Pearson Education accepts no responsibility whatsoever for the accuracy or method of working in the answers given.

Write your name here

Surname	Other names

Pearson Edexcel
Level 1/Level 2 GCSE (9 - 1)

Centre Number	Candidate Number

Mathematics

Paper 1 (Non-Calculator)

Higher Tier

Specimen Papers Set 1	Paper Reference
Time: 1 hour 30 minutes	**1MA1/1H**

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

Total Marks

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.

Turn over

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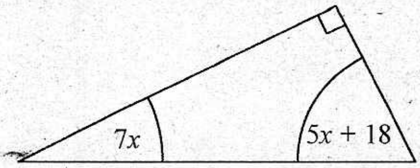
PEARSON

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 The diagram shows a right-angled triangle.



All the angles are in degrees.

Work out the size of the smallest angle of the triangle.

$7x + 5x + 18 + 90 = 180$

$12x + 18 = 90$

$12x = 72$

$x = 6$

$7(6) = 42$

$5(6) + 18 = 48$

42 °

(Total for Question 1 is 3 marks)

2 A box exerts a force of 140 newtons on a table.
The pressure on the table is 35 newtons/m².

Calculate the area of the box that is in contact with the table.

$$p = \frac{F}{A}$$

p = pressure
F = force
A = area

$A = \frac{F}{p}$

$= \frac{140}{35}$

$4 m^2$

(Total for Question 2 is 3 marks)

3 There are only red counters, blue counters, green counters and yellow counters in a bag.

The table shows the probabilities of picking at random a red counter and picking at random a yellow counter.

Colour	red	blue	green	yellow
Probability	0.24	0.22	0.22	0.32

The probability of picking a blue counter is the same as the probability of picking a green counter.

Complete the table.

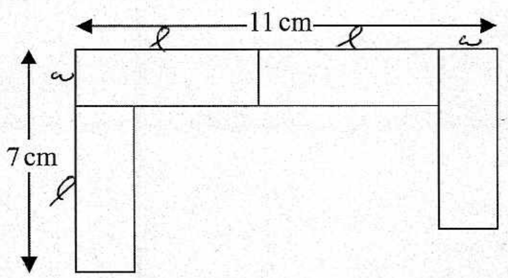
$0.24 + 0.32 = 0.56$

$1 - 0.56 = 0.44$

$\frac{0.44}{2} = 0.22$

(Total for Question 3 is 2 marks)

4 A pattern is made using identical rectangular tiles.



Find the total area of the pattern.

$l + w = 7$

$2l + w = 11$

$l = 4$

$w = 3$

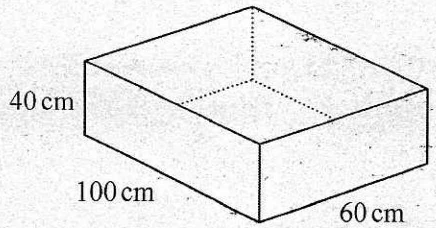
$4 \times 3 = 12$ (one rectangle)

$12 \times 4 = 48$

48 cm^2

(Total for Question 4 is 4 marks)

5 The diagram shows a sand pit.
The sand pit is in the shape of a cuboid.



Sally wants to fill the sand pit with sand.
A bag of sand costs £2.50
There are 8 litres of sand in each bag.

Sally says,

"The sand will cost less than £70"

Show that Sally is wrong.

volume = $40 \times 100 \times 60$

$= 240000 \text{ cm}^3$

$= \underline{240 \text{ litres}}$

$\frac{240}{8} = 30$ bags

$30 \times 2.50 = \underline{£75}$

Sally is wrong.

(Total for Question 5 is 5 marks)

6 Four friends each throw a biased coin a number of times.
The table shows the number of heads and the number of tails each friend got.

	Ben	Helen	Paul	Sharif	
heads	34	66	80	120	300
tails	8	12	40	40	100

The coin is to be thrown one more time.

(a) Which of the four friends' results will give the best estimate for the probability that the coin will land heads?
Justify your answer.

