edexcel

GCSE Mathematics Practice Tests: Set 3

Paper 1H (Non-calculator)

Time: 1 hour 30 minutes

You should have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator.

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Calculators may not be used.**
- Diagrams are NOT accurately drawn, unless otherwise indicated.
- You must **show all your working out.**

Information

- The total mark for this paper is 80
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

PEARSON

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1. The equation of a straight line is $y = 4x + 7$

(a) Write down the gradient of the line.

Remember

$$y = \boxed{m}x + \boxed{c} \leftarrow \text{y-intercept}$$

$\uparrow$
gradient

.... 4 B1

(1)

(b) Write down the y-intercept of the line.

.... 7 B1

(or 0, 7)

(1)

(Total 2 mark)

2. Work out $3\frac{1}{8} - 1\frac{2}{3}$

method 1

$3 - 1 = 2$

$\dfrac{1^{\times 3}}{8_{\times 3}} - \dfrac{2^{\times 8}}{3_{\times 8}}$

$= \dfrac{3}{24} - \dfrac{16}{24}$

$= -\dfrac{13}{24}$

$\therefore 3\frac{1}{8} - 1\frac{2}{3}$

$= 2 - \dfrac{13}{24}$

$= 1\frac{11}{24}$

method 2

$3\frac{1}{8} = \dfrac{3 \times 8 + 1}{8} = \dfrac{25}{8}$

$1\frac{2}{3} = \dfrac{1 \times 3 + 2}{3} = \dfrac{5}{3}$ M1

$\dfrac{25^{\times 3}}{8_{\times 3}} - \dfrac{5^{\times 8}}{3_{\times 8}}$

$= \dfrac{75}{24} - \dfrac{40}{24}$ M1

$= \dfrac{35}{24}$

$= 1\frac{11}{24}$

.... $1\frac{11}{24}$ A1

(Total 3 marks) or $\dfrac{35}{24}$

3. Here are the ingredients needed to make **8** shortbread biscuits.

2 biscuits   4 biscuits

30g   60g

15g   30g

45g   90g

Shortbread biscuits makes **8** biscuits
120 g butter
60 g caster sugar
180 g flour

16 biscuit

240g

120g

360g

Tariq is going to make some shortbread biscuits.
He has the following ingredients

         330 g butter   200 g caster sugar   450 g flour

Work out the greatest number of shortbread biscuits that Tariq can make with his ingredients.
You must show all your working.

Butter – 330g available

240g + 60g + 30g = 330g

16 + 4 + 2 = 22 biscuits possible   M1

Caster Sugar – 200g available

120g + 60g + 15g = 195g

16 + 8 + 2   = 26 biscuits possible

Flour – 450g available

360g + 90g = 450g

16 + 4   = 20 biscuits possible   M1

The greatest number of Tariq can make
is 20 biscuits

.............................20..... biscuits   A1

(Total 3 marks)

4. Railtickets and Cheaptrains are two websites selling train tickets.

Each of the websites adds a credit card charge and a booking fee to the ticket price.

Railtickets	Cheaptrains
Credit card charge: 2.25% of ticket price	Credit card charge: 1.5% of ticket price
Booking fee: 80 pence	Booking fee: £1.90

Nadia wants to buy a train ticket.
The ticket price is £60 on each website.
Nadia will pay by credit card.

Will it be cheaper for Nadia to buy the train ticket from Railtickets or from Cheaptrains?

Railtickets

Ticket price £60·00
Booking fee £ 0·80   M1
Credit card charge £ 1·35   +
_____
£62·15   A1 (both)

Cheaptrains

Ticket price = £60·00
Booking fee = £ 1·90
Credit card charge = £ 0·90 +
_____
£62·80

