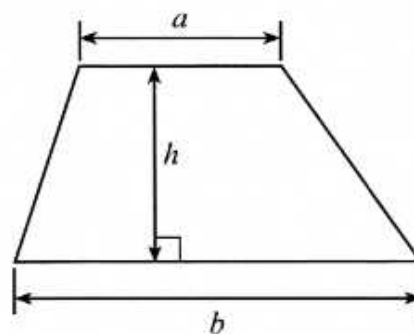
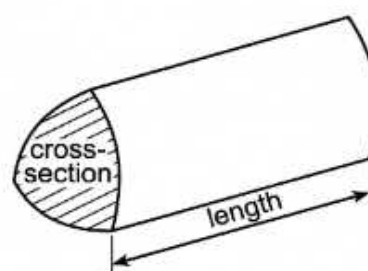


Formula List – Intermediate Tier

Area of trapezium $= \frac{1}{2}(a + b)h$



Volume of prism = area of cross-section \times length

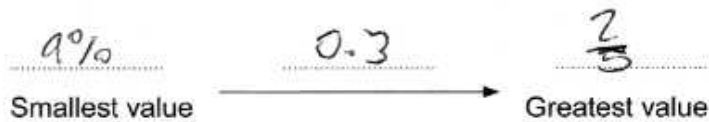


1. Write $\frac{2}{5}$, 9% and 0.3 in ascending order.

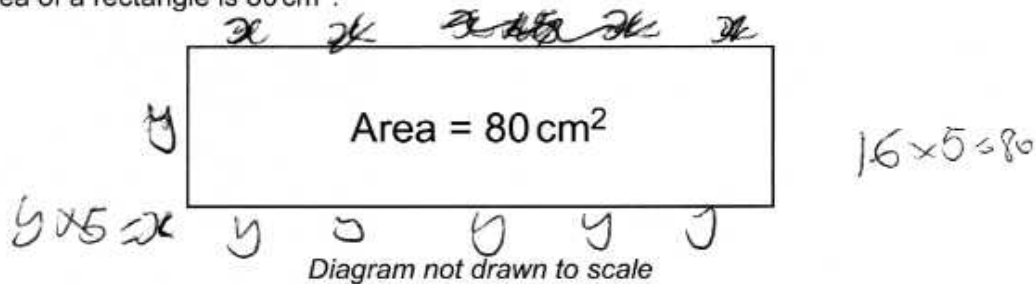
You must show all your working.

[3]

$$0.3 \quad 9\% = 0.09 \quad \frac{2}{5} = \frac{4}{10} \quad 40\% \quad 0.4$$



2. The area of a rectangle is 80 cm^2 .



The length of the rectangle is 5 times its width.

Calculate the length and width of the rectangle.

[2]

$\text{area} = 80 \text{ cm}^2$
 $= x \times (x \times 5) = 80$

13.5	13	15	12	14	16
27	26	30	24	28	32
40.5	39	45	36	42	48
54	52	60	48	56	64
67.5	65	75	60	70	80
81	78	90	72	84	

Length = ~~16~~ 16 cm Width = 5 cm

3300U30-1



3. (a) Solve the following equations.

(i) $\frac{x}{3} = 8$

[1]

$$\frac{x}{3} = 8 \quad x = 24$$

(ii) $3x - 10 = 17$

[2]

$$\begin{array}{rcl} 3x - 10 & = & 17 \\ +10 & +10 & \\ \hline 3x & = & 27 \\ x & = & 27 \div 3 = 9 \end{array}$$

(b) Simplify $6f - 4g + 2f - 9g$.

[2]

$$6f - 4g + 2f - 9g \quad 8f + -13g$$



4. (a) Which of the following is nearest in mass to 5 kg?
Circle the correct answer.

[1]

7 lb

11 lb

15 lb

19 lb

23 lb

- (b) Which of the following is nearest in volume to 100 litres?
Circle the correct answer.

[1]

100 pints

125 pints

150 pints

175 pints

200 pints

5. Rhian is n years old.
Samir is 7 years younger than Rhian.
Nigel is twice as old as Samir.

Write down an expression, in terms of n , for Nigel's age.

[3]

$2(n - 7)$

Nigel's age



6. The mean of four numbers is 7.

(a) What is the total of the four numbers? [1]

$$7, 8, 9, 10 = 34 \div 4 = 8.5 \quad \text{6, 7, 8, 9} \quad 5, 6, 7, 8 = 26$$

$$\begin{array}{r} 15 \\ 14 \end{array} \quad \begin{array}{r} 17 \\ 16 \end{array} \quad \begin{array}{r} 13 \\ 12 \end{array} \quad \begin{array}{r} 15 \\ 14 \end{array}$$

$$230 \div 5 = 46$$

(b) Find a set of four numbers such that:

- their mean is 7
- their range is 6. *1.5 between 1st and 4th*

Write your four numbers in the boxes below. [2]

$$5, 6, 6, 11$$

$$5 + 6 + 6 + 11 = 28$$

$$28 \div 4 = 7$$

$$11 - 5 = 6$$

5

6

6

11

7.

