Name: SOLUTIONS

GCSE 9-1 Higher
Practice Paper
Set B
Paper 3 - Calculator

Corbettmaths

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		4
2		4
3		3
4		2
5		3
6		2
7		2
8		4
9		2
10		3
11		3
12		5
13		3
14		5
15		5
16		7
17		6
18		5
19		2
20		5
21		5
Total		80

1. Sally is raising money for charity.
   The table below has been given to her from the website.
   The donation amounts are in pounds.

Donation	Frequency	
$0 < d \leq 5$	44	M.p $\times$ f
$5 < d \leq 10$	35	$2.5 \times 44 = 110$
$10 < d \leq 20$	16	$7.5 \times 35 = 262.5$
$20 < d \leq 50$	3	$15 \times 16 = 240$
$50 < d \leq 100$	2	$35 \times 3 = 105$
total	100	$75 \times 2 = 150$
		867.5

(a) Calculate an estimate for the mean donation.

$$\frac{867.5}{100} = 8.675$$

£ 8.68

(3)

(b) What percentage of the donations are greater than £20?

5 out of 100 are > £20

5 %

(1)

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2. Nancy goes to the Post Office to exchange money.

Exchange Rates
£1 : $1.31
£1 : €1.14
*Commission Charged

$ £ €

Nancy changes $759.80 and €342 into pounds sterling.
The Post Office deducts their commission and gives Nancy £827.20
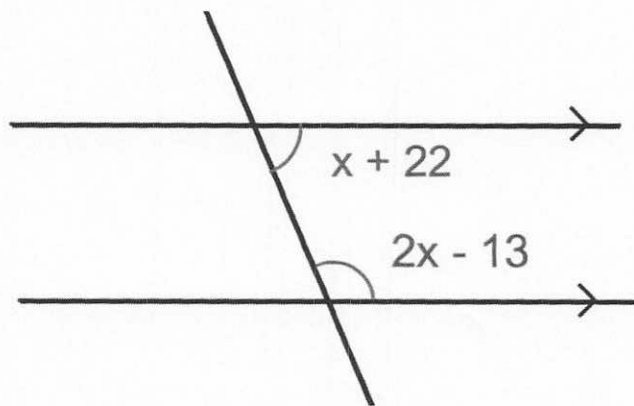
What is the percentage commission?

$759.80 ÷ 1.31 = £580

€342 ÷ 1.14 = £300
                      ‾‾‾‾‾
                      £880

so she's charged   880 - 827.20 = £52.80

$$\frac{52.8}{880} = 6\%$$

.........**6**.....%

(4)

3.

Find x

$$x + 22 = 180 - (2x - 13)$$

$$x + 22 = 193 - 2x \quad \Rightarrow \quad 3x = 171$$

$x = 57$ °

(3)

4.
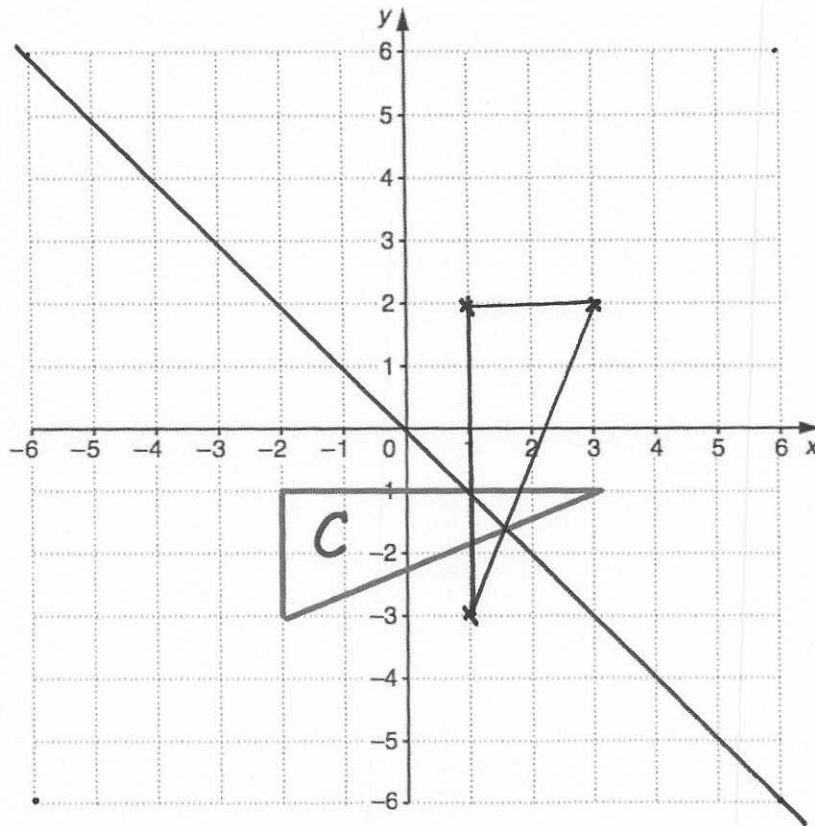
Reflect triangle C in the line $y = -x$

