![AQA]

Please write clearly in block capitals.

Centre number ☐☐☐☐☐ Candidate number ☐☐☐☐

Surname _____

Forename(s) _____

Candidate signature _____
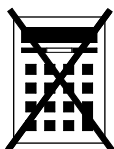
GCSE
MATHEMATICS

H

Higher Tier   Paper 1 Non-Calculator

Tuesday 5 November 2019   Morning   Time allowed: 1 hour 30 minutes

Materials

For this paper you must have:
• mathematical instruments

You must **not** use a calculator.

Instructions

• Use black ink or black ball-point pen. Draw diagrams in pencil.
• Fill in the boxes at the top of this page.
• Answer **all** questions.
• You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
• Do all rough work in this book. Cross through any work you do not want to be marked.

Information

• The marks for questions are shown in brackets.
• The maximum mark for this paper is 80.
• You may ask for more answer paper, graph paper and tracing paper. These must be tagged securely to this answer book.

Advice

In all calculations, show clearly how you work out your answer.

For Examiner's Use	
Pages	Mark
2–3	
4–5	
6–7	
8–9	
10–11	
12–13	
14–15	
16–17	
18–19	
20–21	
22–23	
24–25	
26	
TOTAL	

IB/M/Nov19/E8

8300/1H

Answer **all** questions in the spaces provided

1   Circle the calculation that decreases 250 by 15% $100 - 15 = 85$

[1 mark]

$250 \div 1.15$ 250×0.15 $\boxed{250 \times 0.85}$ $250 \div 0.85$

①

2   Solve $3x = 2x$

Circle your answer.

[1 mark]

$x = -1$ $\boxed{x = 0}$ $x = \dfrac{2}{3}$ $x = \dfrac{3}{2}$

①

3 *A* is (2, 13) and *B* is (10, 1)

$$\left(\frac{2+10}{2}, \frac{13+1}{2}\right) = (6, 7)$$

Circle the midpoint of *AB*.

[1 mark]

(4, 6)   (5, 6.5)   (6, 7)   (8, 12)

4 Circle the expression equivalent to $(2x)^4$

[1 mark]
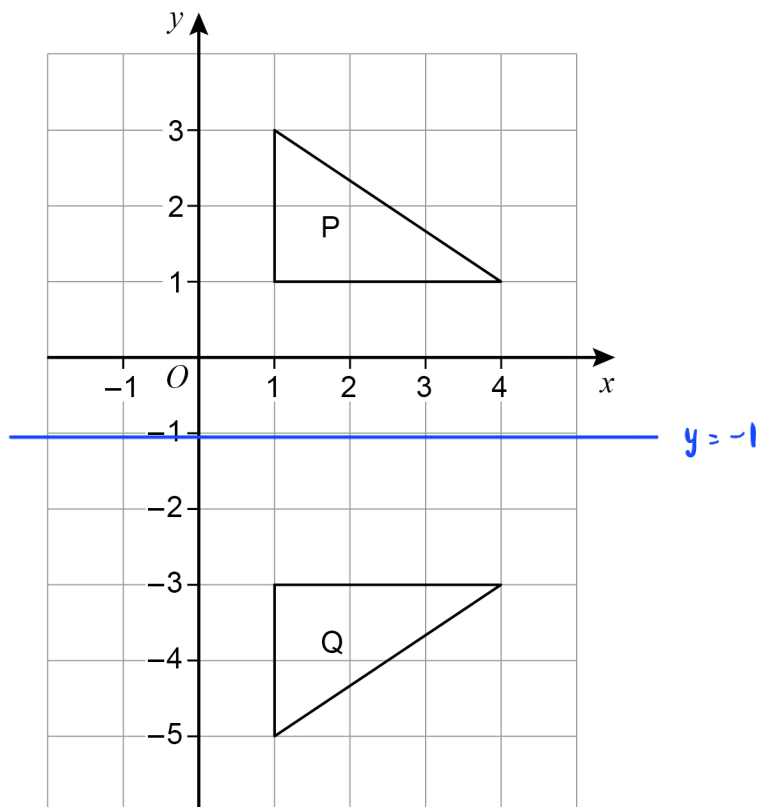
$2x^4$ $6x^4$ $8x^4$ $16x^4$

Turn over for the next question

Do not write outside the box

5 (a) Here are two triangles, P and Q.

