MS RE4

Q13.

edexcel

GCSE Mathematics Practice Tests: Set 5

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 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.

HCF LCM

Answer ALL questions.
Write your answers in the spaces provided.
You must write down all the stages in your working.

1. (a) Find the Highest Common Factor (HCF) of 12 and 20

12 : 1, 2, 3, 4, 6, 12
20 : 1, 2, 4, 5, 10, 20

HCF = 4

4

.....

(2)

(b) Find the Lowest Common Multiple (LCM) of 32 and 48

32 64 96
48 96

LCM = 96

96

.....

(2)

(Total 4 marks)

Ratio and Proportion

2. 5 schools sent some students to a conference.

One of the schools sent both boys and girls.
This school sent 16 boys.
The ratio of the number of boys it sent to the number of girls it sent was 1 : 2

The other 4 schools sent only girls.
Each of the 5 schools sent the same number of students.

Work out the total number of students sent to the conference by these 5 schools.

Boys and Girls School: (x16)

B : G
1 : 2

16 : 32

Total = 48 pupils

Girls Schools

48 pupils

4 x 48 = 192 girls

48 + 240 pupils

48 × 4 = 192

240

.....

(Total 4 marks)

Standard Form Calculations

3. (a) Work out the value of $(6 \times 10^8) \times (4 \times 10^7)$

Give your answer in standard form.

Split: $6 \times 4 = 24$

$10^8 \times 10^7 = 10^{15}$

Combine: 24×10^{15}

Standard form: 2.4×10^{16}

2.4×10^{16}

(2)

(b) Work out the value of $(6 \times 10^8) + (4 \times 10^7)$

Give your answer in standard form.

6×10^8: $= 600000000$

4×10^7: $+ \ 40000000$

640000000

Standard Form: $= 6.4 \times 10^8$

6.4×10^8

(2)

(Total 4 marks)

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4. Sam rolls a fair dice 150 times.
Work out an estimate for the number of times the dice will land on 4.

Relative Frequency

Probability of a 4: $P(4) = \frac{1}{6}$

Relative Frequency: $\frac{1}{6} \times 150 = 150 \div 6$

$= 25$

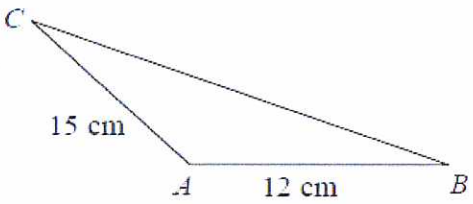
$6 \overline{)150}$ 025

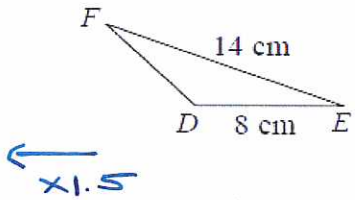
25

(Total 2 marks)

Similar Shapes

5.





ABC and *DEF* are two similar triangles.
Angle *ABC* = Angle *DEF*
Angle *ACB* = Angle *DFE*

Work out the length of *BC*.

Scale factor | 12 ÷ 8 = 1.5

BC: | 14cm × 1.5 = 21cm

21 ..... cm

(Total 2 marks)

Fraction Operations

6. (a) Work out $\frac{1}{3} + \frac{2}{5}$

LCM = 15

$\frac{5}{15} + \frac{6}{15} = \frac{11}{15}$

$\frac{11}{15}$

.....

(2)

(b) Work out $2\frac{3}{4} \times 1\frac{3}{5}$

Give your answer in its simplest form.

$2\frac{3}{4} = \frac{11}{4}$

$1\frac{3}{5} = \frac{8}{5}$

Simplify

$\frac{11}{4} \times \frac{8}{5} = \frac{88}{20}$

$= \frac{44}{10} = \frac{22}{5}$

$\frac{22}{5}$

.....