(2)

5. Jim is making green paint by mixing blue paint and yellow paint in the ratio 8:3

Jim has 120 litres of blue paint and 31.5 litres of yellow paint.

What is the maximum amount of green paint he can make?

$120 \div 8 = 15$ If he uses all 31.5 litres of yellow,
$31.5 \div 3 = 10.5$ he will use $8 \times 10.5 = 84$ litres of blue

$$84 + 31.5 =$$

...........115.5...........litres

(3)

6. y is inversely proportional to x

x	16	8	4
y	5	10	20

Complete the table above

$$x \propto \frac{1}{y} \implies x = \frac{k}{y} \implies xy = k \quad 8 \times 10 = 8$$

(2)

7. $(ax^b)^3 = 27x^{12}$ where *a* and *b* are positive integers.

Work out *a* and *b*

$$(ax^b)^3 = a^3 x^{3b}$$

$$\therefore a^3 = 27$$
$$3b = 12$$

a = 3

b = 4

(2)

8. A group of friends have been surveyed.

38% have been to Canada.
80% have been to France.
11% have been to neither Canada or France.

Find the percentage of the group that have been to Canada and France.

$100 - 11 = 89\%$ have been to either or both

$80 + 38 - 89 = 29\%$ have been to both

........29........%

(4)

9. The equation of a circle C, with centre O, is:
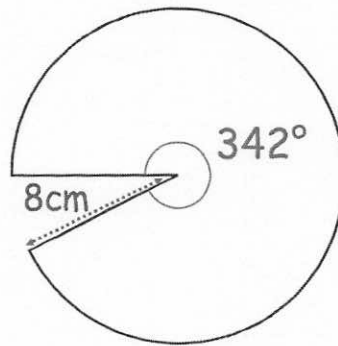
$x^2 + y^2 = 225$

(a) Find the coordinates of the centre O.

(....O...., ...O....)

(1)

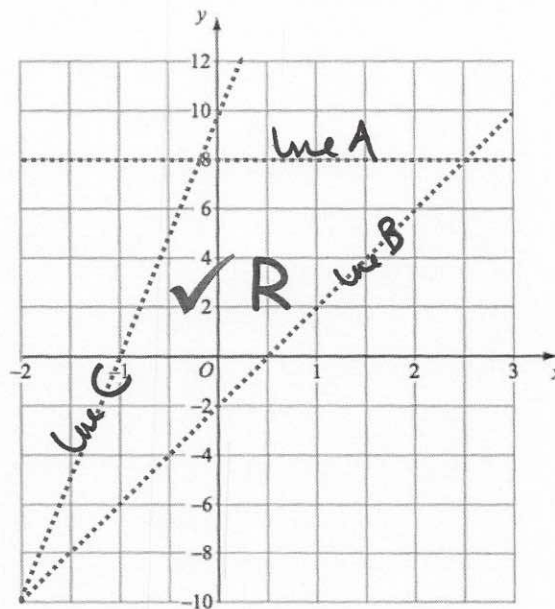(b) Find the radius of C.

