edexcel

GCSE Mathematics Practice Tests: Set 4

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.

ALWAYS LEARNING PEARSON

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1. Here is a list of ingredients needed to make 20 cookies.

Cookies
Ingredients to make **20** cookies.
250 g butter 120 g caster sugar 300 g flour

1 cookie (÷20)

12.5g butter
6g caster
15g flour

Sam is going to make some cookies.

She has these ingredients.

625 g butter 360 g caster sugar 1000 g flour

Work out the greatest number of cookies that Sam can make with her ingredients.
You must show your working.

Butter: 625 ÷ 12.5 = 50 max

Caster: 360 ÷ 6 = 60 max

Flour: 1000 ÷ 15 = 66 max

Can make 50 at most before running out of butter

50

.....

(Total 3 marks)

2. Celina and Zoe both sing in a band.

One evening the band plays for 80 minutes.
Celina sings for 65% of the 80 minutes.

Zoe sings for $\frac{5}{8}$ of the 80 minutes.
Celina sings for more minutes than Zoe sings.

Work out for how many more minutes.
You must show all your working.

65% of 80 = 80 × 0.65 = 52 mins (C)

$\frac{5}{8}$ of 80 = $\frac{5}{8}$ × 80 = 50 mins (Z)

52 - 50 = 2

2

.....minutes

(Total 4 marks)

3.

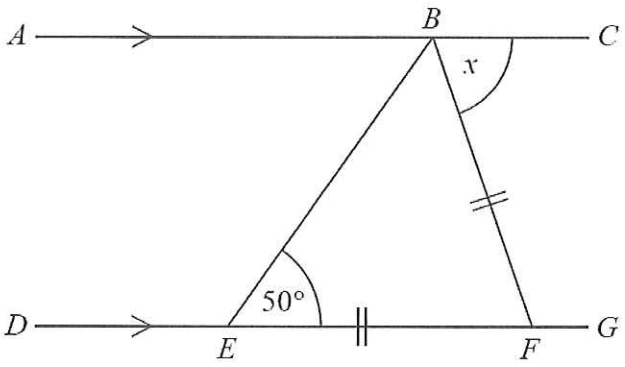


Diagram **NOT** accurately drawn

ABC is a straight line.
DEFG is a straight line.
AC is parallel to *DG*.
EF = *BF*.
Angle *BEF* = 50°.

Work out the size of the angle marked *x*.
Give reasons for your answer.

$\hat{EBF} = 50$ (Base angles on isosceles triangle are equal)

$\hat{EFB} = 80$ (Angles in a triangle add to 180°)

$\hat{FBC} = \hat{EFB} = 80$ (Alternate angles are equal).

80 .....°

(Total 4 marks)

4. (a) Simplify $(c^2 k^5)^4$

$c^8 k^{20}$

.....

(1)

(b) Expand and simplify $(3x + 5)(4x - 1)$

	$4x$	-1
$3x$	$12x^2$	$-3x$
5	$20x$	-5

$12x^2 + 20x - 3x - 5$

$= 12x^2 + 17x - 5$

.....

(2)

(c) Solve $x^2 - 3x - 10 = 0$

$(x - 5)(x + 2) = 0$

$x - 5 = 0 \Rightarrow x = 5$

$x + 2 = 0 \Rightarrow x = -2$

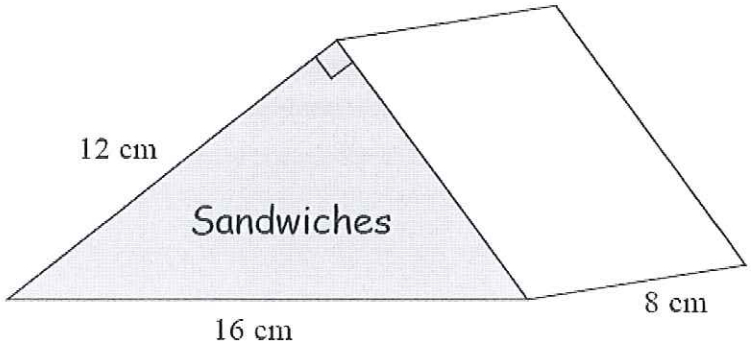
$x =$ 5 or -2

.....