Sharif → more trials so it should be closer to the actual probability

(1)

Paul says,

"With this coin you are twice as likely to get heads as to get tails."

(b) Is Paul correct?
Justify your answer.

No. Taking all others into account it is 3 times as likely

(2)

The coin is to be thrown twice.

(c) Use all the results in the table to work out an estimate for the probability that the coin will land heads both times.

$\frac{3}{4} \times \frac{3}{4}$

$\frac{9}{16}$

(2)

(Total for Question 6 is 5 marks)

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Turn over ►

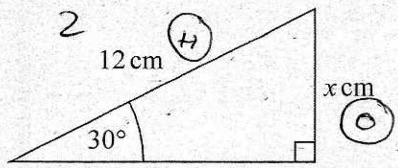
7 (a) Write down the exact value of $\cos 30°$

	0	30	45	60	90
sin	$\sqrt{0}$	1	2	3	4
cos	$\sqrt{4}$	3	2	1	0
	2				

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

(1)

(b)



Given that $\sin 30° = 0.5$,
work out the value of x.

$\sin(\theta) = \frac{O}{H}$

$\sin(30) = \frac{x}{12}$

$0.5 = \frac{x}{12}$

$x = 12 \times 0.5$

6

(2)

(Total for Question 7 is 3 marks)

8 The mass of Jupiter is 1.899×10^{27} kg.
The mass of Saturn is 0.3 times the mass of Jupiter.

(a) Work out an estimate for the mass of Saturn.
Give your answer in standard form.

$0.3 \times 2 \times 10^{27}$

0.6×10^{27}

6×10^{26}

6×10^{26} kg

(3)

(b) Give evidence to show whether your answer to (a) is an underestimate or an overestimate.

over estimate, I rounded up.

(1)

(Total for Question 8 is 4 marks)

9 Walkden Reds is a basketball team.

At the end of 11 games, their mean score was 33 points per game.
At the end of 10 games, their mean score was 2 points higher.

35

Jordan says,

"Walkden Reds must have scored 13 points in their 11th game."

Is Jordan right?
You must show how you get your answer.

$11 \times 33 = 363$

$10 \times 35 = 350$

$363 - 350$

13

(Total for Question 9 is 3 marks)

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10 There are some red counters and some yellow counters in a bag.
There are 30 yellow counters in the bag.
The ratio of the number of red counters to the number of yellow counters is 1:6

(a) Work out the number of red counters in the bag.

5 : 30

$\frac{30}{6} = 5$

5
(2)

Riza puts some more red counters into the bag.
The ratio of the number of red counters to the number of yellow counters is now 1:2

(b) How many red counters does Riza put into the bag?

15 : 30

15 − 5 = 10

10
(2)

(Total for Question 10 is 4 marks)

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11 Write down the value of $125^{\frac{2}{3}}$

Square

cube root

5^2

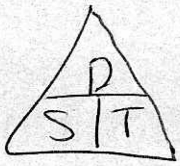
25

(Total for Question 11 is 1 mark)

12 Sean drives from Manchester to Gretna Green.

He drives at an average speed of 50 mph for the first 3 hours of his journey.

He then has 150 miles to drive to get to Gretna Green.
Sean drives these 150 miles at an average speed of 30 mph.



Sean says,

"My average speed from Manchester to Gretna Green was 40 mph."

Is Sean right?
You must show how you get your answer.

1st part

speed = 50
time = 3

distance = 50 × 3
= 150

2nd part

distance = 150
speed = 30

time = $\frac{150}{30}$
= 5

Total Distance = 300
Total Time = 8

speed = $\frac{300}{8} = \frac{150}{4} = 37.5$

Sean is wrong.

(Total for Question 12 is 4 marks)

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13 $m = \sqrt{\frac{k^3 + 1}{4}}$

Make k the subject of the formula.