Working

£60 — 10% £6
      — 1% 60p
      — 0·25% 15p

remember 0·25 = $\frac{1}{4}$

so 0·25% is $\frac{1}{4}$ of 1%

2·25% = 1% + 1% + 0·25%
      = 60p + 60p + 15p
      = 135p   M1
      = £1·35

Working

£60 — 1% 60p
      — 0·5% 30p

1·5% = 1% + 0·5%
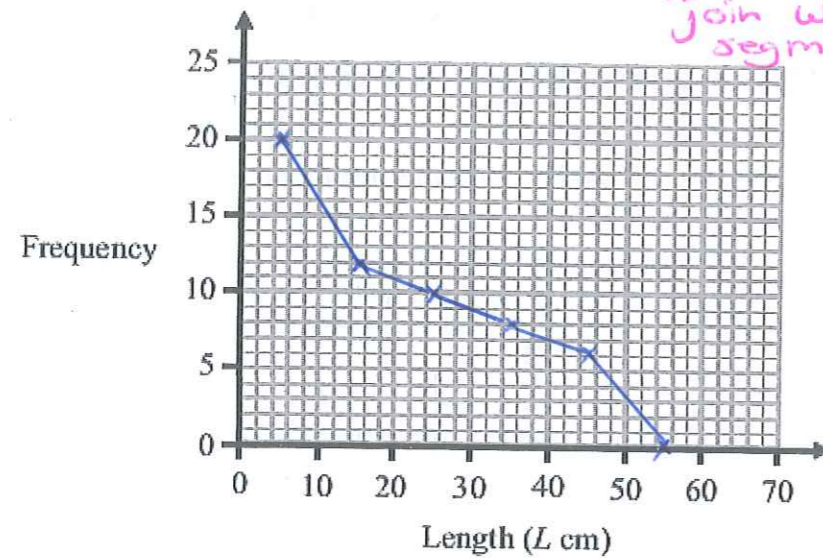   = 60p + 30p
     = 90p
     = £0·90

It will be 65p cheaper for Nadia to buy her train ticket from Railtickets. C1

(Total 4 marks)

5. The table gives information about the lengths of the branches on a bush.

mid point

Length(Lcm)		Frequency
$0 \le L < 10$	5	20
$10 \le L < 20$	15	12
$20 \le L < 30$	25	10
$30 \le L < 40$	35	8
$40 \le L < 50$	45	6
$50 \le L < 60$	55	0

(a) Draw a frequency polygon to show this information.

plot midpoints
join with straight line
segment

B1 points
B1 joined

(2)

(b) Work out the total number of branches on the bush.

Add up the frequencies
20 + 12 + 10 + 8 + 6 + 0   M1

56 A1

(2)

(c) Write down the modal class interval.

the one with the highest frequency

B1

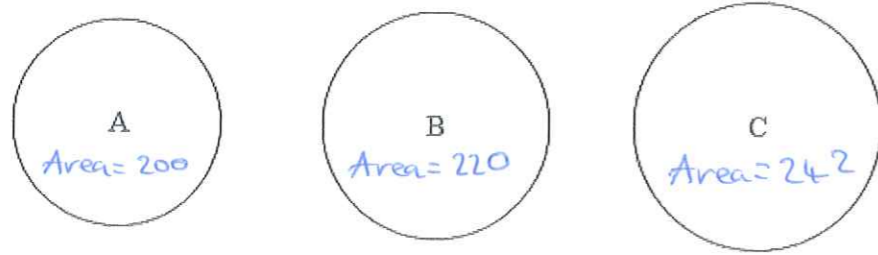$0 \le L < 10$

(1)

(Total 5 marks)

6. Here are three circles A, B and C.

A
Area= 200

B
Area= 220

C
Area= 242

The area of circle A is 200 cm².

The area of circle B is 10% larger than the area of circle A.

The area of circle C is 10% larger than the area of circle B.

How much larger is the area of circle C than the area of circle A?

Circle B   10% of 200 = 20
            Area circle B = 200 + 20
                          = 220 cm²   M1

Circle C   10% of 220 = 22
            Area circle C = 220 + 22   M1
                          = 242 cm²   A1

$$\% \text{ increase} = \frac{242 - 200}{200} \times 100$$

$$= \frac{42}{200} \times 100$$

$$= \frac{21}{100} \times 100$$

$$= 21\%$$

C1   Circle C is 21% larger than Circle A

accept Answer 21% or 42 cm²

(Total 4 marks)

7.　(a)　Expand and simplify　$2(x + 3y) + 4(x - y)$

$$= 2x + 6y + 4x - 4y \quad \text{M1}$$
$$= \underline{6x + 2y} \quad \text{A1}$$

....