$\sqrt{225} = $ ....15....

(1)

10.

342°

8cm

Find the area of the sector above.
Give your answer to 2 decimal places.

$$area = \frac{342}{360} \times \pi \times 8^2 = \frac{304}{5}\pi = 191.0088\ldots$$

191.01 ......cm²

(3)

11.

Line A

R

Line B

Line C

The region labelled R satisfies three inequalities.
State the three inequalities.
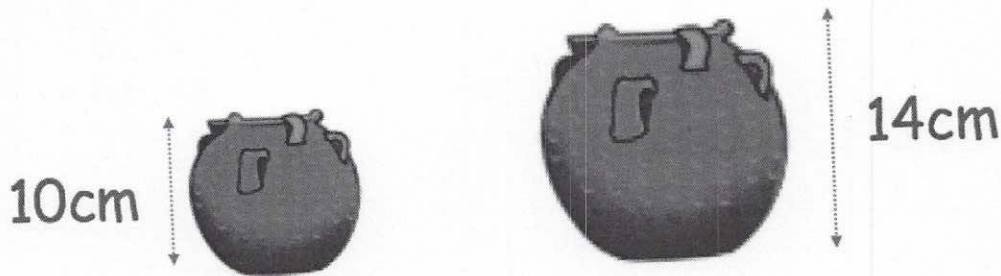
Line A : y = 8
Line B : y = 4x - 2
Line C : y = 10x + 10

y < 8

y > 4x - 2

y < 10x + 10

(3)

12.	Mrs Hampton is potting plants.
She is using two mathematically similar pots, the smaller is 10cm tall and the larger 14cm tall.

She has three bags of soil, each containing 25 litres of soil.

With the first bag, Mrs Hampton fills 20 small pots using all of the soil in the bag.

10cm

14cm

How many large pots can be filled completely using the other two bags of soil?

height scale factor $= 14 \div 10 = 1.4$

volume scale factor $= 1.4^3 = 2.744$

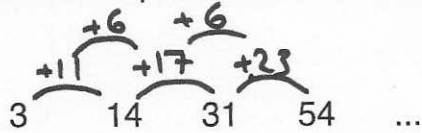Small pot holds $\frac{25}{20} = 1.25$ litres

$\therefore$ large pot holds $1.25 \times 2.744 = 3.43$ litres

$\frac{50}{3.43} = 14.577 \cdots$

......14......

(5)

13. Work out an expression for the nth term of this quadratic sequence

$$\begin{array}{ccccccccc} & & \overset{+6}{\frown} & & \overset{+6}{\frown} & & \\ & \overset{+11}{\frown} & & \overset{+17}{\frown} & & \overset{+23}{\frown} & \\ 3 & & 14 & & 31 & & 54 & & \ldots \end{array}$$

Give your answer in the form $an^2 + bn + c$

$\frac{6}{2} = 3$

$3n^2 : 3, 12, 27, 48$

$ 3 \quad 14 \quad 31 \quad 54$

$2n-2 \longrightarrow 0 \quad +2 \quad +4 \quad +6$

$3n^2 + 2n - 2$

....

(3)

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14. Jamie has some coins in his pocket.

Jamie has to pay 60p for a car park ticket.
He selects 3 coins at random, without replacement, from his pocket.

Work out the probability that he chooses the exact price of the ticket.

4 possible ways he can select exactly 60p

$20p, 20p, 20p = \frac{3}{12} \times \frac{2}{11} \times \frac{1}{10} = \frac{6}{1320}$

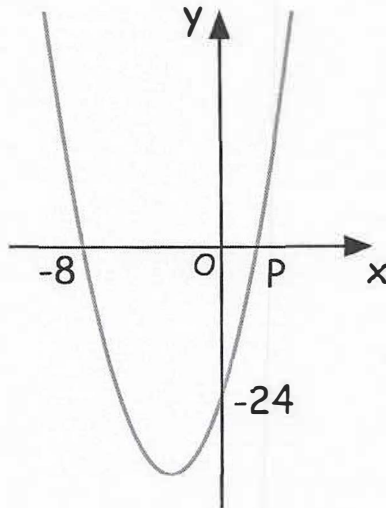$50p, 5p, 5p = \frac{1}{12} \times \frac{2}{11} \times \frac{1}{10} = \frac{2}{1320}$ (This can happen in 3 ways)

so P(exactly 60p) $= \frac{6 + 3 \times 2}{1320} = \quad \frac{12}{1320}$

....

