OCR | H | Nov '24 | P5 - NC

1 Work out.

$1\frac{5}{6} - \frac{2}{3} \div \frac{3}{4}$

$= \frac{11}{6} - \frac{2}{3} \times \frac{4}{3}$

$= \frac{11}{6} - \frac{8}{9}$ ✓✓

$= \frac{33}{18} - \frac{16}{18}$ ✓

$\frac{17}{18}$ ✓

..... **[4]**

2 **(a)** Work out the size of an exterior angle of a regular hexagon. = 6

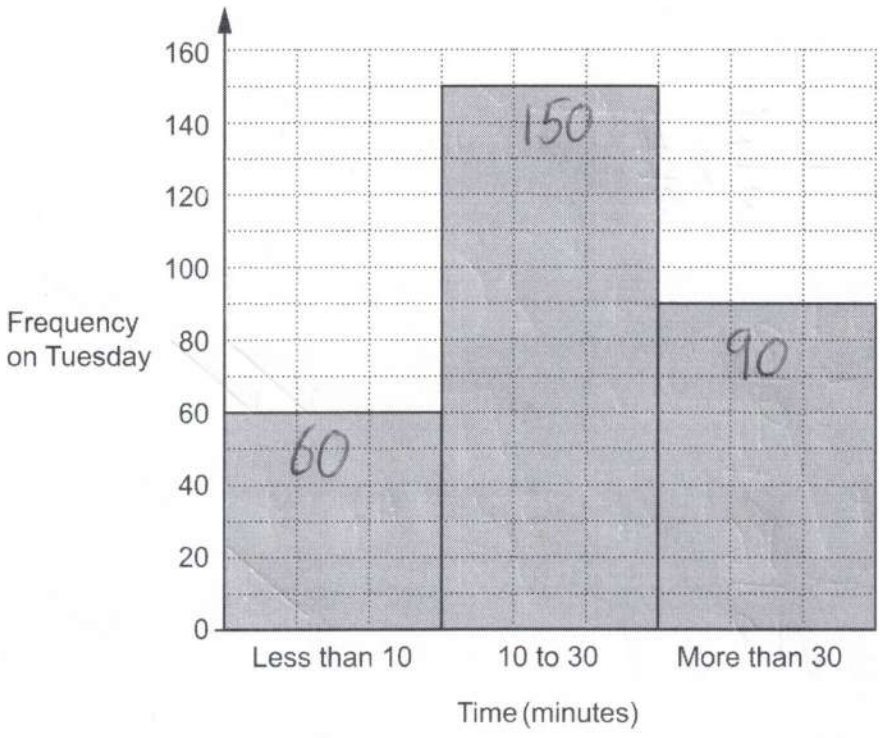
$\frac{360}{6}$ ✓

(a) 60 ✓ ..... **[2]**

(b) Use your answer to part **(a)** to write down the size of an interior angle of a regular hexagon.

$180 - 60 =$ **(b)** 120 ✓ ..... **[1]**

3 The graph shows the time, in minutes, taken by some pupils to travel to school on **Tuesday**.



Total = 300 ✓

(a) Find the percentage of these pupils that took more than 30 minutes to travel to school.

$\frac{90}{300} \times 100 = \frac{90}{3}$ ✓

(a) 30 ✓ ..... % **[3]**

(b) On **Tuesday** the number of pupils taking 10 to 30 minutes to travel to school was 25% less than on Monday.

Find the number of pupils taking 10 to 30 minutes to travel to school on **Monday**.

Tue = 75% = 150

25% = 50 (÷3)

Mon 100% = 200 (×4)

✓ ✓

(b) 200 ✓ ..... **[3]**

4 An electrician charges £30 per visit plus £22 per hour.

Write an expression for the cost, in £, charged by the electrician for one visit lasting n hours.

£ $30 + 2n$ ✓ ✓ **[2]**

5 Anika has a shelf 79.6 cm long.
She has many books, each of width 3.4 cm.
Anika puts two paperweights, each of width 5 cm, and the maximum possible number of books on the shelf.

