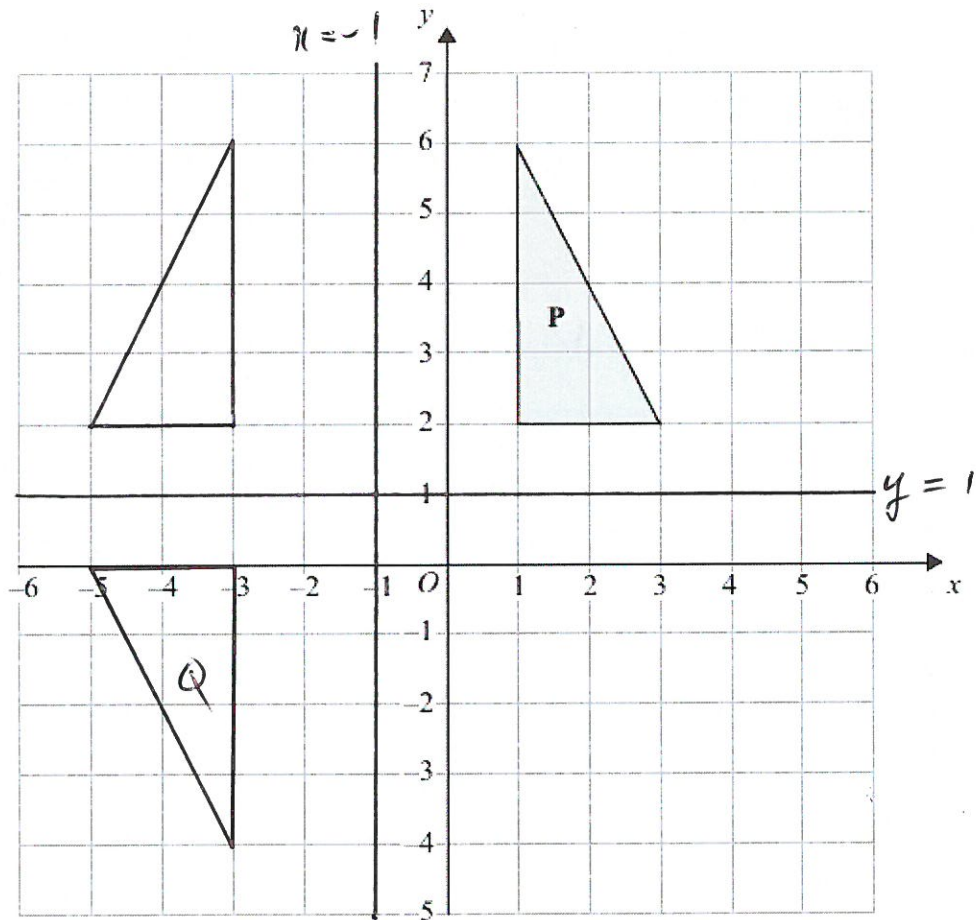
$$= 91$$

$$BC = \sqrt{91}$$

..... 9.54 ..... cm

(Total 3 marks)

12.



Triangle **P** is drawn on a coordinate grid.

The triangle **P** is reflected in the line  $x = -1$  and then reflected in the line  $y = 1$  to give triangle **Q**.

Describe fully the single transformation which maps triangle **P** onto triangle **Q**.

..... ROTATION  $180^\circ$  ABOUT  $(-1, 1)$  .....

.....

(Total 3 marks)

13. A machine part is made by cutting a small square from the centre of a large square piece of steel.

The dimensions of the machine part are shown on the diagram.  
All measurements are in cm.

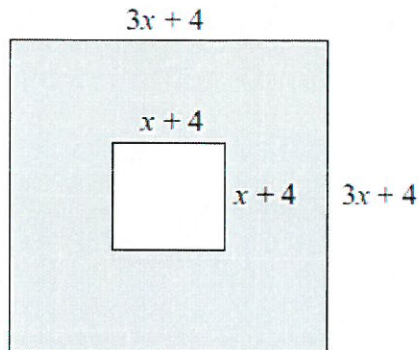


Diagram NOT  
accurately drawn

The perimeter of the small square is two thirds of the perimeter of the large square.