$m^2 = \frac{k^3 + 1}{4}$

$4m^2 = k^3 + 1$

$4m^2 - 1 = k^3$

$k = \sqrt[3]{4m^2 - 1}$

$k = \sqrt[3]{4m^2 - 1}$

(Total for Question 13 is 3 marks)

14 Solve $\frac{x+2}{3x} + \frac{x-2}{2x} = 3$

$2x \qquad \times 3$

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

$$\frac{2x+4+3x-6}{6x} = 3$$

$$\frac{5x-2}{6x} = 3$$

$$5x - 2 = 18x$$

$$-2 = 13x$$

$$x = -\frac{2}{13}$$

$x = \frac{-2}{13}$

(Total for Question 14 is 3 marks)

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15 Show that $\frac{2x^2 - 3x - 5}{x^2 + 6x + 5}$ can be written in the form $\frac{ax+b}{cx+d}$ where a, b, c and d are integers.

$$\frac{(2x-5)\cancel{(x+1)}}{(x+5)\cancel{(x+1)}}$$

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

(Total for Question 15 is 3 marks)

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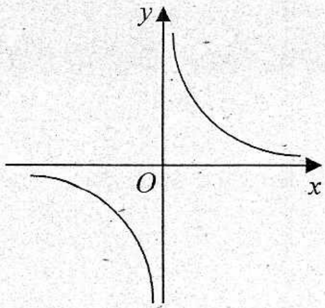
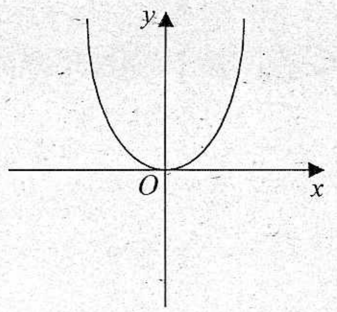
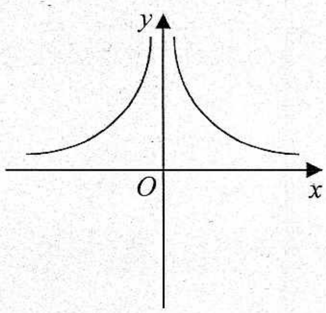
16 These graphs show four different proportionality relationships between y and x.



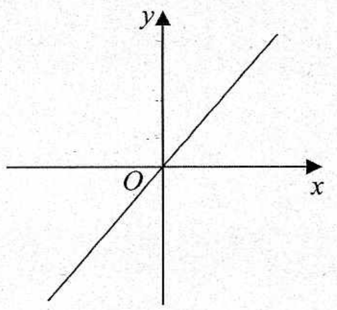
Graph A



Graph B



Graph C



Graph D

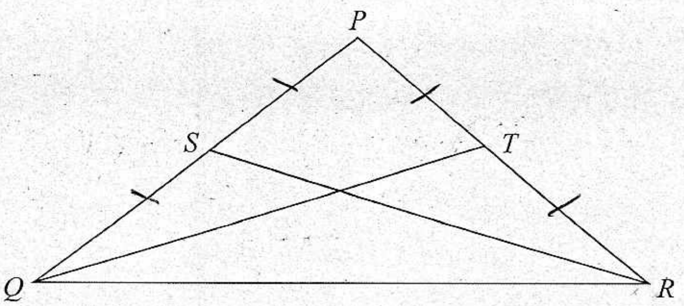
Match each graph with a statement in the table below.

Proportionality relationship	**Graph letter**
y is directly proportional to x $y = kx$	D
y is inversely proportional to x $y = \frac{k}{x}$	A
y is proportional to the square of x $y = kx^2$	B
y is inversely proportional to the square of x	C

$y = \frac{k}{x^2}$

(Total for Question 16 is 2 marks)

17



$PQ = PR$.
S is the midpoint of PQ.
T is the midpoint of PR.

Prove triangle QTR is congruent to triangle RSQ.

QS = TR both half length PQ/PR

QR is common to both triangles

As PQ = PR PRQ is an isosceles triangle

∴ $P\hat{Q}R = P\hat{R}Q$

∴ QTR is congruent to RSQ

SAS

(Total for Question 17 is 3 marks)

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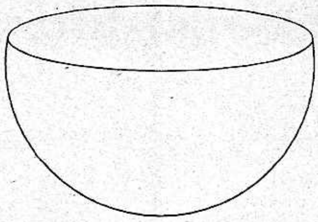
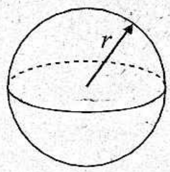
18 The diagram shows a solid hemisphere.



