1 Circle the multiplier that is equivalent to a percentage increase of 15%
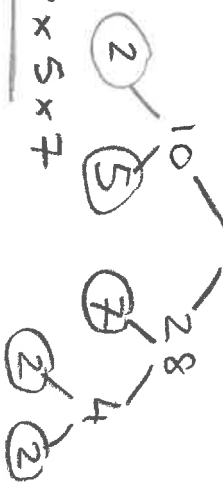
$$100\% + 15\% = \frac{115}{100} = 1.15$$

$$\frac{115}{100} = 1.15$$

0.015   0.15   1.015   (1.15)

[1 mark]

2 (a) Write 280 as a product of its prime factors.

280

10 — 28

②—⑤   ⑦—4

         ②—②

$280 = 2^3 \times 5 \times 7$

[2 marks]

2 (b) $588 = 2^2 \times 3 \times 7^2$

Work out the highest common factor of 280 and 588

$280 = 2^3 \times 5 \times 7$

$588 = 2^2 \times 3 \times 7^2$

$COMMON = 2^2 \times 7 = 4 \times 7 = \boxed{28}$

[2 marks]

3 (a) Write $\dfrac{11^{13} \times 11^3}{11^7}$ as a single power of 11

$= 11^{(13+3-7)}$

$= 11^9$

[1 mark]

3 (b) Write $(4^3)^{15}$ as a single power of 2

$= 4^{3\times5} = 4^{15}$ BUT $4 = 2^2$

So $= (2^2)^{15} = 2^{2\times15} = 2^{30}$

[1 mark]

4 Write 224 as the sum of two cube numbers.

CUBE NUMBERS

$1^3 = 1$ $6^3 = 216$

$2^3 = 8$

$3^3 = 27$

$4^3 = 64$

$5^3 = 125$

$216 + 8 = 224$

[1 mark]

5 Solve the equation $x^2 - 1 = 48$

$ +1 +1$

$x^2 = 49$

$x = \pm\sqrt{49}$

$x = \pm 7$

[2 marks]

6 Estimate the square root of 90

$10^2 = 100$ 90 IS APPROXIMATELY HALF WAY

$9^2 = 81$ BETWEEN 81 AND 100

$\sqrt{90}$ IS APPROXIMATELY BETWEEN

9.2 TO 9.5

[1 mark]

7 Circle the fraction that is a recurring decimal.

$\dfrac{3}{8}$ $\left(\dfrac{8}{9}\right)$ $\dfrac{9}{10}$ $\dfrac{13}{16}$

$8\overline{)3.8^{6}0^{8}0^{8}0}$ 0.888...

$\dfrac{0.375}{8)3.^{3}8^{6}0^{4}0}$ $4)\dfrac{0.8125}{18.^{2}8^{1}0^{2}0}$

$\dfrac{0.8125}{16)13.^{13}8^{6}0^{12}0^{8}0}$

[1 mark]

8 Circle the value of $27^{\frac{1}{3}}$

$= \sqrt[3]{27} = 3$

$\dfrac{1}{9}$ $\dfrac{1}{3}$ ③   9

[1 mark]

9 Write $0.4\dot{5}$ as a fraction in its lowest form

[2 marks]

$x = 0.45555...$
$10x = 4.05555...$
$100x = 45.5555...$
$10x = 4.5555...$
$90x = 41$

$x = \dfrac{41}{90}$

10 (a) The attendance at a football match is 30 400, to 3 significant figures.

Circle the minimum possible attendance.

[1 mark]

| 30 349 | (30 350) | 30 394 | 30 395 |

$30400 - 50 = 30350$

30400 ROUNDED TO 100's
$100 \div 2 = 50$

10 (b) Circle the maximum possible attendance.

[1 mark]

| 30 404 | 30 405 | (30 449) | 30 450 |

$30400 + 49$ (NOT 50)
AS PEOPLE

11 Here are five numbers.

47 000 4.5×10^4 5×10^3 2.8×10^5 125 000

Work out the difference between the largest and smallest numbers.

Give your answer in standard form.

[3 marks]

45000   5000
5000
280000
125000

$280000 - 5000 = 275000$

So 2.75×10^5

12 Circle the value that is equivalent to $6\sqrt{15} \div 3\sqrt{5}$

[1 mark]

| (2√3) | 3√3 | 3√5 | 3√10 |

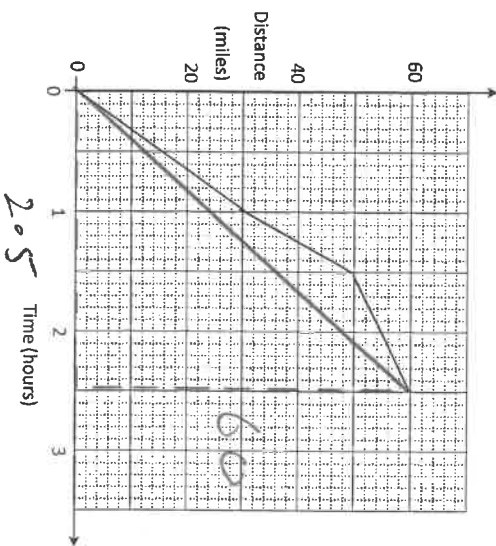$= \dfrac{6\sqrt{15}}{3\sqrt{5}} = \dfrac{6 \times \sqrt{3} \times \sqrt{5}}{3\sqrt{5}} = 2\sqrt{3}$

OR $\dfrac{6\sqrt{15}}{3\sqrt{5}} = \dfrac{6}{3}\sqrt{\dfrac{15}{5}} = 2\sqrt{3}$

13 Here is a distance-time graph.

14 (a) During what times does the graph show the fastest speed?