(3)

(Total 5 marks)

Solving Inequalities

7. (a) Solve the inequality

$3t + 1 < t + 12$

(-1) $3t < t + 11$

$(-t)$ $2t < 11$

$(\div 2)$ $t < \frac{11}{2}$

$t < \frac{11}{2}$

.....

(2)

(b) t is a whole number.
Write down the largest value of t that satisfies

$3t + 1 < t + 12$

from (b) $t < \frac{11}{2}$

t is a whole number $\therefore t = 5$ (maximum)

5

.....

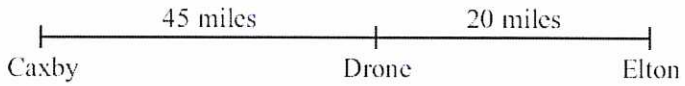
(1)

(Total 3 marks)

Speed Distance Time

D / S T

8. The distance from Caxby to Drone is 45 miles.
The distance from Drone to Elton is 20 miles.



Colin drives from Caxby to Drone.
Then he drives from Drone to Elton.

Colin drives from Caxby to Drone at an average speed of 30 mph.
He drives from Drone to Elton at an average speed of 40 mph.

Work out Colin's average speed for the whole journey from Caxby to Elton.

Journey 1
S = 30mph
D = 45miles
T = (1) = 1.5h

Journey 2
S = 40mph
D = 20miles
T = (2) = 0.5h

Total
S = (5) = 32.5mph
D = (4) = 65miles
T = (3) = 2h

(1) $T = \frac{D}{S} = \frac{45\text{miles}}{30\text{mph}} = 1.5\text{h}$ (2) $T = \frac{D}{S} = \frac{20\text{miles}}{40\text{mph}} = 0.5\text{h}$

(3) $T = 1.5\text{h} + 0.5\text{h} = 2\text{h}$ (4) $D = 45\text{miles} + 20\text{miles} = 65\text{miles}$

(5) $S = \frac{D}{T} = \frac{65\text{miles}}{2\text{hours}} = 32.5$

..... mph
(Total 3 marks)

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9. (*a*) Factorise $x^2 - 49$

Expanding and Solving Quadratics

$x^2 - a^2 = (x+a)(x-a)$ ∴ $x^2 - 49 = (x+7)(x-7)$

$(x+7)(x-7)$
(1)

(*b*) Expand and simplify $(2y + 7)(y - 3)$

Expand $2y^2 - 6y + 7y - 21$

collect $2y^2 + y - 21$

$2y^2 + y - 21$
(2)

(Total 3 marks)

Straight Line Properties

10. Here are the equations of 5 straight lines **A**, **B**, **C**, **D** and **E**.

A $y = 3x + 4$

B $y = 2x - 3$

C $y = 2x + 3$

D $y = 5x - 4$

E $3y = x + 3$

$(\div 3)\ y = \frac{x}{3} + 1$

$y = mx + c$ (gradient, intercept)

One of the lines goes through the point (0, 3).

(a) Write down the letter of this line.

y-intercept = 3

C

.....

(1)

Two of the lines are parallel. $\Rightarrow$ same gradient

(b) Write down the letters of these two lines.

B and C have gradient = 2.

B C

.....

(1)

(Total 2 marks)

---

11. Factorise fully $3xy^2 - 6x^3y$

Factorising

$= 3(xy^2 - 2x^3y)$

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

$= 3xy(y - 2x^2)$

$3xy(y-2x^2)$

.....