(3)

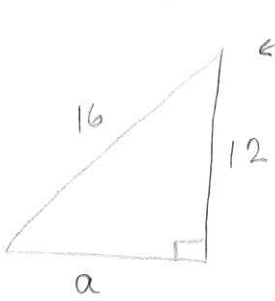
(Total 6 marks)

5. Here is a sandwich packet.



The packet is in the shape of a triangular prism.
The triangular faces are right-angled triangles.

Find the volume of the sandwich packet.



$a^2 + 12^2 = 16^2$

$a^2 + 144 = 256$

$a^2 = 112$

$a = \sqrt{112} = 4\sqrt{7}$

$\text{Area} = \frac{4\sqrt{7} \times 12}{2} = 24\sqrt{7}$

$\text{Volume} = 24\sqrt{7} \times 8 = 507.98$ (2 dp)

507.98 ..... cm^3

(Total 5 marks)

6. Make p the subject of the formula $y = 3p^2 - 4$.

$+4$ $+4$

$y + 4 = 3p^2$

$\div 3$ $\div 3$

$\frac{y+4}{3} = p^2$

$\sqrt{}$ $\sqrt{\frac{y+4}{3}} = p$ $\sqrt{}$

$p = \sqrt{\frac{y+4}{3}}$

(Total 3 marks)

7. There are 10 boys and 20 girls in Mrs Brook's class.
Mrs Brook gave all the class a test.

The mean mark for all the class is 60.
The mean mark for the girls is 56.

Work out the mean mark for the boys.

30 students with a mean of 60
scored $30 \times 60 = 1800$ marks total

20 girls with mean of 56
scored $20 \times 56 = 1120$ marks

So 10 boys scored
$1800 - 1120 = 680$ marks

boys mean $= \frac{680}{10} = 68$

68

(Total 3 marks)

8. The diagram shows a ramp next to a step.

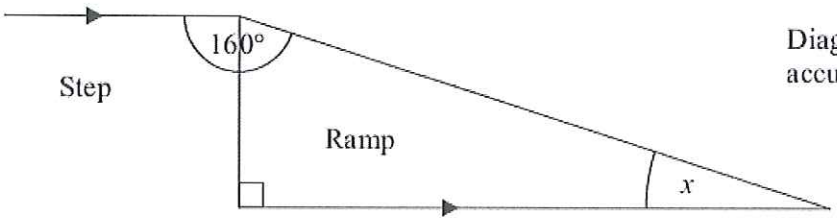


Diagram **NOT** accurately drawn

(i) Work out the size of the angle marked x.

$x =$ 20 °

(ii) Give a reason for your answer.

Step angle = 90 (alternate angles are equal)