[1 mark]

BETWEEN 1 AND 1.5 HOURS
(STEEPEST GRADIENT)

2.5

14 (b) Work out the average speed of the whole journey.

[2 marks]

$= \text{GRADIENT} = \dfrac{\text{DIST}}{\text{TIME}}$

$= \dfrac{60}{2.5} = 24 \text{ mph}$

15 $x : y = 5 : 1$

REWRITE AS: $\dfrac{x}{y} = \dfrac{5}{1}$ or $\dfrac{y}{x} = \dfrac{1}{5}$ so $y = \dfrac{x}{5}$

Circle the equation of y as a function of x.

[1 mark]

| $y = \dfrac{x}{6}$ | $\left(y = \dfrac{x}{5}\right)$ | $y = 5x$ | $y = 6x$ |

1 Here is a linear sequence.

$n=$ 1, 2, 3, 4
5, 13, 21, 29
$+8$ $+8$ $+8$

Circle the expression for the nth term of the sequence.

$n + 8$ $5n + 8$ $8n$ $(8n - 3)$

$+8n$
$+8 \times 1 = 8$ ADD $(-3) = 5$
$8 \times 2 = 16$
$-3 = 13$
so $8n - 3$

[1 mark]

3 Circle the quadratic sequence.

2 8 14 22

2 4 8 16

1 8 27 64

1 4 9 16 $+3$ $+5$ $+7$ $+2$ $+2$ ← SAME DIFFERENCE QUADRATIC AS

[1 mark]

8 (a) Here are the fourth and fifth terms of a Fibonacci-type sequence.

2 13 15 28 43

Each term is the sum of the previous two terms.

Show that the first term is 2

$43 - 28 = 15$
$28 - 15 = 13$
$15 - 13 = 2$

[2 marks]

10 Expand and simplify $(y + 5)(y - 4)$

$y \times y -4 \times y +5y +5 \times (-4)$
$= y^2 -4y +5y -20 = y^2 + y -20$

$-9x$

[2 marks]

2 Expand $3x^2(2x - 5)$

$3x^2 \times 2x + 3x^2 \times (-5)$
$= 6x^3 -15x^2$

Circle your answer.

$6x^3 - 5$ $5x^3 - 8x^2$ $(6x^3 - 15x^2)$

[1 mark]

5 Factorise fully $9a^2 - 6a$

$= 3 \times 3 \times a \times a - 3 \times 2 \times a$
$= 3a(3a - 2)$

COMMON FACTORS GO OUTSIDE BRACKETS

[2 marks]

5 Solve $\frac{x}{3} - 9 = 12$

$\frac{x}{3} = 21$ $+9$ $+9$
$x = 63$ $\times 3$ $\times 3$

[2 marks]

6 (a) Solve the inequality $\frac{3x}{2} < 9$

$3x < 18$ $\times 2$
$x \leq 6$ $\div 3$ $\div 3$

[2 marks]

6 (b) Solve the inequality $4(x + 2) > 12$

$4x + 8 > 12$ -8 -8
$4x > 4$ $\div 4$ $\div 4$
$x > 1$

[2 marks]

6 (c) Represent the solution set that satisfies **both** answers to parts (a) and (b) on the number line.

$x > 1$ $x \leq 6$

SHADED CIRCLE AS LESS THAN 'OR EQUAL'
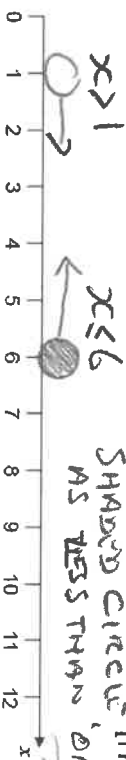
[1 mark]