Here is a statement.

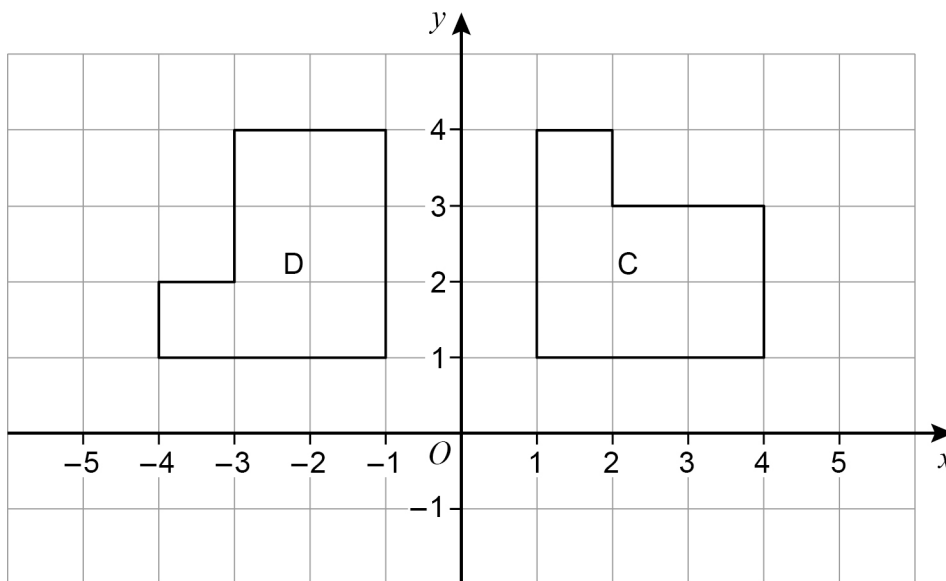A transformation that maps P to Q is a reflection in the line $x = -1$

Make **one** criticism of the statement.

[1 mark]

The line should be y = -1 ①

0 4

5 (b) Here are two shapes, C and D.

Here is a statement.

A transformation that maps C to D is a rotation through 90° anticlockwise.

Make **one** criticism of the statement.

[1 mark]

Should add the centre of rotation about O. ①

Turn over for the next question

2

Turn over ▶

6 (a) A geometric progression starts   4   16

Work out the next term.

[1 mark]

$a = 4, \ r = 4$

$T_3 = 4 \times 4^2$

$= 64$

Answer   64   ①

6 (b) A Fibonacci-type sequence starts   3   −8

The sequence is continued by adding the previous two terms.

Work out the next **two** terms.

[2 marks]

$3, \ -8, \ (3-8), \ (-8+(3-8))$

$3, \ -8, \ -5, \ -13$

Answer   −5   ①   and   −13   ①

Do not write outside the box

7 Given that $a \times 60 = b$ work out the value of $\dfrac{4b}{a}$

[2 marks]

$b = 60a$

$\dfrac{4(60a)}{a}$ ① $= 240$ ①

Answer _____240_____

8 Write $27 \times \left(3^2\right)^7$ as a single power of 3

[3 marks]

