Name:

GCSE 9-1
Practice Paper
Set A
Paper 3 - Calculator

Corbettmɑths

Equipment

1. A black ink ball-point pen.
2. A pencil.
3. An eraser.
4. A ruler.
5. A pair of compasses.
6. A protractor.
7. A calculator

Guidance

1. Read each question carefully.
2. Don't spend too long on one question.
3. Attempt every question.
4. Check your answers seem right.
5. Always show your workings

Information

1. Time: 1 hour 30 minutes
2. The maximum mark for this paper is 80.
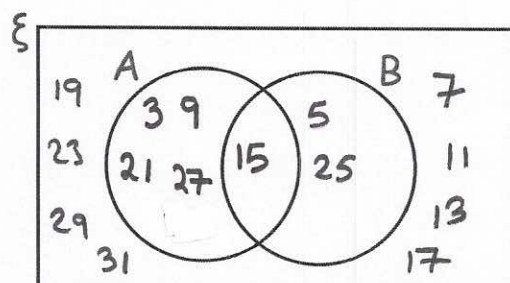3. You may use tracing paper.

Question	Mark	Available
1		6
2		3
3		4
4		4
5		3
6		4
7		3
8		4
9		6
10		3
11		3
12		3
13		3
14		6
15		4
16		5
17		3
18		4
19		4
20		5
Total		80

1.   ξ = {odd numbers less than 32}

A = multiples of 3
B = multiples of 5

(a) Complete the Venn diagram

ξ

A: 39 21 27
B: 5 25
Intersection: 15
19 23 29 31
7 11 13 17

(4)

One of the numbers is selected at random.

(b) Write down P (A ∩ B)

1/16

....

(2)

2.   Solve the simultaneous equations

$3x - y = 23$ ①
$2x + 3y = 8$ ②

Do not use trial and improvement

① ×3 ⇒ $9x - 3y = 69$
$2x + 3y = 8$ +
─────────────
$11x = 77$
$x = 7$

substituting
$3 \times 7 - y = 23$
$21 - y = 23$
$y = -2$

x = ...7........ y = ...-2.......

(3)

3. The table shows the ages of an under-21 rugby squad.

Age	Frequency	
18	5	5
19	5	10
20	9	19
21	4	

total   23

(a) Find the median age.

median player is number $\frac{23+1}{2} = 12$

the 12th oldest is 20

20

(1)

Courtney says that the mean age and median age are the same.

(b) Is Courtney correct?
   You must give a reason for your answer.

Mean $= \dfrac{18 \times 5 + 19 \times 5 + 20 \times 9 + 21 \times 4}{23}$

$= \dfrac{449}{23}$

$= 19.52\ldots$

median = 20
Mean = 19.52

No

(3)

4. Harley sold 380 ice creams.
    He sold only vanilla, chocolate, strawberry and honeycomb ice creams.
    45% of the ice creams are chocolate.

    The ratio of vanilla ice creams to strawberry ice creams to honeycomb ice
    creams is 1:2:8.

    Work out how many more chocolate ice creams are sold than honeycomb ice
    cream.

    55% are not chocolate = 0.55 × 380 = 209

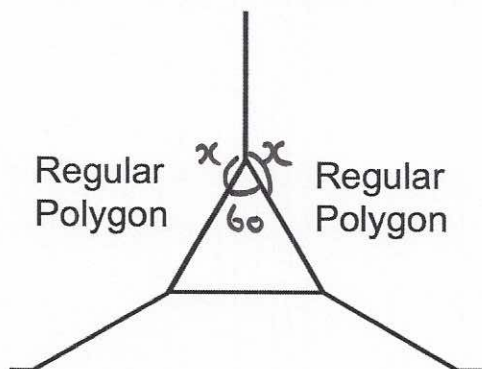   honeycomb is $\frac{8}{11}$ × 209 = 152

    chocolate = 380 - 209 = 171

    171 - 152 =

    .....19.....

