

Name: **Solutions**

GCSE 9-1 Higher
Practice Paper
Set D
Paper 1 - Non 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.

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. The marks for questions are shown in brackets
4. You may use tracing paper.

Question	Mark	Available
1		2
2		4
3		4
4		4
5		4
6		3
7		4
8		3
9		4
10		5
11		3
12		3
13		2
14		4
15		4
16		3
17		4
18		4
19		4
20		3
21		3
22		6
Total		80

1. Work out the value of

$$\frac{2^{-4} \times 2^{-3}}{2^{-11}}$$

$$= \frac{2^{-7}}{2^{-11}} = 2^{(-7 - -11)} = 2^4 =$$

16

(2)

2. $s = vt - \frac{1}{2}at^2$

$$s = 20 \quad t = 4 \quad a = -3$$

(a) Work out the value of v

$$20 = 4v - \frac{1}{2} \times -3 \times 4^2$$

$$4v = -4$$

$$v = -1$$

(2)

(b) Make a the subject of $s = vt - \frac{1}{2}at^2$

$$vt = s + \frac{1}{2}at^2$$

$$\frac{1}{2}at^2 = vt - s$$

$$at^2 = 2vt - 2s$$

$$a = \frac{2vt - 2s}{t^2}$$

(2)

3. Edward and his four friends go on holiday.
The total cost of the holiday is £3600.

Edward is going to stay longer than his friends and he is going to pay 35% of the total cost.

The rest of the total cost is to be shared equally between his four friends.

Edward says,

"I pay twice as much money for the holiday than each of my friends."

Is Edward correct?
Explain your answer.

Edward pays 35%

His friends pay $100 - 35 = 65\%$

$65\% \div 4 = 16.25\%$ each

He is wrong, he pays slightly more than twice as much

(4)

4. It would take 48 days for 5 men to build a house.

(a) How much longer would it take if only 4 men built the house?

$$\begin{array}{l} 48 \text{ days} \rightarrow 5 \text{ men} \\ \times 5 \downarrow \\ 240 \text{ days} \rightarrow 1 \text{ man} \\ \div 4 \downarrow \\ 60 \text{ days} \rightarrow 4 \text{ men} \end{array} \quad \begin{array}{l} \dots\dots\dots 12 \\ \dots\dots\dots (3) \end{array}$$
$$60 - 48 = 12$$

(b) State one assumption you made in working out your answer to (a)

That all the men work at the same
rate
.....
.....
(1)

5. Helen jogs at an average speed of 9.8 kilometres per hour.

Helen runs 3 kilometres.

(a) Work out an estimate for how long it takes Helen to run 3 kilometres.

$$\text{time} = \frac{\text{distance}}{\text{speed}} = \frac{3}{10} \text{ hour} =$$

18 minutes
.....
(3)

(b) Is your answer to (a) an underestimate or an overestimate?
Give a reason for your answer.

This is an underestimate as I rounded up her
speed, but in reality she ran slower and took longer
.....
.....
(1)

6. Solve the simultaneous equations

$$3x + 5y = 1$$

$$2x - 3y = 7$$

Do not use trial and improvement

$$9x + 15y = 3$$

$$10x - 15y = 35 \quad \textcircled{+}$$

$$19x = 38$$

$$x = 2$$

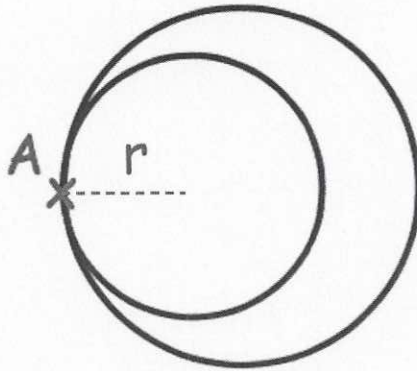
$$6 + 5y = 1$$

$$5y = -5$$

$$y = -1$$

$$x = \dots 2 \dots y = \dots -1 \dots \quad \textcircled{3}$$

7. A is a point on two circles.
The smaller circle is inside the larger circle.



The difference between the area of the smaller circle and the larger circle is 20cm^2

The radius of the smaller circle is r cm

The radius of the larger circle is 2cm greater than the radius of the smaller circle.