Work out the amount of space on the shelf that is left over.
You must show your working.

$79.6 - 10 = 69.6$ ✓

$69.6 \div 3.4$ ✓

$\Rightarrow 696 \div 34$

$34\overline{)696}$ 020 etc $\Rightarrow$ 20 books ✓

$3.4 \times 20 = 68\text{cm}$ ✓

$69.6 - 68$

1.6 ✓

..... cm **[5]**

6 Jack has ten cards numbered 11 to 20.
He picks a card at random.

Jack says,

In these ten cards, there are two multiples of 5 and five even numbers.
Therefore, the probability that I pick a card that is a multiple of 5 or an even number is $\frac{2}{10} + \frac{5}{10} = \frac{7}{10}$.

Describe the error in Jack's method and give the correct answer.

The error is he has included '20' twice ✓

6/10 ✓

The correct answer is ..... [2]

7 Felix makes craft figures at a constant rate.
He can make 5 craft figures in 40 minutes.

(a) Find the number of craft figures Felix can make in 4 hours. = 240m ✓

5cf = 40m

(x6) ✓

30cf = 240m

30 ✓

(a) ..... [3]

(b) Darcie makes craft figures 10% quicker than Felix. → 36min

Work out how long Darcie takes to make 15 craft figures.

5cf = 36m ✓

(x3) ✓

15cf = 36 × 3 = 108

108 ✓

(b) ..... minutes [3]

8 Here is a question and an incorrect answer.

Question:

Expand the brackets and simplify fully.

$3(a + 2b) + a$

Answer:

$a4 + 6 \times b$

Explain why the answer is **not** correct.

a4 should = 4a 6xb should = 6b

.....

..... [2]

9 Solve.

$3x + 12 = 9 - 7x$

$10x = -3$ ✓✓

$x = -\frac{3}{10}$ ✓

or -0.3

$x =$ ..... [3]

10 A straight line has equation $y = 4x + 9$.

(a) Write down the gradient of the line.

$m = 4$

(a) 4 ✓ [1]

(b) Casey says the graph of $y = 4x + 9$ passes through the point (3, 23).

Is Casey correct?
Show how you decide.

$23 = 4 \times 3 + 9$

$23 = 12 + 9$ X

m ✓

NO because (3,23) does not satisfy the equation $y = 4x + 9$ ✓ [2]

(or similar)

11 A bag only contains green, red, blue and yellow discs.

Orla carries out an experiment.
She picks one disc at a time from the bag, records its colour and then returns the disc to the bag.
When she has finished the experiment, Orla works out the relative frequency of each colour.
Some of her results are shown in the table.

Colour	Green	Red
Relative frequency	0.35	0.25

Y B
3x x

The relative frequency of the yellow discs was three times the relative frequency of the blue discs.

In total, there are 2000 discs in the bag.

(a) Use this information to find an estimate for the **total** number of green and yellow discs that are in the bag.
You must show your working.

$4x + 0.6 = 1$ ✓

$4x = 0.4$

$x = 0.1$ ✓

G + Y

$= 0.35 + 0.3$

$= 0.65$ ✓

2000×0.65 ✓

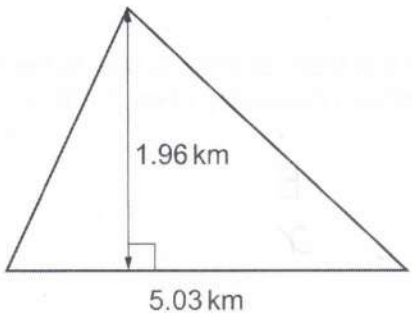
1300 ✓

(a) ..... **[5]**

(b) Explain why your estimate may **not** be reliable.

She may only have done the experiment a small number of times ✓ **[1]**

12 A housing estate is built on a triangular piece of land.



Not to scale

There are 3951 people living on the estate. = 4000 ✓

Work out an **estimate** of the population density of the estate in people per km^2.