(Total 2 marks)

Plotting Cubics

$x=1$: $y=(1)^3+2(1)-1 = 1+2-1 = 2$

$x=0$: $y=(0)^3+2(0)-1 = 0+0-1 = -1$

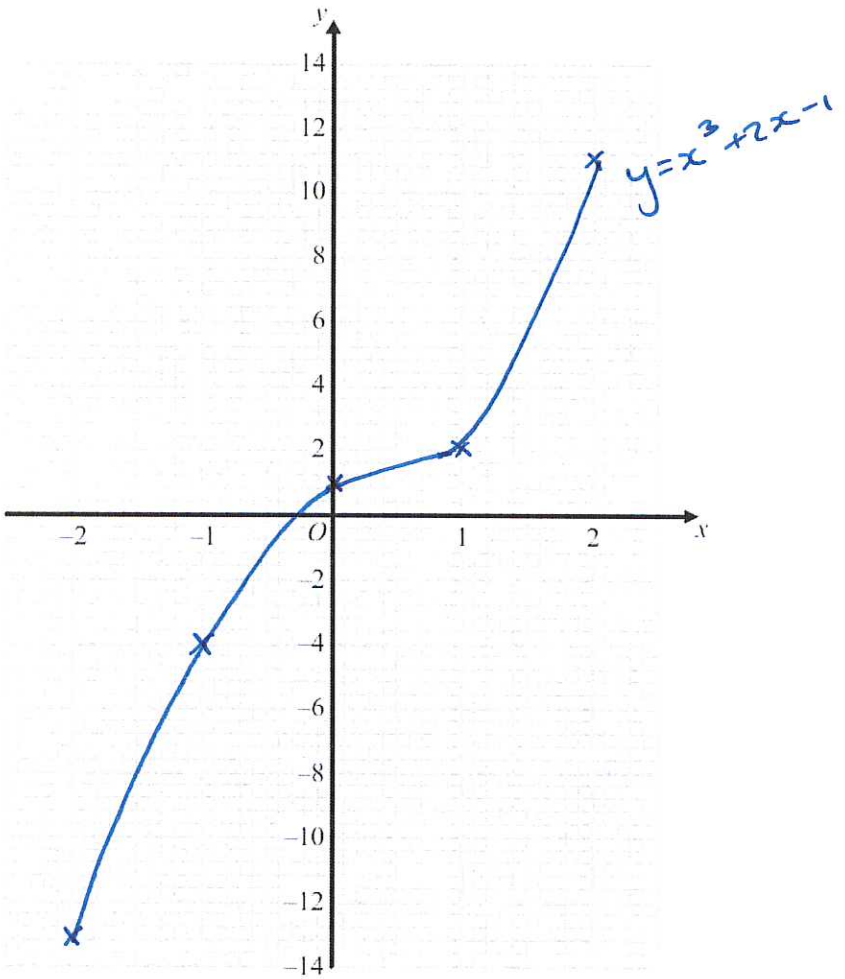
$x=-2$: $y=(-2)^3+2(-2)-1 = -8-4-1 = -13$

12. (*a*) Complete this table of values for $y = x^3 + 2x - 1$

x	–2	–1	0	1	2
y	−13	–4	−1	2	11

(2)

(*b*) On the grid, draw the graph of $y = x^3 + 2x - 1$



(2)

(Total 4 marks)

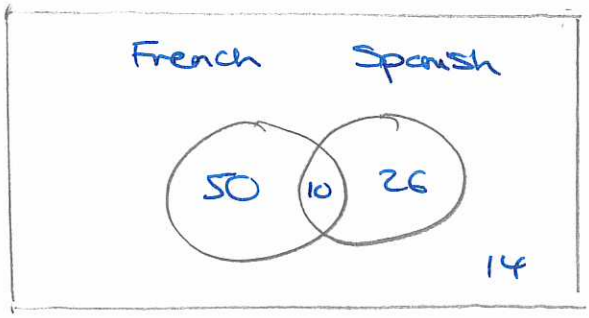
Venn Diagrams

13. Here is some information about 100 students.

60 students study French.
36 students study Spanish.
14 students **do not** study either French or Spanish.

(a) Draw a Venn diagram to show this information.

100-14=86
So 86 go into the circles.
But 60+36=96
∴ 96-86=10...
10 must be intersection (FnS)



(4)

One of the 100 students is picked at random.