$$\begin{array}{r} 180 \\ 063 \\ \hline 117 \end{array}$$

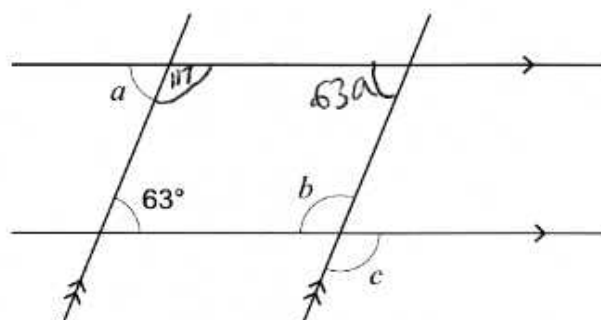


Diagram not drawn to scale

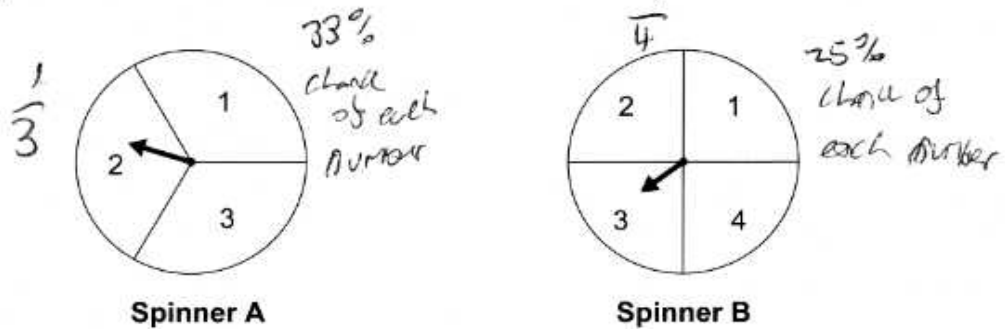
Find the size of each of the angles a , b and c . [3]

$$a = 63^\circ \quad b = 117^\circ \quad c = 117^\circ$$



8. In this question, you will be assessed on the quality of your organisation, communication and accuracy in writing.

Two fair spinners are shown below.



In a game, the numbers shown by the two pointers are added together.
In the diagram, the score gained would be $2 + 3 = 5$.

A winning score is 6 or more.

How many winning scores would you expect when the game is played 60 times?
You must show all your working.

[5 + 2 OCW]

Possible outcomes = $3+3, 4+2, 4+3$

$a = \frac{2}{3}$ = landing on either 2 or 3

$b = \frac{2}{4}$ = landing on either 3 or 4

$$\frac{2}{4} + \frac{2}{3} = \frac{6}{12} + \frac{8}{12} = \frac{14}{12}$$

$$\frac{14}{12} \times 60 = 70$$

$$\frac{14}{12} = \frac{7}{6}$$

$$7 \times 10 = 70$$



Examiner
only

9. (a) Express 48 as a percentage of 400.

- (b) Share £45 in the ratio 8 : 1.

$$8 + 1 = 9$$

45

$$81 \div 9 = 9$$

gusts

1280 4/18

£ 40

and

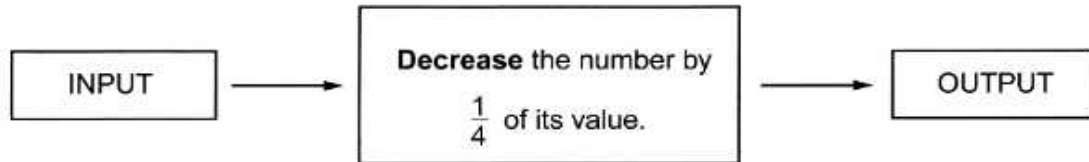
41

- (c) Express $1 - \frac{1}{2^3}$ as a single fraction in the form $\frac{a}{b}$, where a and b are integers.

Answer =



10. A number machine is shown below.



For a given INPUT number, there will be an OUTPUT number.
The OUTPUT is then put back in the number machine as the next INPUT.
This process is then repeated many times.

The first INPUT number is 512.