(2)

(b)　Factorise completely　$8p - 12pq$

the HCF of 8 and 12 is 4
the HCF of p and pq is p

$$8p - 12pq$$
$$= 4 \times 2 \times p - 4 \times 3 \times p \times q$$
$$= \underline{4p(2 - 3q)}$$

....

B1 any correct factorisation　(2)
B1 fully correct　**(Total 4 marks)**

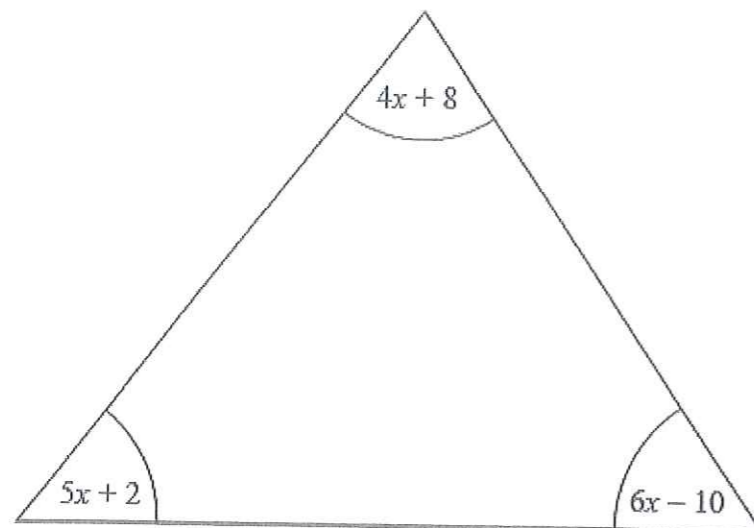8. The diagram shows a triangle.

Diagram **NOT**
accurately drawn

All the angles are measured in degrees.

Show that the triangle is isosceles.

If the triangle is isosceles then two angles will be equal

Step 1 Find x

m1

$(4x) + 8 + (5x) + 2 + (6x) - 10 = 180$

$15x = 180 \quad [\div 15 \text{ m1}$

$x = 12 \text{ A1}$

$\begin{array}{r} 1\ 2 \\ 15\overline{)1\ 8^30} \end{array}$

Step 2 Find the size of each angle

$\begin{array}{lll} 4x+8 & 5x+2 & 6x-10 \\ = 4\times12+8 & = 5\times12+2 & = 6\times12-10 \\ = 48+8 & = 60+2 & = 72-10 \\ = 56° & = 62° & = 62° \end{array}$

m1

Two angles equal 62° therefore the triangle C1
is isosceles

(Total 5 marks)

9. (a) Find the Highest Common Factor (HCF) of 30 and 42.

30   Factors 1, 2, 3, 5, ⑥, 10, 15, 30
1 × 30
2 × 15   M1
3 × 10
5 × 6
  42   Factors 1, 2, 3, ⑥, 7, 14, 21, 42
1 × 42
2 × 21
3 × 14
6 × 7

HCF = 6 A1

(2)

(b) Find the Lowest Common Multiple (LCM) of 30 and 45.

30 Multiples 30, 60, ⑨⓪, 120, 150, - - - - - - - .
45 Multiples 45 ⑨⓪, - - - - -   M1

LCM = 90 A1

(2)

(Total 4 marks)

10.