Show that the radius of the smaller circle is $\frac{5}{\pi} - 1$ cm

$$\text{area of smaller circle} = \pi r^2$$

$$\text{area of larger circle} = \pi(r+2)^2 = \pi r^2 + 4\pi r + 4\pi$$

$$\text{Difference} = 4\pi r + 4\pi = 20$$

$$\therefore 4\pi r = 20 - 4\pi$$

$$r = \frac{20}{4\pi} - 1$$

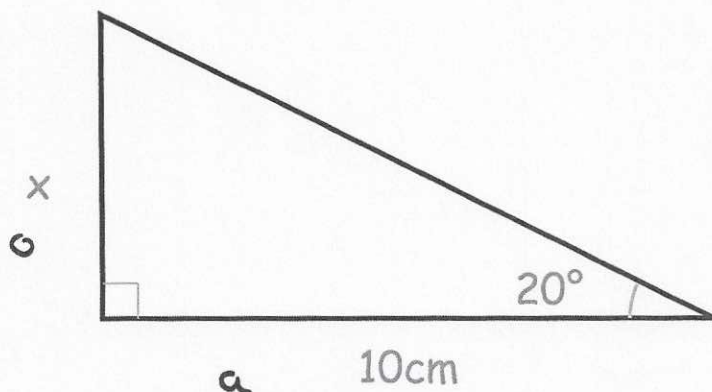
$$r = \frac{5}{\pi} - 1$$

(4)

8. (a) Write down the exact value of $\sin 30^\circ$

$\frac{1}{2}$
.....
(1)

The diagram shows a right angled triangle ABC



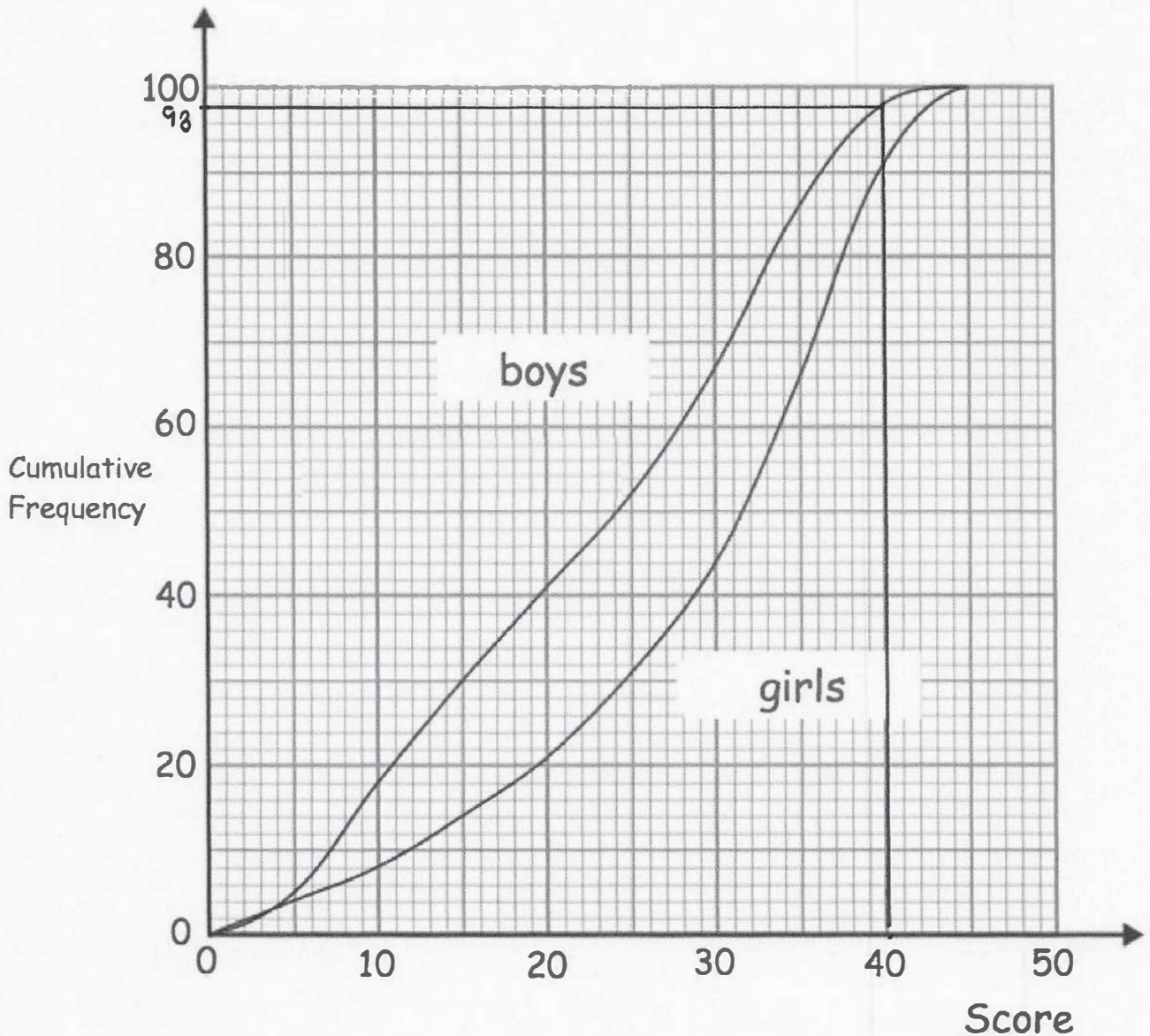
Angle	Sine	Cosine	Tangent
20°	0.34	0.94	0.36
70°	0.94	0.34	2.75