Area = $\frac{1}{2} \times 5 \times 2 = 5$ km^2 ✓

4000 ÷ 5 ✓

$$5\overline{)4000} = 800$$

800 ✓

..... people per km^2 **[4]**

13 Write $\frac{4}{11}$ as a recurring decimal.

$$11\overline{)4.^{4}0^{7}0^{4}0} \ldots = 0.36$$ m ✓

0.$\dot{3}\dot{6}$ ✓

..... **[2]**

14 The expected value of a painting, £P, is given by the formula

$P = 2500 \times 1.2^n$

where n is the number of years after it was bought and $0 \leqslant n \leqslant 4$.

(a) Write down the value of the painting when it was bought.

$n=0$

(a) £ 2500 **[1]**

(b) Write down the annual percentage increase in the expected value of the painting.

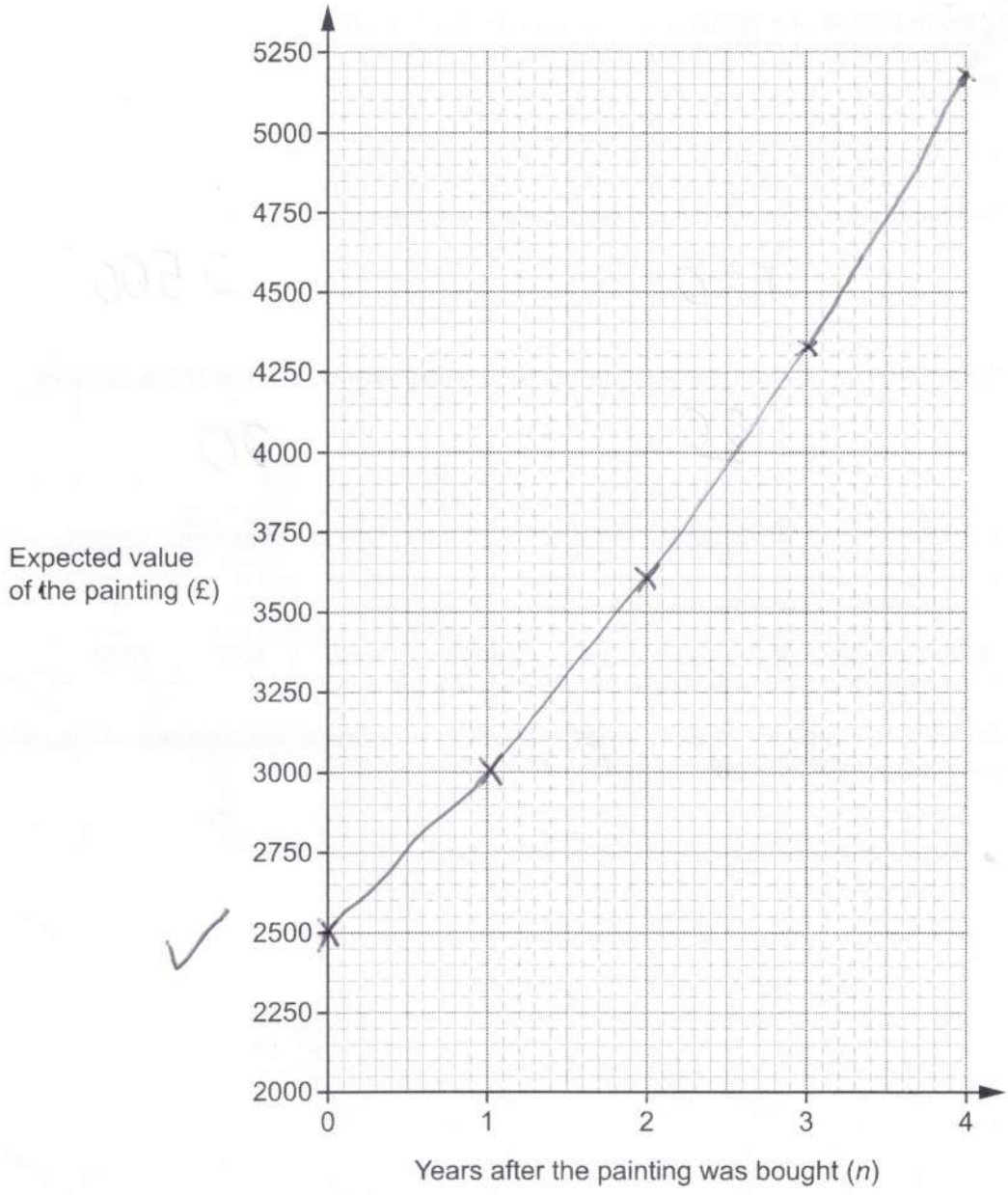
1.20

(b) 20 % **[1]**

(c) The table shows the expected value of the painting n years after it was bought.

Years after the painting is bought (n)	1	2	3	4
Expected value of the painting (£)	3000	3600	4320	5184