Work out the length of a side of the small square.

$$\text{PERIMETER OF LARGE SQUARE} = 4(3x + 4) = 12x + 16$$

$$\text{PERIMETER OF SMALL SQUARE} = \frac{2}{3}(12x + 16) = 4(x + 4)$$

$$\therefore 2(12x + 16) = 12(x + 4)$$

$$\therefore 24x + 32 = 12x + 48$$

$$\therefore 12x = 16$$

$$\therefore x = \frac{16}{12} = \frac{4}{3}$$

$$\therefore x + 4 = \frac{4}{3} + 4 = \frac{4}{3} + \frac{12}{3} = \frac{16}{3} = 5\frac{1}{3}$$

$$\underline{\quad 5\frac{1}{3} \quad \text{cm}}$$

(Total 5 marks)

14.  $F$  is inversely proportional to the square of  $x$ .  
 $F = 0.8$  when  $x = 5$ .

(a) Find a formula for  $F$  in terms of  $x$ .

$$F \propto \frac{1}{x^2}$$

$$F = \frac{k}{x^2}$$

$$0.8 = \frac{k}{5^2} = \frac{k}{25}$$

$$\therefore k = 0.8 \times 25 = 20$$

$$\therefore F = \frac{20}{x^2}$$

$$\underline{F = \frac{20}{x^2}} \quad (3)$$

(b) Work out the positive value of  $x$  when  $F = 320$ .

$$320 = \frac{20}{x^2}$$

$$\therefore x^2 = \frac{20}{320} = \frac{1}{16}$$

$$\therefore x = \frac{1}{4}$$

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

(or 0.25) (Total 5 marks)

15. Here is a parallelogram.

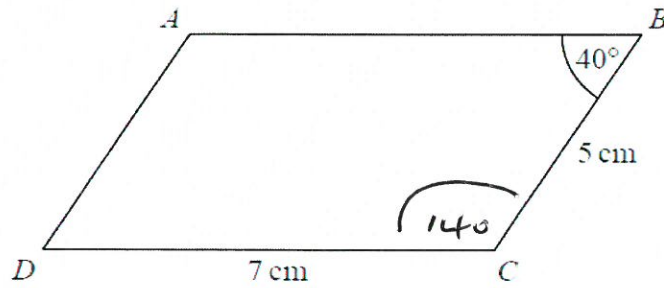


Diagram **NOT**  
accurately drawn

$DC = 7 \text{ cm}$   
 $CB = 5 \text{ cm}$   
Angle  $ABC$  is  $40^\circ$

Work out the area of the parallelogram.  
Give your answer correct to 1 decimal place.

$$\text{Area} = 2 \times \frac{1}{2} \times 5 \times 7 \times \sin 140$$

.....  $22.5 \text{ cm}^2$

(Total 3 marks)

16. Clive wants to estimate the number of bees in a beehive.

Clive catches 50 bees from the beehive.  
He marks each bee with a dye.  
He then lets the bees go.

The next day, Clive catches 40 bees from the beehive.  
8 of these bees have been marked with the dye.

(i) Work out an estimate for the number of bees in the beehive.

$$\text{EXPECTED NUMBER OF BEES WITH DYE} = \frac{\text{PROBABILITY OF BEES WITH DYE}}{\text{NUMBER OF BEES}}$$

$$8 = \text{PROBABILITY} \times 40$$

$$\therefore \text{PROBABILITY} = \frac{8}{40} = \frac{1}{5}$$

$$\therefore \frac{1}{5} \text{ OF BEES} = 50$$

$$\therefore \text{TOTAL NUMBER OF BEES} = 50 \times 5 = 250.$$

..... 250 ..... bees

(ii) Write down any assumptions you have made.

..... THE 40 BEES ARE A REPRESENTATIVE SAMPLE .....

.....

.....

.....

(Total 4 marks)



17. A new shopping centre is opened and 500 new jobs are created. ~~11~~  $n = 0$   
After 2 years, the number of jobs has increased to 700.