Work out the value of x.

$\tan 20^\circ = \frac{x}{a}$ $x = \tan 20^\circ \times 10 = 0.36 \times 10$

3.6
.....cm
(2)

9. A teacher gave 100 boys and 100 girls a maths test. The test was out of 45 marks. The cumulative frequency curves show how each group performed.



- (a) Find an estimate for the number of boys who scored over 40 marks.

$$100 - 98 = \underline{\quad 2 \quad}$$

(1)

- (b) Make two comparisons between the distributions of the boys and girls scores.

The girls scored higher than the boys, as the girls had a median of 31.5 compared to the boys who had a median of 24. The boys' marks are more spread out (less consistent) than the girls' marks, as the IQR for the boys is 19.5 and the IQR for the girls is 14.5

10. (a) Factorise fully $3x^2 - 75$

$$3(x^2 - 25) =$$

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

(b) Simplify $\frac{2(x+3)^2}{x+3}$

$$= 2(x+3)$$

$$\frac{2x+6}{\dots\dots\dots} \quad (1)$$

(c) Simplify $\frac{x^2 + 3x - 4}{x^2 - 8x + 7}$

$$\frac{(x+4)(x-1)}{(x-7)(x-1)}$$

$$\frac{x+4}{x-7} \dots\dots\dots \quad (2)$$

11. An online retailer normally sells clothes at 50% more than the cost price.

In a sale the price of all clothes are reduced until they are only 5% more than the cost price.

By what percentage of the original selling price have the price of the clothes been reduced?