① $3^3 \times 3^{14}$ ①

$= 3^{3+14}$

$= 3^{17}$ ①

Answer _____3^{17}_____

Turn over for the next question

8

Turn over ▶

9   Here are two solids.

Cylinder

radius 4 cm   height 10 cm

10 cm

← 4 cm →
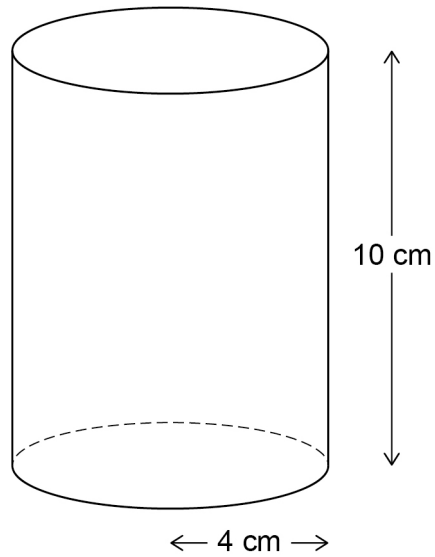
Hemisphere

radius 6 cm

← 6 cm →
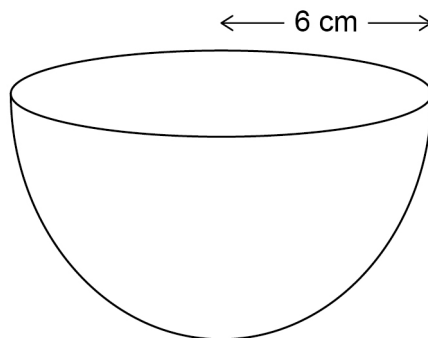
volume of a hemisphere $= \dfrac{2}{3}\pi r^3$ where r is the radius

Which solid has the greater volume?

You **must** show your working.

[4 marks]

Volume of cylinder : $\pi \times 4^2 \times 10$

$= 160\pi$ ①

Volume of a hemisphere : $\frac{2}{3} \times \pi \times 6^3$ ①

$= \frac{2}{3}(216) \times \pi$

$= 144\pi$ ①

Answer _____ cylinder ① _____

Turn over for the next question

4

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box

10 Saj makes Rose Pink paint and Cherry Pink paint.

He mixes red paint with white paint as shown.

Rose Pink
red : white = 1 : 2

Cherry Pink
red : white = 4 : 3

He makes 60 litres of Rose Pink paint.

To this Rose Pink paint he adds

80 litres of red paint and 28 litres of white paint.

Has he now made Cherry Pink paint?

You **must** show your working.

[4 marks]

$60 \div 3 = 20$ litres ①

Initially : rose pink = 20 litre red + 40 litre white

After added : 20 + 80 red , 40 + 28 white

= 100 red , 68 white ① ①

red : white = $\frac{100}{4}$: $\frac{28}{4}$ = 25 : 17 .

No. He does not make Cherry Pink paint. ①

Do not write outside the box

11 (a) Work out $\dfrac{2 \times 10^{14}}{8 \times 10^{9}}$

Give your answer in standard form.

[2 marks]

$\dfrac{2}{8} \times 10^{14-9}$

$\therefore 0.25 \times 10^{5}$ ①

$= 2.5 \times 10^{4}$ ①

Answer $\underline{\quad 2.5 \times 10^{4} \quad}$

11 (b) $6200.07 = 6.2 \times 10^{c} + 7 \times 10^{d}$

Work out the values of c and d.

[2 marks]

$6.2 \times 1000 = 6200 \quad, \quad c = {}^{3}$

$7 \times 0.01 = 0.07 \quad, \quad d = -2$

$c = \underline{\quad 3 \quad}$ ① $\qquad d = \underline{\quad -2 \quad}$ ①

Turn over for the next question

8

Turn over ▶

12 $V = \dfrac{k}{H}$ where k is a constant.

Which **two** statements are correct?

Tick **two** boxes.

[1 mark]

☐ V is directly proportional to H

☑ V is inversely proportional to H

☑ V is directly proportional to $\dfrac{1}{H}$

☐ V is inversely proportional to $\dfrac{1}{H}$

13 The nth term of a sequence is $\dfrac{n(n-4)}{\sqrt{n+3}}$

Work out the sum of the 1st and 6th terms.

[3 marks]

1st term : $\dfrac{1(1-4)}{\sqrt{1+3}} = \dfrac{-3}{\sqrt{4}} = \dfrac{-3}{2}$ ①

6th term : $\dfrac{6(6-4)}{\sqrt{6+3}} = \dfrac{12}{\sqrt{9}} = \dfrac{12}{3} = 4$ ①

Sum : $-1.5 + 4 = 2.5$ ①

Answer ___2.5___

14 $8300 = 100 \times 83$ $\sqrt{100} = 10$, $\sqrt{81} = 9$ $10 \times 9 = 90$

Circle the number that is closest in value to $\sqrt{8300}$

[1 mark]
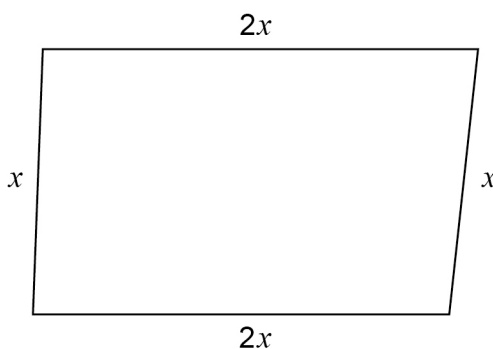
19 (90) ① 830 900

Turn over ▶

5

15 Here is a **sketch** of a quadrilateral.

All lengths are in centimetres.