(b) Work out the probability that this student studies French or Spanish or both.

P(FRENCH OR SPANISH OR BOTH) = 86/100
50 + 26 + 10

86/100

.....

(2)

(Total 6 marks)

Angles in Polygons

14.

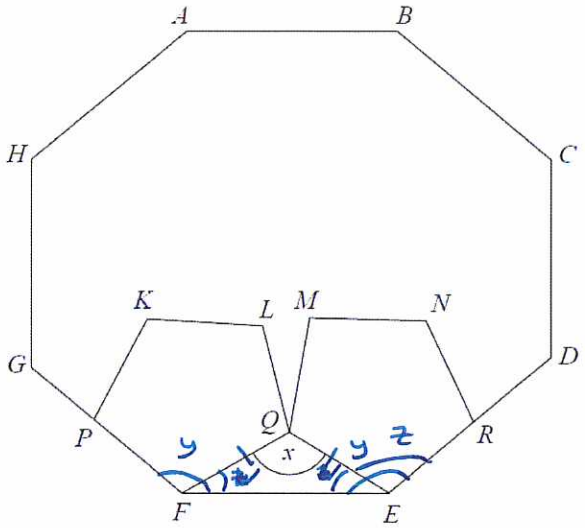


Diagram **NOT** accurately drawn

ABCDEFGH is a regular octagon.
KLQFP and *MNREQ* are two identical regular pentagons.

Work out the size of the angle marked x.
You must show all your working.

Octagon

Sum of interiors $= (n-2) \times 180$ (n = sides)

$(8-2) \times 180 = 1080^\circ$

$180 \times 6 = 1080$

Each octagon interior $\frac{1080^\circ}{8} = 135^\circ = y^\circ$

$8 \overline{)1080} = 135$

Now Pentagon

$(5-2) \times 180 = 540^\circ$

$180 \times 3 = 540$

$\frac{540^\circ}{5} = 108^\circ = z^\circ$

$5 \overline{)540} = 108$

$\therefore w^\circ + 108^\circ = 135^\circ$

$w^\circ + z^\circ = y^\circ$

(-108°)

$w^\circ = \hat{QEF} = 27^\circ = \hat{QFE}$

Base angles in isosceles triangle (identical pentagons)

$x^\circ = 180^\circ - 27^\circ - 27^\circ = 126^\circ$

Angles in a triangle = 180° ..... °

(Total 4 marks)

15. The diagram shows two identical squares placed side by side to form a rectangle.
All measurements are in centimetres.

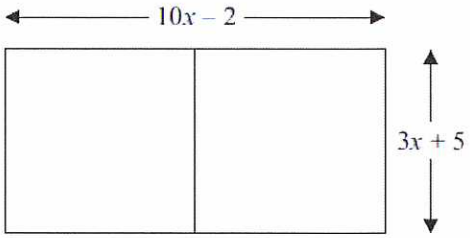


Diagram **NOT** accurately drawn

Calculate the numerical value of the length of the rectangle.

Length = 2 × square length

$10x - 2 = 2L$

$(\div 2)$ $\quad 5x - 1 = L$

square length = square width

$5x - 1 = 3x + 5$

$(-3x)$ $\quad 2x - 1 = 5$

$(+1)$ $\quad 2x = 6$

$(\div 2)$ $\quad x = 3$

length of rectangle

$= 10x - 2$

$= 10(3) - 2$

$= 30 - 2 = 28$

28 ..... cm

(Total 4 marks)

Independent Probability Events

16. S is the event 'picking a red counter' and $P(S) = \frac{2}{9}$

(a) Write down the value of $P(S')$

Sum of probabilities = 1
NOT probability (A) = 1 − P(A)

$\therefore P(S') = 1 - P(S)$
$= 1 - \frac{2}{9}$
$= \frac{7}{9}$

$\frac{7}{9}$ ....

(1)

Miles puts 3 green blocks, 5 white blocks and 1 pink block in a bag.