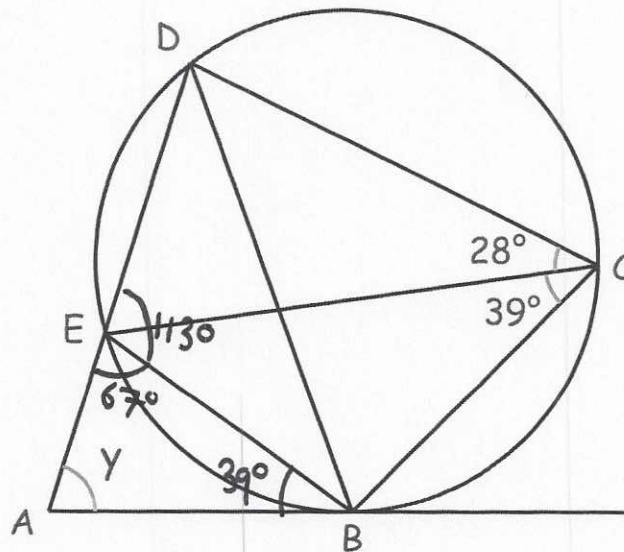
If x is cost price,
 usual selling price = $1.5x$
 sale price = $1.05x$
 \therefore % reduction = $\frac{1.5x - 1.05x}{1.5x} = \frac{0.45}{1.5} = \frac{45}{150} = \frac{30}{100}$

.....30%
(3)

12. Shown below is cyclic quadrilateral BCDE

AB is a tangent to the circle.

AED is a straight line.