(5)

15. Below is a sketch of the graph $y = x^2 + bx + c$

The curve passes through the points $(-8, 0)$, $(0, -24)$ and $(P, 0)$

Work out the coordinates of the turning point of the graph.

$C = -24$

$y = x^2 + bx - 24 = 0$

factorises to

$y = (x + 8)(x - p) = 0$

$\therefore p = 3$

turning point happens half way
between $x = -8$ & $x = 3$

$(-2.5, -30.25)$

(5)

$\therefore x = \dfrac{-8 + 3}{2} = -2.5$

$y = (x + 2.5)^2 - 30.25$

16. (a) Show the equation $x^3 + 3x^2 + 5 = 0$ can be rearranged to give

$$x = -3 - \frac{5}{x^2}$$

$$x^3 = -3x^2 - 5$$

$$\div x^2 \quad x = -3 - \frac{5}{x^2}$$

(2)

(b) Using $x_{n+1} = -3 - \frac{5}{(x_n)^2}$

with $x_0 = -4$

find the values of x_1, x_2 and x_3

$$x_1 = -3 - \frac{5}{(-4)^2} = -3.3125$$

$$x_2 = \ldots$$

$x_1 = $ -3.3125
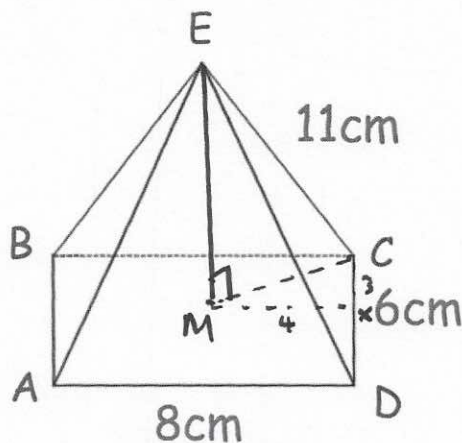
$x_2 = $ -3.4556...

$x_3 = $ -3.4187...

(3)

(c) Explain the relationship between the values of x_1, x_2 and x_3 and the equation $x^3 + 3x^2 + 5 = 0$

They are increasingly accurate approximatuy to a solutian to the equation $x^3 + 3x^2 + 5 = 0$

(2)

17. Shown below is a rectangular-based pyramid.
The apex E is directly over the centre of the base.

E

11cm

B

C

M

×6cm

A

D

8cm

AD = 8cm
CD = 6cm
CE = 11cm

(a) Calculate the height of the pyramid

$h = EM$

$CM^2 = 3^2 + 4^2 \Rightarrow CM = 5$

$\therefore h^2 = 11^2 - 5^2 = \sqrt{96} = 4\sqrt{6}$

__9.797....__cm

(3)

(b) Calculate the angle between face ABE and the based ABCD

this is the same as angle $E\hat{X}M$ is the diagrm

$\tan E\hat{X}M = \dfrac{4\sqrt{6}}{4}$ $\Rightarrow E\hat{X}M = \tan^{-1}(\sqrt{6}) =$ __67.8°__

(3)