remember to check that all units are the same

8 cm

Diagram NOT accurately drawn

6 cm

20 cm
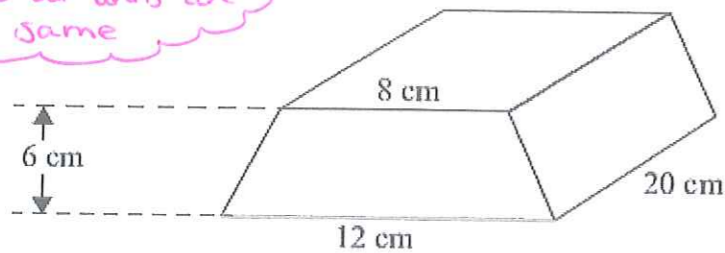
12 cm

The diagram shows a solid prism made from metal.
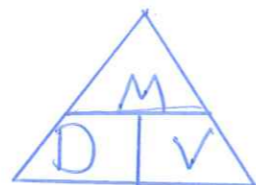The cross-section of the prism is a trapezium.

The parallel sides of the trapezium are 8 cm and 12 cm.
The height of the trapezium is 6 cm.
The length of the prism is 20 cm.

The density of the metal is 5 g/cm³.

Calculate the mass of the prism.
Give your answer in kilograms.

$M = D \times V$

$\dfrac{M}{D \mid V}$

$\dfrac{M}{5 \mid 1200}$

we need to find the Volume of the prism

Volume prism = Area Cross-section × length
(end face)

$$= \left(\dfrac{8+12}{2} \times 6 \right) \times 20$$

$$= 60 \, \text{ml} \times 20 \, \text{ml}$$

$$= 1200 \text{cm}^3$$

.... 6 kg

(Total 5 marks)

Mass = Density × Volume
= 5 × 1200 ml
= 6000g A1   ÷ 1000
= 6 kg
A1

11. (a) Write down the value of 25^0

anything to the power of zero is one

1   B1

(1)

(b) Write down the value of $49^{-\frac{1}{2}}$

$= \dfrac{1}{49^{1/2}}$

$= \dfrac{1}{\sqrt{49}}$

accept $\pm \frac{1}{7}$

$\dfrac{1}{7}$ B1

(1)

(c) Write as a power of 2 $\dfrac{4 \times 8}{16^3}$

$\dfrac{4 \times 8}{16^3} = \dfrac{2^2 \times 2^3}{(2^4)^3}$ M1 $= \dfrac{2^{2+3}}{2^{4 \times 3}}$ M1 $= \dfrac{2^5}{2^{12}} = 2^{5-12}$
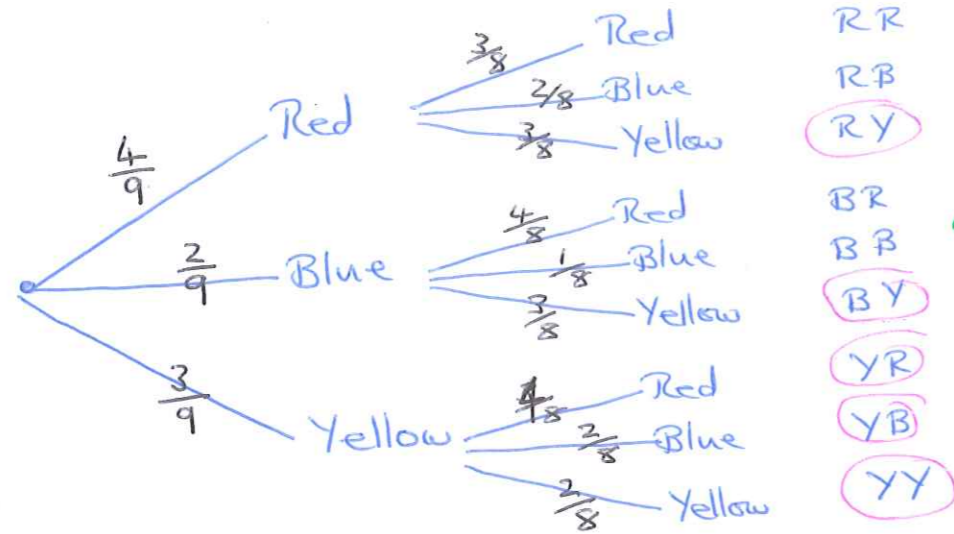
$= 2^{-7}$ A1

(3)

(Total 5 marks)

12. There are 9 counters in a box.

4 of the counters are red.
2 of the counters are blue.
3 of the counters are yellow.