He takes at random a block from the bag.
He writes down the colour of the block.

He puts the block back in the bag. ← Independent
He then takes at random a second block from the bag and writes down its colour.

(b) Work out the probability that

(i) he takes one white block and one pink block,

P(white and pink) = P(W, P) + P(P, W)
$= \left(\frac{5}{9} \times \frac{1}{9}\right) + \left(\frac{1}{9} \times \frac{5}{9}\right)$
$= \frac{5}{81} + \frac{5}{81} = \frac{10}{81}$

$\frac{10}{81}$ ....

(ii) at least one of the blocks he takes is white.

NOTE: NOT ON MARK SCHEME

P(white once) = P(W, P) + P(P, W) + P(G, W) + P(W, G) + P(W, W)
$= \frac{10}{81}$ (from (i)) $+ \left(\frac{3}{9} \times \frac{1}{9}\right) + \left(\frac{1}{9} \times \frac{3}{9}\right) + \left(\frac{5}{9} \times \frac{5}{9}\right)$

....

(5)

$= \frac{10}{81} + \frac{3}{81} + \frac{3}{81} + \frac{25}{81} = \frac{41}{81}$

(Total 6 marks)

Volume of prisms fluids

17. Sumeet has a pond in the shape of a prism.

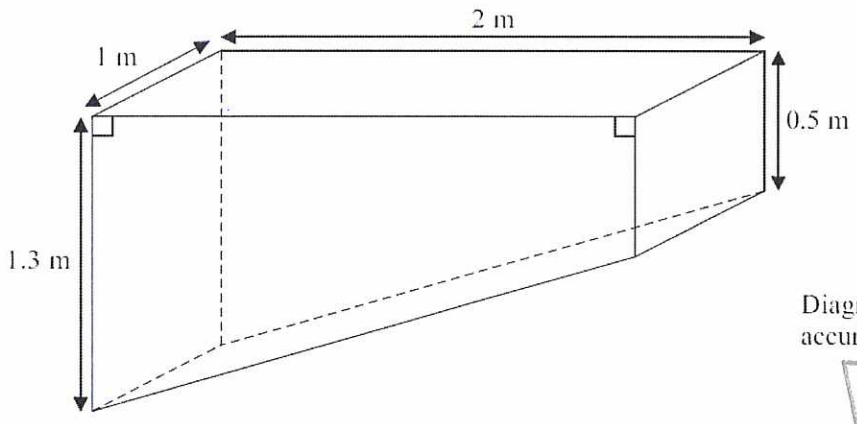
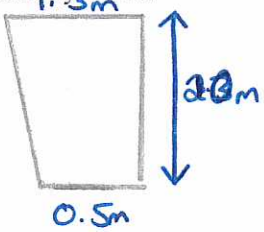


Diagram **NOT** accurately drawn



The pond is completely full of water.
Sumeet wants to empty the pond so he can clean it.
Sumeet uses a pump to empty the pond.

The volume of water in the pond decreases at a constant rate.
The level of the water in the pond goes down by 20 cm in the first 30 minutes.

Work out how much more time Sumeet has to wait for the pump to empty the pond completely.

cross-sectional area "front face"

Volume = CSA × Length

$CSA = \frac{h(a+b)}{2}$

$CSA = \frac{2(1.3+0.5)}{2} = 1.8m^2$

Volume = $1.8m^2$ × Length

$V = 1.8m^2 \times 1m = 1.8m^3$

Volume gone after 30 seconds (from top of pond)

$V = 2m \times 1m \times 0.2m = 0.4m^3$

Rate of volume decrease

$\text{Rate} = \frac{0.4m^3}{\frac{1}{2}\text{hour}} = 0.8m^3$ per hour

Time for pool to drain

$1.8m^3 \div 0.8m^3$ per hour $= 8\overline{)18.^{2}0^{4}0}$ 2.25

$1.8 \div 0.8 = 18 \div 8$

= 2.25 hours in total

Already waited 30 minutes

∴ Time to wait = 2.25h − 0.5h

= 1.75h

(Total 6 marks)

Powers of 2
- Index Laws

18. (a) Write the following five numbers in order of size.
Start with the smallest number.