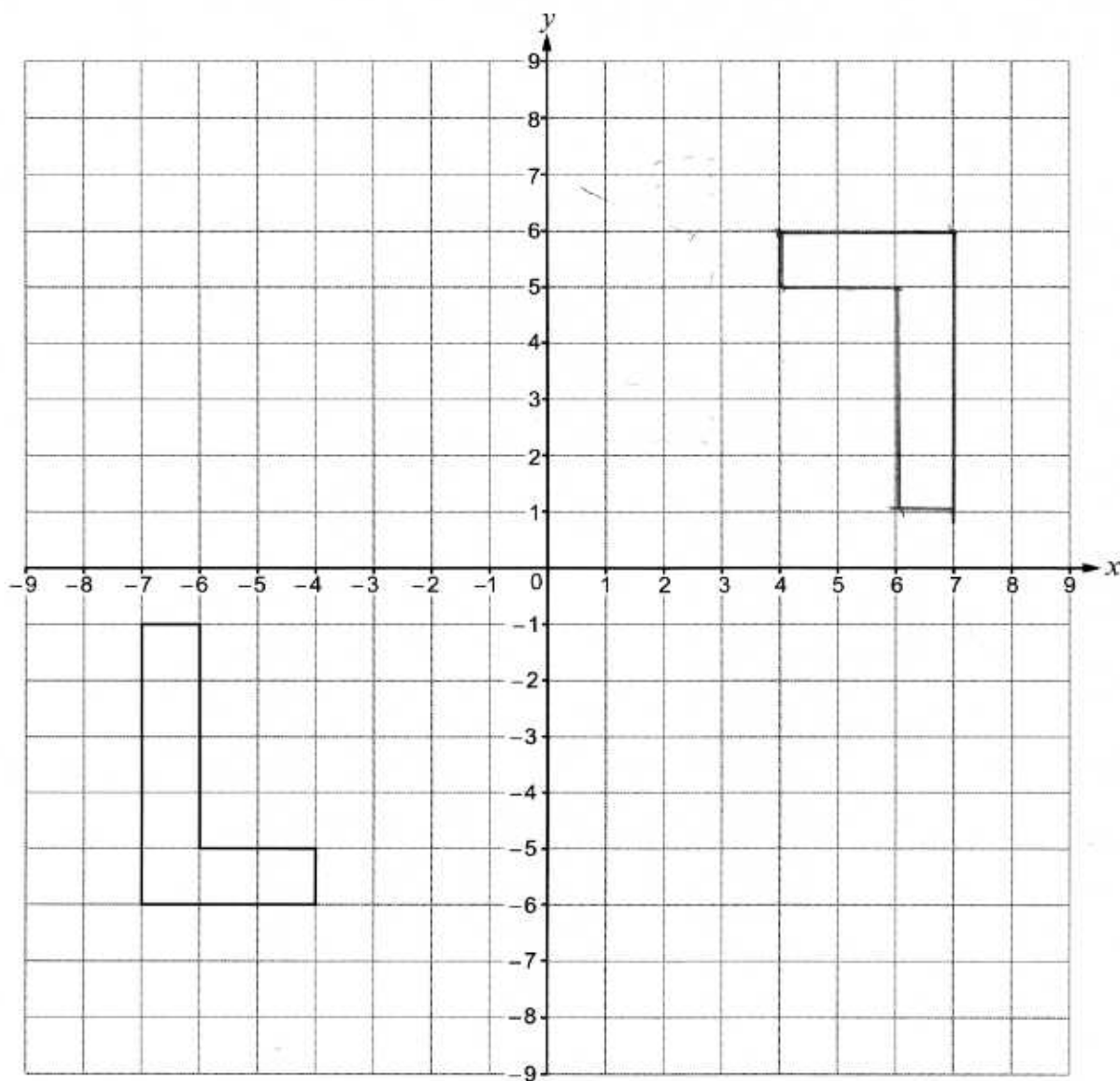
What will be the first OUTPUT number that is less than 300?

[4]