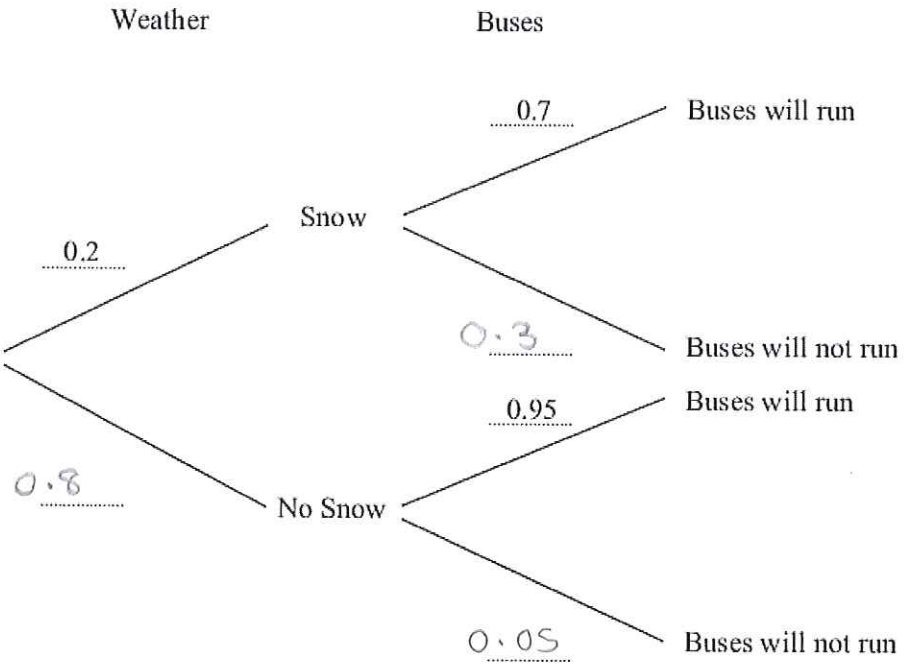
Angle at top of ramp = 160 − 90 = 70°

So x = 180 − 90 − 70 = 20 (angles in a triangle add to 180°)

(Total 3 marks)

9. The decision tree diagram gives information about the probability of snow for the first 50 days in winter and the probability of whether buses will run or not run.

(a) Complete the decision tree diagram.



(2)

(b) Work out the probability that it will snow and the buses will not run.

$0.2 \times 0.3 = 0.06$

0.06

(2)

(Total 4 marks)

10. A baker makes jam rolls.

The baker uses flour, butter and jam in the ratio 8 : 4 : 5 to make jam rolls.

The table shows the cost per kilogram of some of these ingredients.

Cost per kilogram	
Flour	40p
Butter	£2.50
Jam	£1.00

The total weight of the flour, butter and jam for each jam roll is 425 g.

Work out the cost of these ingredients for 200 jam rolls.