Assuming that the number of jobs in the shopping centre increases exponentially, work out how many jobs there will be 5 years after the shopping centre first opened.

$$\text{NUMBER OF JOBS} = y.$$

$$\text{NUMBER OF YEARS} = x$$

$$y = k a^x \quad k \text{ AND } a \text{ ARE CONSTANTS}$$

$$500 = k a^0 = k$$

$$k = 500$$

$$700 = 500 \times a^2$$

$$\therefore a^2 = \frac{700}{500} = \frac{7}{5}$$

$$\therefore a = \sqrt{1.4}$$

$$\begin{aligned} \text{AFTER 5 YEARS} \quad y &= 500 \times \sqrt{1.4}^5 \\ &= 500 \times 1.4^{5/2} \end{aligned}$$

..... 1160  
(or 1159) (Total for 5 marks)

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18. Write as a single fraction in its simplest form

$$\frac{2}{x-4} - \frac{1}{x+3}$$

$$\frac{2(x+3) - (x-4)}{(x-4)(x+3)}$$

$$= \frac{2x+6-x+4}{(x-4)(x+3)}$$

$$= \frac{x+10}{(x-4)(x+3)}$$

$$\frac{x+10}{(x-4)(x+3)}$$

(Total 3 marks)

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19. Nomusa has 30 sweets.

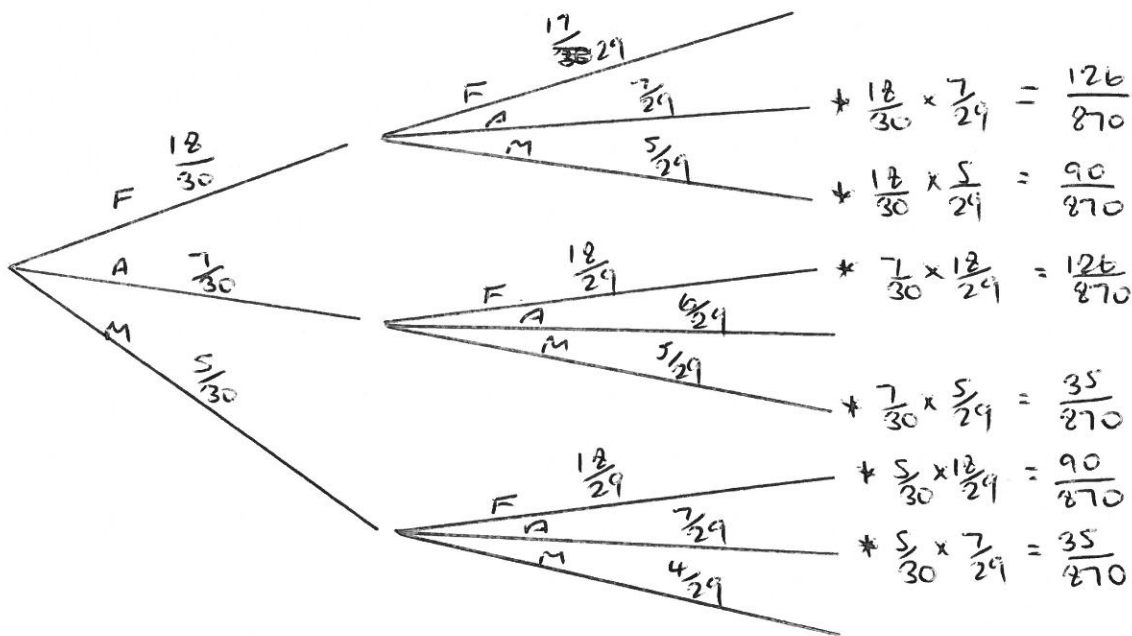
She has

- 18 fruit sweets
- 7 aniseed sweets
- 5 mint sweets

} 30 SWEETS.

Nomusa is going to take at random two sweets.

Work out the probability that the two sweets will **not** be the same type of sweet.  
You must show all your working.



$$\frac{126}{870} + \frac{90}{870} + \frac{126}{870} + \frac{35}{870} + \frac{90}{870} + \frac{35}{870}$$

$$\frac{502}{870}$$

(Total 4 marks)

20. Solve the inequality  $x(2x+3) > 20$

$$2x^2 + 3x - 20 > 0$$

$$(2x-5)(x+4) > 0$$

$$\therefore 2x-5 > 0 \text{ AND } x+4 > 0$$

$$\therefore x > \frac{5}{2} \text{ AND } x > -4$$

$$\therefore x > \frac{5}{2} \text{ OR } x < -4$$

$$\underline{\text{OR}} \quad 2x-5 < 0 \text{ AND } x+4 < 0$$

$$\underline{\text{OR}} \quad x < \frac{5}{2} \text{ AND } x < -4$$

$$\underline{x > \frac{5}{2} \text{ OR } x < -4}$$

(Total 4 marks)

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TOTAL FOR PAPER IS 80 MARKS