$512 \div 0.25 = 25\%$ $512 \div 1.25 = 409.6$
 $512 - 25.6 = 486.4$ $5\% = 25.6$
 $25\% = 126.8$
 $486.4 - 126.8 = 359.6$
 $5\% = 17.98$
 $359.6 - 17.98 = 341.62$
 $25\% = 85.4$
 $341.62 - 85.4 = 256.22$
 $5\% = 12.811$
 $256.22 - 12.811 = 243.409$
 $25\% = 60.852$
 $243.409 - 60.852 = 182.557$
 $5\% = 9.12785$
 $182.557 - 9.12785 = 173.42915$
 $25\% = 43.3572875$
 $173.42915 - 43.3572875 = 130.0718625$
 $5\% = 6.503593125$
 $130.0718625 - 6.503593125 = 123.568269375$
 $25\% = 30.89206734375$
 $123.568269375 - 30.89206734375 = 92.67620203125$
 $5\% = 4.6338101015625$
 $92.67620203125 - 4.6338101015625 = 88.0423919296875$
 $25\% = 22.010597982421875$
 $88.0423919296875 - 22.010597982421875 = 66.031793947265625$
 $5\% = 3.30158969736328125$
 $66.031793947265625 - 3.30158969736328125 = 62.73020424990234375$
 $25\% = 15.6825510624755859375$
 $62.73020424990234375 - 15.6825510624755859375 = 47.0476531874267578125$
 $5\% = 2.352382659371337890625$
 $47.0476531874267578125 - 2.352382659371337890625 = 44.69527052805542$
 $25\% = 11.173817632013855$
 $44.69527052805542 - 11.173817632013855 = 33.521452896041565$
 $5\% = 2.17607264480207825$
 $33.521452896041565 - 2.17607264480207825 = 31.345380251239486$
 $25\% = 7.8363450628098715$
 $31.345380251239486 - 7.8363450628098715 = 23.509035188429614$
 $5\% = 1.5754517594214807$
 $23.509035188429614 - 1.5754517594214807 = 21.933583429008133$
 $25\% = 5.483395857252033$
 $21.933583429008133 - 5.483395857252033 = 16.4501875717561$
 $5\% = 1.072509378587805$
 $16.4501875717561 - 1.072509378587805 = 15.377678193168295$
 $25\% = 3.8444195482920737$
 $15.377678193168295 - 3.8444195482920737 = 11.533258644876221$
 $5\% = 0.776662932243811$
 $11.533258644876221 - 0.776662932243811 = 10.75659571263241$
 $25\% = 2.6891486781581025$
 $10.75659571263241 - 2.6891486781581025 = 8.067447034474307$
 $5\% = 0.52837235172371535$
 $8.067447034474307 - 0.52837235172371535 = 7.5390746827505915$
 $25\% = 1.8847686706876479$
 $7.5390746827505915 - 1.8847686706876479 = 5.6543060120629435$
 $5\% = 0.28271530060314717$
 $5.6543060120629435 - 0.28271530060314717 = 5.371590711459796$
 $25\% = 1.342897677864949$
 $5.371590711459796 - 1.342897677864949 = 4.028693033594847$
 $5\% = 0.20143465167974235$
 $4.028693033594847 - 0.20143465167974235 = 3.8272583819151045$
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 $3.8272583819151045 - 0.9568145954787761 = 2.8704437864363285$
 $5\% = 0.19352219430931642$
 $2.8704437864363285 - 0.19352219430931642 = 2.676921592127012$
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 $2.676921592127012 - 0.669230398031753 = 2.007691194095259$
 $5\% = 0.13289459700476295$
 $2.007691194095259 - 0.13289459700476295 = 1.874796597090496$
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 $1.874796597090496 - 0.468698649272624 = 1.406097947817872$
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 $1.406097947817872 - 0.0903048973908936 = 1.3157930504269784$
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 $1.3157930504269784 - 0.3289482626067446 = 0.9868447878202338$
 $5\% = 0.06694223939101169$
 $0.9868447878202338 - 0.06694223939101169 = 0.9199025484292221$
 $25\% = 0.22997563710730553$
 $0.9199025484292221 - 0.22997563710730553 = 0.6899269113219166$
 $5\% = 0.04599634556609583$
 $0.6899269113219166 - 0.04599634556609583 = 0.6439305657558207$
 $25\% = 0.16098264143945517$
 $0.6439305657558207 - 0.16098264143945517 = 0.4829479243163655$
 $5\% = 0.032146396237791275$
 $0.4829479243163655 - 0.032146396237791275 = 0.4508015280785742$
 $25\% = 0.11270038201964355$
 $0.4508015280785742 - 0.11270038201964355 = 0.33810114605893065$
 $5\% = 0.02254005730392873$
 $0.33810114605893065 - 0.02254005730392873 = 0.3155610887550019$
 $25\% = 0.07889027218875047$
 $0.3155610887550019 - 0.07889027218875047 = 0.23667081656625143$
 $5\% = 0.015833540828262571$
 $0.23667081656625143 - 0.015833540828262571 = 0.22083727573798886$
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 $0.22083727573798886 - 0.055209318934497215 = 0.16562795680349164$
 $5\% = 0.011281397840174582$
 $0.16562795680349164 - 0.011281397840174582 = 0.15434655896331706$
 $25\% = 0.03858663974077927$
 $0.15434655896331706 - 0.03858663974077927 = 0.11575991922253779$
 $5\% = 0.0077879959611268895$
 $0.11575991922253779 - 0.0077879959611268895 = 0.1079719232614109$
 $25\% = 0.026992980815352725$
 $0.1079719232614109 - 0.026992980815352725 = 0.08097894244605817$
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 $0.08097894244605817 - 0.0053989471230705485 = 0.07557999532298762$
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 $0.0191799835433322 - 0.0012737491771666116 = 0.01790623436616559$
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 $0.0054859484577189145 - 0.0019147793831075658 = 0.0035711690746113487$
 $5\% = 0.0002735834539058174$
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 $0.00010620519249678449 - 0.000008627274974541062 = 0.00010757791752224343$
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 $0.00010757791752224343 - 0.00002689422938057083 = 8.06836881416626 \times 10^{-5}$
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 $8.06836881416626 \times 10^{-5} - 0.0000012691510365787065 = 7.9414537075874 \times 10^{-5}$
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 $7.559786986168468 \times 10^{-5} - 0.0000000003891151707915947 = 7.55939787099755 \times 10^{-5}$
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 $25\% = 0.000000000000015925827031643808$
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 $5\% = 0.000000000000003891151707915947$
 $7.55917768843583 \times 10^{-5} - 0.000000000000003891151707915947 = 7.559177684544678 \times 10^{-5}$
 $25\% = 0.0000000000000015925827031643808$
 $7.559177684544678 \times 10^{-5} - 0.0000000000000015925827031643808 = 7.559177682952095 \times 10^{-5}$
 $5\% = 0.0000000000000003891151707915947$
 $7.559177682952095 \times 10^{-5} - 0.0000000000000003891151707915947 = 7.559177682562978 \times 10^{-5}$
 $25\% = 0.00000000000000015925827031643808$
 $7.559177682562978 \times 10^{-5} - 0.00000000000000015925827031643808 = 7.559177682403719 \times 10^{-5}$
 $5\% = 0.00000000000000003891151707915947$
 $7.559177682403719 \times 10^{-5} - 0.00000000000000003891151707915947 = 7.559177682364803 \times 10^{-5}$
 $25\% = 0.000000000000000015925827031643808$
 $7.559177682364803 \times 10^{-5} - 0.000000000000000015925827031643808 = 7.559177682348877 \times 10^{-5}$
 $5\% = 0.000000000000000003891151707915947$
 $7.559177682348877 \times 10^{-5} - 0.000000000000000003891151707915947 = 7.559177682344985 \times 10^{-5}$
 $25\% = 0.0000000000000000015925827031643808$
 $7.559177682344985 \times 10^{-5} - 0.0000000000000000015925827031643808 = 7.559177682343392 \times 10^{-5}$
 $5\% = 0.0000000000000000003891151707915947$
 $7.559177682343392 \times 10^{-5} - 0.0000000000000000003891151707915947 = 7.559177682343003 \times 10^{-5}$
 $25\% = 0.00000000000000000015925827031$