10 (a) Complete the table of values for $y = x^2 - 2x$

SUBSTITUTE x VALUES INTO EQUATION **[2 marks]**

x	−1	0	1	2	3
y	3	0	−1	0	3

$y = (-1)^2 - 2x(-1)$ $y = 2^2 - 2x2$ $y = 3^2 - 2x3$

$= 1 + 2$ $= 4 - 4$ $= 9 - 6$

$= 3$ $= 0$ $= 3$

10 (b) Draw the graph of $y = x^2 - 2x$ for values of x from −1 to 3
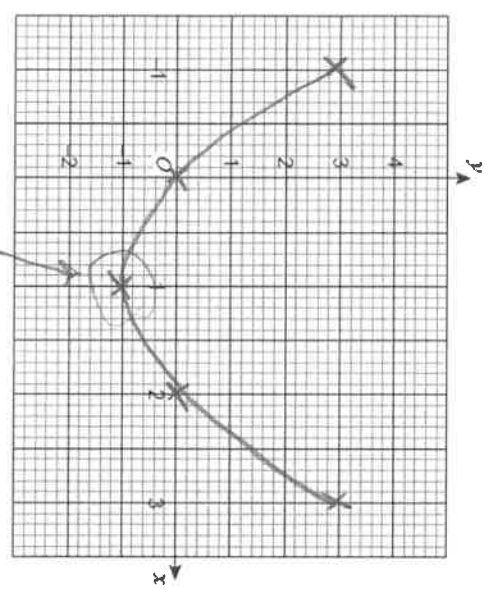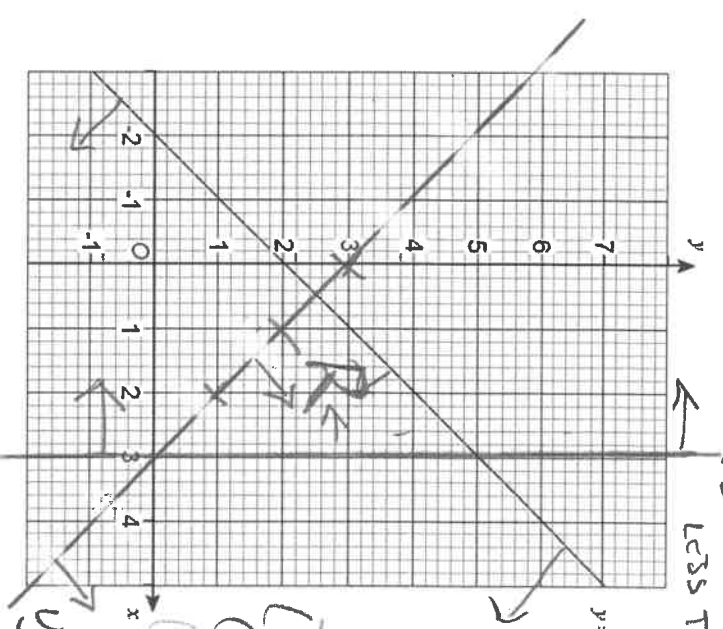
[2 marks]

10 (c) Write down the coordinates of the turning point of the graph.

$(1, -1)$

[1 mark]

---

19 The grid shows the graph of $y = x + 2$

$x < 3$ SOLID LINE AS "LESS THAN "OR EQUAL"

$y = x + 2$

LESS THAN

DRAW $y = 3 - x$

x	y
0	3) $y = 3 - 0$
1	2) $y = 3 - 1$
2	1) $y = 3 - 2$

$y > 3 - x$

On the grid, identify the region represented by

$y \leqslant x + 2$ and $y > 3 - x$ and $x < 3$

Label the region R.

VERTICAL LINE STRAIGHT **[3 marks]**

---

13 A circle has equation $x^2 + y^2 = 4$

Circle the length of its radius.

$x^2 + y^2 = r^2$

So $r^2 = 4$, $r = 2$

2	4	8	16

[1 mark]

---

1 The equation of a line is $y = 2x - 1$

Circle the point that is the intercept with the y-axis.
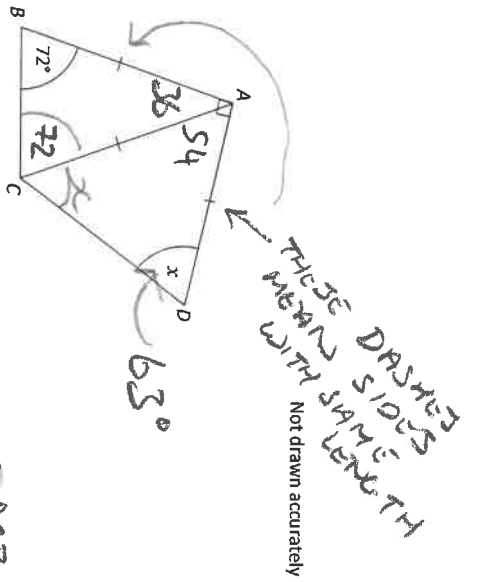
Y INTERCEPT, So $(0, -1)$

$(1, -1)$	$(0, -1)$	$(-1, 0)$	$(0, \frac{1}{2})$	$(\frac{1}{2}, 0)$

[1 mark]

1 $AB = AC = AD$

Angle $BAD = 90°$

THESE DASHES MEAN SIDES WITH SAME LENGTH

Not drawn accurately

Work out the size of angle x.

You **must** show your working which may be on the diagram.

[4 marks]

TRIANGLE ABC IS ISOSCELES SO ANGLE $ACB = 72°$

$\angle BAC = 180 - 72 - 72 = 36°$ $\angle CAB = 90 - 36 = 54$

$\angle ACD = \angle ADC = x$ AS ISOSCELES

$x = \dfrac{180 - 54}{2} = 63°$

2   The diagram shows a solid cone.

Not drawn accurately

$r = 5$
$d = 10$
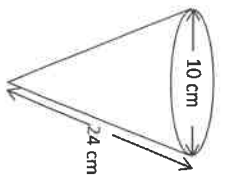
SURFACE AREA = AREA OF CURVED SURFACE + BASE

$= \pi r l + \pi r^2$

You are given that   curved surface area of a cone $= \pi \times$ radius $\times$ slant height $= l$

Work out the **total** surface area of the cone in terms of π.