    (4)

5. Shown below are two identical regular polygons and an equilateral triangle.

    Regular Polygon x x Regular Polygon   60

    Calculate the number of sides each regular polygon has.

    $2x + 60 = 360$

    ∴ $x = 150°$ (interior angle)

    ∴ exterior angle = 30°

    360 ÷ 30 =

    .....12.....

    (3)

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6. Material A has a density of 5.8g/cm³.
   Material B has a density of 4.1g/cm³.

   377g of Material A and 1.64kg of Material B form Material C.

   Work out the density of Material C.

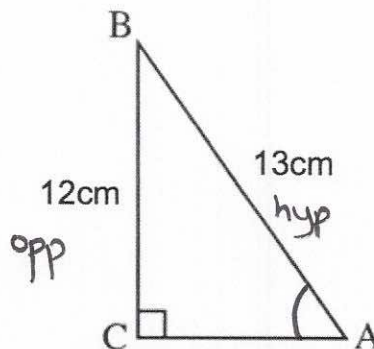$$A: V_A = \frac{377}{5.8} = 65 cm^3 \qquad B: V_B = \frac{1640}{4.1} = 400 cm^3$$

$$\therefore V_C = 465 cm^3 \qquad M_C = 1640 + 377 = 2017g$$

$$D_C = \frac{2017}{465} = 4.3376 \cdots$$

_____4.34_____ g/cm³

(4)

7.

Calculate the size of angle BAC.

$$\text{Sin } B\hat{A}C = \frac{12}{13}$$

$$B\hat{A}C = \text{Sin}^{-1}\left(\frac{12}{13}\right) = 67.38 \cdots$$

_____67.4_____ °

(3)

8. Shown is a square and a circle.
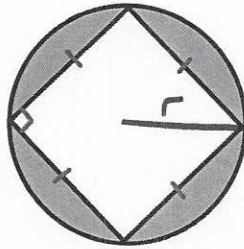
Each vertex of the square is on the circumference of the circle.

The area of the circle is 81cm²

Find the area of the shaded region.
Give your answer to 4 significant figures.

$$\text{area} = \pi r^2 = 81 \qquad \therefore r = \sqrt{\frac{81}{\pi}} = 5.0777\ldots$$

$$\text{side length of the Square} = \sqrt{r^2 + r^2} = 7.18\ldots$$

$$\therefore \text{shaded area} = 81 - (7.18)^2 = 29.43379\ldots$$

29.43 ....cm²

(4)

9. The functions $f(x)$ and $g(x)$ are given by the following:

$$f(x) = 8 - 3x$$
$$g(x) = 4x$$

(a) Calculate the value of $gf(3)$

$f(3) = 8 - 3 \times 3 = -1$

$g(-1) = 4x - 1 = -4$

-4

(2)

(b) Solve the equation $gf(x) = 80$

$g(f(x)) = g(8-3x)$

$= 4(8-3x)$

$= 32 - 12x$

$32 - 12x = 80 \Rightarrow 12x = -48$

$x = -4$

(4)

10. Charlotte invests £5000.
The bank pays 10% interest for the first year and then y% every year after that.
After three years, Charlotte has £5610.55

Calculate y.

$5000 \times 1.1 \times x^2 = 5610.55$

$x^2 = 1.0201$

$x = 1.01$

$\therefore y = 1\%$

y .....1%.....

(3)

11. A food standards inspector is going to visit 3 establishments in one day.
In the town, there are 40 restaurants and 12 cafes.

He writes a list of the three different establishments, and the order will either be:

| Cafe |
| Restaurant |
| Restaurant |

| Restaurant |
| Cafe |
| Cafe |

How many possible lists could he write?