On the page opposite, draw a suitable graph to show the expected value of the painting n years after it was bought, where $0 \leqslant n \leqslant 4$.



√plots

√curve

[3]

(d) An art collector correctly works out 2500×1.2^{10} as 15479.

They say,

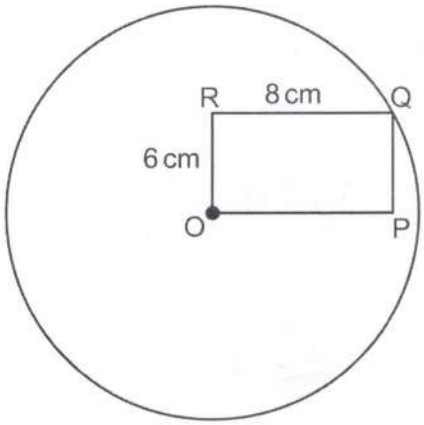
The expected value of the painting 10 years after it was bought is £15479.

What assumption has the art collector made.

That the annual % increase stays the same. ✓

[1]

15 (a) The diagram shows a rectangle, OPQR, and a circle, centre O, which passes through Q.
OR = 6 cm and RQ = 8 cm.



Not to scale

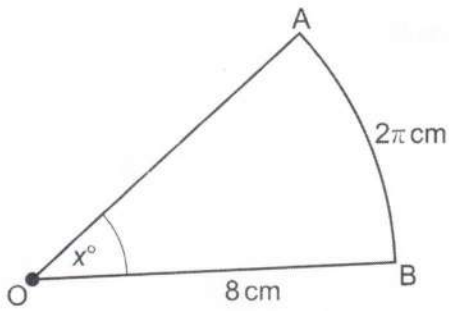
Find the circumference of the circle.
Give your answer in terms of π.

$OQ = \sqrt{8^2 + 6^2} = \sqrt{100} = 10$ ✓✓

Circumference $= 2 \times \pi \times 10$ ✓

(a) 20π ✓ cm **[4]**

(b) AOB is a sector of a circle, centre O and radius 8 cm.
Angle AOB = $x°$.
The arc, AB, has length 2π cm.



Not to scale

Find the area of the sector.
Give your answer in terms of π.