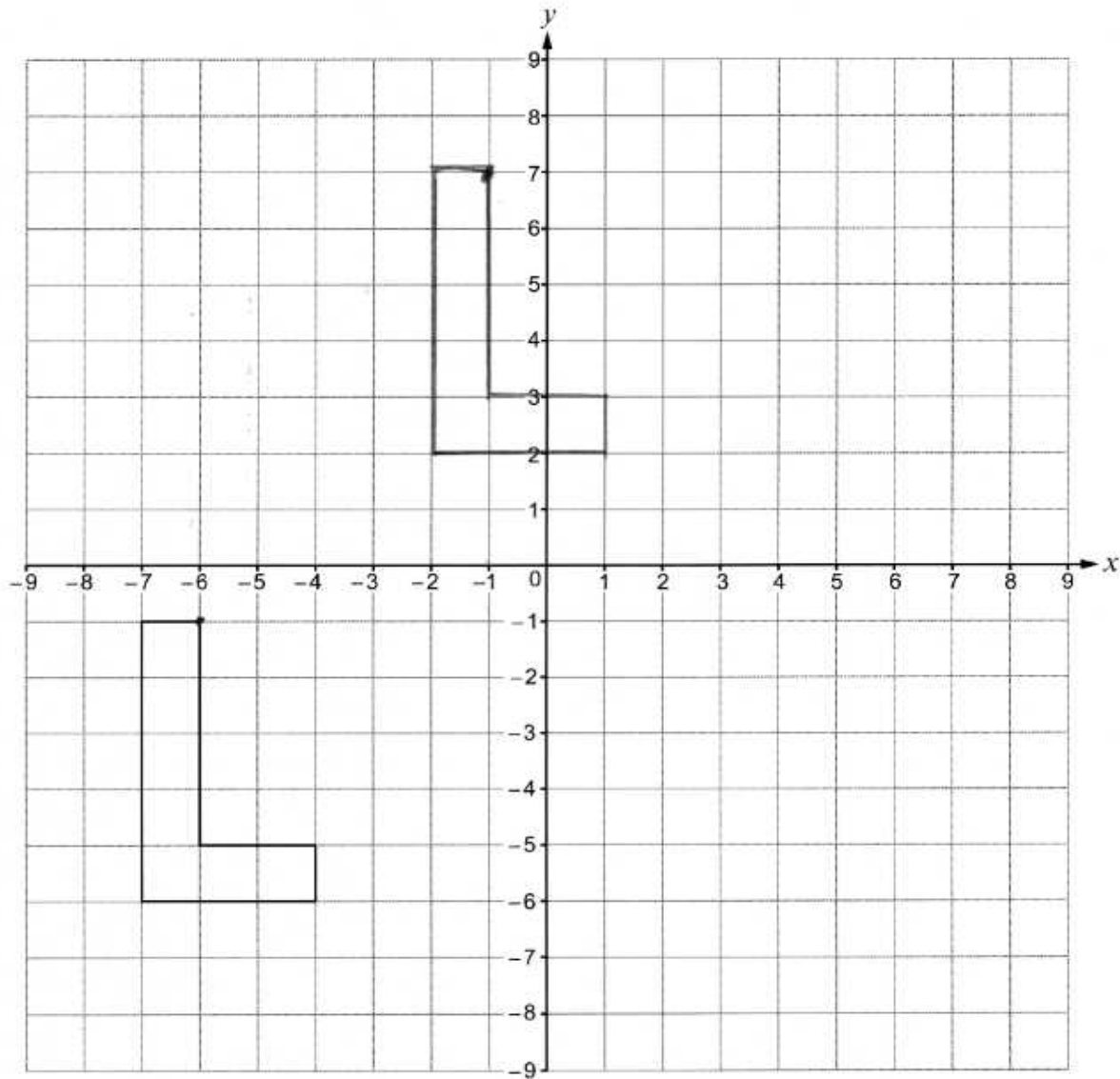
11. (a) Rotate the shape shown below by 90° anticlockwise about the origin.

[2]



- (b) (i) Translate the shape shown below using the column vector $\begin{pmatrix} -1 \\ 7 \end{pmatrix}$.

[1]



- (ii) Write down the column vector that will reverse the translation in part (i).