2^0 ④ $= 1$

$\sqrt{2}$ ⑤ ↑ more than 1 less than 2

$\frac{1}{2}$ ② $= 0.5$

2^{-2} ① $= \frac{1}{4} = 0.25$

$\frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$ ③ (Rationalised) ↑ more than 0.5 less than 1

⇒ OR use index laws : $2^{-2}, 2^{-1}, 2^{-\frac{1}{2}}, 2^0, 2^{\frac{1}{2}}$

$2^{-2}, \frac{1}{2}, \frac{1}{\sqrt{2}}, 2^0, \sqrt{2}$

(2)

(b) Simplify $\left(\frac{2}{\sqrt{2}}\right)^3$

Give your answer in the form $a\sqrt{2}$ where a is an integer.

cube number $= \left(\frac{2}{\sqrt{2}}\right) \times \left(\frac{2}{\sqrt{2}}\right) \times \left(\frac{2}{\sqrt{2}}\right)$

expand $= \frac{8}{\sqrt{2}\sqrt{2}\sqrt{2}}$

$= \frac{8}{2\sqrt{2}}$

Rationalise $\left(\times \frac{\sqrt{2}}{\sqrt{2}}\right)$ $= \frac{8}{2\sqrt{2}} \frac{\sqrt{2}}{\sqrt{2}}$

$= \frac{8\sqrt{2}}{4}$

$= 2\sqrt{2}$

$2\sqrt{2}$

(3)

(Total 5 marks)