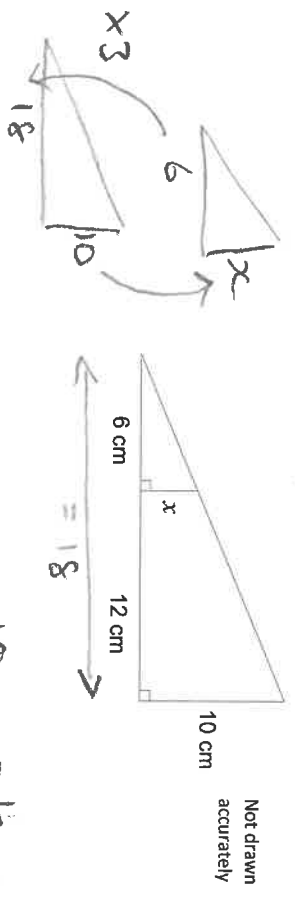$SA = \pi \times 5 \times 24 + \pi \times 5^2$

$= 120\pi + 25\pi = 145\pi \ cm^2$ ANS

[4 marks]

1   Which of these is **not** a condition for congruent triangles?

Circle the correct answer.

[1 mark]

SSS   (AAA)   ASA   RHS

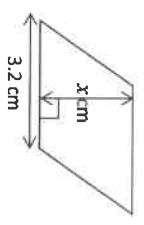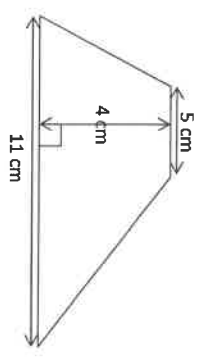**2**   SIMILAR TRIANGLES

Not drawn accurately

×3
18
6
10

Work out the length x. $10 \div 3 = \dfrac{10}{3}$ or $3\frac{1}{3}$ or 3.3

$= 18$

[2 marks]

2   Not drawn accurately

AREA OF TRAPEZIUM $= \dfrac{1}{2}(5+11) \times 4$

$= \dfrac{1}{2} \times 16 \times 4 = 8 \times 4 = 32 \ cm^2$

AREA OF PARALLELOGRAM $= 3.2 \times x = 3.2x$

$4 \times 3.2x = 32$

$12.8x = 32$

$x = 32 \div 12.8$

$x = 2.5 \ cm$ ANS

The area of the trapezium is four times the area of the parallelogram.

Work out the value of x.

[3 marks]

2 (a) Work out the exterior angle of a hexagon.
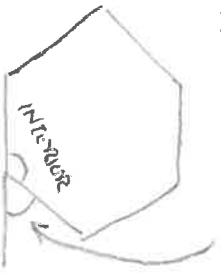
[2 marks]

$360 \div 6 = 60°$

2 (b) Write down the interior angle.

[1 mark]

$180 - 60 = 120°$

INTERIOR

60 EXTERIOR
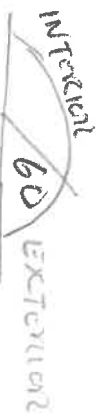
ANGLES ON STRAIGHT LINE ADD TO 180°

1 What is the value of sin A for this triangle?

Not drawn accurately

B

2 cm

√13

C 3 cm A
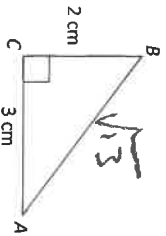
$\sin A = \dfrac{\text{OPPOSITE}}{\text{HYPOTENUSE}}$

HYPOTENUSE $= \sqrt{2^2 + 3^2}$

$= \sqrt{4+9}$

$= \sqrt{13}$

$\sin A = \dfrac{2}{\sqrt{13}}$

Circle your answer.

[1 mark]

$\dfrac{2}{3}$ $\dfrac{2}{5}$ $\dfrac{2}{\sqrt{13}}$ $\dfrac{3}{\sqrt{13}}$

1 Here is a triangular prism.

It has a volume of 60 cm³.

h

5 cm

8 cm
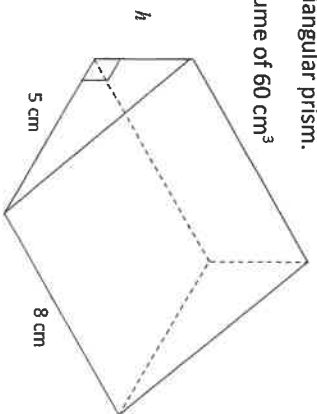
Work out the height, h.

[3 marks]

VOLUME = AREA OF CROSS SECTION × LENGTH

$= \frac{1}{2} \times 5 \times h \times 8$

$= 20h$

BUT $20h = 60 \text{ cm}^3$

$h = 60 \div 20$

$h = 3 \text{ cm}$ ANS

CHECK $\frac{1}{2} \times 5 \times 3 \times 8 = 60 \text{ cm}^3$ ✓

7 50 people took a test.