$2x$

x x

Not drawn
accurately

$2x$

Tick **one** box for each statement.

[3 marks]

	True	May be true	Not true
The quadrilateral is a rectangle		✓	
The quadrilateral is a parallelogram	✓		
The quadrilateral is a rhombus			✓
The quadrilateral is a kite			✓

③

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16 In a box there are some buttons.

45 are large and the rest are small.

Some are yellow and the rest are green.

The number of small is $\frac{5}{3}$ of the number of large.

The number of green is 300% of the number of yellow.

There are 12 small yellow buttons.

How many large green buttons are there?

You may use the two-way table to help you.

[4 marks]

	Large	Small	
Yellow	18 ①	12	30 ①
Green	27 ①	63	90
	45	75 ①	

Small: $\frac{5}{3} \times 45 = 75$

Total: $45 + 75 = 120$

yellow: $\frac{1}{4} \times 120 = 30$

Answer _____27_____

7

Turn over ▶

17 $\mathbf{a} = \begin{pmatrix} -3 \\ 2 \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} 1 \\ -5 \end{pmatrix}$

Work out $\mathbf{a} - 3\mathbf{b}$

Circle your answer.

$\begin{bmatrix} -3 \\ 2 \end{bmatrix} - 3\begin{bmatrix} 1 \\ -5 \end{bmatrix}$

$= \begin{bmatrix} -3 \\ 2 \end{bmatrix} - \begin{bmatrix} 3 \\ -15 \end{bmatrix}$

[1 mark]

$\boxed{\begin{pmatrix} -6 \\ 17 \end{pmatrix}}$ ①
$\qquad \begin{pmatrix} -6 \\ -13 \end{pmatrix}$
$\qquad \begin{pmatrix} 0 \\ 17 \end{pmatrix}$
$\qquad \begin{pmatrix} 0 \\ -13 \end{pmatrix}$

18 Solve $\dfrac{x+15}{3} = 2(x + 10)$

[4 marks]