Pavinder takes at random two counters from the box.

Work out the probability that he takes at least one yellow counter.

$\frac{4}{9}$ Red $\begin{cases} \frac{3}{8} \text{ Red} & RR \\ \frac{2}{8} \text{ Blue} & RB \\ \frac{3}{8} \text{ Yellow} & (RY) \end{cases}$

$\frac{2}{9}$ Blue $\begin{cases} \frac{4}{8} \text{ Red} & BR \\ \frac{1}{8} \text{ Blue} & BB \\ \frac{3}{8} \text{ Yellow} & (BY) \end{cases}$

$\frac{3}{9}$ Yellow $\begin{cases} \frac{4}{8} \text{ Red} & (YR) \\ \frac{2}{8} \text{ Blue} & (YB) \\ \frac{2}{8} \text{ Yellow} & (YY) \end{cases}$

B1
we of 8 as
den. on 2nd tie

M1 any one app. product

P(at least one yellow counter)
= P(RY) + P(BY) + P(YR) + P(YB) + P(YY)   M1
= $\left(\frac{4}{9} \times \frac{3}{8}\right) + \left(\frac{2}{9} \times \frac{3}{8}\right) + \left(\frac{3}{9} \times \frac{4}{8}\right) + \left(\frac{3}{9} \times \frac{2}{8}\right) + \left(\frac{3}{9} \times \frac{2}{8}\right)$

= $\frac{12}{72} + \frac{6}{72} + \frac{12}{72} + \frac{6}{72} + \frac{6}{72}$

= $\frac{42}{72}$

A1 $\frac{42}{72}$

(Total 4 marks)

13. Simplify fully $\dfrac{2x^2 - 7x + 3}{x^2 - 9}$

Factorise numerator and denominator and cancel common factors

$$= \frac{(2x-1)(x-3)}{(x+3)(x-3)} \text{ M1}$$ M1

$$= \frac{2x-1}{x+3} \text{ A1}$$

$2x^2 - 7x + 3$

$\begin{bmatrix} 2x & -1 \\ x & -3 \end{bmatrix} -6x - x = -7x$

$2x^2 \qquad 3$

$2x^2 - 7x + 3 = (2x-1)(x-3)$

$x^2 - 9 = (x+3)(x-3)$ *Difference of two squares*

.... $\dfrac{2x-1}{x+3}$

(Total 3 marks)

14. Work out $(2 + \sqrt{3})(2 - \sqrt{3})$
Give your answer in its simplest form.

$$= 4 - 2\sqrt{3} + 2\sqrt{3} - \sqrt{3}\sqrt{3} \text{ M1}$$

$$= 4 \qquad\qquad - 3$$

$$= 1$$

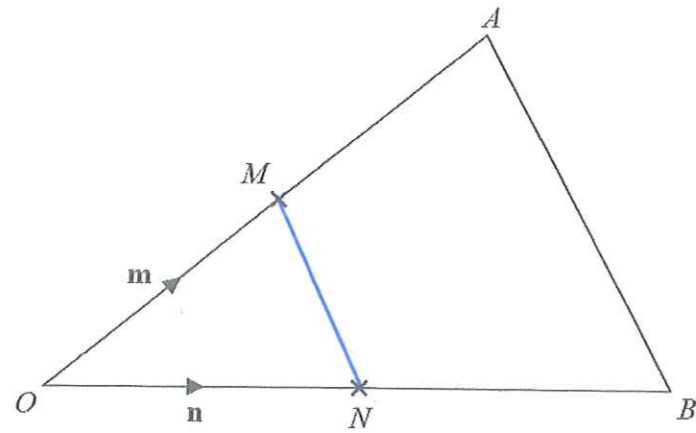.................... 1 A1

(Total 2 marks)

15.

Diagram **NOT** accurately drawn

OAB is a triangle.
M is the midpoint of *OA*.
N is the midpoint of *OB*.