$12 \times 40 \times 39 = 18720$

or   +

$40 \times 12 \times 11 = 5280$

24,000
....
(3)

12. The points D, E, F and G lie in a straight line.

$$DE : EG = 1 : 4 \quad = 4 : 16$$
$$DF : FG = 9 : 11$$

Work out DE : EF : FG

$DE = \frac{4}{20}$ of total length EG

$FG = \frac{11}{20}$ of total length EG

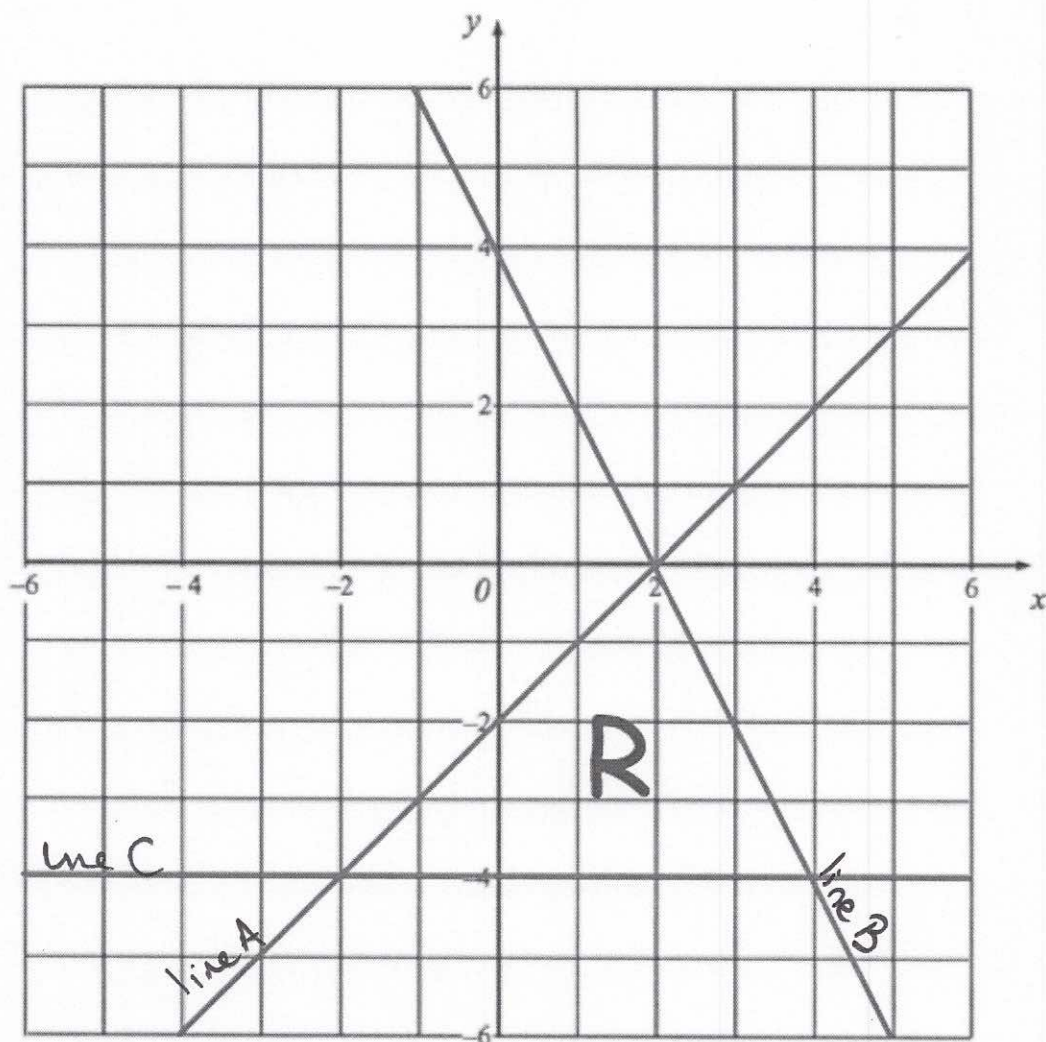$DF = \frac{9}{20}$ so $EF = \frac{9}{20} - \frac{4}{20} = \frac{5}{20}$

∴ ratio $= \frac{4}{20} : \frac{5}{20} : \frac{11}{20}$

............4...........:............5...........:.....11.......