arc = $2\pi = \frac{2\pi \times 8 \times x}{360}$ ✓

$x = \frac{360}{8} = 45°$ ✓

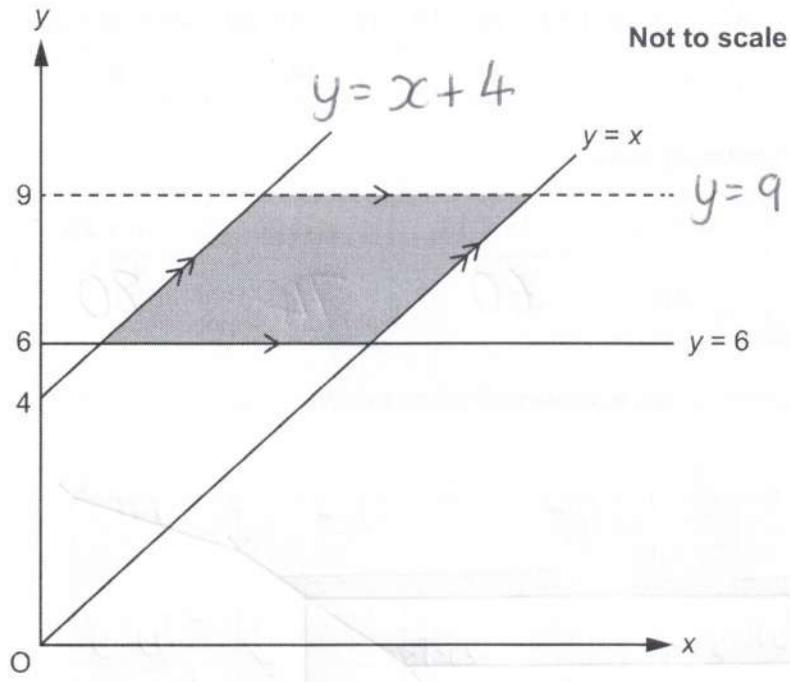
Area = $\pi \times 8^2 \times \frac{45}{360}$ ✓

$= \pi \times 64 \times \frac{1}{8}$

8π ✓

(b) ..... cm^2 **[4]**

16 In the diagram below, the shaded region is a parallelogram.
The parallelogram can be identified by four inequalities.
Two of the inequalities are $y \geqslant 6$ and $y \geqslant x$.



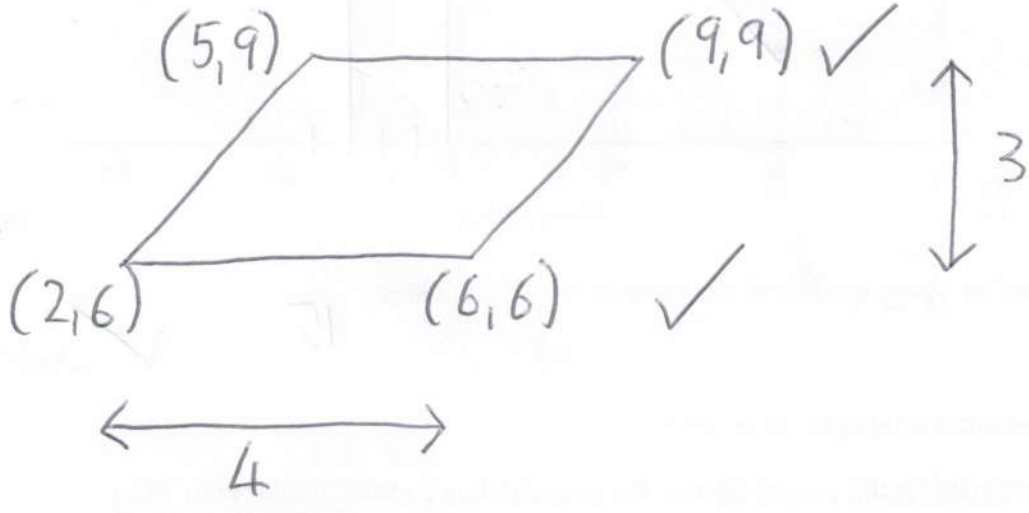
(a) Write down the other **two** inequalities that identify the parallelogram.

(a) $y < 9$ ✓

$y \leqslant x + 4$ ✓✓

[3]

(b) Work out the area of the parallelogram.
You must show your working.



$4 \times 3 = 12$ ✓ ✓

(b) 12 square units **[4]**

17 A farmer grows pumpkins.
The farmer records the masses, m kilograms, of 80 of their pumpkins.
The table shows the results.