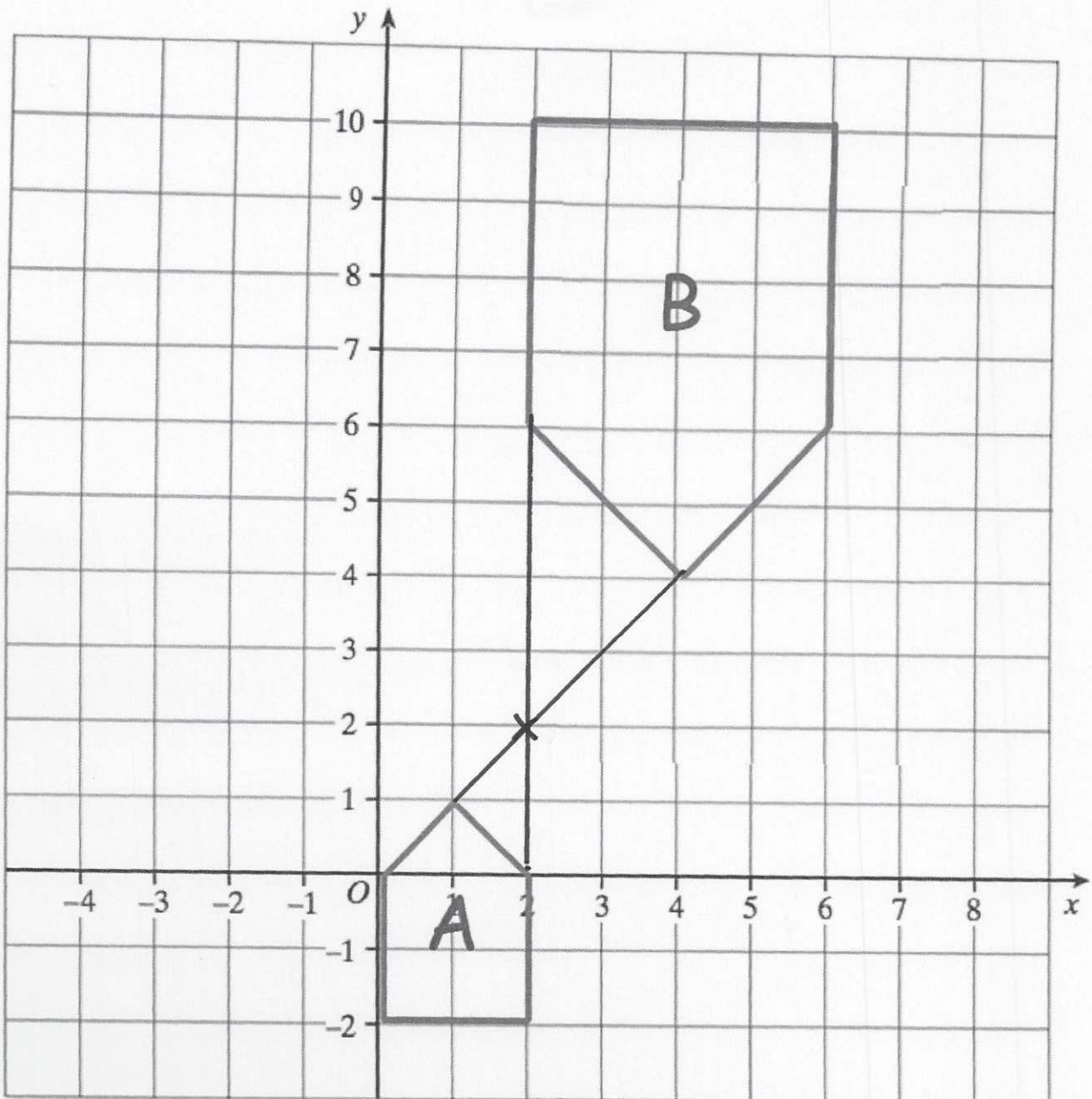


Work out the size of angle y .

$$y = 180 - (67 + 39)$$

$y = 74^\circ$
.....
(3)

13.



Describe fully the single transformation that maps shape A onto shape B.

enlargement

scale factor -2

centre $(2,2)$

(2)

14. (a) Work out the value of $25^{-\frac{3}{2}}$

$$\frac{1}{25^{\frac{3}{2}}} = \frac{1}{\sqrt{25^3}} = \frac{1}{5^3} =$$

$$\frac{1}{125}$$

.....
(2)

$$2^a = 4\sqrt{2}$$

- (b) Find the value of a

$$4 = 2^2$$

$$\sqrt{2} = 2^{\frac{1}{2}}$$

$$a = 2 + \frac{1}{2} =$$

$$2\frac{1}{2}$$

.....
(2)

-
15. Shapes A, B and C are similar.

The height of shape A is 8cm

The height of shape C is 4cm

The ratio of the surface area of shape B to the surface area of shape C is 25:9

Work out the ratio of the volume of shape A to shape B.

$$\text{ratio of lengths } A:C = 2:1 = 6:3$$

$$\text{ratio of area } B:C = 25:9$$

$$\therefore \text{ratio of lengths } B:C = 5:3$$

$$\text{so ratio of lengths } A:B:C = 6:5:3$$

$$\therefore \text{ratio of lengths } A:B = 6:5$$

$$\text{ratio of volumes } 6^3:5^3 = 216:125$$

.....
(4)

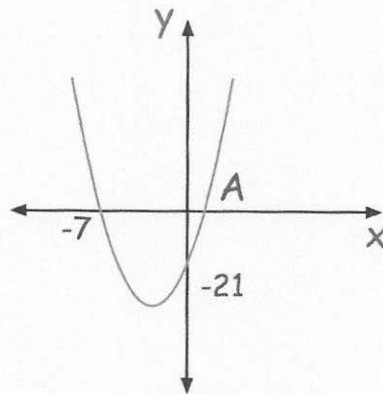
16. Show algebraically that $0.9\dot{1}\dot{3}$ can be written as $\frac{452}{495}$

$$\begin{aligned}
 x &= 0.9131313 \dots \\
 10x &= 9.131313 \dots \\
 1000x &= 913.131313 \dots \quad - \\
 \hline
 990x &= 904 \\
 \Rightarrow x &= \frac{904}{990} = \frac{452}{495}
 \end{aligned}$$

(3)

17. Melanie draws the graph of $y = x^2 + ax + b$

The graph crosses the x-axis at the points $(-7, 0)$ and **A**
 The graph crosses the y-axis at the point $(0, -21)$



- (a) Find the coordinates of the point A

$$b = -21$$

$$x^2 + ax - 21 = (x + 7)(x - 3)$$

$$x = 3$$

$$\underline{(3, 0)}$$

(2)