$\overrightarrow{OM} = \mathbf{m}$

$\overrightarrow{ON} = \mathbf{n}$

Show that *AB* is parallel to *MN*.

$\overrightarrow{MN} = \overrightarrow{MO} + \overrightarrow{ON}$

$= -\mathbf{m} + \mathbf{n}$

$= \mathbf{n} - \mathbf{m}$ M1

$\overrightarrow{AB} = \overrightarrow{AO} + \overrightarrow{OB}$

$= -2\mathbf{m} + 2\mathbf{n}$

$= 2\mathbf{n} - 2\mathbf{m}$ M1

$\overrightarrow{AB} = 2\overrightarrow{MN}$

$\therefore \overrightarrow{AB}$ and $\overrightarrow{MN}$ are parallel   C1

(Total 3 marks)

16.

angle at Circumference
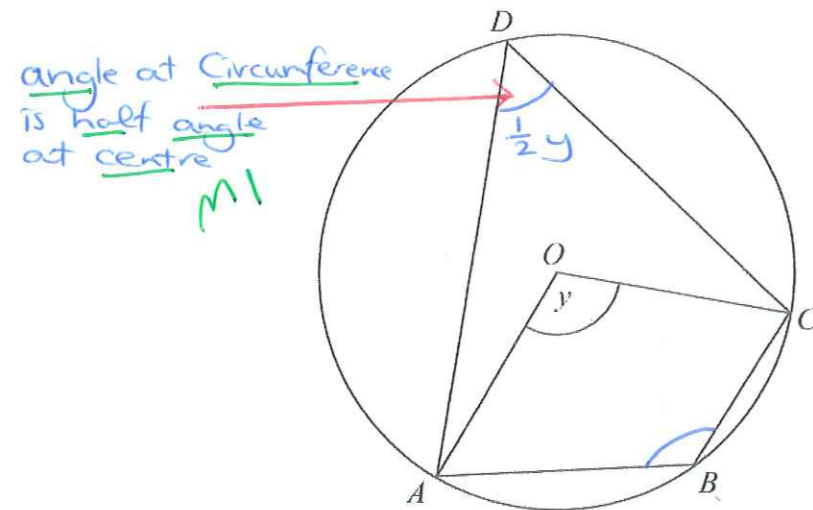is half angle
at centre
M1

Diagram **NOT** accurately drawn

A, B, C and D are points on the circumference of a circle, centre O.

Angle $AOC = y$.

Find the size of angle ABC in terms of y.
Give a reason for each stage of your working.

$A\hat{D}C$ and $A\hat{B}C$ are opposite angles in a
cyclic quadrilateral and therefore they must
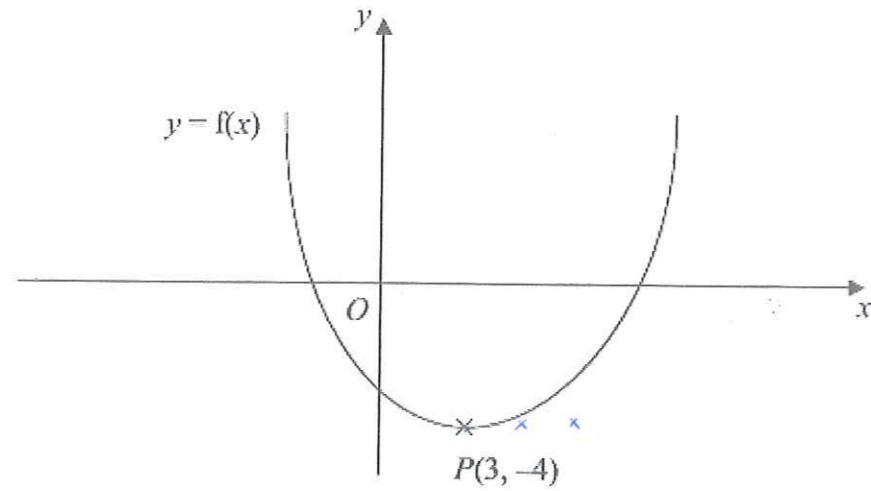add up to $180°$ C1 (both reasons)

$$A\hat{D}C + A\hat{B}C = 180°$$
$$\tfrac{1}{2}y + A\hat{B}C = 180°$$
$$A\hat{B}C = 180° - \tfrac{1}{2}y \quad A1$$