Before the test, they predicted whether they would pass or fail.
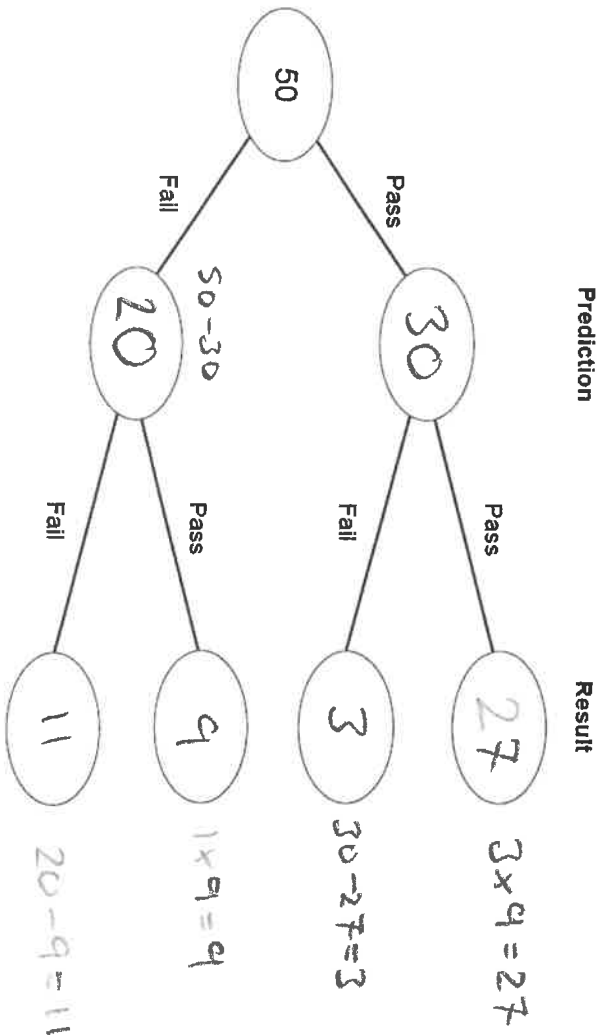
30 people predicted they would pass.

36 people did pass.

Of these 36 people, three times as many predicted pass as predicted fail.

Complete the frequency tree.

So, 3 + 1 = 4 PARTS

36 ÷ 4 = 9

| | Prediction | Result |

50

Pass

30

Fail 50 - 30

20

Pass

27   3 × 9 = 27

Fail

3   30 - 27 = 3

Pass

9   1 × 9 = 9

Fail

11   20 - 9 = 11

[3 marks]

5 A spinner lands on red, blue or green.

The relative frequencies after 400 spins are shown.

Colour	red	blue	green
Relative frequency	0.35	0.5	0.15

How many more times did it land on red than green?

[2 marks]

RED = 0.35 × 400 = 140

GREEN = 0.15 × 400 = 60

140 - 60 = 80

11 Two ordinary fair dice are rolled.

11 (a) Complete the tree diagram.

[1 mark]

1st dice   2nd dice

$\frac{1}{6}$ 4

5/6   Not 4

$\frac{1}{6}$ 4

5/6   Not 4

$\frac{1}{6}$ 4

5/6   Not 4

P(4,4) = $\frac{1}{6} \times \frac{1}{6}$

= $\frac{1}{36}$
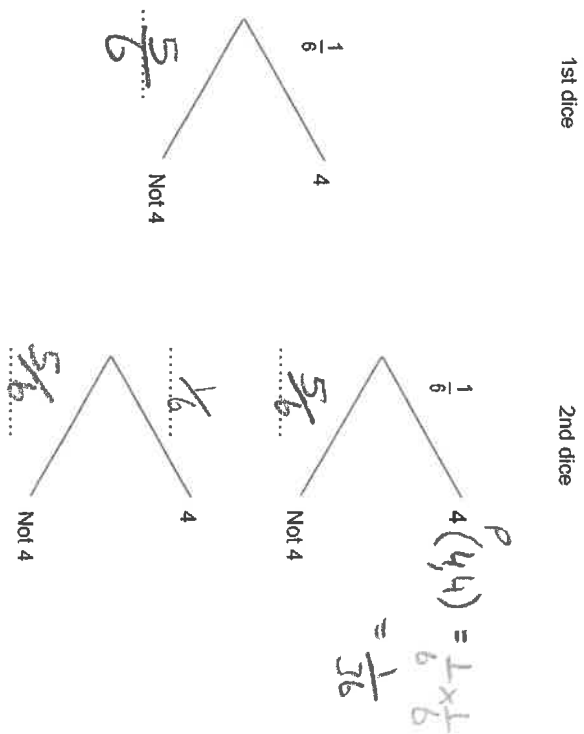
2 The probability that a biased coin lands on heads is $\frac{2}{3}$

The coin is spun twice.

Circle the probability of two heads.

$\frac{2}{9}$ $\frac{4}{6}$ $\boxed{\frac{4}{9}}$ $\frac{4}{3}$

[1 mark]

$\frac{2}{3} \times \frac{2}{3} = \frac{4}{9}$

11 (b) Circle the probability that **both** dice land on 4

[1 mark]

$\frac{1}{4}$ $\frac{2}{12}$ $\frac{2}{6}$ $\frac{1}{12}$ ⟨$\frac{1}{36}$⟩

$$P(4,4) = \frac{1}{6} \times \frac{1}{6} = \frac{1}{36}$$

11 (c) Work out the probability that at least one of the dice does **not** land on 4

[2 marks]