F B J

8 : 4 : 5 ← total = 17 parts

Makes 425g, so each part is $\frac{425}{17} = 25$g

Flour: 8 parts = 8 × 25 = 200g = 0.2 kg

Costs 0.2 × 40 = 8p

Butter: 4 parts = 4 × 25 = 100g = 0.1 kg

Costs 0.1 × £2.50 = £0.25 = 25p

Jam: 5 parts = 5 × 25 = 125g = 0.125 kg

Costs 0.125 × £1 = £0.125 = 12.5p

1 roll costs 25 + 8 + 12.5 = 45.5p

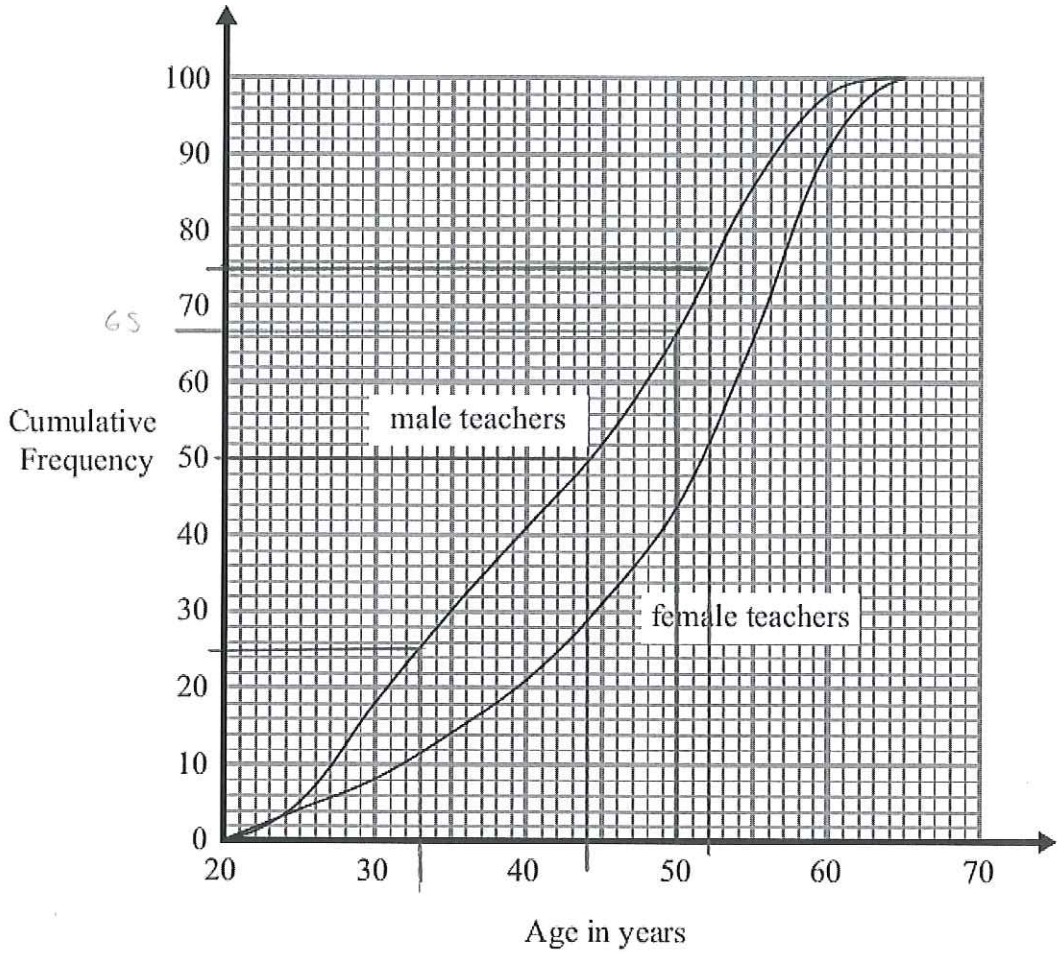
200 rolls cost 45.5 × 200 = 9100p = £91.00

£ 91

(Total 6 marks)

11. A student did a survey of teachers' ages.

The cumulative frequency curves show information about the ages of the male teachers and the ages of the female teachers.



(a) Find an estimate for the number of the male teachers older than 50 years of age.

67 were younger

100 altogether

so 33 older

33

(2)

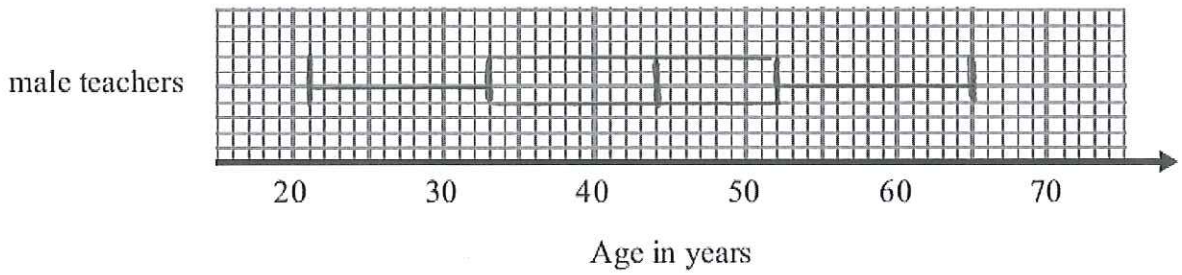
100 altogether LQ = 25th = 33

Med = 50th = 44

UQ = 75th = 52

The youngest male teacher was 21 years of age.
The oldest male teacher was 65 years of age.

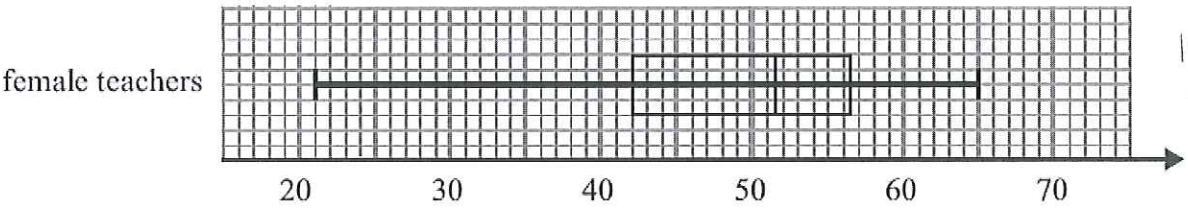
(b) On the grid, draw a box plot to show the distribution of the ages of the male teachers.