$\dfrac{x+15}{3} = 2x + 20$ ①

$x + 15 = 3(2x + 20)$

$x + 15 = 6x + 60$
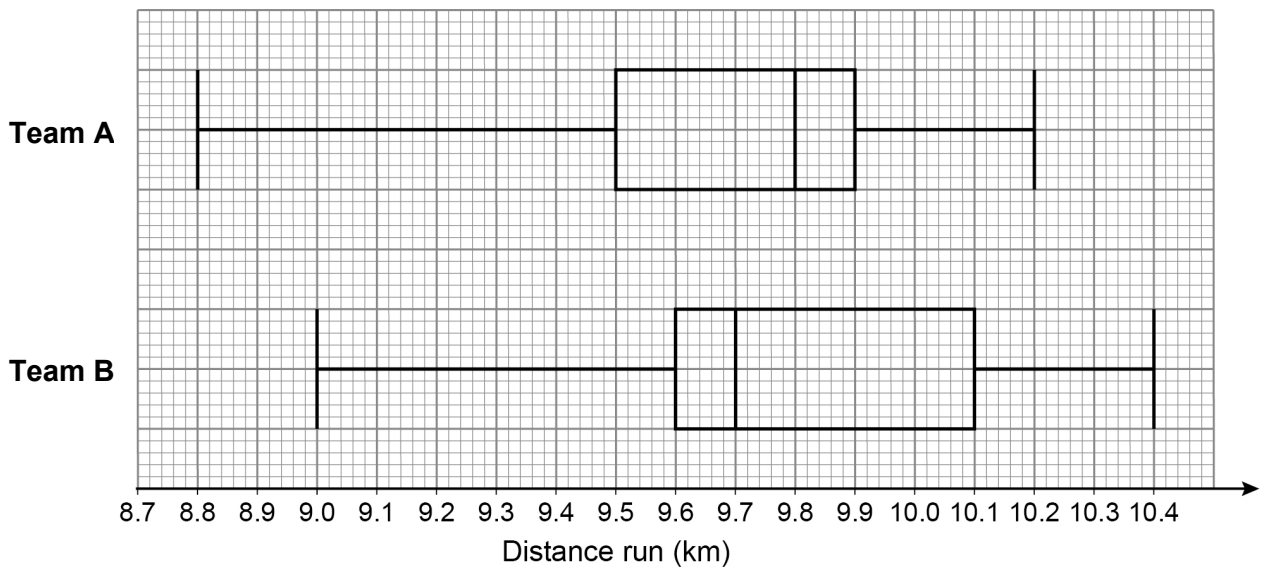
$6x - x = 15 - 60$ ①

$5x = -45$ ①

$x = \dfrac{-45}{5}$

$= -9$ ①

$x = \underline{\qquad -9 \qquad}$

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19 The box plots represent the distances run by the players in a football match.

19 (a) On average, which team's players ran further?

Tick a box.

☑ Team A ☐ Team B

Give a reason for your answer.

[1 mark]

The median is higher ①

19 (b) The players in Team A ran more consistent distances.

How do the box plots show this?
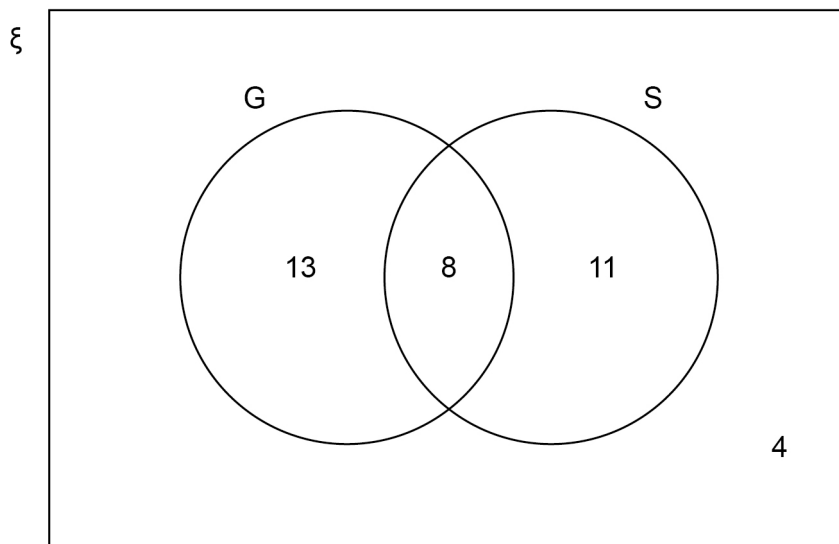
[1 mark]

Interquartile range is lower ①

7

Turn over ▶

IB/M/Nov19/8300/1H

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20 The Venn diagram shows information about some houses.

G = houses with a garage

S = houses with a shed

A house is chosen at random.

20 (a) The house has a garage.

What is the probability that it has a shed?

[1 mark]

Answer $\dfrac{8}{21}$ ①

20 (b) The house does **not** have a garage.

What is the probability that it does **not** have a shed?

[1 mark]

Answer $\dfrac{4}{15}$ ①

IB/M/Nov19/8300/1H

20 (c) Show that $P(G \cap S)' > P(G \cup S')$

[2 marks]

$= \dfrac{13 + 11 + 4}{36} > \dfrac{13 + 8 + 4}{36}$

$= \dfrac{28}{36} > \dfrac{25}{36}$ (shown)

21 Work out $0.70\overset{\cdot\cdot}{48} - 0.001$

Circle your answer.

[1 mark]

$0.70\overset{\cdot\cdot}{38}$ $0.703\overset{\cdot}{8}$ $0.70\overset{\cdot}{3}8\overset{\cdot}{3}$ $\boxed{0.703\overset{\cdot\cdot}{84}}$

0.704848

$- \quad 0.001$

$\overline{0.703848 \dots}$

$= 0.703\overset{\cdot\cdot}{84}$

Turn over for the next question

5

Turn over ▶

22   (−3, 10) is a point on line L.