AT LEAST ONE DOESN'T LAND ON 4 MEANS
EITHER OR BOTH, SO THIS IS ALL THE OTHER
OPTIONS, SO

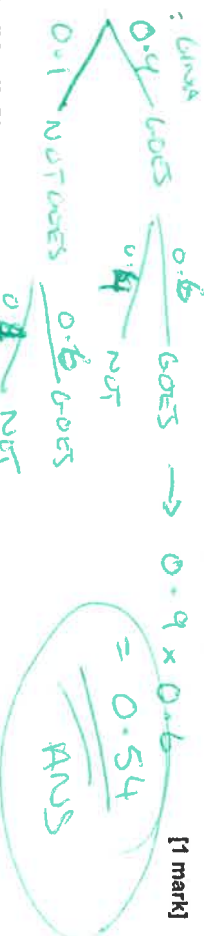$$1 - \frac{1}{36} = \frac{36}{36} - \frac{1}{36} = \frac{35}{36}$$

18 The probability that Gina goes to the gym on Saturday is 0.9
The probability that Dave goes to the gym on Saturday is 0.6
These probabilities are **independent**.

18 (a) Calculate the probability that **both** Gina and Dave go to the gym on Saturday.

[1 mark]

GINA
0.9   GOES → 0.9 × 0.6
0.1   NOT GOES
    0.6 GOES   = 0.54
    0.6 GOES   ⟨ANS⟩

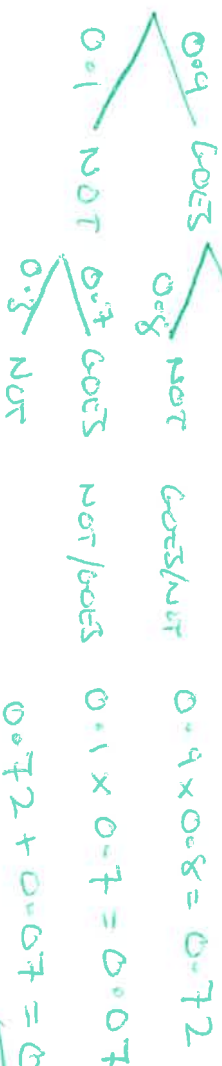**18 (b)** If Gina goes to the gym on Saturday the probability that she goes on Sunday is 0.2
If Gina does **not** go to the gym on Saturday the probability that she goes on Sunday is 0.7

Calculate the probability that Gina goes to the gym on exactly **one** of the two days.

[4 marks]

FOR GINA ONLY ON JUST ONE DAY

SAT   SUN
0.9   GOES   0.8   NOT   0.9 × 0.8 = 0.72
    0.2   GOES
0.1   NOT   0.7   GOES   0.1 × 0.7 = 0.07
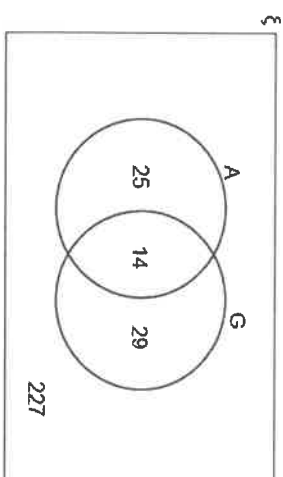   0.3   NOT

0.72 + 0.07 = 0.79 ⟨ANS⟩

25 In the Venn diagram
ξ = 295 students in a college
A = students who take Art
G = students who take Geography

25 (a) One student is chosen at random.
Work out the probability the student takes Art.

[1 mark]

$\frac{39}{295}$ TOTAL ART = 25 + 14
          = 39

25 (b) One student who takes Geography is chosen at random.
Work out the probability the student **also** takes Art.

[1 mark]

TOTAL GEOGRAPHY = 14 + 29
          = 43

SO 14 OF THESE STUDY ART.

THEREFORE

$\frac{14}{43}$

7 At a nursery, the mean age of 4 children is 31 months.

Katy joins the nursery.

The mean age of all 5 children is now 30 months.

Work out the age of Katy.

[4 marks]

$$\text{MEAN AGE} = 31 = \frac{\_+\_+\_+\_}{4}$$

$$\text{TOTAL AGES} = 31 \times 4 = 124$$

TOTAL AGE FOR FIVE CHILDREN $= 5 \times 30 = 150$

KATY $= 150 - 124 = 26$ MONTHS

9 Here is a frequency table for the times taken to solve a puzzle.

Times, t (min)	Frequency
$0 < t \leq 1$	38
$1 < t \leq 2$	16
$2 < t \leq 3$	17
$3 < t \leq 4$	15
$4 < t \leq 5$	14
	Total = 100

$38 + 16 = 54$ 54 TIMES

Circle the class interval that contains the median.

[1 mark]

$0 < t \leq 1$ $1 < t \leq 2$ $2 < t \leq 3$ $3 < t \leq 4$

MEDIAN MUST BE HALF OF 100 = 50

SO NEED CLASS INTERVAL FOR 50th

SO 50th IS IN $1 < t \leq 2$

10 A charity collection was made.

Information about the amounts given by men is shown in the table.

Amount, x (£)	Midpoint	Number of men	
$0 < x < 5$	2.5 $\times$	11 =	27.50
$5 \leq x < 10$	7.5 $\times$	7 =	52.50
$10 < x < 15$	12.5 $\times$	2 =	25
		Total = 20	105

[4 marks]

The mean amount given by **women** was £6.30 per person.