(Total 4 marks)

17. This is a sketch of the curve with the equation $y = f(x)$.
The only minimum point of the curve is at $P(3, -4)$.

$y = f(x)$

$P(3, -4)$

(a) Write down the coordinates of the minimum point of the curve with the equation
$y = f(x - 2)$. Shift RIGHT 2

B1   B1
(...5..., ..-4..)

(2)

(b) Write down the coordinates of the minimum point of the curve with the equation
$y = f(x + 5) + 6$

Shift   move
LEFT   UP 6
5

B1   B1
(...-2..., ..2..)
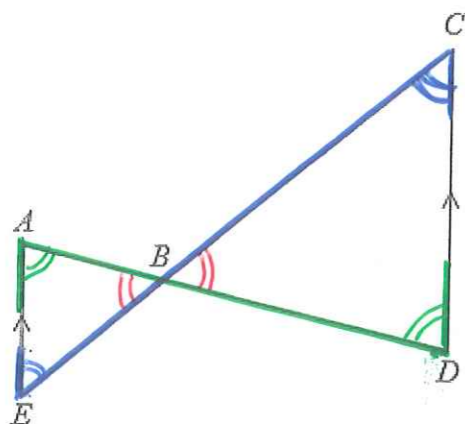
(2)

(Total 4 marks)

18.

Diagram **NOT** accurately drawn

AE is parallel to *CD*.
ABD and *EBC* are straight lines.

Prove that triangle *ABE* is similar to triangle *DBC*.
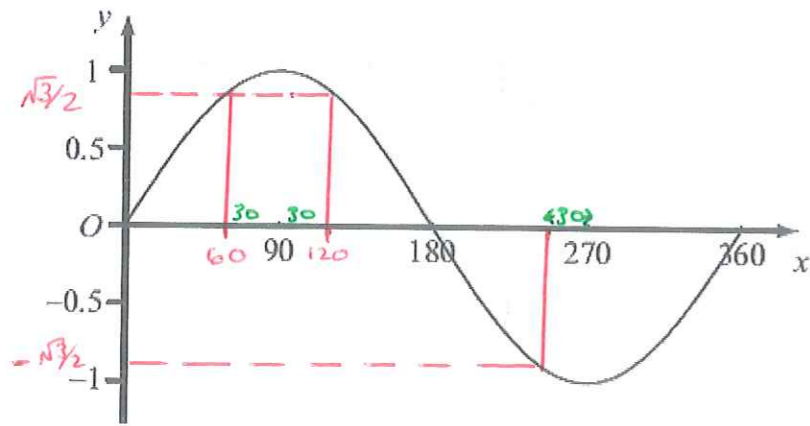Give reasons for each stage of your proof.

$A\hat{B}E = C\hat{B}D$ M1 vertically opposite angles are equal

$E\hat{A}B = B\hat{D}C$ A1 alternate angles are equal   C1

$A\hat{E}B = B\hat{C}D$ alternate angles are equal

All angles in triangle ABE are ~~equal~~ the same as in triangle DBC therefore the triangles are similar.   C1

Angle Angle Angle (AAA)

(Total 4 marks)