Volume of sphere $= \frac{4}{3}\pi r^3$

Surface area of sphere $= 4\pi r^2$



The volume of the hemisphere is $\frac{250}{3}\pi$

Work out the exact total surface area of the solid hemisphere.
Give your answer as a multiple of π.

volume of hemisphere $= \frac{1}{2} \cdot \frac{4}{3} \pi r^3$

$= \frac{2}{3} \pi r^3$

$\frac{1}{2} \times \frac{4}{3} = \frac{4}{6} = \frac{2}{3}$

$\frac{250}{\cancel{3}} \cancel{\pi} = \frac{2}{\cancel{3}} \cancel{\pi} r^3$

$250 = 2r^3$

$125 = r^3$

$r = 5$

Surface Area $= \pi r^2 + \frac{1}{2} \cdot 4\pi r^2$

$= 3\pi r^2$

$= 3\pi (5)^2$

$= 75\pi$

75π cm^2

(Total for Question 18 is 4 marks)

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Turn over ▶

19 Simplify fully $\frac{(6-\sqrt{5})(6+\sqrt{5})}{\sqrt{31}}$

You must show your working.

$$\frac{36 + 6\sqrt{5} - 6\sqrt{5} - 5}{\sqrt{31}}$$

$$\frac{31}{\sqrt{31}} \times \frac{\sqrt{31}}{\sqrt{31}} = \frac{31\sqrt{31}}{31}$$

$\sqrt{31}$

(Total for Question 19 is 3 marks)

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

$n \ , \ n+1$ (consecutative integers)

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

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

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

$2n + 1$

Sum of n and $n+1$ $= n + n + 1$

$= 2n + 1$

(Total for Question 20 is 4 marks)

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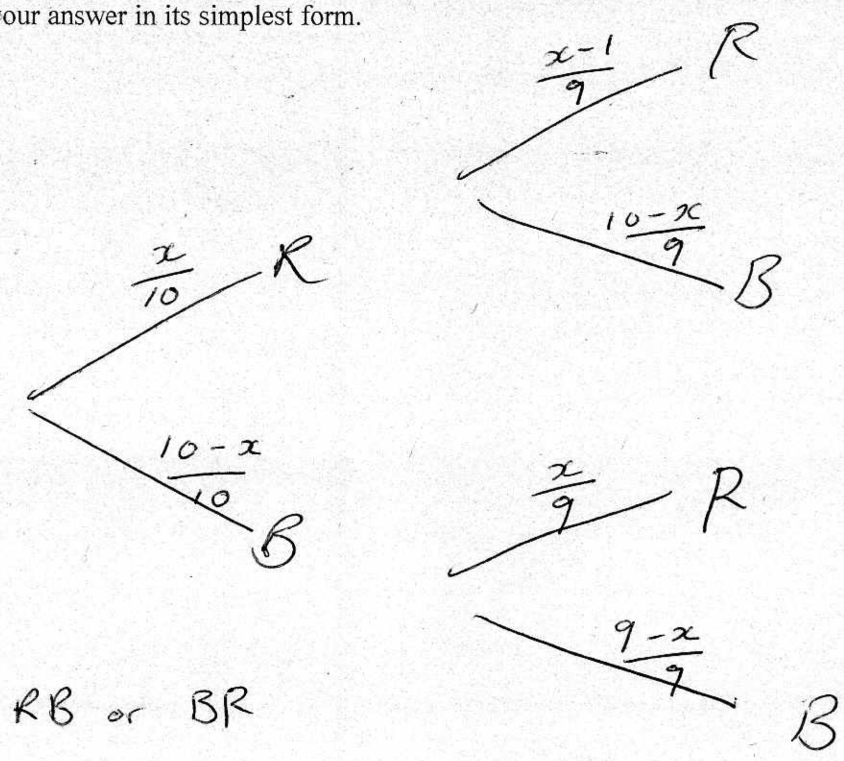
21 There are 10 pens in a box.