Compare the mean amounts given by **men** and **women**.

ESTIMATE OF MEAN FOR MEN

$$= \frac{105}{20} = £5.25$$

SO WOMEN GIVE MORE ON AVERAGE THAN MEN

11 Five integers have

a mode of 6

a median of 8

a mean of 10

What is the **greatest** possible range of the five integers?

You **must** show your working.

[3 marks]

6 6 8 9 21

$21 - 6 = 15$ ANS

MEAN OF 10 MEANS THE TOTAL OF THE NUMBERS ADDED TOGETHER IS $10 \times 5 = 50$

$50 - 8 - 6 - 6 = 30$ LAST TWO NUMBERS

NUMBERS COULD BE 14 AND 16 (ADD TO 30) BUT LAST NUMBER HAS TO BE AS BIG AS POSSIBLE, SO $30 - 9 = 21$

Booster day (Higher): Representation of Data

5 The scatter graph shows the number of driving lessons and the number of tests needed to pass by 10 people.

Number of tests needed to pass (y-axis, 0 to 7)
Number of driving lessons (x-axis, 0 to 70)
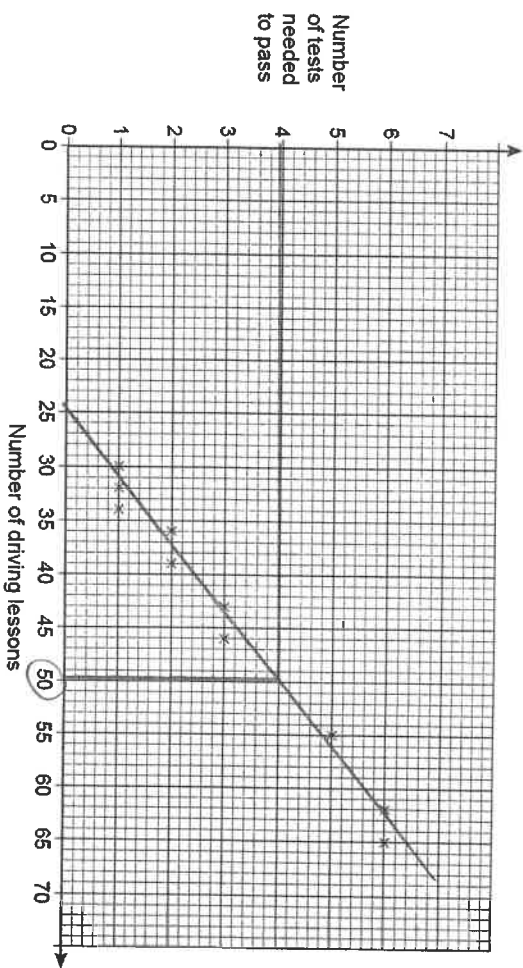
5 (a) Describe the correlation.

Circle your answer.

(strong positive)   weak positive   weak negative   strong negative

[1 mark]

5 (b) Use a line of best fit to estimate the number of tests needed to pass by a person who has 50 lessons. DRAW LINE UP FROM 50 THEN

ACROSS = 4

[2 marks]

5 (c) Meera says,

"I can use the trend to predict the number of driving tests needed to pass for any number of driving lessons."

Comment on her statement.

[1 mark]

THE TREND DOES NOT TAKE INTO ACCOUNT THE
ABILITY OF DIFFERENT STUDENTS. SOME MAY
NEED MORE, AND SOME LESS

---

18 Here is some information about the times, in minutes, 80 teachers took to get to work.
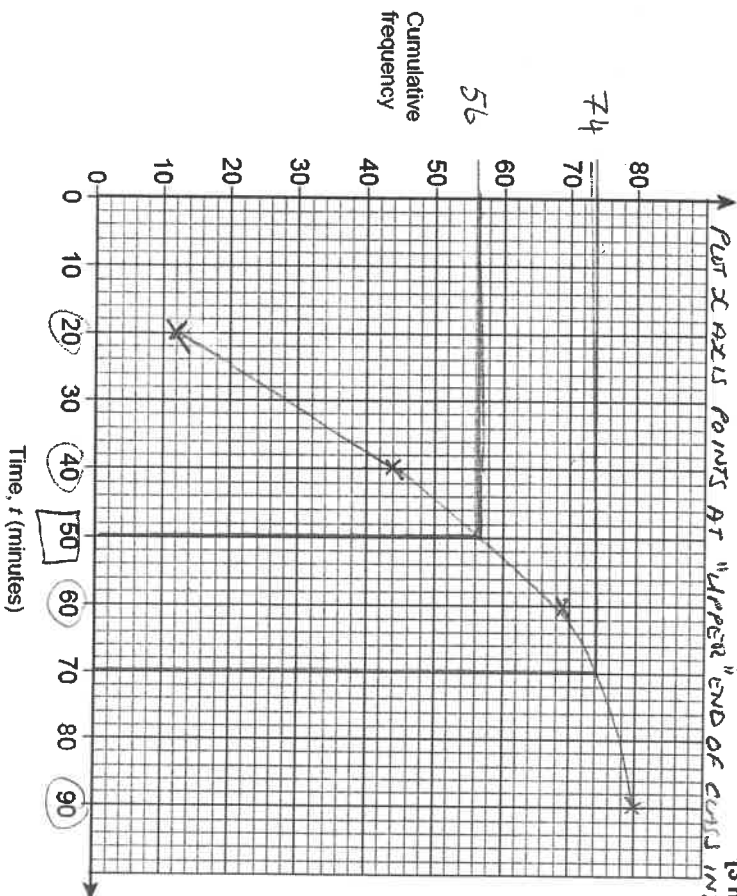
Time t (minutes)	Frequency	CUMULATIVE FREQUENCY
0 < t ≤ 20	12	12
20 < t ≤ 40	32	12+32 = 44
40 < t ≤ 60	25	44+25 = 69
60 < t ≤ 90	11	69+11 = 80