- (b) Find the coordinates of the turning point

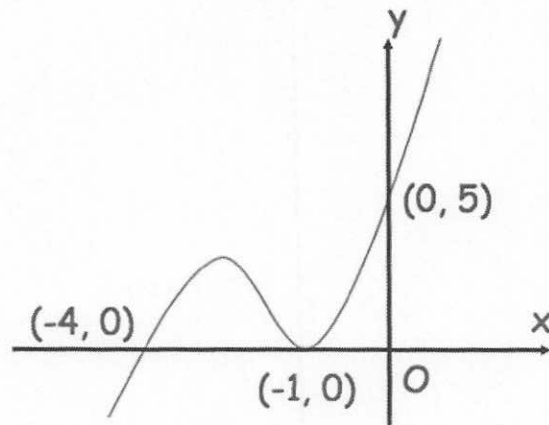
$$(x + 7)(x - 3) : x^2 + 4x - 21$$

$$(x + 2)^2 - 25$$

$$\underline{(-2, -25)}$$

(2)

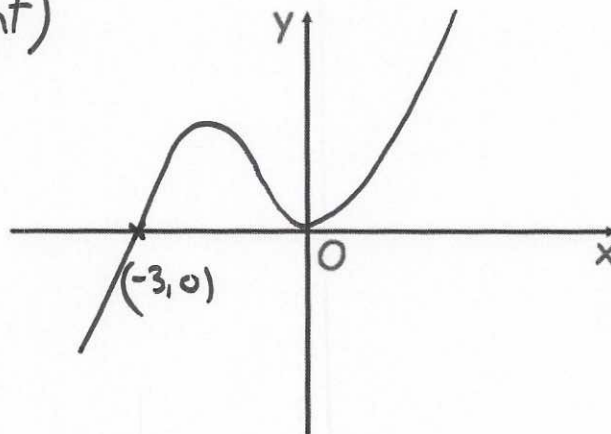
18. Shown below is the curve with equation $y = f(x)$.
The curve passes through the points $(-4, 0)$, $(-1, 0)$ and $(0, 5)$



Sketch the curve with equation:

(a) $y = f(x - 1)$

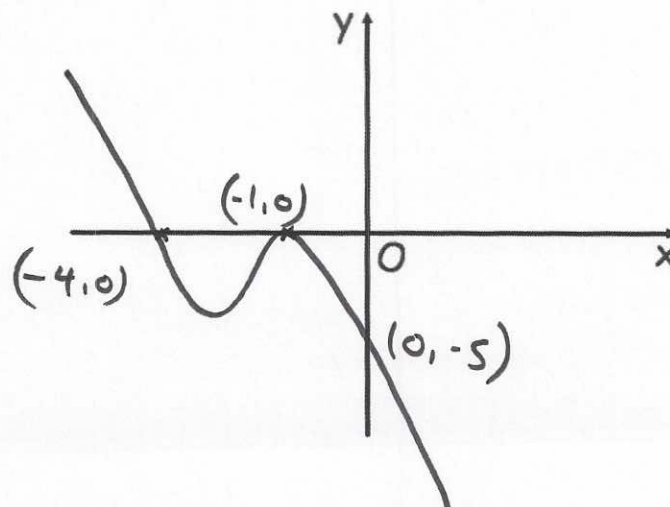
(shift 1 to the right)



(2)

(b) $y = -f(x)$

(reflect in x axis)



(2)

19. For all values of x

$$f(x) = 3x + 2 \quad \text{and} \quad g(x) = (x - 3)^2$$

(a) Find $fg(x)$

$$\begin{aligned} f(g(x)) &= f((x-3)^2) \\ &= 3(x-3)^2 + 2 \end{aligned}$$

(2)

(b) Find $f^{-1}(-12)$

$$3x + 2 = -12$$

$$3x = -14$$

$$x = \frac{-14}{3}$$

$$\frac{-14}{3}$$

(2)

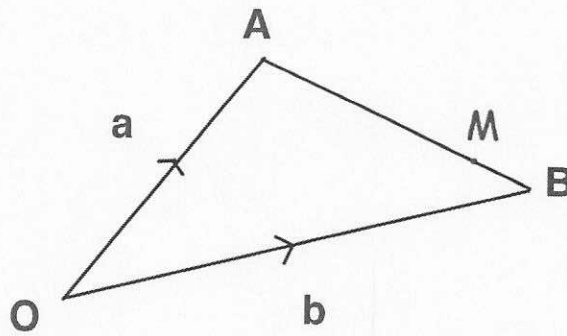
20. Express $\frac{\sqrt{3} + 2}{2 - \sqrt{3}}$ in the form $a + b\sqrt{3}$ where a and b are integers.