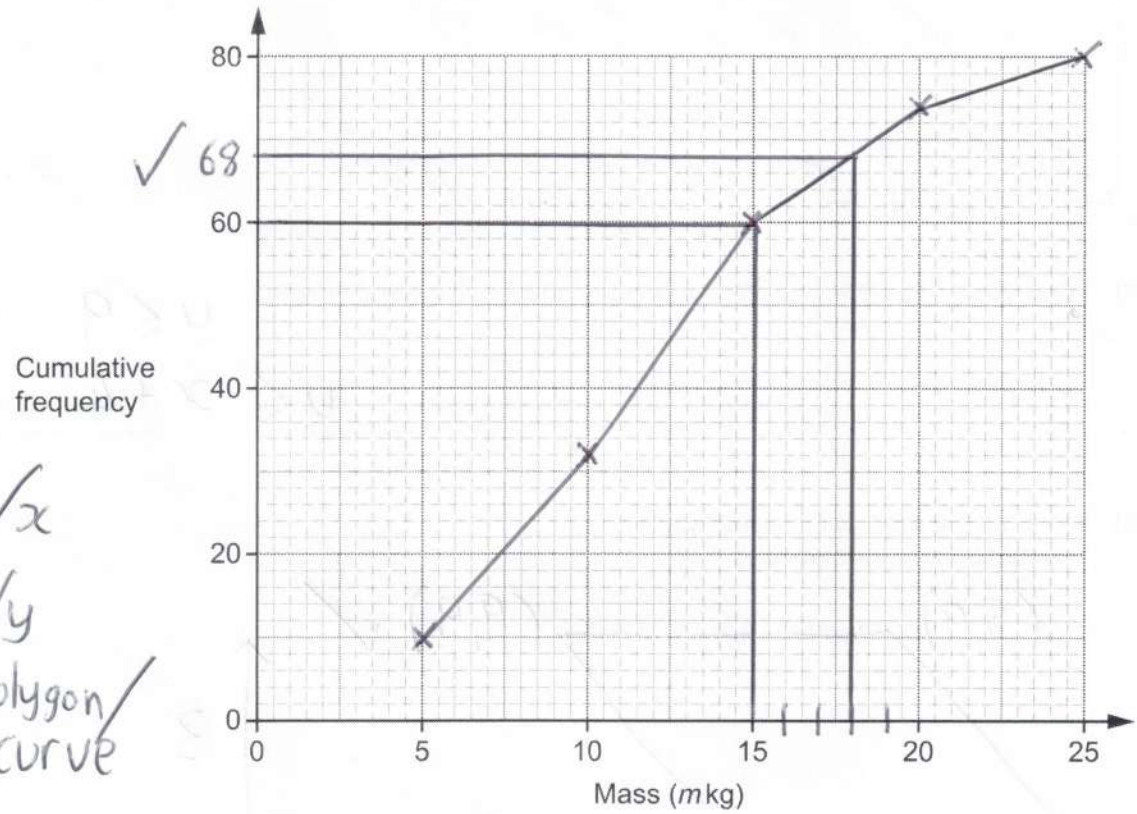
Mass (m kg)	$0 < m \leqslant 5$	$5 < m \leqslant 10$	$10 < m \leqslant 15$	$15 < m \leqslant 20$	$20 < m \leqslant 25$
Frequency	10	22	28	14	6

(a) Complete the cumulative frequency table.

Mass (m kg)	$m \leqslant 5$	$m \leqslant 10$	$m \leqslant 15$	$m \leqslant 20$	$m \leqslant 25$
Cumulative frequency	10	32	60	74	80

[1]

(b) Draw the cumulative frequency graph to represent these results.



[3]

(c) Write down the upper quartile of the mass of the 80 pumpkins.

(c) ..... kg **[1]**

(d) The farmer picks a pumpkin at random.

Find an estimate for the probability that the pumpkin has a mass greater than 18 kg.

(d) ..... **[2]**

18 Solve.

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

You must show your working.