19. The diagram shows a sketch of the curve $y = \sin x°$ for $0 \le x \le 360$

The exact value of $\sin 60° = \dfrac{\sqrt{3}}{2}$

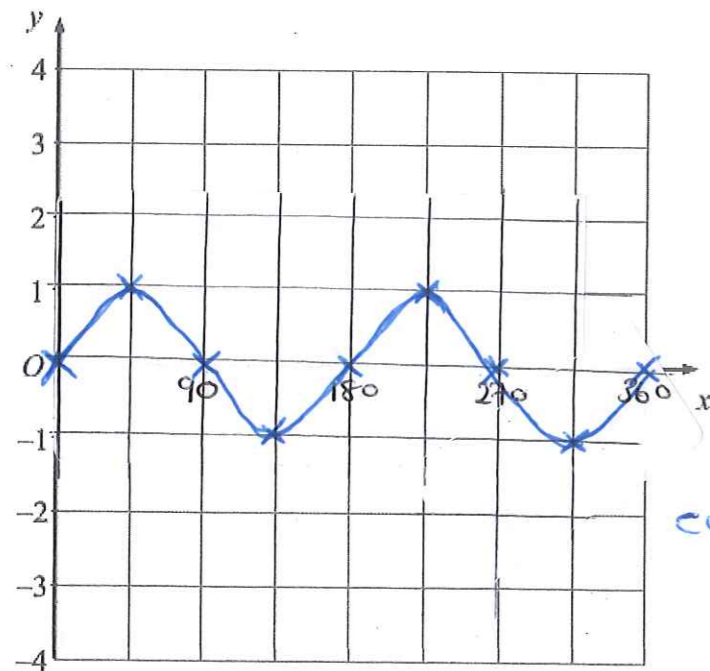(a) Write down the exact value of

    (i) $\sin 120°$,

                                  $\dfrac{\sqrt{3}}{2}$ B1

    (ii) $\sin 240°$.

                                  $-\dfrac{\sqrt{3}}{2}$ B1

(2)

(b) On the grid below, sketch the graph of $y = \sin 2x°$ for $0 \le x \le 360$

B1 (amplitude 1)

B1 (x-intercepts)

curve not straight lines.

(2)

(Total 4 marks)

20. Prove algebraically that the difference between the squares of any two consecutive integers is equal to the sum of these two integers.

let n and $n+1$ be consecutive integers M1

Difference between squares

$(n+1)^2 - n^2$ M1

$= (n^2 + 2n + 1) - n^2$

$= n^2 + 2n + 1 - n^2$

$= 2n + 1$ A1

$(n+1)^2 - n^2 = n + (n+1)$

sum

$n + n + 1$

$= 2n + 1$

$\therefore$ the difference between the squares of any two consecutive integers is equal to the sum of these two integers. C1

(Total 4 marks)

21 Sketch the graph of $f(x) = -x^2 - 3x + 5$, showing the coordinates of the turning point and the coordinates of any intercepts with the coordinate axes.

$$y = -x^2 - 3x + 5$$
$$= -(x^2 + 3x - 5)$$
$$= -(x \qquad)(\qquad) \qquad \text{doesn't factorise}$$

complete square

$$y = -(x^2 + 3x - 5)$$
$$= -\left[\left(x + \frac{3}{2}\right)^2 - \frac{9}{4} - 5\right] \quad \text{M1}$$
$$= -\left[\left(x + \frac{3}{2}\right)^2 - \frac{29}{4}\right]$$
$$= -\left(x + \frac{3}{2}\right)^2 + \frac{29}{4} \quad \text{A1}$$

$-\frac{9}{4} - \frac{5 \times 4}{1 \times 4}$

$= -\frac{9}{4} - \frac{20}{4}$

$= -\frac{29}{4}$

$= -7\frac{1}{4}$

turning point $\left(-\frac{3}{2}, \frac{29}{4}\right)$

x-intercept $\quad y = 0 \qquad -\left(x + \frac{3}{2}\right)^2 + \frac{29}{4} = 0$

$$\frac{29}{4} = \left(x + \frac{3}{2}\right)^2$$

y-intercept $\quad x = 0, y = 5$

$$\pm\frac{\sqrt{29}}{2} = x + \frac{3}{2}$$

$$\pm\frac{\sqrt{29}}{2} - \frac{3}{2} = x$$

(Total 4 mark)

$\left(-\frac{3}{2}, \frac{29}{4}\right)$

$5 \times$ C1

C1

$\frac{-\sqrt{29} - 3}{2}$

$\frac{\sqrt{29} - 3}{2}$

TOTAL FOR PAPER IS 80 MARKS