IQR = 52 - 33 = 19

(4)

The box plot below shows information about the ages of the female teachers.



IQR = 51.5 - 42 = 9.5

(c) Make two comparisons between the distributions of the ages of male teachers and female teachers.

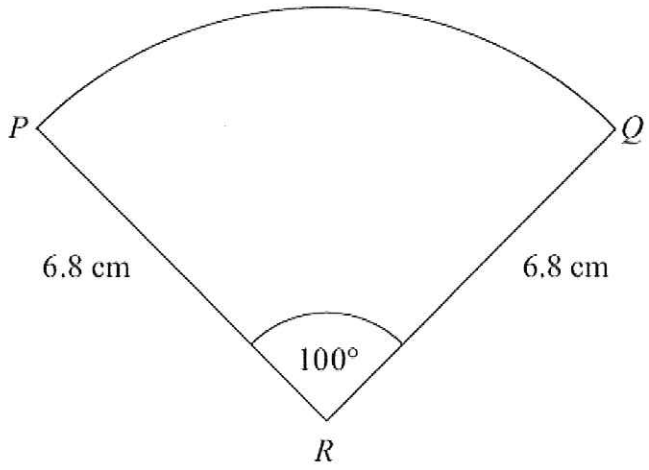
Female teachers were older on average as they have a higher median.

Ages of female teachers were less spread around the middle than male teachers (smaller IQR) but both groups had same range overall.

(2)

(Total 8 marks)

12. The diagram shows a sector of a circle of radius 6.8 cm.



PQ is an arc of the sector.
Angle *PRQ* = 100°.

Work out the perimeter of the sector.
Give your answer correct to 3 significant figures.

This is $\frac{100}{360}$ of a whole circle. $\frac{100}{360} = \frac{5}{18}$

Arc $PQ = \frac{5}{18} \times 2 \times \pi \times r = \frac{10}{18} \times \pi \times 6.8 = 11.868...$

Perimeter =

$6.8 + 6.8 + 11.868...$

$= 25.468...$

$= 25.5$ (3sf)

25.5 ..... cm

(Total 3 marks)

13. f is the function $f(x) = 2x + 5$.

(*a*) Find f(3).

$2 \times 3 + 5 = 11$

11

(1)

(*b*) Express the inverse function f^{-1} in the form $f^{-1}(x) =$

$\rightarrow \times 2 \rightarrow + 5$

$\div 2 \leftarrow -5 \leftarrow x$

$\frac{x-5}{2}$ $\quad x-5$

$f^{-1}(x) = \frac{x-5}{2}$

(2)

g is the function $g(x) = x^2 - 25$.

(*c*) Find g(–3).

$(-3)^2 - 25 = 9 - 25 = -16$

-16

(1)

(*d*) (i) Find gf(*x*).
Give your answer as simply as possible.

Sub $2x+5$ for x in $g(x)$

$g(f(x)) = (2x+5)^2 - 25$

$= 4x^2 + 20x + 25 - 25$

	$2x$	5
$2x$	$4x^2$	$10x$
5	$10x$	25

$gf(x) = 4x^2 + 20x$

(ii) Solve $gf(x) = 0$.

$4x^2 + 20x = 0$

$4x(x+5) = 0$

$4x = 0 \Rightarrow x = 0$

$x + 5 = 0 \Rightarrow x = -5$

0 or -5

(5)

(Total 9 marks)

14. Dan does an experiment to find the value of π.
He measures the circumference and the diameter of a circle.

He measures the circumference, C, as 170 mm to the nearest millimetre.
He measures the diameter, d, as 54 mm to the nearest millimetre.