Equation of Circles

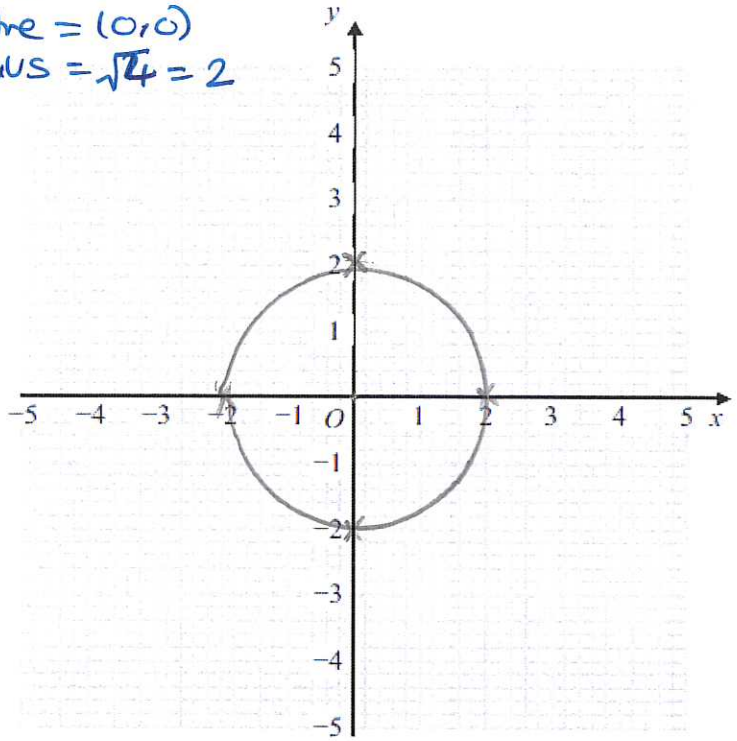
$(x-a)^2+(y-b)^2=r^2$

$x^2+y^2=4$

$\therefore$ centre $=(0,0)$

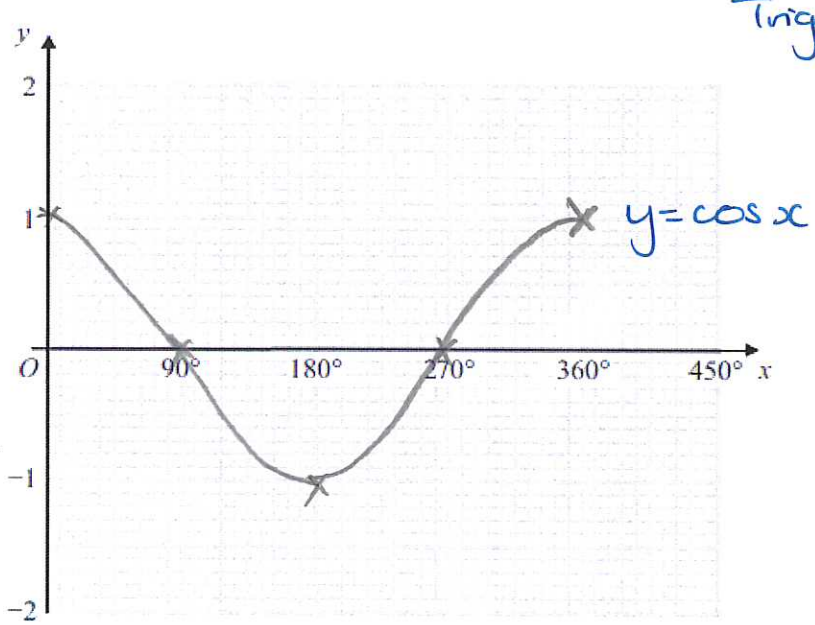
radius $=\sqrt{4}=2$

19.



(a) On the grid, draw the graph of $x^2 + y^2 = 4$

Trigonometric Graphs



(2)

(b) On the grid, sketch the graph of $y = \cos x$ for $0° \leq x \leq 360°$

(2)

(Total 4 marks)

Simplifying and Multiplying Algebraic Fractions

20. Show that $\frac{2x^2+x-15}{2x^3+6x^2} \times \frac{6x^3}{2x^2-11x+15}$ simplifies to $\frac{ax}{x+b}$, where a and b are integers.

factorise first fraction

$$\frac{2x^2+x-15}{2x^3+6x^2} = \frac{(2x-5)(x+3)}{2x^2(x+3)} = \frac{(2x-5)}{2x^2}$$

Now multiply:

$$\frac{2x-5}{2x^2} \times \frac{6x^3}{2x^2-11x+15}$$

$$= \frac{6x^3(2x-5)}{2x^2(2x^2-11x+15)}$$

Simplify:

$$= \frac{3x(2x-5)}{(2x^2-11x+15)}$$

factorise:

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

Simplify:

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

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

.....

(Total 3 marks)

Perpendicular Lines

21. A is the point with coordinates (1, 3).
B is the point with coordinates (4, –1).
The straight line L goes through both A and B.

Is the line with equation $2y = 3x - 4$ perpendicular to line L?
You must show how you got your answer.

To test perpendicular, we need gradients of two lines L_1 and L_2.

$L_1: 2y = 3x - 4$ $(\div 2)$

$2y = 3x - 4$

$y = \frac{3}{2}x - 4$ $\therefore$ gradient of $L_1 = m_1 = \frac{3}{2}$

L_2 : ... (1,3) and (4,-1)

$m = \frac{y_2 - y_1}{x_2 - x_1}$

L_2 gradient $= m_2 = \frac{-1-3}{4-1} = \frac{-4}{3}$

Perpendicular if $m_1 \times m_2 = -1$

But $M_1 \times M_2 = \frac{3}{2} \times -\frac{4}{3} = \frac{-12}{6} = -2 \neq -1$

Conclusion

$\therefore$ Not perpendicular □.

(Total 4 marks)

TOTAL FOR PAPER IS 80 MARKS