There are x red pens in the box.
All the other pens are blue. $(10-x)$ Blue

Jack takes at random two pens from the box.

Find an expression, in terms of x, for the probability that Jack takes one pen of each colour.
Give your answer in its simplest form.



RB or BR

$$\frac{x}{10} \times \frac{10-x}{9} + \frac{10-x}{10} \times \frac{x}{9}$$

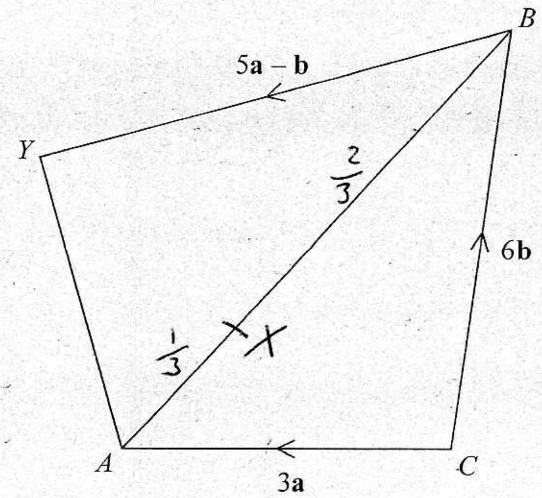
$$\frac{x(10-x)}{90} + \frac{x(10-x)}{90}$$

$$\frac{10x-x^2+10x-x^2}{90} = \frac{20x-2x^2}{90}$$

$\frac{10x-x^2}{45}$

(Total for Question 21 is 5 marks)

22



CAYB is a quadrilateral.

$\overrightarrow{CA} = 3\mathbf{a}$
$\overrightarrow{CB} = 6\mathbf{b}$
$\overrightarrow{BY} = 5\mathbf{a} - \mathbf{b}$

X is the point on *AB* such that $AX : XB = 1 : 2$

Prove that $\overrightarrow{CX} = \frac{2}{5}\overrightarrow{CY}$

$\overrightarrow{AB} = -3a + 6b$

$\overrightarrow{AX} = \frac{1}{3}(-3a + 6b)$

$= -a + 2b$

$\overrightarrow{CX} = 3a - a + 2b$

$= 2a + 2b$

$\overrightarrow{CY} = 6b + 5a - b$

$= 5a + 5b$

$2a + 2b = \frac{2}{5}(5a + 5b)$

(Total for Question 22 is 5 marks)

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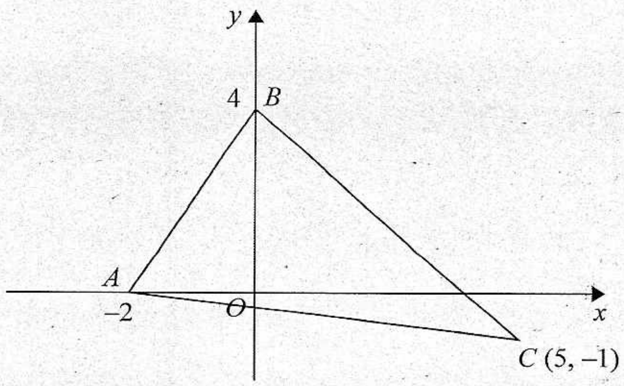
23



Find an equation of the line that passes through C and is perpendicular to AB.

AB

$(-2, 0)$ $(0, 4)$
x_1 y_1 x_2 y_2

$m = \frac{4-0}{0--2}$
$= 2$

perp $m = -\frac{1}{2}$

$y = -\frac{1}{2}x + c$ $(5, -1)$
x y

$-1 = -\frac{1}{2}(5) + c$

$-1 = \frac{-5}{2} + c$

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

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

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

(Total for Question 23 is 4 marks)

TOTAL FOR PAPER IS 80 MARKS

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