(4, 0) and (6, 10) are points on line M.

L and M are parallel.
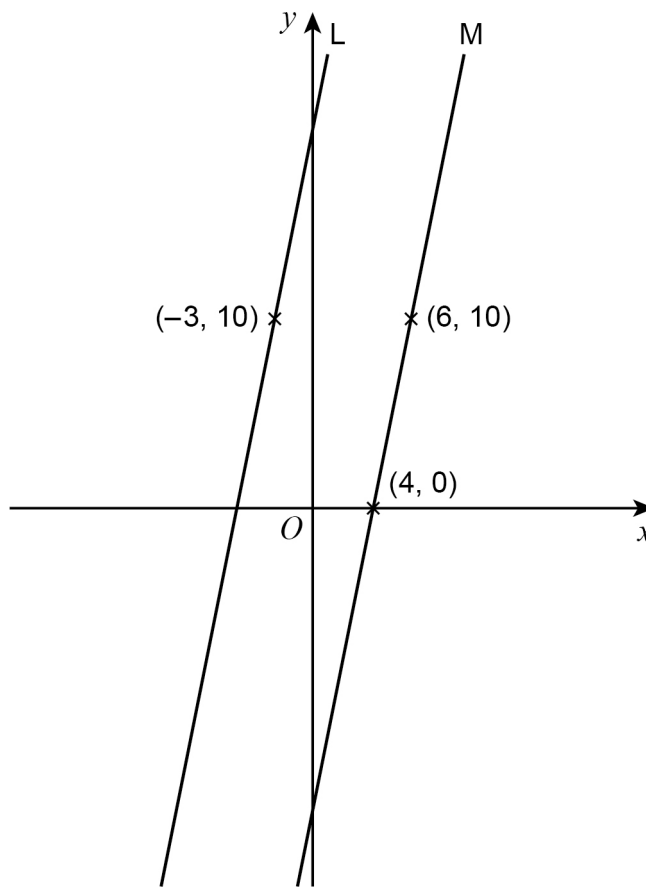
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Work out the equation of line L.

Give your answer in the form $y = mx + c$

[3 marks]

gradient of M : $\dfrac{10-0}{6-4}$ = $\dfrac{10}{2}$ = 5 ①

gradient of L = M = 5

equation of L : 10 = 5(−3) + c ①

c = 25

∴ y = 5x + 25

①

Answer $y = 5x + 25$

Do not write
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23 (a) Factorise $5x^2 + 6x - 8$

[2 marks]

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

Answer $(5x-4)(x+2)$ ②

23 (b) Simplify fully $\dfrac{x^2 + 9x + 14}{x^2 - 4}$

[3 marks]

$$x^2 + 9x + 14 = (x+2)(x+7) \quad ①$$

$$x^2 - 4 = (x-2)(x+2) \quad ①$$

$$\frac{(x+2)(x+7)}{(x+2)(x-2)} = \frac{x+7}{x-2} \quad ①$$

Answer $\dfrac{x+7}{x-2}$

Turn over for the next question

8

Turn over ▶

2 1

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24 Work out $\sqrt{18} - \dfrac{28}{\sqrt{50}}$

Give your answer in the form $\dfrac{\sqrt{a}}{b}$ where a and b are integers.

[4 marks]

$$\sqrt{18} - \frac{28}{\sqrt{50}} \times \frac{\sqrt{50}}{\sqrt{50}} \quad ①$$

$$\sqrt{18} - \frac{28\sqrt{50}}{50}$$

$$\frac{50\sqrt{18} - 28\sqrt{50}}{50}$$

$$= \frac{50\sqrt{9 \times 2} - 28\sqrt{25 \times 2}}{50} \quad ①$$

$$= \frac{150\sqrt{2} - 140\sqrt{2}}{50} \quad ①$$

$$= \frac{10\sqrt{2}}{50}$$

$$= \frac{\sqrt{2}}{5} \quad ①$$

Answer $\dfrac{\sqrt{2}}{5}$

25 A bag contains 8 balls.

3 are red and 5 are blue.

2 balls are taken from the bag at random without replacement.