$$\frac{(\sqrt{3} + 2)}{(2 - \sqrt{3})} \times \frac{(2 + \sqrt{3})}{(2 + \sqrt{3})} = \frac{2\sqrt{3} + 3 + 4 + 2\sqrt{3}}{4 - 3}$$

$$= 4\sqrt{3} + 7$$

$$\frac{7 + 4\sqrt{3}}{1} \quad (3)$$

21.



OAB is a triangle.

M is a point on AB such that $AM : MB = 5 : 2$

$$\vec{OA} = \mathbf{a} \quad \vec{OB} = \mathbf{b}$$

Express \vec{MO} in terms of \mathbf{a} and \mathbf{b}

$$\vec{AB} = \mathbf{b} - \mathbf{a}$$

$$\therefore \vec{MB} = \frac{2}{7}\mathbf{b} - \frac{2}{7}\mathbf{a}$$

$$\begin{aligned} \vec{MO} &= \vec{MB} + \vec{BO} \\ &= \frac{2}{7}\mathbf{b} - \frac{2}{7}\mathbf{a} - \mathbf{b} \end{aligned}$$

$$= -\frac{2}{7}\mathbf{a} - \frac{5}{7}\mathbf{b}$$

.....
(3)

22. 45 students were asked if they have visited Canada, Mexico or the USA.

~~11~~ 11 students had been to Canada

~~1~~ 1 student had visited all three countries

~~2~~ 2 students had visited Canada and Mexico but not the USA.

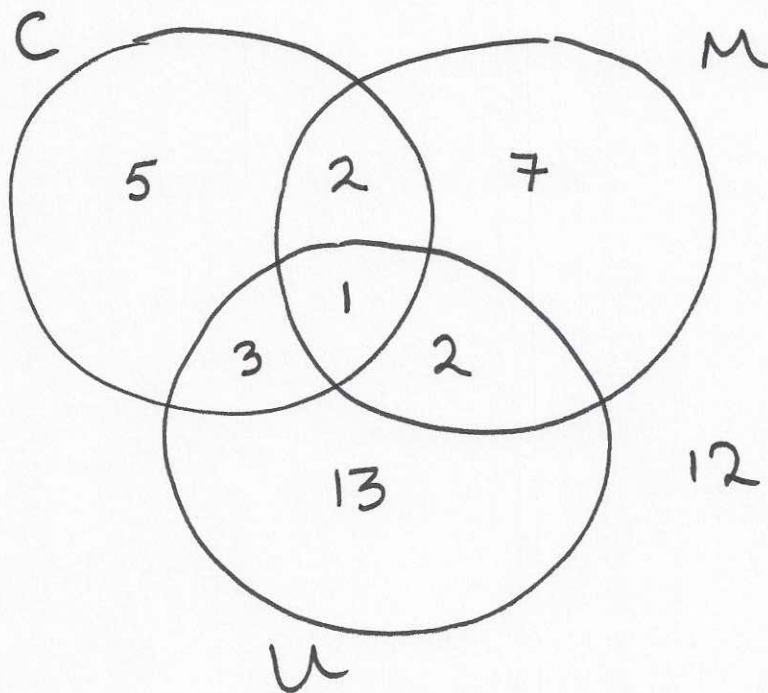
~~3~~ 3 students had visited Mexico and the USA.

~~12~~ 12 students had not visited any of the countries.

~~6~~ 6 out of the ~~19~~ 19 students who had visited the USA, had been to at least one of the other countries.

Two of the 45 students are chosen at random.

Work out the probability that they both had only visited Mexico.



$$\frac{7}{45} \times \frac{6}{44} = \frac{42}{1980}$$

$$\frac{42}{1980}$$

(6)