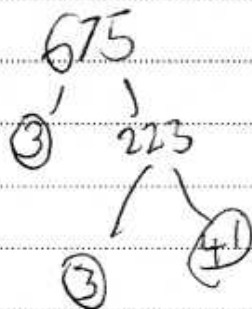
[1]

$$\begin{pmatrix} -6 \\ -1 \end{pmatrix}$$



12. (a) Express 675 as a product of its prime factors in index form. [3]

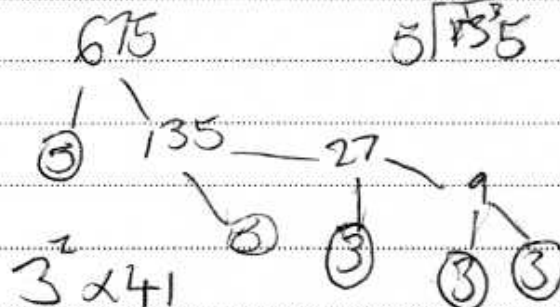
1, 3, 5, 7, 9, 11, 13, 17,



$$3 \times 3 = 9 \quad 9 \times 41$$

$$5^2 \times 3^3$$

$$\begin{array}{r} 135 \\ 5 \overline{) 675} \\ \underline{500} \\ 175 \\ 150 \\ \underline{25} \\ 25 \\ \underline{25} \\ 0 \end{array}$$



$$\begin{array}{r} 41 \\ 3 \overline{) 123} \\ \underline{60} \\ 63 \\ \underline{60} \\ 3 \\ \underline{3} \\ 0 \end{array}$$

- (b) 360 expressed as a product of its prime factors in index form is $2^3 \times 3^2 \times 5$.

What is the smallest whole number that 360 can be multiplied by to give a square number? [1]

$$36 + 36 = 72 \quad 72 + 36 = 108 \quad 108 + 36 = 144$$

$$1440$$

Smallest whole number is 120



13. (a) Simplify each of the following.
Circle your answer in each case.

(i) $m^4 \times m^3 =$

[1]

m^7

m^{12}

m^{43}

$7m$

$12m$

(ii) $\frac{m^{15}}{m^5} =$

[1]

m^{75}

$\frac{1}{m^3}$

m^3

m^{10}

$\frac{1}{m^{10}}$

- (b) Write down an expression for the n th term of the following sequence.

[2]

4,

11,

18,

25,

32

$11 - 4 = 7$

$18 - 11 = 7$

$25 - 18 = 7$

$32 - 25 = 7$

$39 - 32 = 7$

- (c) List all of the integers that satisfy the following inequality.

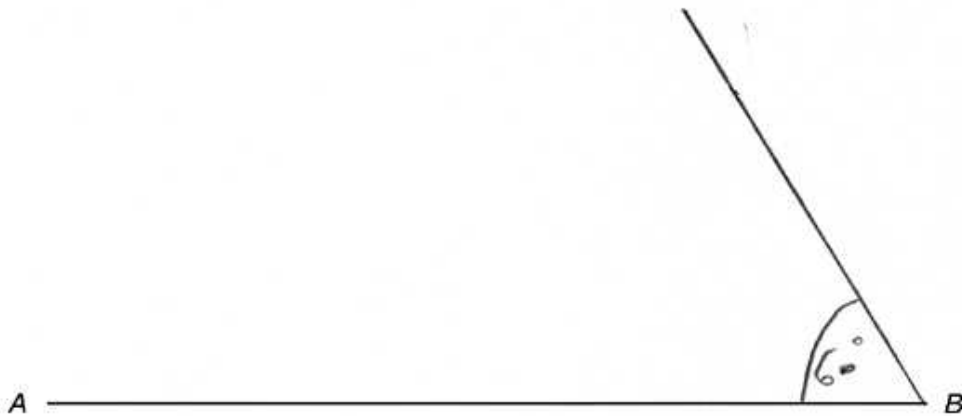
[2]