18 (a) On the grid, draw a cumulative frequency graph.

PLOT POINTS AT "UPPER" END OF EACH INTERVAL
PLOT x AXIS POINTS ON y AXIS FOR CUMULATIVE FREQUENCY

[3 marks]

Cumulative frequency (y-axis, 0 to 80)
Time, t (minutes) (x-axis, 0 to 90)

74
56

18 (b) Estimate the number of teachers who took between 50 minutes and 70 minutes to travel to work.

DRAW LINES UP FROM 50 AND 70, ACROSS
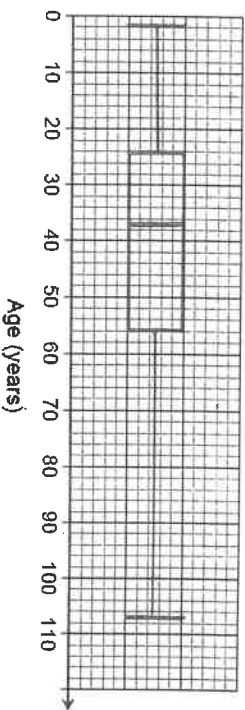AND TAKE READING FROM y AXIS:

74 - 56 = 18

19 In the UK in 2000

25% of the population were under 24 years old

50% of the population were under 37 years old

the inter-quartile range of the ages was 32 years

the oldest person was 107 years old.

19 (a) Show the information on a box plot.

[3 marks]

(LQ) UPPER QUARTILE = INTERQUARTILE RANGE + LQ

= 32 + 24 = 56

LOWEST AGE CAN BE O, OR 1 YEARS OLD

Age (years)

19 (b) It is predicted that in 2050 the age distribution in the UK will have

lower quartile   26 years

median   44 years

upper quartile   66 years

Make two comments about the predicted change in the age distribution in the UK from 2000 to 2050
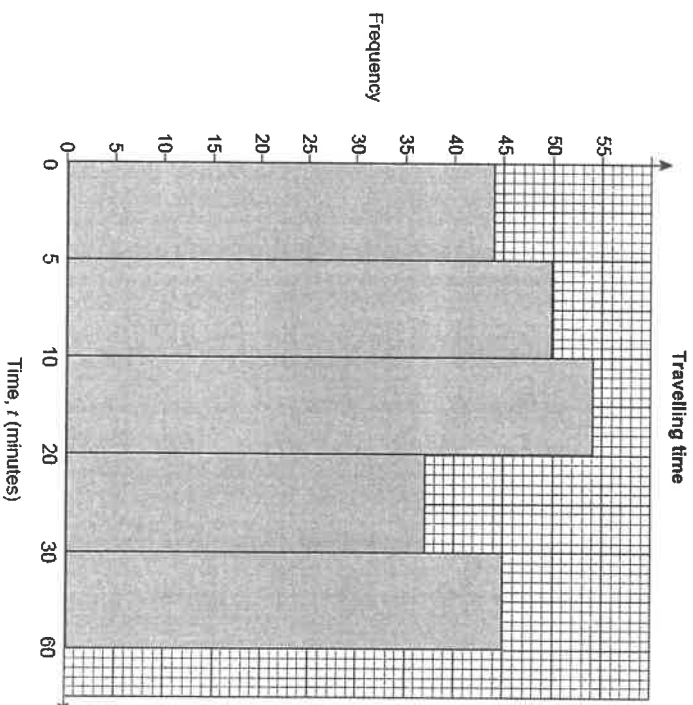
[2 marks]

1. IF THE MEDIAN GOES UP FROM 37 TO 44 THEN AVERAGE INCREASES ALSO

2. NEW INTER-QUARTILE RANGE = 66 - 26 = 40

SO IQR RISES BY 8 YEARS, SO VALUES OF AGES ARE MORE SPREAD OUT.

---

17 Joe asked 230 students how long it took them to travel to school.

The results are shown in the table.

Travelling time, t (minutes)	Number of students
$0 < t \leqslant 5$	44
$5 < t \leqslant 10$	50
$10 < t \leqslant 20$	54
$20 < t \leqslant 30$	37
$30 < t \leqslant 60$	45

This is Joe's attempt to draw a histogram to show the data.

Travelling time

Frequency

Time, t (minutes)

Make **two** criticisms of his histogram.

[2 marks]

1. IT SHOULD SAY "FREQUENCY DENSITY" ON THE Y AXIS

2. THE BARS ON THE GRAPH SHOULD BE DIFFERENT WIDTHS TO MATCH THE CLASS INTERVALS