18. Solve the equations

$$x^2 + y^2 = 25$$
$$x + y = 7$$

$$x = 7 - y$$

substitute to give

$$(7-y)^2 + y^2 = 25$$

$$49 - 14y + 2y^2 = 25$$

$$2y^2 - 14y + 24 = 0$$

$$y^2 - 7y + 12 = 0$$

$$(y-3)(y-4) = 0$$

$$y = 3, \; y = 4$$

$$\therefore \; x = 4 \quad x = 3$$

$$x = 3 \qquad y = 3$$
$$y = 4 \qquad x = 4$$
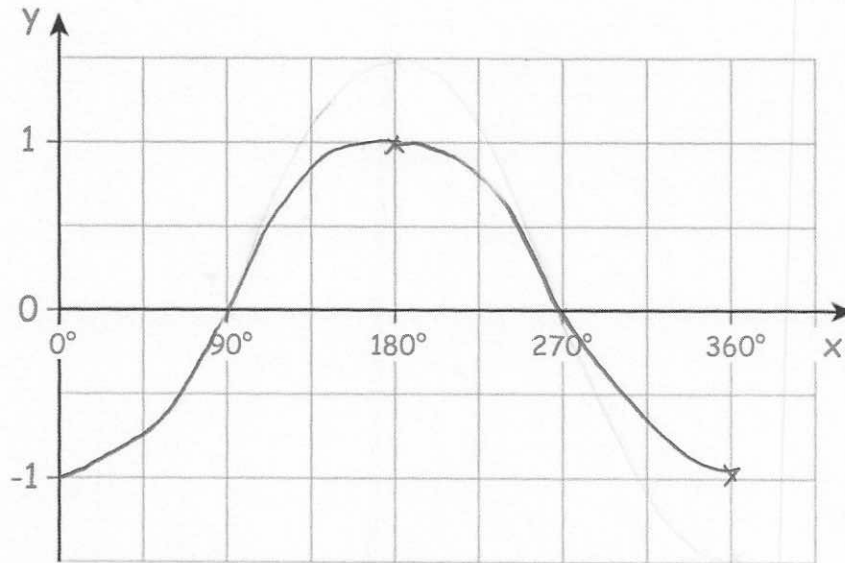
(5)

19. For all the values of x

$f(x) = x - 180$

$g(x) = \cos x$

Draw the graph of the function $y = gf(x)$ for $0° \le x \le 360°$

(2)

$gf(x) = g(f(x))$

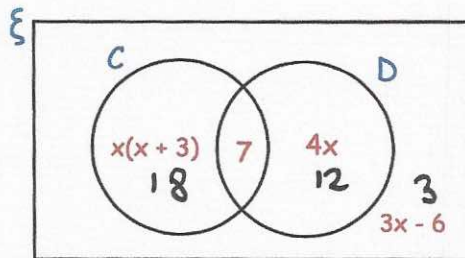$= \cos(x - 180°)$

(which is $y = \cos x$ shifted 180° to the right)

20. The Venn diagram shows information about the pets owned by 40 students

ξ = 40 students
C = students who own a cat
D = students who own a dog

A student is chosen at random.
They own a cat.
Work out the probability that they own a dog.

total = 40

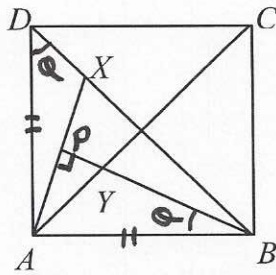$\therefore x^2 + 3x + 7 + 4x + 3x - 6 = 40$

$x^2 + 10x - 39 = 0$

$(x+13)(x-3) = 0$

$x = 3$ (ignore negative)

$P(dog | cat) = \frac{7}{25}$

(5)

Q21.   ABCD is a square, X is a point in the diagonal BD and the
        perpendicular from B to AX meets AC in Y.

        Prove that triangles AXD and AYB are congruent.

$AB = AD$ (since ABCD is a square)

$B\hat{A}Y = A\hat{D}X (= 45°)$ (since the diagonals bisect the right angles
                                        of the square)

If $Y\hat{B}A = \alpha$

then
    $B\hat{A}X = 90 - \alpha$ (since in $\triangle$ APB, the other 2 angles are 90° and α)

$\therefore D\hat{A}X = \alpha$

    $\therefore Y\hat{B}A = D\hat{A}X = \alpha$

        $\therefore$ AXD & AYB are congruent ASA .

(5)