$$13 < 2n < 19$$

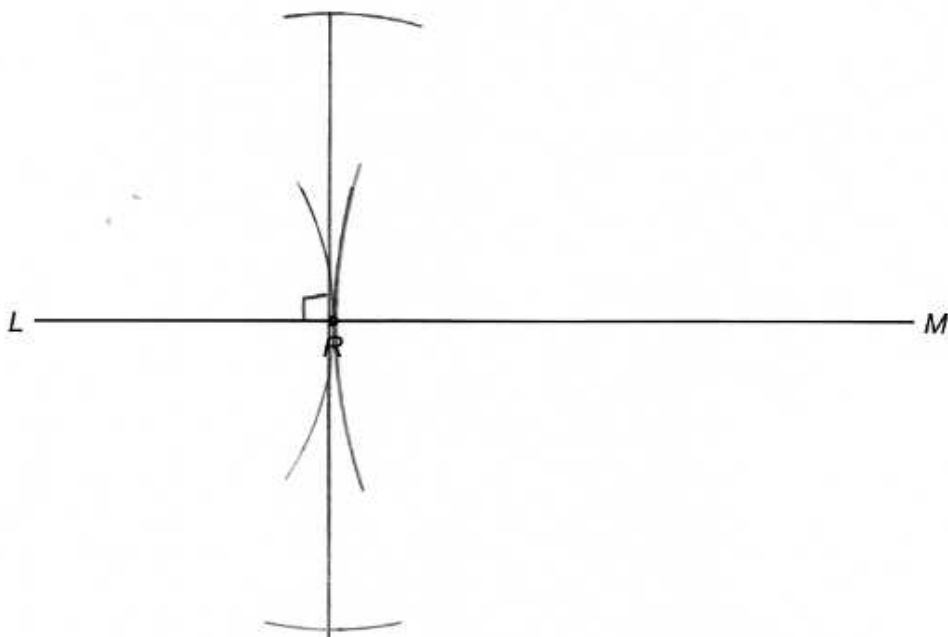
Integers are



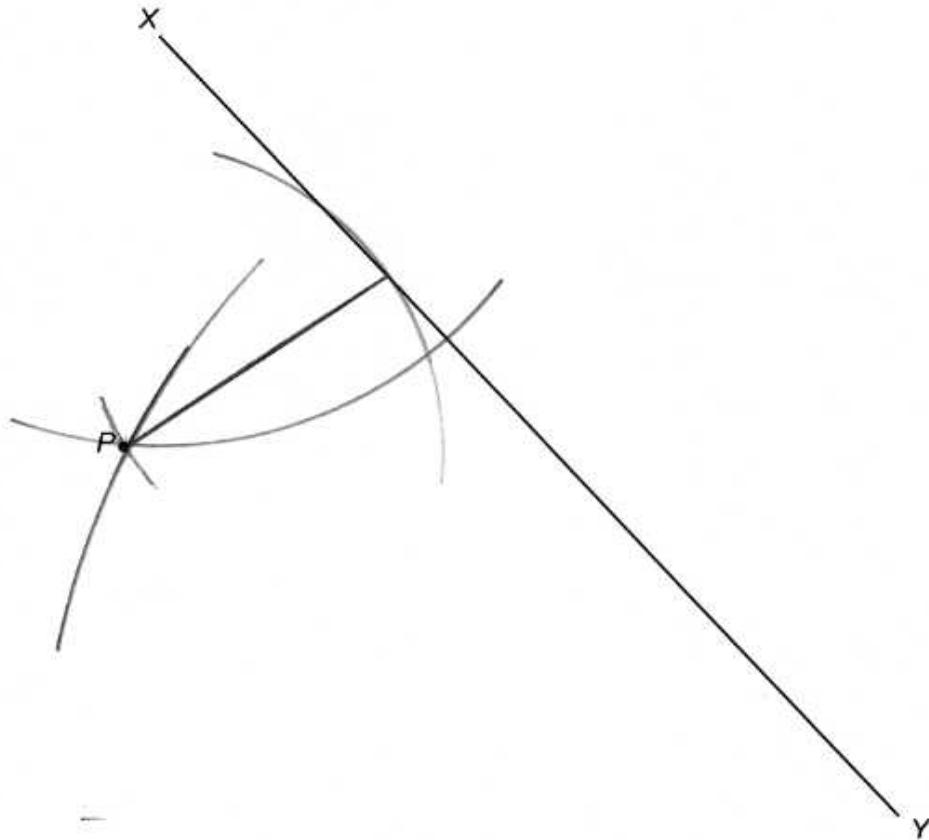
14. (a) Line AB is shown below.
Using only a ruler and a pair of compasses, construct an angle of 60° at point B . [1]



- (b) R is a point on the line LM .
Using only a ruler and a pair of compasses, construct an angle of 90° at point R . [1]



- (c) Using only a ruler and a pair of compasses, construct a perpendicular line from the point P to the line XY . [2]



15. The shape below consists of a semicircle attached to one side of a right-angled triangle.
 $\angle ABC = 90^\circ$, $AB = 8$ cm, $BC = 6$ cm.
 BC is the diameter of the semicircle.

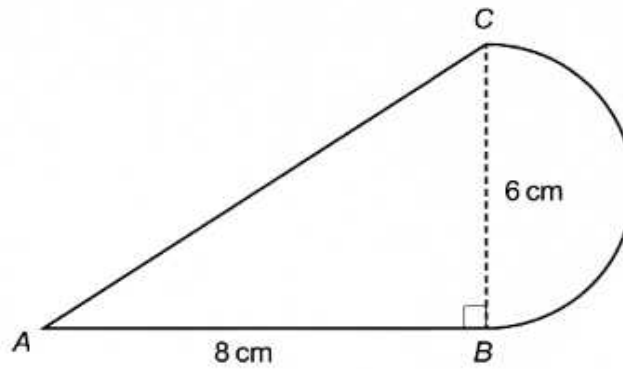


Diagram not drawn to scale

Calculate the perimeter of the shape.
 Use $\pi = 3.14$.
 You must show all your working.

[5]



16. Two time periods are measured as 4 hours 40 minutes and 2 hours 50 minutes. Each measurement is correct to the nearest 10 minutes.

What is the least possible sum of these two time periods?
Give your answer in hours and minutes.