$x^2 - 5 = 4x(x-4)$

$x^2 - 5 = 4x^2 - 16x$ ✓

$0 = 3x^2 - 16x + 5$ ✓✓ (ac = 15)

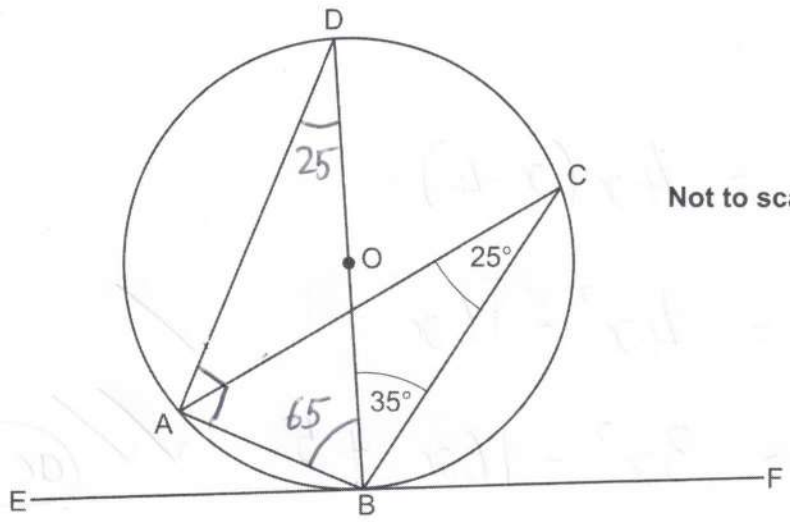
$0 = 3x^2 - 15x - x + 5$

$0 = 3x(x-5) - 1(x-5)$ M✓

$0 = (x-5)(3x-1)$ ✓

$x =$ 5 or $x =$ $\frac{1}{3}$ ✓ **[6]**

19 A, B, C and D are points on the circumference of a circle, centre O.
BD is a diameter of the circle.
EBF is a tangent to the circle.



Not to scale

(a) Give a reason why angle BAD = 90°.

Angle in a semi-circle = 90 ✓

..... **[1]**

(b) Write down **one** other angle that is 90°.
Give a reason for your answer.

Angle EBO ✓ because tangent and radius meet at right angle ✓

..... **[2]**

(c) Write down the value of angle CAD.

(c) 35 ✓ ° **[1]**

(d) Write down the value of angle EBA.

90 - 65

(d) 25 ✓ ° **[1]**

20 Simplify.

$\sqrt{160} \div \sqrt{2}$

$\frac{\sqrt{16} \times \sqrt{5} \times \sqrt{2}}{\sqrt{2}}$ ✓

$4\sqrt{5}$ ✓

..... **[2]**

21 **(a)** Work out.

$\left(\frac{1}{8}\right)^{\frac{1}{3}}$

$\sqrt[3]{\frac{1}{8}}$ $\frac{\sqrt[3]{1}}{\sqrt[3]{8}}$

$\frac{1}{2}$ ✓

(a) ..... **[1]**

(b) $2^x \times 4^y = 16$

Show that $y = 2 - \frac{x}{2}$. **[4]**

$2^x \times (2^2)^y = 2^4$ ✓✓

$2^x \times 2^{2y} = 2^4$

so $x + 2y = 4$ ✓

$2y = 4 - x$ ✓

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

22 A sequence has nth term $2n^2 + 1$.

Prove algebraically that the sum of any two consecutive terms in this sequence is always a multiple of 4. **[6]**

n $n+1$ m ✓

$\Rightarrow 2(n)^2 + 1 + 2(n+1)^2 + 1$ ✓

$= 2n^2 + 1 + 2n^2 + 2 + 4n + 1$ ✓✓

$= 4n^2 + 4n + 4$ ✓

$= 4(n^2 + n + 1)$ ✓

which is a multiple of 4

END OF QUESTION PAPER