Dan uses $\pi = \frac{C}{d}$ to find the value of π.

Calculate the upper bound and the lower bound for Dan's value of π.

$UB\,\pi = \frac{UB(C)}{LB(d)} = \frac{170.5}{53.5} = 3.1869\ldots$

$LB\,\pi = \frac{LB(C)}{UB(d)} = \frac{169.5}{54.5} = 3.1109\ldots$

upper bound = 3.19

lower bound = 3.11

(Total 4 marks)

15. Simplify $\dfrac{x+1}{2} + \dfrac{x+3}{3}$

$\times 3$ $\times 2$

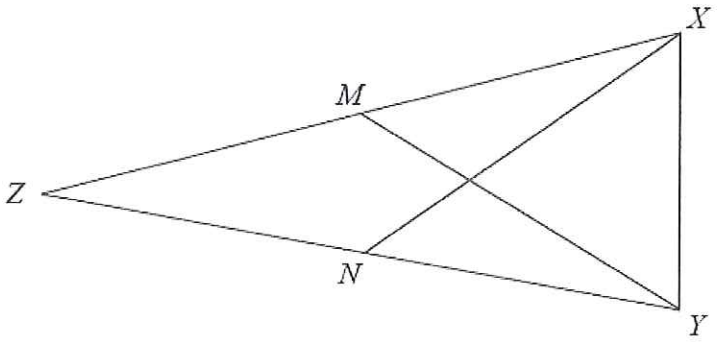
$$\frac{3(x+1)}{6} + \frac{2(x+3)}{6} = \frac{3x+3+2x+6}{6} = \frac{5x+9}{6}$$

$\dfrac{5x+9}{6}$

.....

(Total 3 marks)

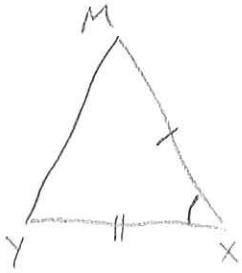
16. The diagram shows an isosceles triangle XYZ.

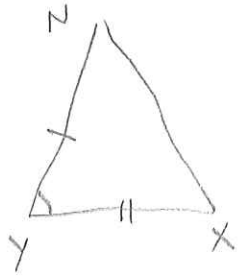


$XZ = YZ$

M is the midpoint of XZ.
N is the midpoint of YZ.

Prove that triangle XMY is congruent to triangle YNX.
Give reasons for each stage of your working.





MX = NY since triangle XYZ is isosceles & midpoints of equal length lines are equal lengths.

XY is a shared side

$M\hat{X}Y = M\hat{Y}X$ since base angles on an isosceles triangle are equal.

⇒ triangles are congruent by SAS condition

(Total 4 marks)

17. $A : B : C = x + 1 : 3 : x - 1$

$A + B + C = 60$

$B = 30$

Work out the value of x.

A B C

$x + 1 : 3 : x - 1$

$= 10(x+1) : 30 : 10(x-1)$

$10(x+1) + 30 + 10(x-1) = 60$

$10x + 10 + 30 + 10x - 10 = 60$

$20x + 30 = 60$

$20x = 30$

$x = \frac{30}{20} = 1.5$

1.5

.....

(Total 5 marks)

18. Prove that

$$(2n + 3)^2 - (2n - 3)^2 \text{ is a multiple of } 8$$

for all positive integer values of n.

	$2n$	$+3$
$2n$	$4n^2$	$6n$
$+3$	$6n$	9

	$2n$	-3
$2n$	$4n^2$	$-6n$
-3	$-6n$	9

$$(2n+3)^2 - (2n-3)^2$$

$$= 4n^2 + 12n + 9 - (4n^2 - 12n + 9)$$

$$= 4n^2 + 12n + 9 - 4n^2 + 12n - 9$$

$$= 24n$$

$$= \underline{\underline{8 \times 3n}}$$

(Total 3 marks)

TOTAL FOR PAPER IS 80 MARKS