25 (a) Write down the probability that there is **at least** 1 red ball still in the bag.

[1 mark]

Answer   1   ①

25 (b) Work out the probability that there are **at least** 2 red balls still in the bag.

[3 marks]

$3R = \dfrac{5}{8} \times \dfrac{4}{7} = \dfrac{20}{56}$ ①

$2R = \dfrac{3}{8} \times \dfrac{5}{7}$ or $\dfrac{5}{8} \times \dfrac{3}{7}$

$= \dfrac{15}{56}$ or $\dfrac{15}{56}$

$\dfrac{20}{56} + 2\left(\dfrac{15}{56}\right)$ ①

$= \dfrac{20}{56} + \dfrac{30}{56}$

$= \dfrac{50}{56}$

Answer $\dfrac{50}{56}$ ①

8

Turn over ▶

26   Here are a circle and a sector of the circle.

They each have radius r.
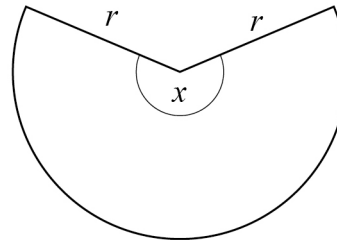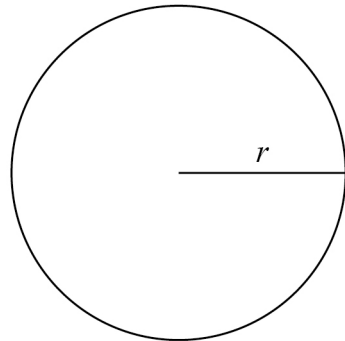
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circumference of circle = perimeter of sector

Work out the size of angle x.

Give your answer in terms of π

[4 marks]

circumference = $2\pi r$ ①

length of arc = $\dfrac{x}{360} \times 2\pi r$ ①

perimeter of sector = $\dfrac{x}{360} \times 2\pi r + 2r$

$2\pi r = \dfrac{x}{360} \times 2\pi r + 2r$ ①

$2r(\pi) = 2r\left(\dfrac{x\pi}{360} + 1\right)$

$x = \dfrac{360\pi - 360}{\pi} = \dfrac{360 - \dfrac{360}{\pi}}{}$ ①

Answer _____$360 - \dfrac{360}{\pi}$_____ degrees

27 A curve has the equation $y = x^2 - 6x + 17$

The turning point of the curve is at $(a, 8)$

27 (a) By completing the square, or otherwise, work out the value of a.

[2 marks]

$y = (x-3)^2 - 9 + 17$

$= (x-3)^2 + 8$

①

Answer   3   ①

27 (b) The turning point of the curve $y = x^2 + 4x + b$ also has y-coordinate 8

Work out the value of b.

[2 marks]

$y = (x+2)^2 - 4 + b$ ①

$-4 + b = 8$

$b = 12$ ①

Answer   12

8

Turn over ▶

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28 Work out the value of $100^{-\frac{1}{2}}$

[2 marks]

$$= \frac{1}{\sqrt{100}}$$

$$= \frac{1}{10} = 0.1 \quad ②$$

Answer _____ 0.1 _____

29 Show that the value of $5\sin 30° \times \cos 30° \times 8\tan 30°$ is an integer.

[4 marks]
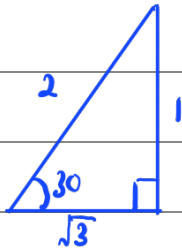
$\sin 30° = \frac{1}{2}$

$\cos 30° = \frac{\sqrt{3}}{2}$ ①

$\tan 30° = \frac{1}{\sqrt{3}}$ or $\frac{\sqrt{3}}{3}$

$$5\left(\frac{1}{2}\right) \times \frac{\sqrt{3}}{2} \times 8\left(\frac{1}{\sqrt{3}}\right)$$

$$= \frac{5}{2} \times \frac{\sqrt{3}}{2} \times \frac{8\sqrt{3}}{3} \quad ①$$

$$= \frac{40\sqrt{3}\sqrt{3}}{12} \quad ① = \frac{40(3)}{12} = \frac{120}{12} = 10 \quad ①$$

END OF QUESTIONS

6

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