(3)

13.

The region labelled R satisfies three inequalities.

State the three inequalities

Line A has equation $\quad y = x - 2$

Line B has equation $\quad y = -2x + 4 \quad$ (or $2x + y = 4$)

Line C has equation $\quad y = -4$

$y \geqslant -4$

$y \leqslant x - 2$

$y \leqslant -2x + 4 \quad *$

($*$ or $2x + y \leqslant 4$)

(3)

14. (a) Simplify fully

$$\frac{5x^2 - 13x - 6}{x^2 - 9}$$

$$= \frac{(5x+2)(x-3)}{(x+3)(x-3)} =$$

$$\frac{5x+2}{x+3}$$

....

(3)

(b) Make m the subject of the formula

$$y = \frac{m+4}{m+5}$$
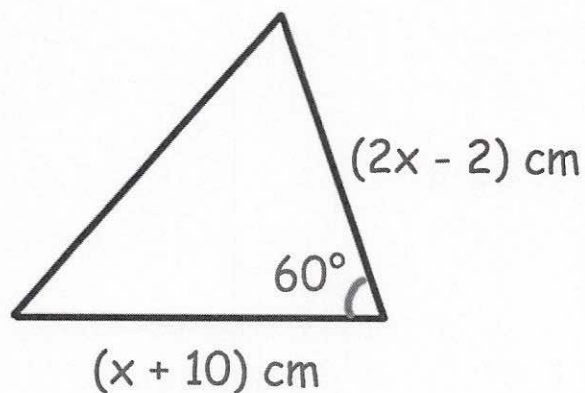
$$y(m+5) = m+4$$

$$my + 5y = m+4$$

$$my - m = 4 - 5y$$

$$m(y-1) = 4-5y$$

$$m = \frac{4-5y}{y-1}$$

....

(3)

$$\left(\text{or} \quad \frac{5y-4}{1-y} \right)$$

15.

(2x - 2) cm

60°

(x + 10) cm

The area of the triangle is 90√3 cm²

Work out the value of x.

$$\text{area} = \tfrac{1}{2}ab\sin C$$

$$= \tfrac{1}{2}(2x-2)(x+10)\sin 60$$

$$= \tfrac{\sqrt{3}}{2}(x^2 + 9x - 10) = 90\sqrt{3}$$

$$\therefore x^2 + 9x - 10 = 180$$

$$\therefore x^2 + 9x - 190 = 0$$

$$(x + 19)(x - 10) = 0$$

x = ...10..........

(4)

16. Using $x_{n+1} = -3 - \dfrac{2}{x_n^2}$

with $x_0 = -3.5$

(a) find the values of x_1, x_2 and x_3

$$x_1 = -3 - \frac{2}{(-3.5)^2} = -3.163\ldots$$

$$x_2 = \ldots\ldots$$

$x_1 = -3.163\ldots$

$x_2 = -3.1998\ldots$

$x_3 = -3.1953\ldots$

(3)

(b) Explain the relationship between the values of x_1, x_2 and x_3 and the equation $x^3 + 3x^2 + 2 = 0$

They are increasingly accurate solutions to the equation

$\left(\text{since } x^3 + 3x^2 + 2 = 0 \Rightarrow x^3 = -3x^2 - 2 \right.$

$\left. \Rightarrow x = -3 - \frac{2}{x^2} \right)$

(2)

17. The curved surface area of a cone is given by the formula

$$A = \pi r l$$

where A is the curved surface area
r is the radius of the base of the cone
and l is the slant height

Given   A = 220 cm² correct to 3 significant figures,
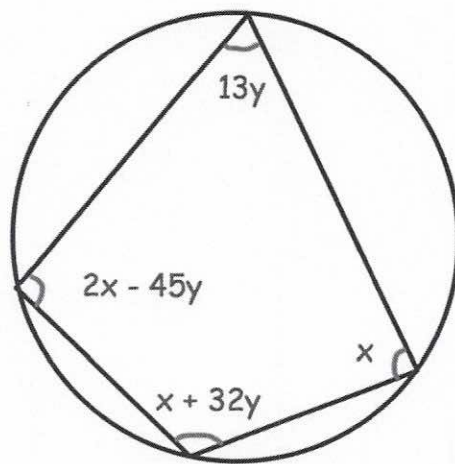   and r = 8 cm correct to 1 significant figure.