[3]

$$4.40 \geq 60 \times 4 + 40 \\ \geq 280 \text{ min}$$

$$2.50 \geq 60 \times 2 + 50 \\ \geq 290 \text{ min}$$

Answer = hours minutes



17. Whitney walks, cycles or travels on the bus to work each day.

On any randomly chosen day:

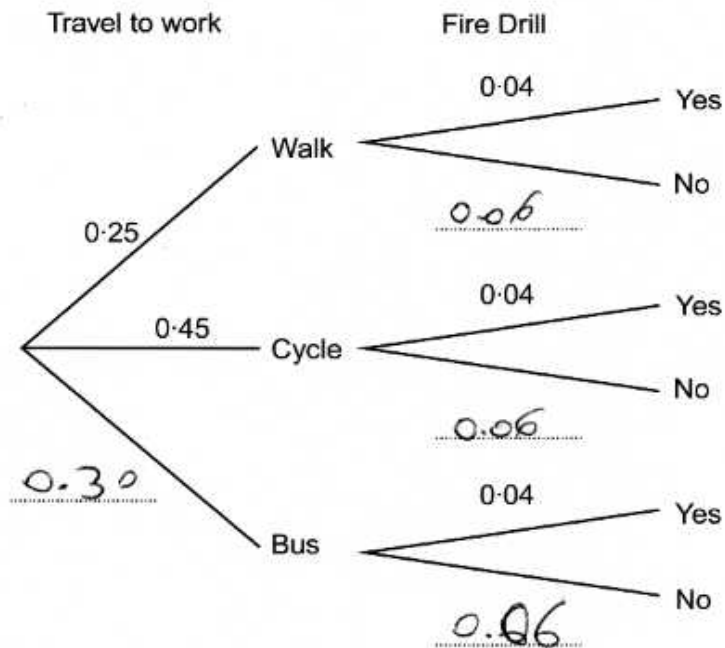
- the probability that she walks to work is 0.25
- the probability that she cycles to work is 0.45.

At work, the probability that there will be a fire drill on any randomly chosen day is 0.04.

How Whitney travels to work is independent of whether or not there is a fire drill.

(a) Complete the tree diagram shown below.

[3]



$$0.25 + 0.45 + 0.30 = 1.00$$

(b) On a randomly chosen day, what is the probability that Whitney walks to work and there is a fire drill? [2]

$$0.25 \times 0.04 = 0.01$$

$$25 \times 4 = 100$$

$$\frac{1}{100}$$



18. In the following formulae, each measurement of length is represented by a letter.

Consider the dimensions implied by each formula.

For each case, write down whether the formula could be for a length, an area, a volume or none of these.

The first one has been done for you.

[3]

<u>Formula</u>	<u>Formula could be for</u>
$4d + r - 2w$	length
$w(l + b + h)$	length
$d^3 + 3 \cdot 14r$	volume
$\frac{w^3}{d^2}$	area
$3 \cdot 14r^3 - lbh$	length
$\frac{4w^2}{d}$	width



19. (a) Express 0.0076 in standard form.

[1]

~~100~~ 0.76×10^2

- (b) Calculate the value of $(3 \times 10^{17}) \times (2 \times 10^{-12})$.
Give your answer in standard form.

[1]

6×10^5

- (c) Calculate the value of $(2.3 \times 10^4) + (5 \times 10^3)$.
Give your answer in standard form.

[2]

2.3

4.6

2.9.2

11.5

11.5×10^7



20. XY is a tangent to a circle, centre O , at the point A .

$$\hat{AYO} = 54^\circ$$

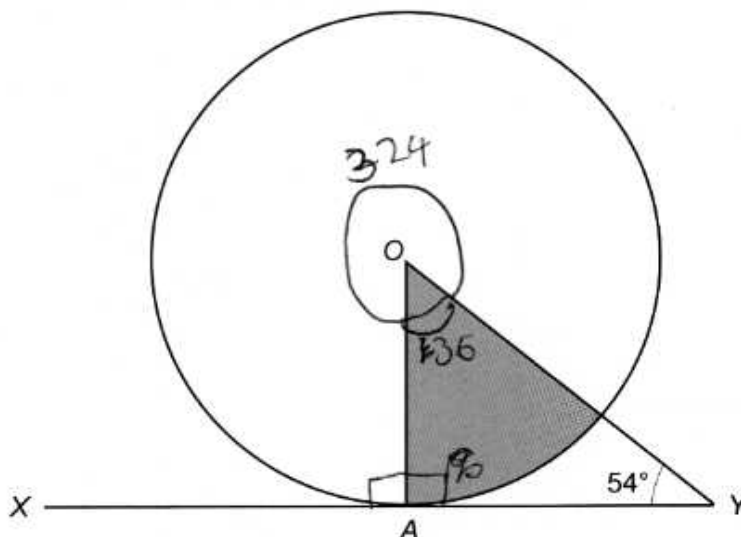


Diagram not drawn to scale

- (a) What percentage of the whole circle is shaded?
You **must** show how you calculated your answer.

[3]

$$54^\circ + 90^\circ = 144$$

$$180 - 144 = 36$$

$$360 - 36$$

$$= 324$$

$$360 \div 36 = 10$$

$$\frac{36 \div 36}{360 \div 36} = \frac{1}{10} \text{ shaded}$$

10% Shaded

- (b) What tangent property of circles did you use in order to answer part (a)?

[1]

END OF PAPER



Question number	Additional page, if required. Write the question number(s) in the left-hand margin.	Examine only
10.	$388.72 \leq 10\% \leq 38.872$ $5\% \leq 19.437$ $\begin{array}{r} 388.72 \\ 097.181 \\ \hline 291.549 \end{array}$ $\begin{array}{r} 38.872 \\ 38.872 \\ 19.437 \\ \hline 97.181 \\ 2211 \end{array}$	



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