Calculate the upper bound for l.

$$l = \frac{A}{\pi r}$$

$$\therefore l_{Max} = \frac{A_{Max}}{\pi \times r_{Min}} = \frac{220.5}{\pi \times 7.5} = 9.3583 \ldots$$

9.4
..............................cm
(3)

18.

Find the values of x and y

cyclic quadrilateral :

$\therefore$ $x + 32y + 13y = 180$ $x + 45y = 180$
and
$2x - 45y + x = 180$ $3x - 45y = 180$
                        _____
                         $4x = 360$

                         $x = 90$ $y = 2$

                                                    (4)
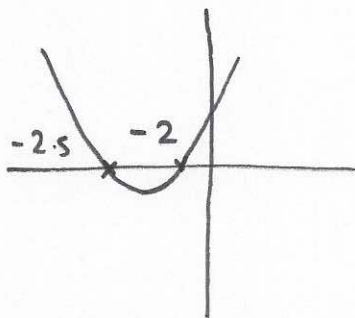
19.   Solve the inequality $2x^2 + 9x + 10 > 0$

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

so critical points are $x = -2$
                         $x = -2\frac{1}{2}$

                         $x < -2.5$ or $x > -2$

                                                    (4)

20. The circle C has equation $x^2 + y^2 = 4$

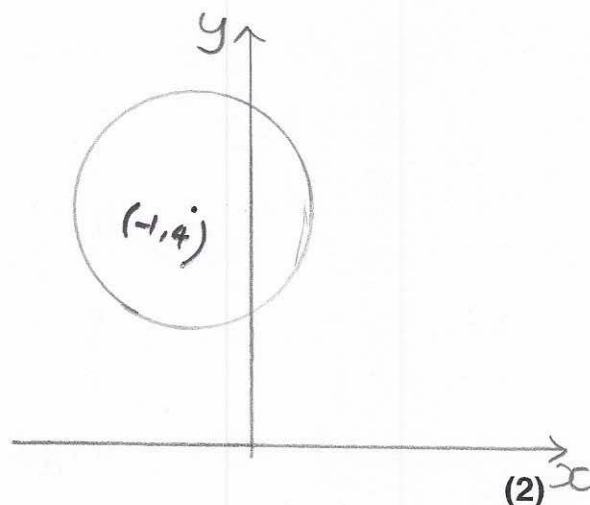The circle is reflected in the line $y = 2$ to give circle D

Circle D is translated by the vector $\begin{pmatrix} -1 \\ 0 \end{pmatrix}$ to give circle E

(a) Draw a sketch of circle E

C has centre $(0,0)$ radius = 2

D has centre $(0,4)$ radius 2

E has centre $(-1,4)$ radius 2

$(-1,4)$

(2)

(b) Write down the coordinates of the centre of circle E

$(\underset{-1}{\ldots\ldots} , \underset{4}{\ldots\ldots})$

(1)

(c) Write down the coordinates of points where circle E meets the y-axis

equation is $(x+1)^2 + (y-4)^2 = 4$

$x=0$ ∴ $1^2 + (y-4)^2 = 4$

$(y-4)^2 = 3$

$y = 4 \pm \sqrt{3}$

$(\underset{0}{\ldots} , \underset{4-\sqrt{3}}{\ldots})$ and $(\underset{0}{\ldots} , \underset{4-\sqrt{3}}{\ldots})$

(2)